Year 1 Monitoring Report for Stream Mitigation of South Muddy Creek Tributaries
(Queen Property)

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

Prepared for:
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Submitted: September 2007

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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 Tributary 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 geomorphological 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 1 Annual Monitoring for this project.

Monitoring of the vegetation was completed in September 2006 using the methodology of the Carolina Vegetation Survey. Stem counts completed in 30 vegetation plots showed an average density of 284 stems per acre for the site. This density does not meet the success criteria of 320 stems/acre after three years of monitoring. Eighteen of the thirty vegetation plots fall below this threshold number; these plots are scattered throughout the project area. Additional trees and shrubs were planted in April, 2007 to bring the average live stem density to 390 stems per acre, meeting the three year threshold of 320 stems per acre.

Monitoring of the stream identified a number of problem areas along the tributaries of South Muddy Creek, including areas of aggradation, bank failure and bank scour. The problem areas along the streams appear to be limited to only a few areas for each tributary, concentrated within a few hundred feet of channel length. Areas of erosion have resulted in bank scour along meander bends or around riffles and log sills. A few areas of aggradation have resulted in bar formation in the channel near riffle areas. Despite the few areas along meander bends and in the general stream bed with erosion and sedimentation problems, the majority of the stream channels remained stable. The median particle sizes of the stream channels ranged from very fine to very coarse gravel in the riffle/run areas, and silt to fine sand in the pool/glide areas. Remedial maintenance work on the stream channel is not planned 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 this project are designated as Tributary A, A2, B and C. Tributaries A, B and C confluence directly with South Muddy Creek. Tributary A2 confluences with Tributary A.

The directions to the project site are as follows:

> 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 pastureland for cattle 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 geomorphological 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

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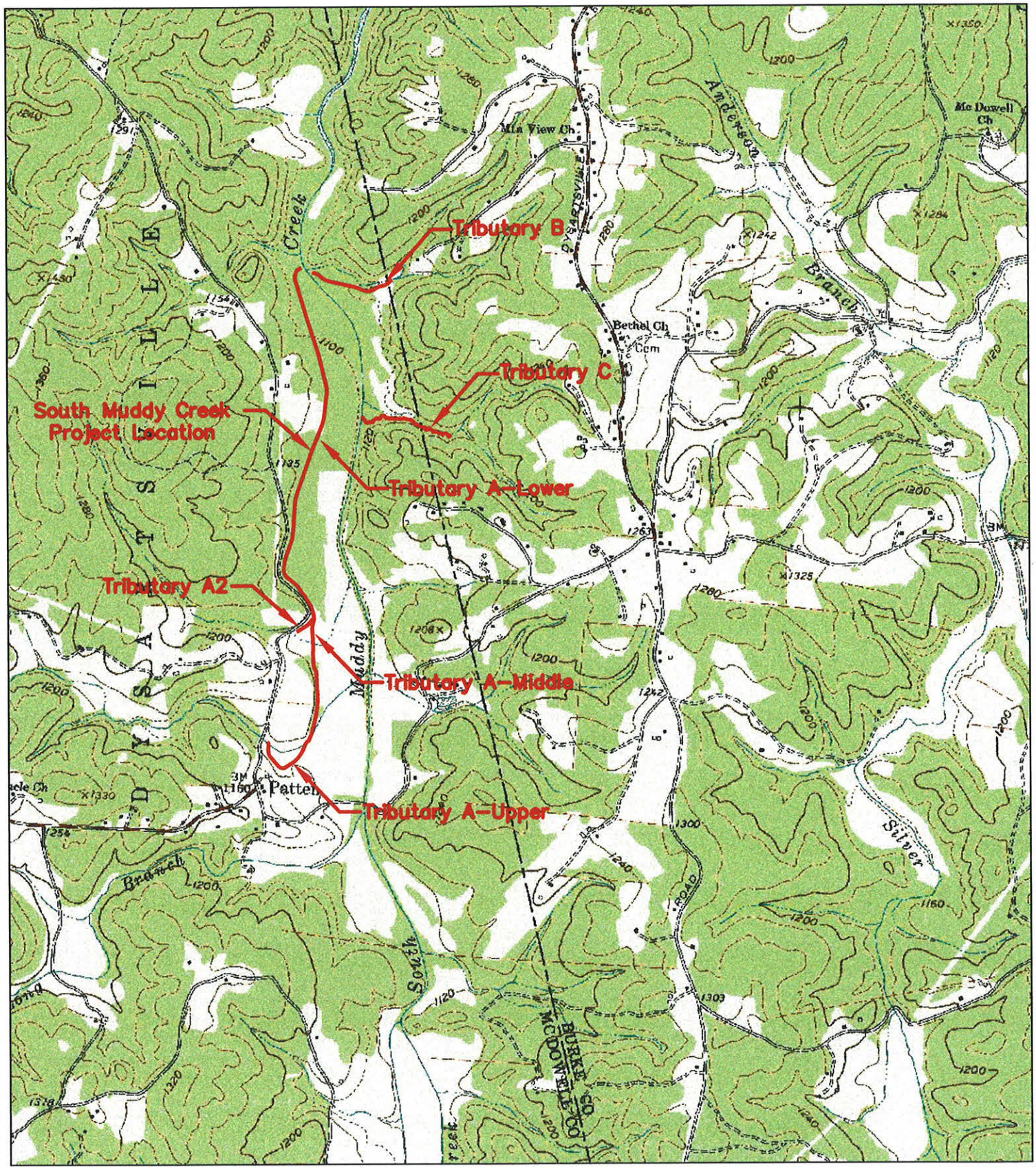
SOUTH MUDDY CREEK TRIBUTARIES

MONITORING

FIGURE 1

Date:	September, 2007	Job No.	2004-2359	Scale:	1" = 2000'



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 0.0014 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 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 riffle/pool sequences.

Enhancement Level I was accomplished 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 of Tributary C provided 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. 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 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 will permanently exclude cattle from this project reach. The fencing along Tributary C limits cattle access to a single point along the stream that is reinforced with stone underlain by non-woven fabric to prevent degradation that would otherwise occur. All fencing has been placed at the outer edge of the conservation easement.

Information on the project structure and objectives is included in Tables I and II as follows:

Table I. Project Structure Table
South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01

Project Segment/Reach ID	Linear Footage or Acreage
A (upper)	1,609 l.f.
A (middle)	1,094 l.f.
A	1,052 l.f.
A (lower)	7,349 l.f.
A2	480 l.f.
B	2,041 l.f.
C	1,601 l.f.
TOTAL	**15,226 l.f.**

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
A	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
B	Restoration	Priority 2	2,041 l.f.	Restore dimension, pattern, and profile
C	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 Exhibit Table III. The project contact information is provided in Exhibit 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%[1]	N/A	N/A	N/A
Construction	Feb 2006	N/A	Apr 2006
Temporary S&E applied to entire project area[2]	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		
Year 3 monitoring	2008		
Year 4 monitoring	2009		
Year 5 monitoring	2010		

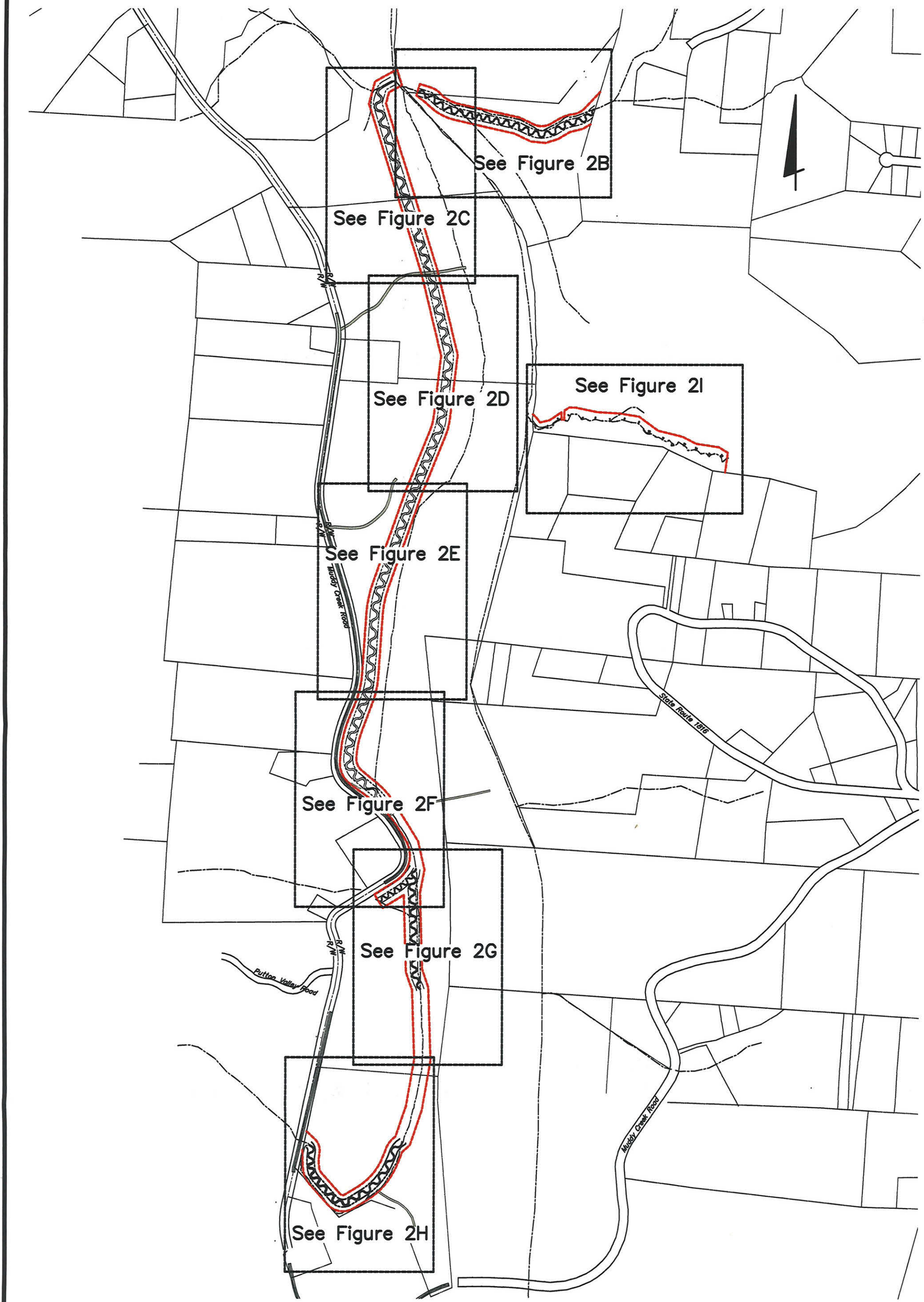
[1]Full-delivery project; 90% submittal not provided.

[2]Erosion and sediment control applied incrementally throughout the course of the project.

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 Vegetation Monitoring POC	Warren Knotts, EMH&T Holly Blunck, EMH&T

Table V. Project Background Table South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01	
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 -3rd Tributaries A2, B, C - 2nd
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	C
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



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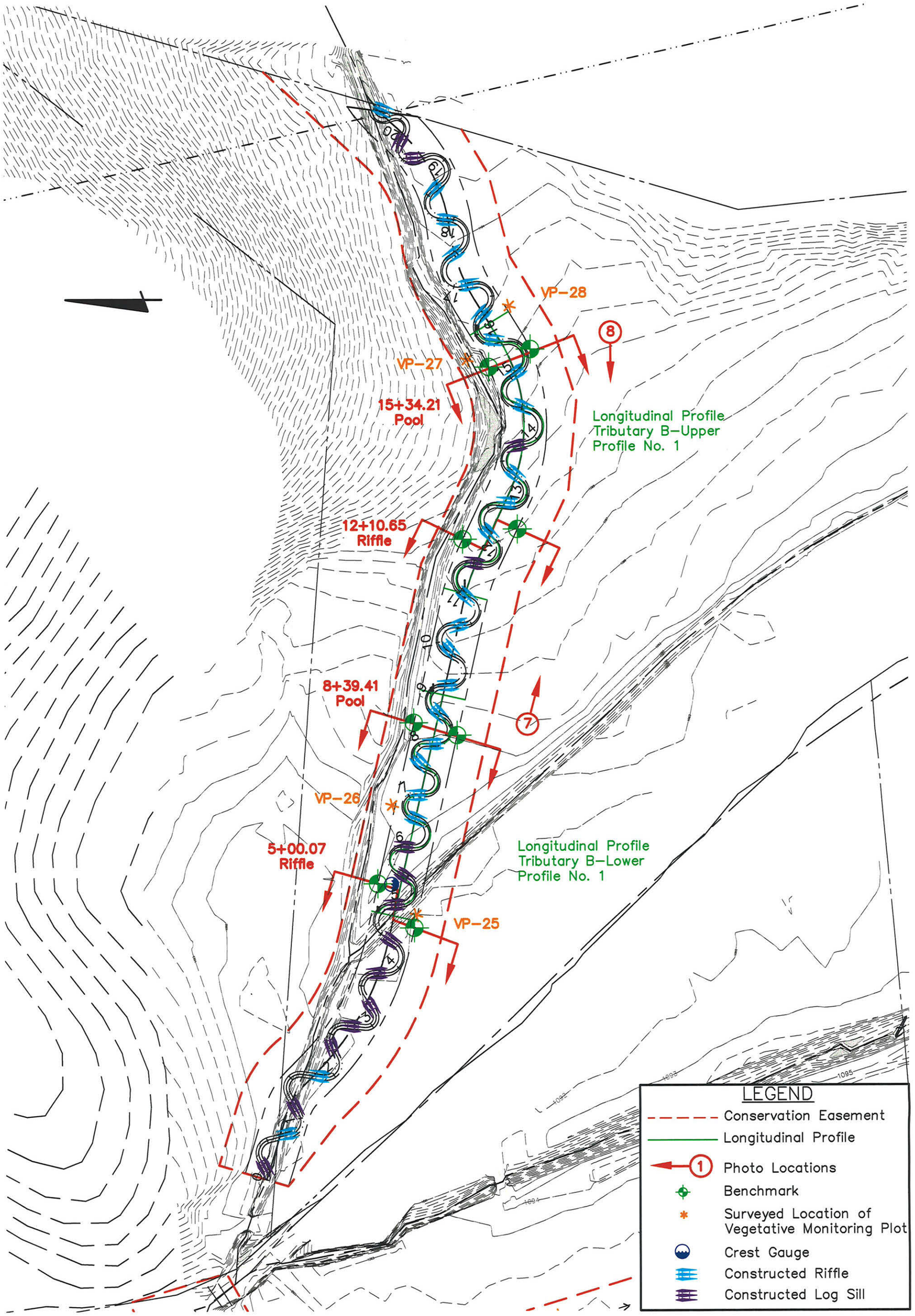
SOUTH MUDDY CREEK TRIBUTARIES

MONITORING

FIGURE 2A

INDEX MAP

Date:	September, 2007
Scale:	1" = 600'
Job No:	2006-1627



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SOUTH MUDDY CREEK TRIBUTARIES

MONITORING

FIGURE 2B
TRIBUTARY B

Date: September, 2007

Scale: 1" = 600'

Job No: 2006-1627

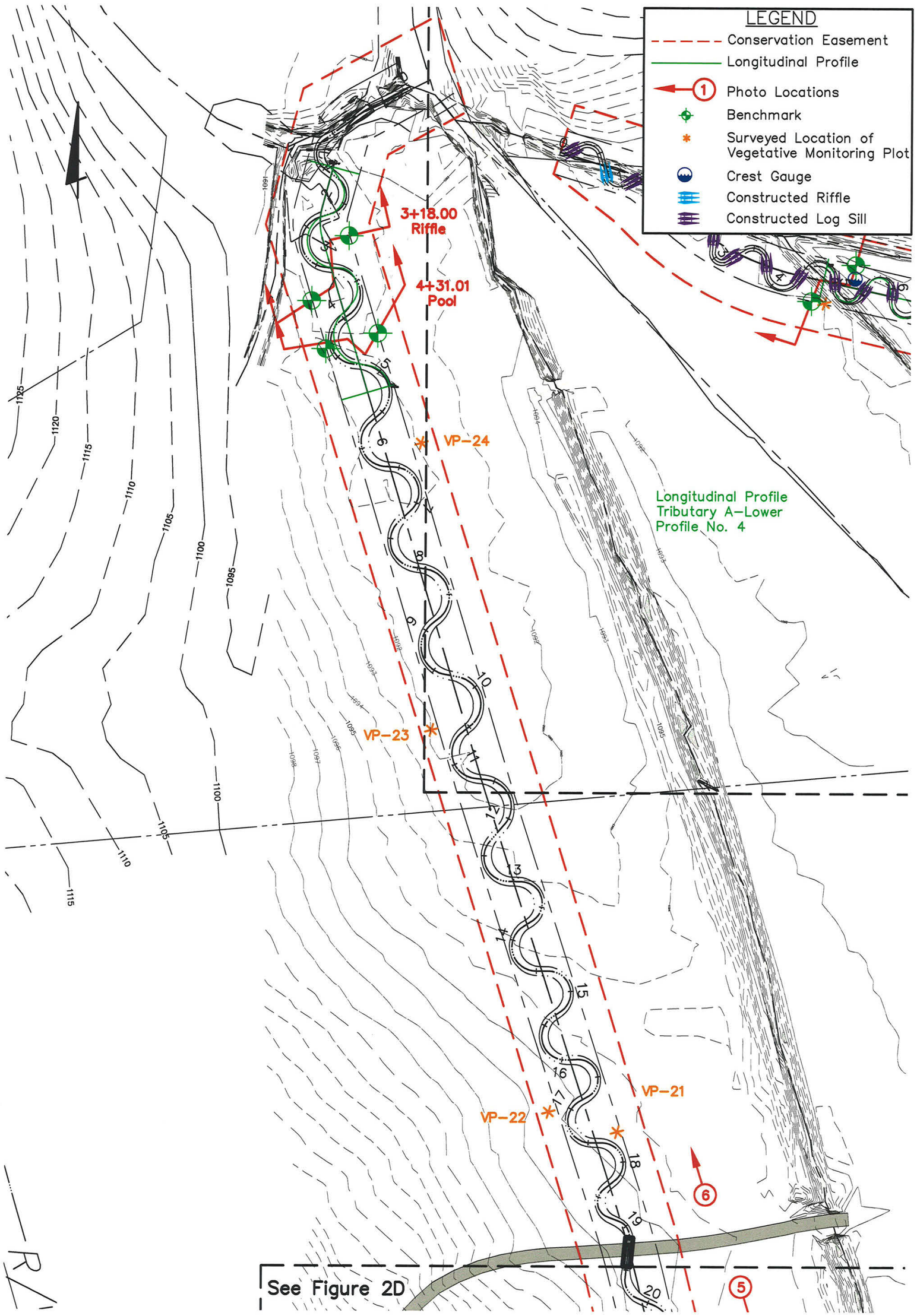

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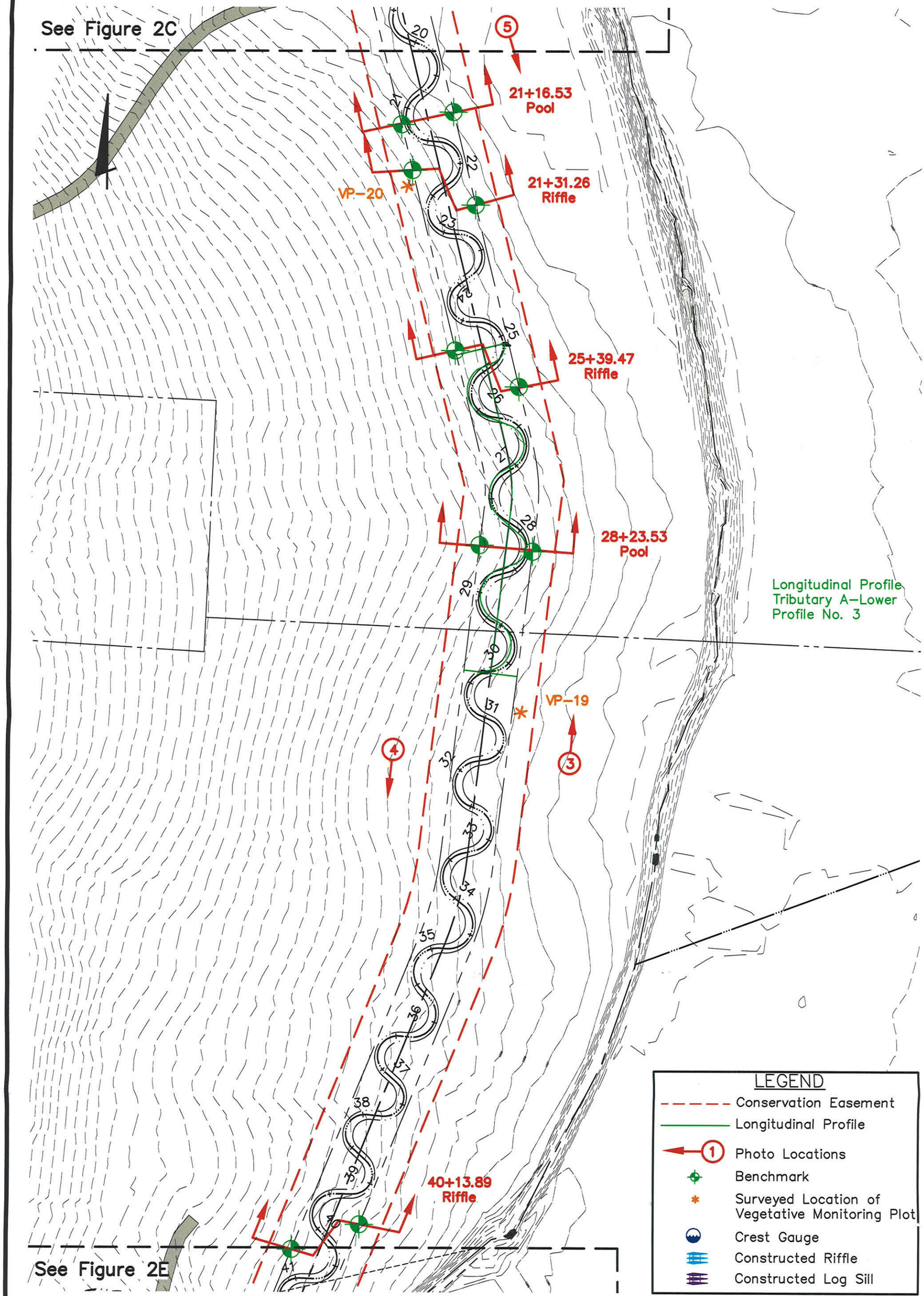
FIGURE 2C

TRIBUTARY A - LOWER

Date:	September, 2007
Scale:	1" = 100'
Job No:	2006-1627



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MONITORING

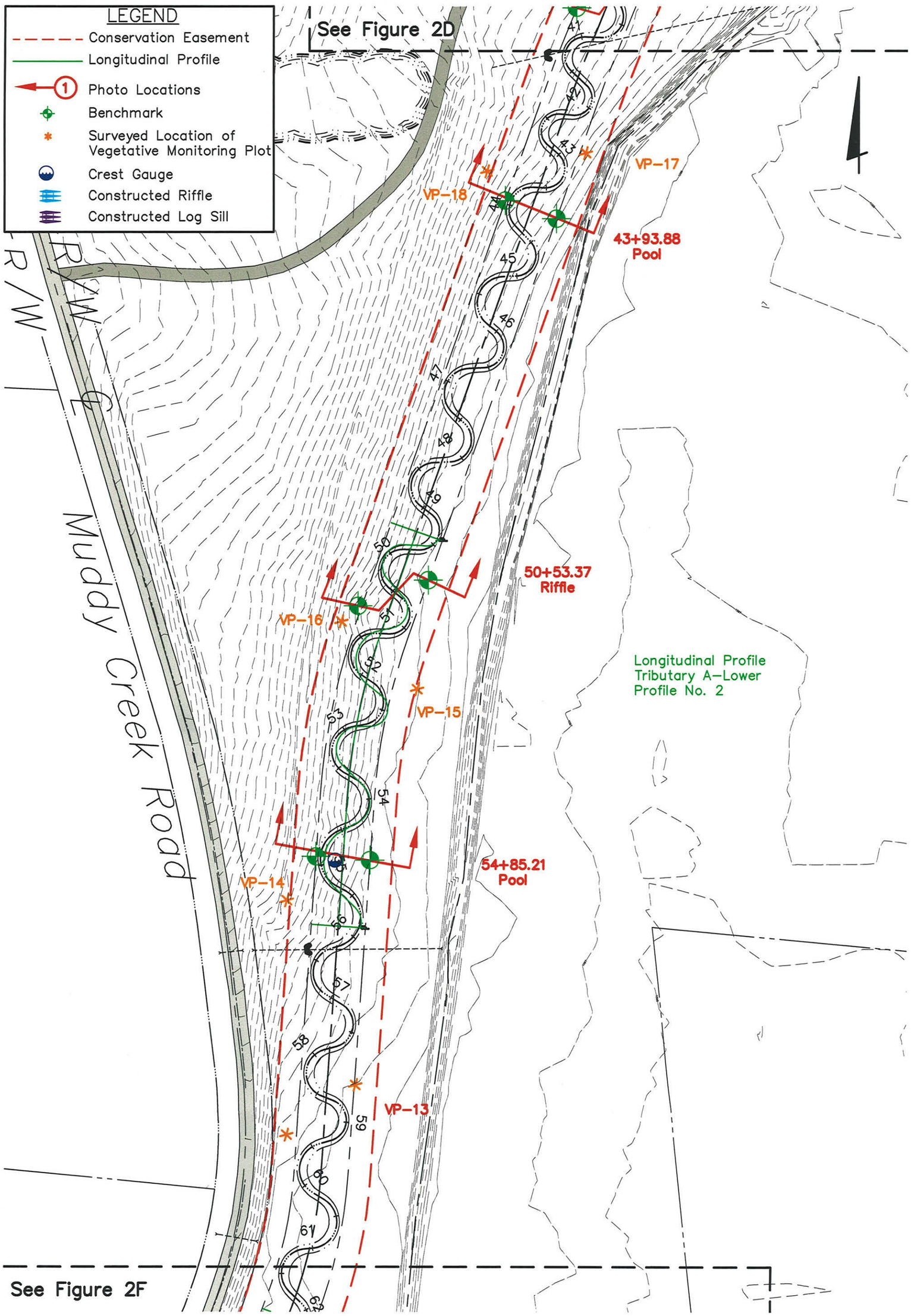
FIGURE 2D

TRIBUTARY A - LOWER

Date: September, 2007

Scale: 1" = 100'

Job No: 2006-1627



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MONITORING

FIGURE 2E

TRIBUTARY A - LOWER

Date:	September, 2007
Scale:	1" = 100'
Job No:	2006-1627

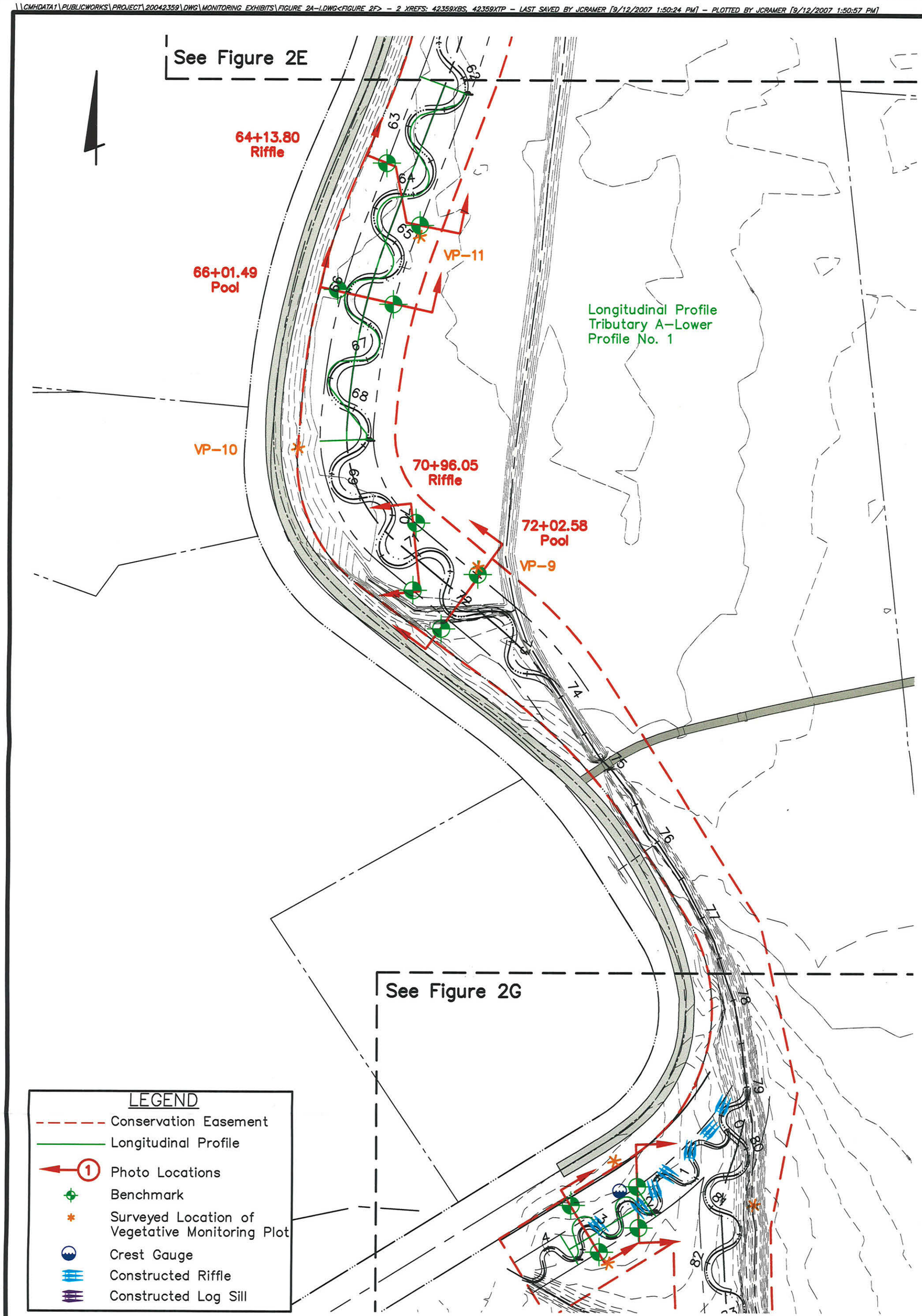

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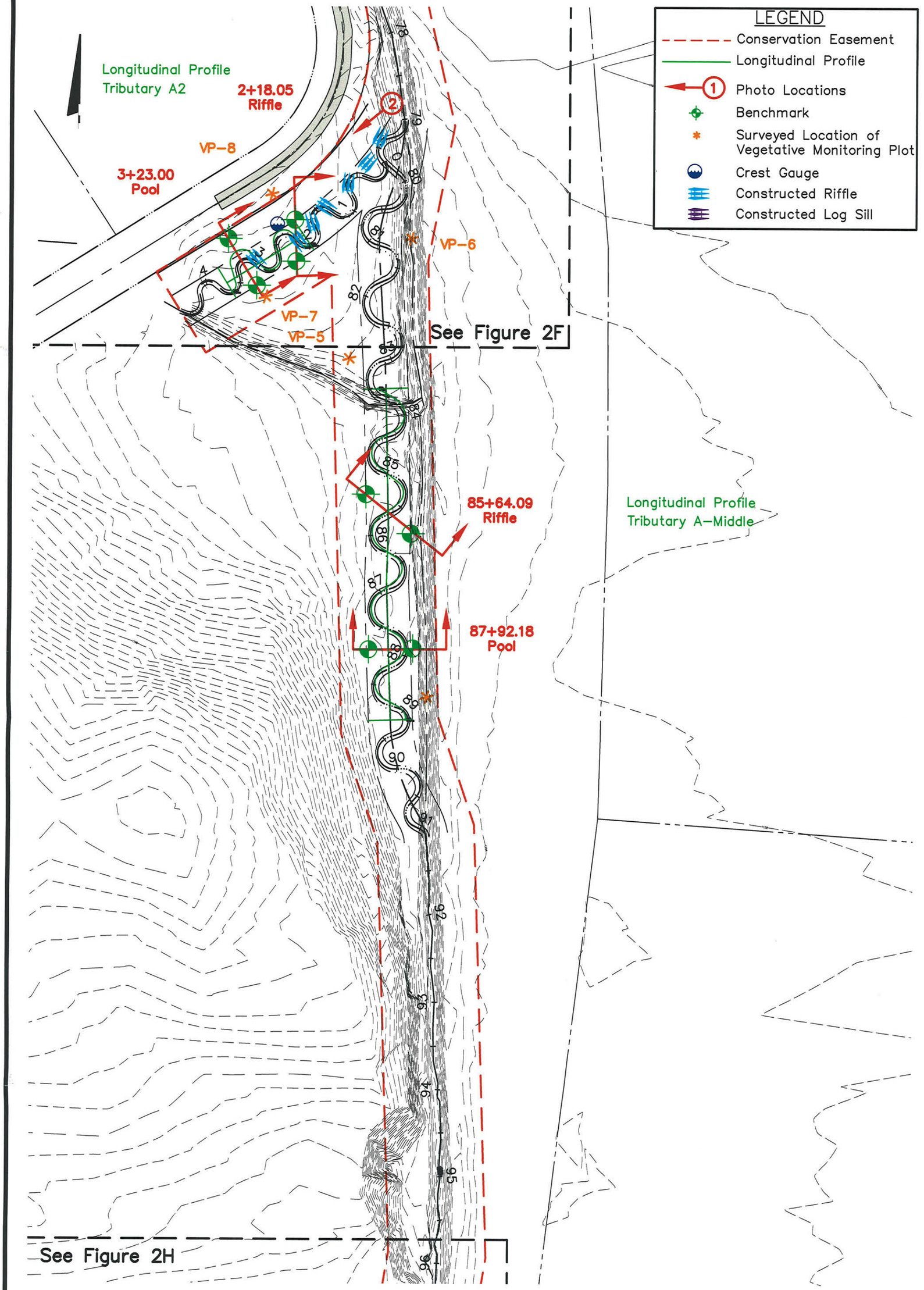
FIGURE 2F

TRIBUTARY A - LOWER

Date: September, 2007

Scale: 1" = 100'

Job No: 2006-1627



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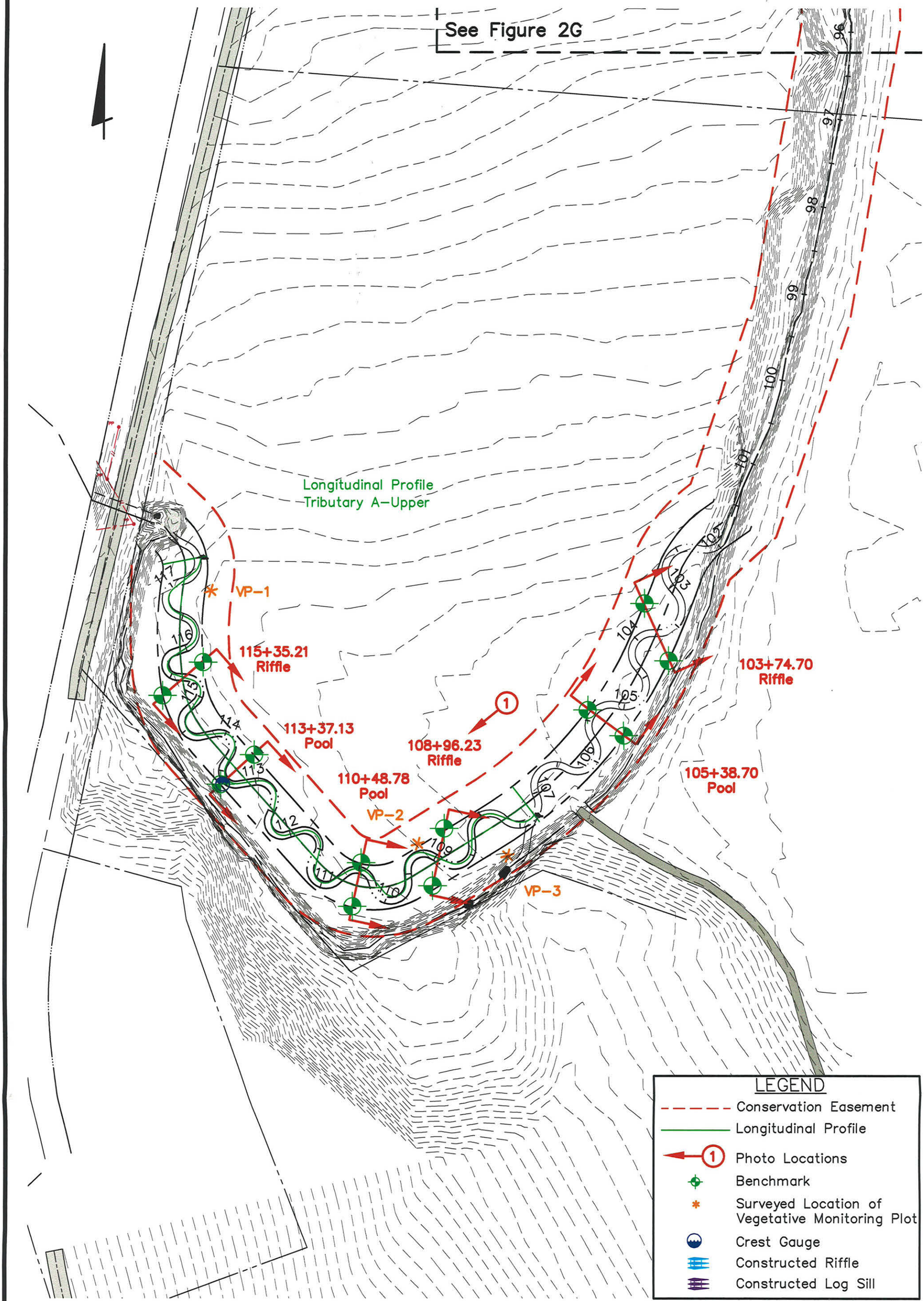
MONITORING

FIGURE 2G

TRIBUTARY A2 AND TRIBUTARY A - MIDDLE

Date:	September, 2007
Scale:	1" = 100'
Job No:	2006-1627



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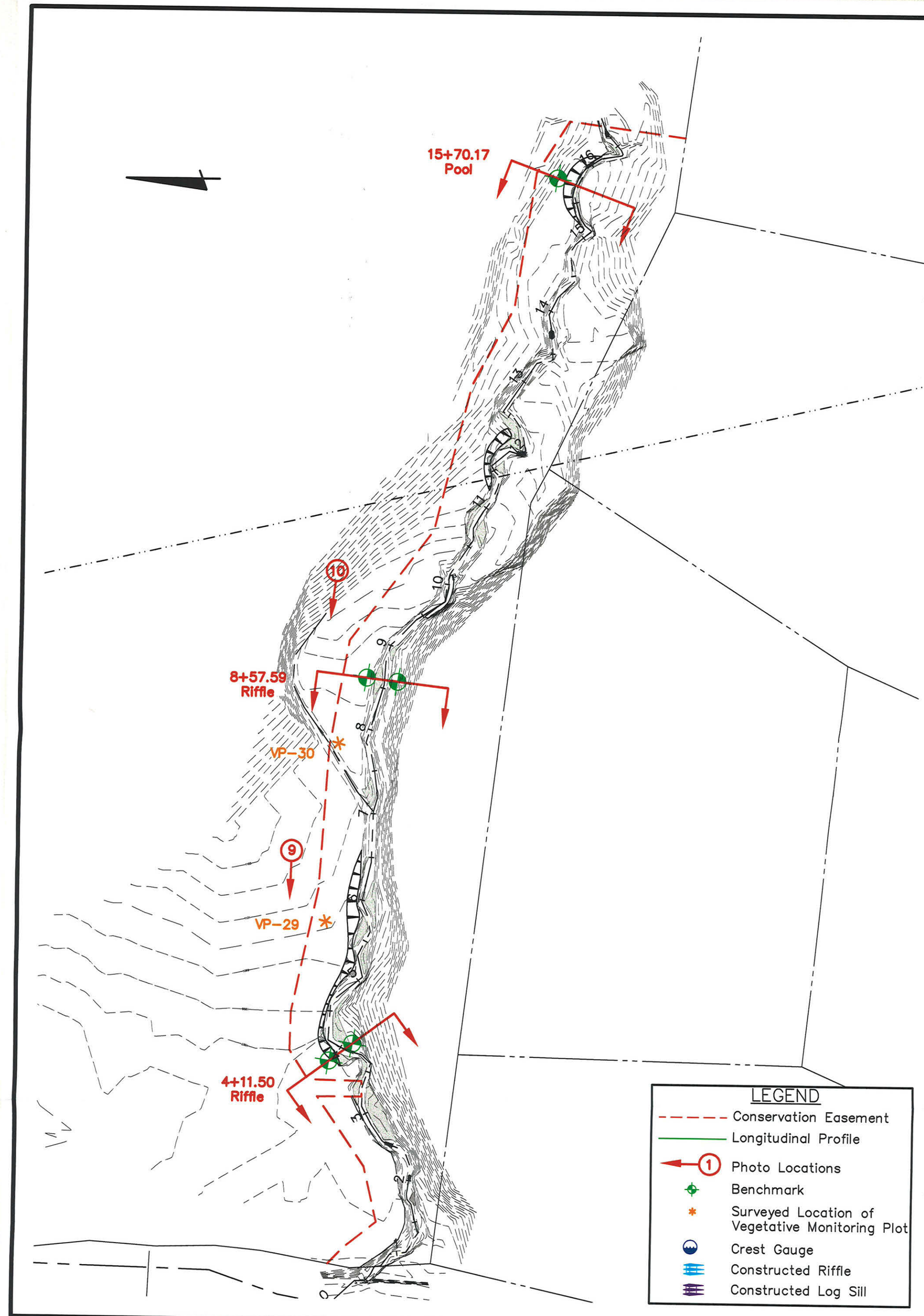
MONITORING

FIGURE 2H

TRIBUTARY A - UPPER

Date:	September, 2007
Scale:	1" = 100'
Job No:	2006-1627



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MONITORING

FIGURE 2I

TRIBUTARY C

Date: September, 2007

Scale: 1" = 100'

Job No: 2006-1627

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	T	OM %
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

2. Vegetative Problem Areas

Vegetative Problem Areas are defined as areas either lacking vegetation or containing populations of exotic vegetation. There were no problem areas identified along any of the tributaries in Monitoring Year 1 to report in Table VII. There are 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.

3. Vegetation Problem Area Plan View

The location of each vegetation problem area found in future monitoring years will be shown on a vegetative problem area plan view.

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*.

Table VIII. Stem counts for each species arranged by plot.
South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01

Species	Plots																													Year 1 Totals
	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	
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	8	13	7	10	7	8	7	10	7	6	7	7	5	8	4	4	7	4	5	11	3	8	7	8	11	6	11	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	284																														

The average stem density for the entire site falls below the minimum criteria of 320 stems per acre after three years. Eighteen 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). Only one seedling was found in these two plots. The remainder of the plots with an insufficient number of stems are scattered throughout the project area.

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. The following table provides the number of additional trees planted in each plot; these trees will be included in the vegetation monitoring protocol for the Year 2 Monitoring Report.

Plot	Number of Additional Trees	Plot	Number of Additional Trees
1	3	16	0
2	3	17	4
3	3	18	0
4	4	19	3
5	0	20	0
6	5	21	2
7	4	22	3
8	2	23	5
9	3	24	3
10	3	25	3
11	4	26	3
12	5	27	2
13	5	28	2
14	0	29	Unknown
15	5	30	Unknown

These additional trees bring the average live stem density to 390 stems per acre, meeting the three year threshold of 320 stems per acre.

5. Vegetation Plot Photos

Vegetation plot photos are provided in Appendix A.

B. Stream Assessment

1. Hydrologic Criteria

A network of six (6) crest-stage stream gages 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.

2. Stream Problem Areas

A summary of the areas of concern identified during the visual assessment of the stream is included in Table IX.

Table IX. Stream Problem Areas 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
	3+00 (A2)	Overwide channel, 40 feet aggraded	
Bank failure	79+50 (A Middle)	Mat failed; scour hole, 5'	SPA 2, SPA 3
	12+10 (B)	Complete loss of riffle, bank failure.	
Bank scour	103+00 (A Upper)	Large hole, scour (15 feet)	SPA 4, SPA 5, SPA 6
	83+30 (A Middle)	Sloughing, coir log undercut and fallen into pool (15 feet)	
	82+70 (A Middle)	Sloughing, coir log undercut and fallen into pool (15 feet)	
	3+00 (A Lower)	Sloughing	
	19+70 (B)	Channel scouring around log sill	
	18+50 (B)	Scour at outside meander bend; significant aggradation	
	16+00 (B)	Scour, matting loose and failing, bank slough	
	15+70 (C)	Bank scour/ sloughing	
	4+50 (C)	Bank scour/ sloughing	

A number of unstable areas were found along the tributaries of South Muddy, including areas of aggradation, bank failure and bank scour. Tributary A2 was the only section to have aggradation problems. The Upper and Lower sections of Tributary A only had one area of bank scour each, while Tributaries B, C and the Middle section of Tributary A each had a few areas of bank scour and/or bank erosion. The problem areas along the streams appear to be concentrated within a few hundred feet of channel length.

3. Stream Problem Areas Plan View

The location of each structural problem area is shown on the stream problem area plan view included in Appendix B.

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 19-20. 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 Xa through Table Xf. 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 Xa. 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	100%	100%				
B. Pools	100%	100%				
C. Thalweg	100%	100%				
D. Meanders	100%	96%				
E. Bed General	100%	100%				
F. Vanes / J Hooks etc.	N/A	N/A				
G. Wads and Boulders	N/A	N/A				

Table Xb. 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	100%	100%				
B. Pools	100%	100%				
C. Thalweg	100%	100%				
D. Meanders	100%	84%				
E. Bed General	100%	100%				
F. Vanes / J Hooks etc.	N/A	N/A				
G. Wads and Boulders	N/A	N/A				

Table Xc. 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
A. Riffles	100%	100%				
B. Pools	100%	100%				
C. Thalweg	100%	100%				
D. Meanders	100%	98%				
E. Bed General	100%	100%				
F. Vanes / J Hooks etc.	N/A	N/A				
G. Wads and Boulders	N/A	N/A				

Table Xd. Categorical Stream Feature Visual Stability Assessment South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01 Segment/Reach: A2						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
A. Riffles	100%	86%				
B. Pools	100%	100%				
C. Thalweg	100%	100%				
D. Meanders	100%	100%				
E. Bed General	100%	86%				
F. Vanes / J Hooks etc.	N/A	N/A				
G. Wads and Boulders	N/A	N/A				

Table Xe. Categorical Stream Feature Visual Stability Assessment South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01 Segment/Reach: B						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
A. Riffles	100%	96%				
B. Pools	100%	100%				
C. Thalweg	100%	100%				
D. Meanders	100%	89%				
E. Bed General	100%	100%				
F. Vanes / J Hooks etc.	N/A	N/A				
G. Wads and Boulders	N/A	N/A				
H. Log Sills	100%	93%				

Table Xf. 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	100%	100%				
B. Pools	100%	100%				
C. Thalweg	100%	100%				
D. Meanders	100%	94%				
E. Bed General	100%	100%				
F. Vanes / J Hooks etc.	N/A	N/A				
G. Wads and Boulders	N/A	N/A				

Those features not included in the stream restoration were labeled N/A. This includes features such as vanes, J hooks, wads and boulders. Also, 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.

The only categories that included any unstable features for Tributaries Upper A, Middle A, Lower A and C were meanders, which had erosion along the outer bends. The areas along Tributary A2 with unstable features were all locations of aggradation and bar formation in the riffles. The unstable features of Tributary B had erosion along meander bends and bank scouring around riffles and log sills.

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 XI for comparison with the monitoring data shown in the tables in the appendix.

There are a few items to note about the information in Table XI. The data provided for Year 1 only reflects data from the reaches assessed in the Year 1 longitudinal profiles, while the As-Built data was collected for the entire reach of each tributary. The stream pattern data provided for Year 1 is the same as the data provided from the As-Built surveys, as it was determined that pattern had not changed significantly, and was therefore not resurveyed in the field. Also, the substrate information presented in Table XI was collected in September 2006 when the vegetation surveys were completed.

IV. METHODOLOGY

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). 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 will occur in the fall of 2007, to provide six months between the Year 1 and Year 2 surveys. Subsequent stream monitoring will occur in the fall of Years 3, 4 and 5 to provide a full year 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.

Exhibit Table XI. Baseline Morphology and Hydraulic Summary
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)}

Parameter	Reference Reach Data [1]						XS 114+61.61, -35.13									Monitoring		
	S. Muddy Birchfield [2]			S. Muddy Trib 4 [2]			Pre-Existing			Design			As-Built[3]			Year 1 [4]		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi.^{2}			1.3			0.14			1.38			1.38			1.38			1.38
Bankfull Width (Wbkf) - ft.			10.8			7.35			6.55			7.60	11.00	14.00	12.50	11.00	14.00	
Flood Prone Width (Wfpa) - ft.			100			43			9.12			50.00			50			50
Bankfull Cross-Section Area (Abkf) - ft.^{2}			20.7			9.1			5.91			10.44	8.86	12.24	10.55	8.86	12.24	
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.90			1.80	0.63	1.11	0.87	0.63	1.11	
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.78				1.28	1.66	1.47	1.28	1.66	
Width/Depth Ratio			5.6			6.1			7.28			4.22	9.91	22.22	16.07	9.91	22.22	
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.39			6.58	3.57	4.55	4.06	3.57	4.55	
Bank Height Ratio			1.0			1.8			3.59			1.00			1.11			1.11
Wetted Perimeter - ft.			14.6			9.95			8.35			9.09	12.00	14.38	13.19	12.00	14.38	
Hydraulic radius - ft.			1.42			0.91			0.71			1.15	0.62	1.02	0.82	0.62	1.02	
Pattern																		
Belt Width (Wblt) - ft.						50				46.38	64.9				50			50
Radius of Curvature (Rc) - ft.						10						19.00	10.67	24.71	16.26	10.67	24.71	16.26
Meander Length (Lm) - ft.						50				76	106.4		60	107	78.5	60	107	78.5
Meander Width Ratio (Wblt/Wbkf)						6.8						6.58			4.00			4.00
Profile																		
Min Run Length (Lrif) - ft.			16			10							23.8	130.3	53.3	23.8	130.3	53.3
Min Run Slope (Srif) - ft./ft.			0.026			0.032							0.0026	0.0069	0.0048	0.0026	0.0069	0.0048
Pool Length (Lpool) - ft.			9			24							26.8	96.8	46.8	26.8	96.8	46.8
Pool-Pool Spacing (p-p) - ft.			40			27							85.3	159.9	128.7	85.3	159.9	128.7
Substrate																		
d_{50} (mm)			20			26						20			3.4			3.4
d_{84} (mm)			38			76						38			12.5			12.5
Additional Reach Parameters																		
Valley Length (ft)						295			2520			1049			1097			660.04
Channel Length (ft)			236			479			2644			1539			1609			926.47
Sinuosity						1.6			1.05			1.47			1.47			1.40
Water Surface Slope (Save)			0.006			0.022			0.0035			0.0030			0.0023			0.0023
Bankfull Slope (Sval)			NA			0.025						0.0044			0.0033			0.0033
Rosgen Classification			E4			E4			F/G			E4			C5			C5
Bankfull mean velocity (Vbkf)			4.7			6.9			2.77			1.98			1.98			1.98
Bankfull Discharge (Qbkf)			98			60			26.00			20.7			20.7			20.7

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

[2] S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

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

[4] 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 with no 'Med' 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 at the time of this report.

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)}

Parameter	Reference Reach Data [1]						XS 114+61.61, -35.13									Monitoring		
	S. Muddy Birchfield [2]			S. Muddy Trib 4 [2]			Pre-Existing			Design			As-Built[3]			Year 1 [4]		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi.^{2}			1.3			0.14			1.38			1.38			1.38			1.38
Bankfull Width (Wbkf) - ft.			10.8			7.35			6.55			8.00			15.00			15.00
Flood Prone Width (Wfpa) - ft.			100			43			9.12			50.00			60.00			60.00
Bankfull Cross-Section Area (Abkf) - ft.^{2}			20.7			9.1			5.91			12.00			12.61			12.61
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.90			2.00			0.84			0.84
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.78						1.50			1.50
Width/Depth Ratio			5.6			6.1			7.28			4.00			17.86			17.86
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.39			6.25			4.00			4.00
Bank Height Ratio			1.0			1.8			3.59			1.00			1.11			1.11
Wetted Perimeter - ft.			14.6			9.95			8.35			9.66			15.49			15.49
Hydraulic radius - ft.			1.42			0.91			0.71			1.24			0.81			0.81
Pattern																		
Belt Width (Wblt) - ft.						50				48.80	68.32				50.00			50.00
Radius of Curvature (Rc) - ft.						10						20.00	15.04	41.80	20.62	15.04	41.80	20.62
Meander Length (Lm) - ft.						50				80.00	112.00		75.00	91.00	85.00	75.00	91.00	85.00
Meander Width Ratio (Wblt/Wbkf)						6.8						6.25			3.33			3.33
Profile																		
Min Run Length (Lrif) - ft.			16			10							36.5	72.5	52.3	36.5	72.5	52.3
Min Run Slope (Srif) - ft./ft.			0.026			0.032							0.0012	0.0032	0.0026	0.0012	0.0032	0.0026
Pool Length (Lpool) - ft.			9			24							18.4	42.5	34.1	18.4	42.5	34.1
Pool-Pool Spacing (p-p) - ft.			40			27							49.8	83.6	66.5	49.8	83.6	66.5
Substrate																		
d_{50} (mm)			20			26						20			0.23			0.23
d_{84} (mm)			38			76						38			0.41			0.41
Additional Reach Parameters																		
Valley Length (ft)						295			816			816			816			375.94
Channel Length (ft)			236			479			824			1203			1094			517.09
Sinuosity						1.6			1.01			1.47			1.34			1.38
Water Surface Slope (Save)			0.006			0.022			0.0035			0.002			0.0017			0.0017
Bankfull Slope (Sval)			NA			0.025						0.003			0.0020			0.0020
Rosgen Classification			E4			E4			F/G			E			C5			C5
Bankfull mean velocity (Vbkf)			4.7			6.9			2.77			1.71			1.98			1.98
Bankfull Discharge (Qbkf)			98			60			26.00			20.5			20.7			20.7

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

[2] S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

[3] 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' values with no 'Med' 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 at the time of this report.

Exhibit Table XI. Baseline Morphology and Hydraulic Summary
South Muddy Creek Tributaries Stream Restoration / EEP Project No. D04006-01
Station/Reach: Tributary A2 {Long-Term Monitoring Profile Station 0+00 to 1+96.06 (196.06 feet)}

Parameter	Reference Reach Data [1]						XS 3+61.77, -216.17									Monitoring		
	S. Muddy Birchfield [2]			S. Muddy Trib 4 [2]			Pre-Existing			Design			As-Built[3]			Year 1 [4]		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi.^{2}			1.3			0.14			0.27			0.27			0.27			0.27
Bankfull Width (Wbkf) - ft.			10.8			7.35			7.09			5.00			11.65			11.65
Flood Prone Width (Wfpa) - ft.			100			43			11.19			30.00			30			30
Bankfull Cross-Section Area (Abkf) - ft.^{2}			20.7			9.1			4.29			2.40			7.63			7.63
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.60			2.80			0.66			0.66
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.12						1.41			1.41
Width/Depth Ratio			5.6			6.1			11.82			3.85			17.65			17.65
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.58			6.00			9.44			9.44
Bank Height Ratio			1.0			1.8			5.85			1.00			1.26			1.26
Wetted Perimeter - ft.			14.6			9.95			7.52			6.08			12.04			12.04
Hydraulic radius - ft.			1.42			0.91			0.57			0.79			0.63			0.63
Pattern																		
Belt Width (Wblt) - ft.						50				30.5	42.7				40.00			40.00
Radius of Curvature (Rc) - ft.						10						12.5	8.19	14.26	12.00	8.19	14.26	12.00
Meander Length (Lm) - ft.						50				50	70		47.00	57.00	51.00	47.00	57.00	51.00
Meander Width Ratio (Wblt/Wbkf)						6.8						6.00			3.43			3.43
Profile																		
Min Riffle Length (Lrif) - ft.			16			10							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	0.0626
Pool Length (Lpool) - ft.			9			24							31.90	47.10	39.50	31.90	47.10	39.50
Pool-Pool Spacing (p-p) - ft.			40			27							55.50	79.40	67.60	55.50	79.40	67.60
Substrate																		
d_{50} (mm)			20			26						26						
d_{84} (mm)			38			76						76						
Additional Reach Parameters																		
Valley Length (ft)						295			310			334			334			102.45
Channel Length (ft)			236			479			325			462			480			196.06
Sinuosity						1.6			1.05			1.38			1.44			1.91
Water Surface Slope (Save)			0.006			0.022			0.0156			0.0206			0.01025			0.0017
Bankfull Slope (Sval)			NA			0.025						0.0284			0.01035			0.0020
Rosgen Classification			E4			E4			F/G			E4			C4			C4
Bankfull mean velocity (Vbkf)			4.7			6.9			4.46			3.87			3.87			3.87
Bankfull Discharge (Qbkf)			98			60			18.4			18.4			18.4			18.4

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

[2] S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

[3] 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' values with no 'Med' 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 at the time of this report.

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. 1 Station 0+00 to 5+88.16 (588.16 feet)}

Parameter	Reference Reach Data [1]						XS 1+66.16, -4.60									Monitoring		
	S. Muddy Birchfield [2]			S. Muddy Trib 4 [2]			Pre-Existing			Design			As-Built[3]			Year 1 [4]		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi.^{2}			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			13.00
Flood Prone Width (Wfpa) - ft.			100			43			10.41			60.00			60.00			60.00
Bankfull Cross-Section Area (Abkf) - ft.^{2}			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			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																		
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										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	118.70	99.70
Substrate																		
d_{50} (mm)			20			26									0.13			0.13
d_{84} (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

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

[2] S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

[3] 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' values with no 'Med' 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 at the time of this report.

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. 2 Station 0+00 to 6+23.77 (623.77 feet)}

Parameter	Reference Reach Data [1]						XS 1+66.16, -4.60									Monitoring		
	S. Muddy Birchfield [2]			S. Muddy Trib 4 [2]			Pre-Existing			Design			As-Built[3]			Year 1 [4]		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi.^{2}			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			23.00
Flood Prone Width (Wfpa) - ft.			100			43			10.41			60.00			60			60.00
Bankfull Cross-Section Area (Abkf) - ft.^{2}			20.7			9.1			4.89			20.16	7.10	19.87	13.29			16.69
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.74			2.80	0.55	1.16	0.83			0.74
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.39				1.00	2.09	1.62			1.42
Width/Depth Ratio			5.6			6.1			8.91			4.00	14.79	31.08	19.28			31.80
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.58			6.00	2.61	7.98	16.76			2.61
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			23.59
Hydraulic radius - ft.			1.42			0.91			0.67			1.64	0.53	1.12	0.81			0.72
Pattern																		
Belt Width (Wblt) - ft.						50				61.00	85.40				60			60
Radius of Curvature (Rc) - ft.						10						25.00	15.22	39.94	24.86	15.22	39.94	23.19
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			2.61
Profile [3]																		
Min Run Length (Lrif) - ft.			16			10										65.60	78.70	70.00
Min Run Slope (Srif) - ft./ft.			0.026			0.032										0.00228	0.00344	0.00229
Pool Length (Lpool) - ft.			9			24										41.90	56.40	47.10
Pool-Pool Spacing (p-p) - ft.			40			27										66.20	124.30	87.80
Substrate [3]																		
d_{50} (mm)			20			26									0.13			0.13
d_{84} (mm)			38			76									0.29			0.29
Additional Reach Parameters [3]																		
Valley Length (ft)						295			5710			5164			5178			449.17
Channel Length (ft)			236			479			5948			7391			7349			623.77
Sinuosity						1.6			1.04			1.43			1.42			1.39
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			0.0007
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			20.70

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

[2] S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

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

[4] 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 with no 'Med' 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 at the time of this report.

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)}

Parameter	Reference Reach Data [1]						XS 1+66.16, -4.60									Monitoring		
	S. Muddy Birchfield [2]			S. Muddy Trib 4 [2]			Pre-Existing			Design			As-Built [3]			Year 1 [4]		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi.^{2}			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			18.00
Flood Prone Width (Wfpa) - ft.			100			43			10.41			60.00			60.00			60.00
Bankfull Cross-Section Area (Abkf) - ft.^{2}			20.7			9.1			4.89			20.16	7.10	19.87	13.29			14.39
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.74			2.80	0.55	1.16	0.83			0.80
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.39				1.00	2.09	1.62			1.62
Width/Depth Ratio			5.6			6.1			8.91			4.00	14.79	31.08	19.28			22.50
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.58			6.00	2.61	7.98	16.76			3.33
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			18.70
Hydraulic radius - ft.			1.42			0.91			0.67			1.64	0.53	1.12	0.81			0.77
Pattern																		
Belt Width (Wblt) - ft.						50				61.00	85.40				60			60.00
Radius of Curvature (Rc) - ft.						10						25.00	15.22	39.94	24.86	19.56	32.82	29.53
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			3.33
Profile [3]																		
Min Run Length (Lrif) - ft.			16			10										77.50	132.00	104.70
Min Run Slope (Srif) - ft./ft.			0.026			0.032										0.00195	0.00289	0.00242
Pool Length (Lpool) - ft.			9			24										37.90	63.70	53.40
Pool-Pool Spacing (p-p) - ft.			40			27										101.80	106.70	104.30
Substrate [3]																		
d_{50} (mm)			20			26									0.13			0.13
d_{84} (mm)			38			76									0.29			0.29
Additional Reach Parameters [3]																		
Valley Length (ft)						295			5710			5164			5178			369.80
Channel Length (ft)			236			479			5948			7391			7349			518.94
Sinuosity						1.6			1.04			1.43			1.42			1.40
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			0.00099
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			20.70

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

[2] S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

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

[4] 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 with no 'Med' 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 at the time of this report.

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. 4 Station 0+00 to 3+46.16 (346.16 feet)}

Parameter	Reference Reach Data [1]						XS 1+66.16, -4.60									Monitoring		
	S. Muddy Birchfield [2]			S. Muddy Trib 4 [2]			Pre-Existing			Design			As-Built[3]			Year 1 [4]		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi.^{2}			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.^{2}			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																		
Belt Width (Wblt) - ft.						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	0.00267
Pool Length (Lpool) - ft.			9			24												214.10
Pool-Pool Spacing (p-p) - ft.			40			27										28.60	34.40	
Substrate																		
d_{50} (mm)			20			26									0.04			0.04
d_{84} (mm)			38			76									0.07			0.07
Additional Reach Parameters																		
Valley Length (ft)						295			5710			5164			5178			259.00
Channel Length (ft)			236			479			5948			7391			7349			346.16
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			0.0012
Bankfull Slope (Sval)			NA			0.025						0.0020	0.0007	0.00099	0.00084			0.00078
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			20.70

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

[2] S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

[3] 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' values with no 'Med' 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 at the time of this report.

Exhibit Table XI. Baseline Morphology and Hydraulic Summary
South Muddy Creek Tributaries Stream Restoration / EEP Project No. D04006-01
Station/Reach: Tributary B {Upper Tributary B Long-Term Monitoring Profile Station 0+00 to 4+75.72 (475.72 feet)}

Parameter	Reference Reach Data [1]						XS 12+28.00, -35.88									Monitoring		
	S. Muddy Birchfield [2]			S. Muddy Trib 4 [2]			Pre-Existing			Design			As-Built[3]			Year 1 [4]		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi.^{2}			1.3			0.14			0.44			0.44			0.44			0.44
Bankfull Width (Wbkf) - ft.			10.8			7.35			7.83			6.20	5.11	10.98				5.11
Flood Prone Width (Wfpa) - ft.			100			43			11.86			45.38			50.00			50.00
Bankfull Cross-Section Area (Abkf) - ft.^{2}			20.7			9.1			4.86			7.36	6.06	7.56				2.99
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.62			1.60	0.58	0.69				0.58
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.22				1.17	1.84				1.17
Width/Depth Ratio			5.6			6.1			12.63			3.88	8.81	15.91				8.81
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.51			7.32	10.02	21.51				21.51
Bank Height Ratio			1.0			1.8			4.40			1.00	1.00	1.18				1.00
Wetted Perimeter - ft.			14.6			9.95			8.22			7.53	5.68	11.84				5.68
Hydraulic radius - ft.			1.42			0.91			0.59			0.98	0.53	0.64				0.53
Pattern																		
Belt Width (Wblt) - ft.						50				45.38	52.95				50.00			50.00
Radius of Curvature (Rc) - ft.						10						15.50	10.20	19.38	14.05	12.95	19.38	16.79
Meander Length (Lm) - ft.						50				62.00	86.80		60.00	80.00	70.00	60.00	80.00	70.00
Meander Width Ratio (Wblt/Wbkf)						6.8						7.32						9.78
Profile																		
Min Riffle Length (Lrif) - ft.			16			10										11.50	15.70	14.50
Min Riffle Slope (Srif) - ft./ft.			0.026			0.032										0.016	0.060	0.040
Pool Length (Lpool) - ft.			9			24										18.10	23.50	20.10
Pool-Pool Spacing (p-p) - ft.			40			27										51.90	66.10	59.80
Substrate																		
d_{50} (mm)			20			26									55.06			55.1
d_{84} (mm)			38			76									83.88			83.9
Additional Reach Parameters																		
Valley Length (ft)						295			1360			1302			1312			320.61
Channel Length (ft)			236			479			1455			2052			2041			475.72
Sinuosity						1.6			1.07			1.58			1.56			1.48
Water Surface Slope (Save)			0.006			0.022			0.0124			0.0123	0.0091	0.0099				0.0099
Bankfull Slope (Sval)			NA			0.025						0.0078	0.0089	0.0097				0.0097
Rosgen Classification			E4			E4			B			E	E4	C4				E4
Bankfull mean velocity (Vbkf)			4.7			6.9			4.18			2.83			2.83			2.83
Bankfull Discharge (Qbkf)			98			60			20.4			20.4			20.4			20.4

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

[2] S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

[3] 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' values with no 'Med' 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 at the time of this report.

Exhibit Table XI. Baseline Morphology and Hydraulic Summary
South Muddy Creek Tributaries Stream Restoration / EEP Project No. D04006-01
Station/Reach: Tributary B {Lower Tributary B Long-Term Monitoring Profile Station 0+00 to 4+ 4.08 (404.08 feet)}

Parameter	Reference Reach Data [1]						XS 12+28.00, -35.88									Monitoring		
	S. Muddy Birchfield [2]			S. Muddy Trib 4 [2]			Pre-Existing			Design			As-Built[3]			Year 1 [4]		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi.^{2}			1.3			0.14			0.44			0.44			0.44			0.44
Bankfull Width (Wbkf) - ft.			10.8			7.35			7.83			6.20	5.11	10.98				10.98
Flood Prone Width (Wfpa) - ft.			100			43			11.86			45.38			50.00			50.00
Bankfull Cross-Section Area (Abkf) - ft.^{2}			20.7			9.1			4.86			7.36	6.06	7.56				7.56
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.62			1.60	0.58	0.69				0.69
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.22				1.17	1.84				1.84
Width/Depth Ratio			5.6			6.1			12.63			3.88	8.81	15.91				15.91
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.51			7.32	10.02	21.51				10.02
Bank Height Ratio			1.0			1.8			4.40			1.00	1	1.18				1.18
Wetted Perimeter - ft.			14.6			9.95			8.22			7.53	5.68	11.84				11.84
Hydraulic radius - ft.			1.42			0.91			0.59			0.98	0.53	0.64				0.64
Pattern																		
Belt Width (Wblt) - ft.						50				45.38	52.95				50.00			50.00
Radius of Curvature (Rc) - ft.						10						15.5	10.20	19.38	14.05	10.20	15.54	13.34
Meander Length (Lm) - ft.						50				62	86.8		60.00	80.00	70.00	60.00	80.00	70.00
Meander Width Ratio (Wblt/Wbkf)						6.8						7.32						4.55
Profile																		
Min Riffle Length (Lrif) - ft.			16			10										12.00	25.00	18.60
Min Riffle Slope (Srif) - ft./ft.			0.026			0.032										0.02	0.04	0.03
Pool Length (Lpool) - ft.			9			24										13.30	21.40	17.10
Pool-Pool Spacing (p-p) - ft.			40			27										84.10	113.70	97.50
Substrate																		
d_{50} (mm)			20			26									55.06			55.06
d_{84} (mm)			38			76									83.88			83.88
Additional Reach Parameters																		
Valley Length (ft)						295			1360			1302			1312			404.08
Channel Length (ft)			236			479			1455			2052			2041			251.58
Sinuosity						1.6			1.07			1.58			1.56			1.61
Water Surface Slope (Save)			0.006			0.022			0.0124			0.0123	0.0091	0.0099				0.0091
Bankfull Slope (Sval)			NA			0.025						0.0078	0.0089	0.0097				0.0089
Rosgen Classification			E4			E4			B			E	E4	C4				C4
Bankfull mean velocity (Vbkf)			4.7			6.9			4.18			2.83			2.83			2.83
Bankfull Discharge (Qbkf)			98			60			20.4			20.4			20.4			20.4

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

[2] S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

[3] 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' values with no 'Med' 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 at the time of this report.

APPENDIX A
Vegetation Raw Data

1. Vegetation Monitoring Plot Photos
2. Vegetation Data Tables

Vegetation Plot 1
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 2
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 3
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 4
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 5
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 6
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 7
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 8
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 9
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 10
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 11
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 12
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 13
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 14
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 15
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 16
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 17
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 18
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 19
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 20
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 21
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 22
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 23
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 24
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 25
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 26
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 27
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 28
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 29
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Vegetation Plot 30
Monitoring Year 1
(EMH&T, Inc. 9/19/06)

Table 1. Vegetation Metadata	
Report Prepared By	Holly Blunck
Date Prepared	12/15/2006 9:03
database name	CVS_EEP_DataEntry_v202.mdb
database location	Q:\ENVIRONMENTAL\Monitoring\EEP Vegetation Database
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
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 Vigor by Species							
	Species	**4**	**3**	**2**	**1**	**0**	**Missing**
	Alnus serrulata	15	6	2			
	Cephalanthus occidentalis	4					
	Cornus amomum	54	8	2			
	Fraxinus pennsylvanica	20	11				
	Quercus alba	22	13	2			
	Quercus pagoda	10	3				
	Quercus phellos	3	7				
	Salix nigra	5					
	Sambucus canadensis	1					
	Platanus occidentalis	16	6				
TOT:	**10**	**150**	**54**	**6**			

Table 3. Vegetation Damage by Species

	Species	All Damage Categories	(no damage)	Deer	Diseased	Flood	Insects	Other/Unknown Animal	Die-back
	Alnus serrulata	23	20						3
	Cephalanthus occidentalis	4	4						
	Cornus amomum	64	55		2	1			6
	Fraxinus pennsylvanica	31	29		1		1		
	Platanus occidentalis	22	21		1				
	Quercus alba	37	30			1	1		5
	Quercus pagoda	13	13						
	Quercus phellos	10	7				3		
	Salix nigra	5	5						
	Sambucus canadensis	1	1						
TOT:	**10**	**210**	**185**	**0**	**4**	**2**	**5**	**0**	**14**

Table 4. Vegetation Damage by Plot										
	plot	All Damage Categories	(no damage)	_Enter other damage_	Deer	Diseased	Flood	Insects	Other/Unknown Animal	(other damage)
	D0400601-01-0001	10	7							3
	D0400601-01-0002	8	7							1
	D0400601-01-0003	13	13							
	D0400601-01-0004	7	6				1			
	D0400601-01-0005	10	9				1			
	D0400601-01-0006	7	5			2				
	D0400601-01-0007	8	8							
	D0400601-01-0008	7	7							
	D0400601-01-0009	10	7			1		1		1
	D0400601-01-0010	7	7							
	D0400601-01-0011	6	5			1				
	D0400601-01-0012	7	7							
	D0400601-01-0013	7	5					2		
	D0400601-01-0014	5	5							
	D0400601-01-0015	8	7							1
	D0400601-01-0016	4	4							
	D0400601-01-0017	4	4							
	D0400601-01-0018	7	7							
	D0400601-01-0019	4	3							1
	D0400601-01-0020	5	4					1		
	D0400601-01-0021	11	8							3
	D0400601-01-0022	3	2							1
	D0400601-01-0023	8	8							
	D0400601-01-0024	7	6					1		
	D0400601-01-0025	8	8							
	D0400601-01-0026	11	10							1
	D0400601-01-0027	6	6							
	D0400601-01-0028	11	9							2
	D0400601-01-0030	1	1							
TOT:	**29**	**210**	**185**	**0**	**0**	**4**	**2**	**5**	**0**	**14**

Table 5. Stem Count by Plot and Species

	Species	Total Stems	# plots	avg# stems	plot D0400601-01-0001	plot D0400601-01-0002	plot D0400601-01-0003	plot D0400601-01-0004	plot D0400601-01-0005	plot D0400601-01-0006	plot D0400601-01-0007	plot D0400601-01-0008	plot D0400601-01-0009	plot D0400601-01-0010	plot D0400601-01-0011	plot D0400601-01-0012	plot D0400601-01-0013	plot D0400601-01-0014	plot D0400601-01-0015	plot D0400601-01-0016	plot D0400601-01-0017	plot D0400601-01-0018	plot D0400601-01-0019	plot D0400601-01-0020	plot D0400601-01-0021	plot D0400601-01-0022	plot D0400601-01-0023	plot D0400601-01-0024	plot D0400601-01-0025	plot D0400601-01-0026	plot D0400601-01-0027	plot D0400601-01-0028	plot D0400601-01-0030
	Alnus serrulata	23	4	5.8																								5	8	3	7	
	Cephalanthus occidentalis	4	1	4										4																			
	Cornus amomum	64	21	3	5	5	6		3	5	2	3	4	3	5	2		1	1	1		3	1	2	3	2	6	1					
	Fraxinus pennsylvanica	31	17	1.8	3	2	2			2		1	2			3		2	1	1	3	3		1		1	1	2					1
	Platanus occidentalis	22	12	1.8	1		3	2	6			2	1				1		2			1	1		1			1					
	Quercus alba	37	17	2.2	1		2	5	1		1	1	3		1		1	2	4	2	1		2		6		1	3					
	Quercus pagoda	13	4	3.3																								3	3	3	4	
	Quercus phellos	10	5	2		1										1	5							2	1								
	Salix nigra	5	1	5							5																						
	Sambucus canadensis	1	1	1												1																	
TOT:	**12**	**210**	**12**		**10**	**8**	**13**	**7**	**10**	**7**	**8**	**7**	**10**	**7**	**6**	**7**	**7**	**5**	**8**	**4**	**4**	**7**	**4**	**5**	**11**	**3**	**8**	**7**	**8**	**11**	**6**	**11**	**1**

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

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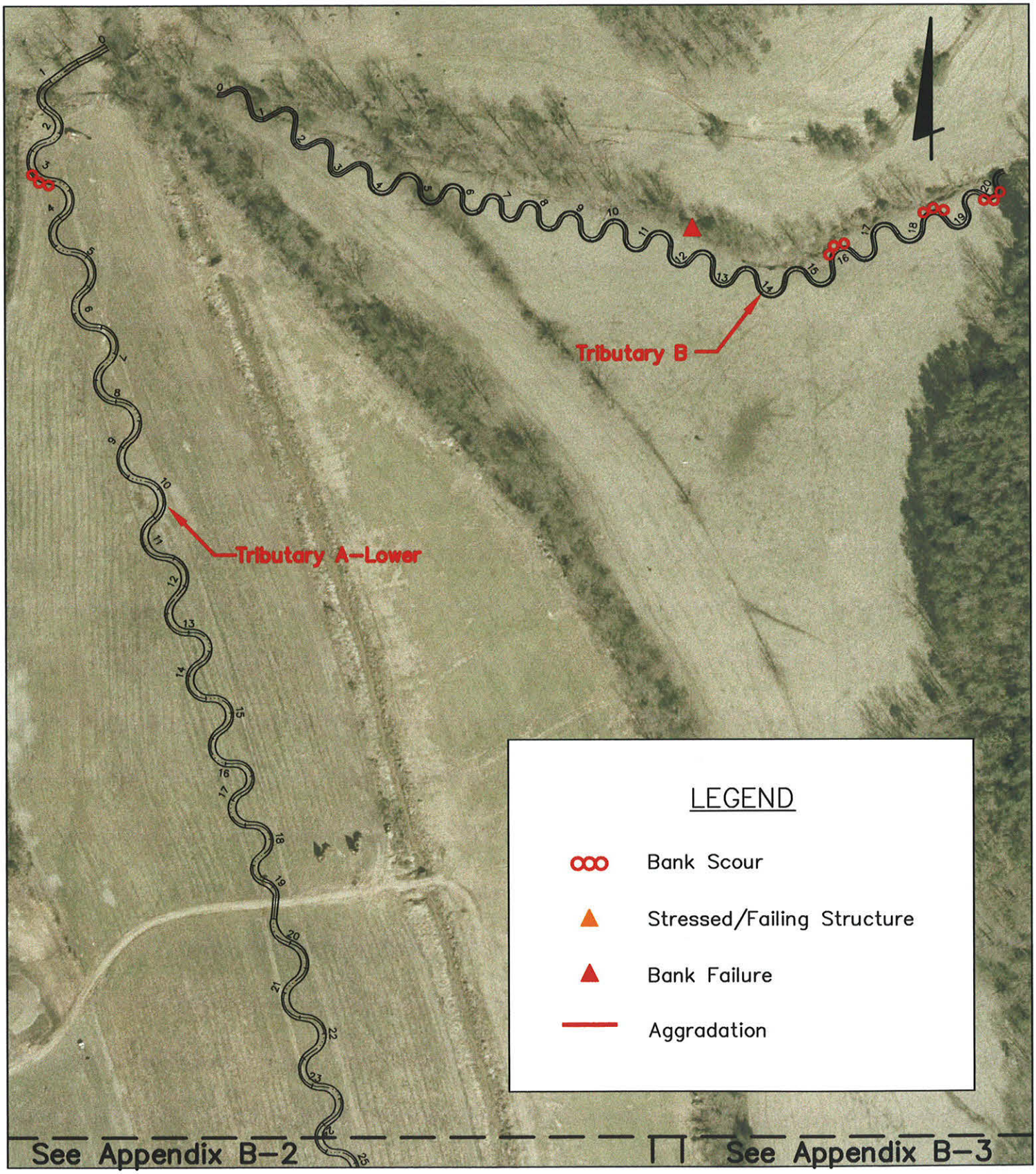
SOUTH MUDDY CREEK TRIBUTARIES

MONITORING

APPENDIX B-1

TRIBUTARY A - LOWER AND TRIBUTARY B

Date:	September, 2007	Job No.	2006-1627	Scale:	1" = 500'



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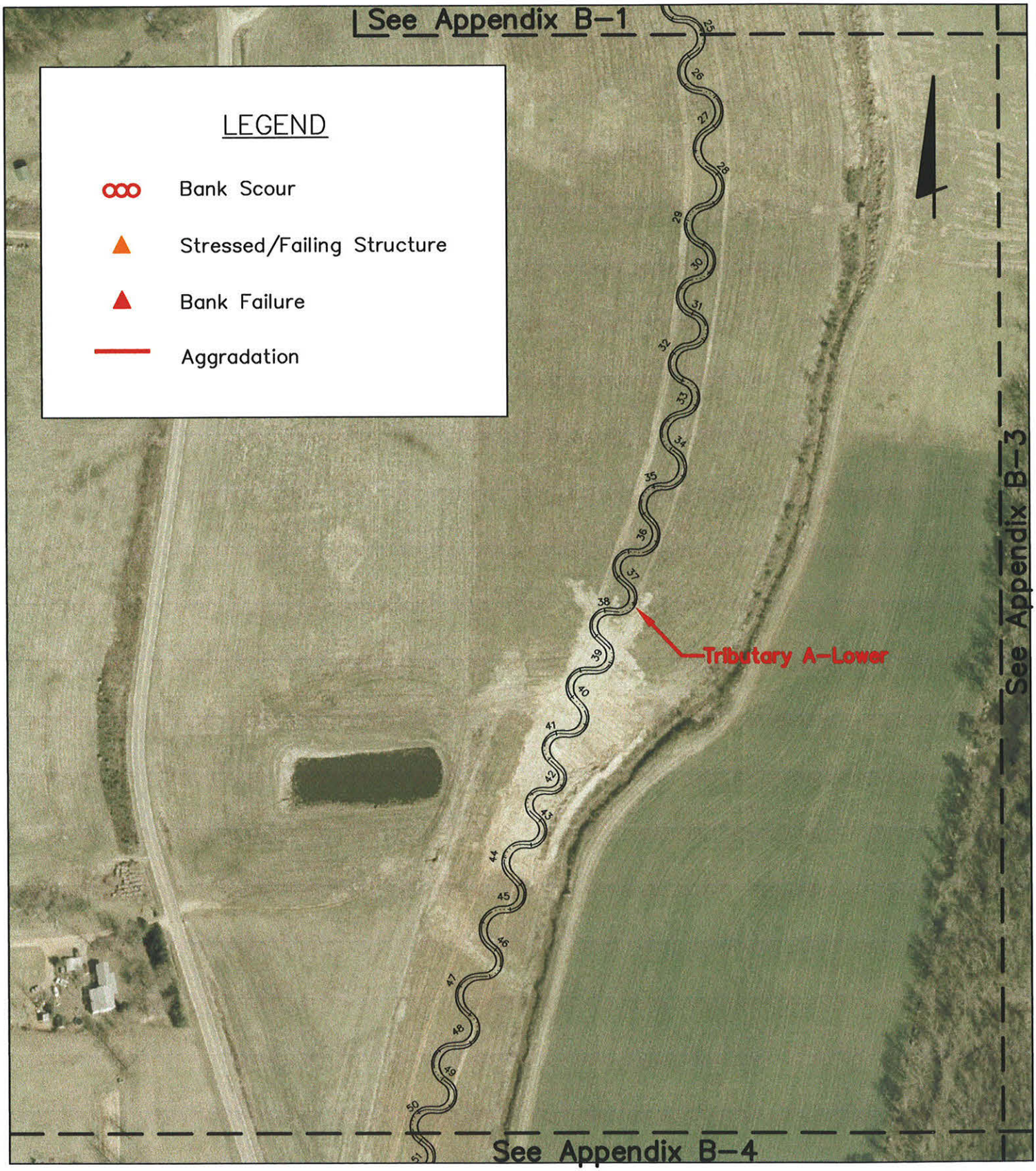
MONITORING

APPENDIX B-2

TRIBUTARY A-LOWER

Date:	September, 2007	Job No.	2006-1627	Scale:	1" = 500'



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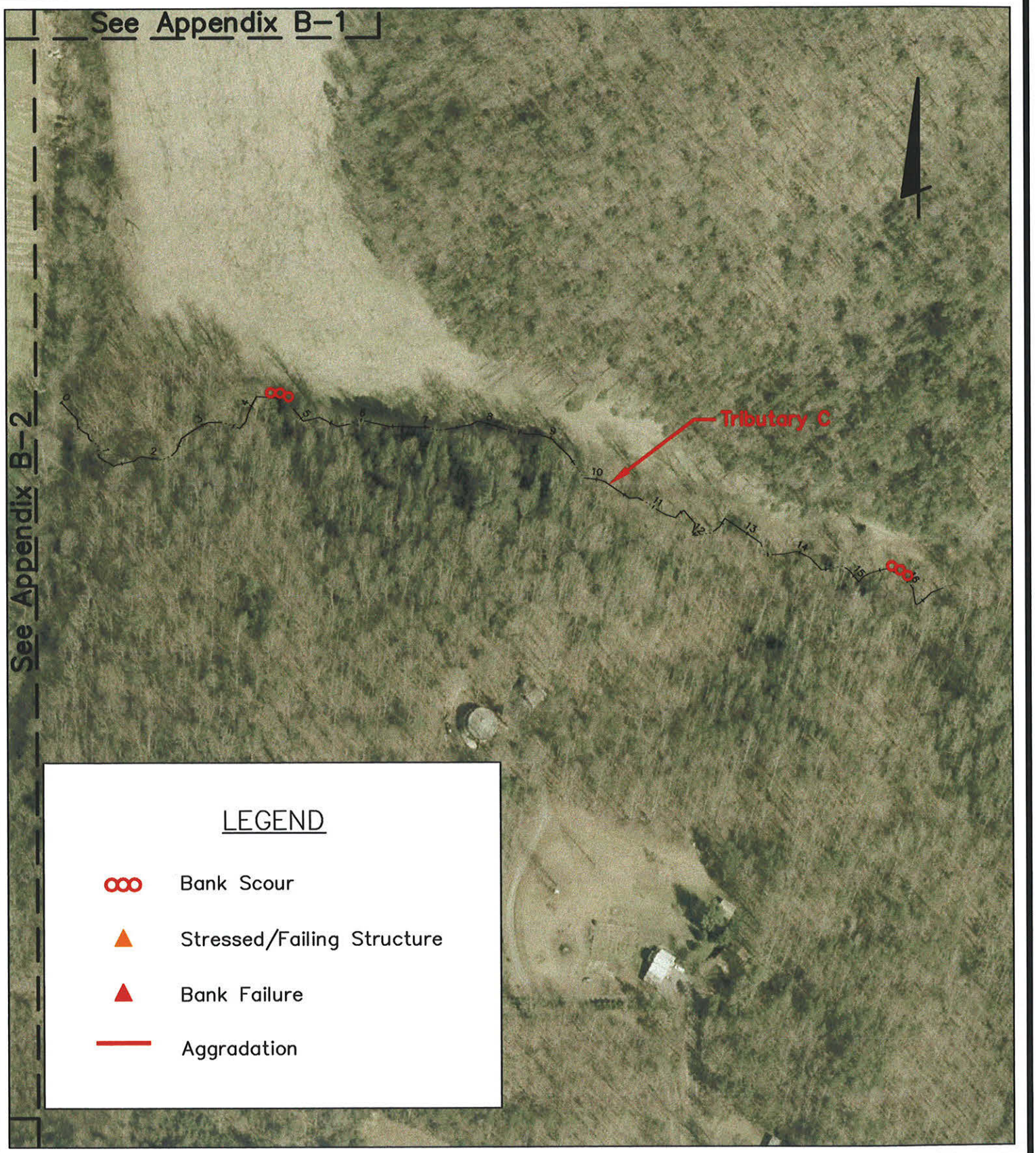
MONITORING

APPENDIX B-3

TRIBUTARY C

Date:	September, 2007	Job No.	2006-1627	Scale:	1" = 500'



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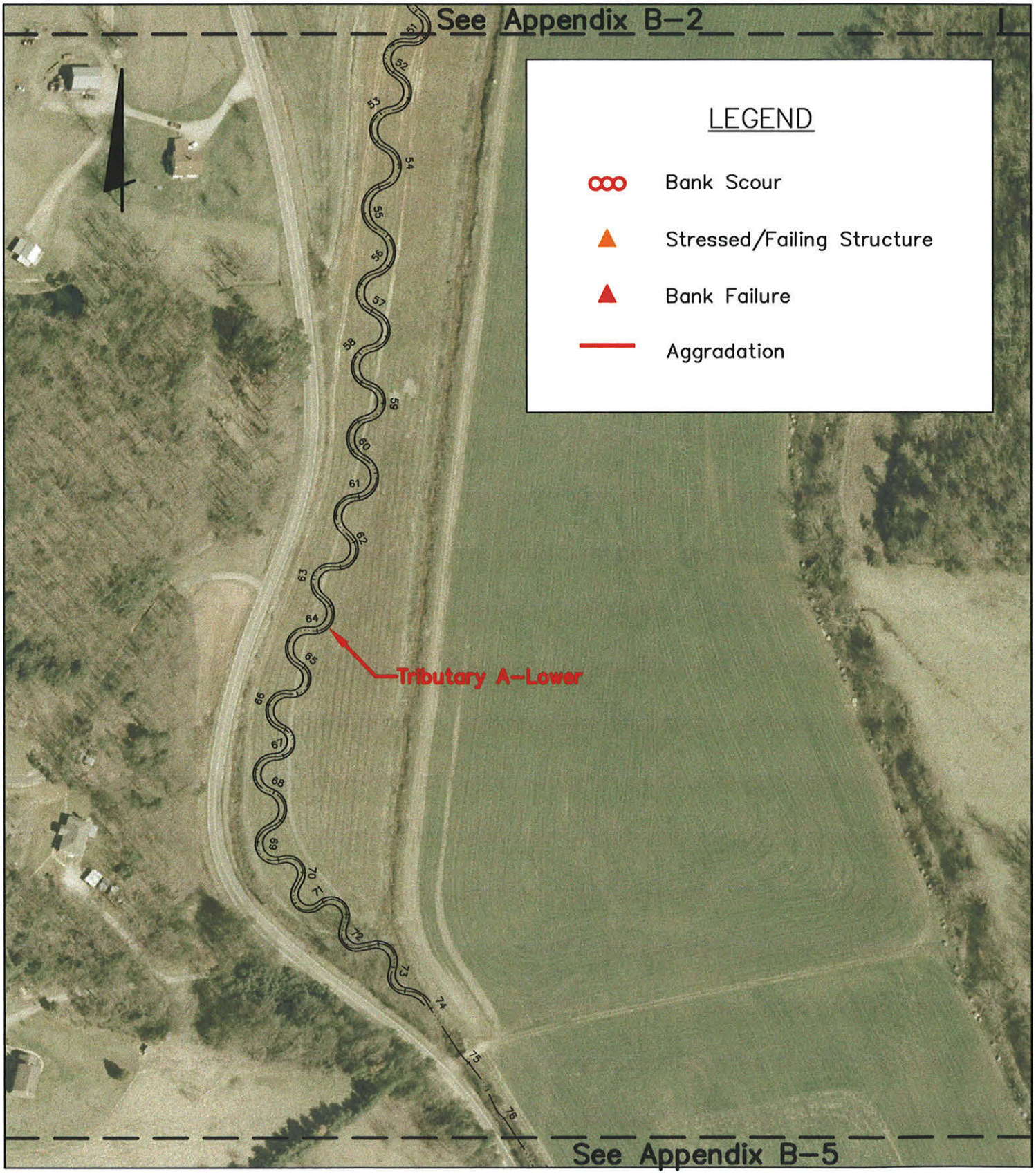
MONITORING

APPENDIX B-4

TRIBUTARY A-LOWER

Date:	September, 2007	Job No.	2006-1627	Scale:	1" = 500'



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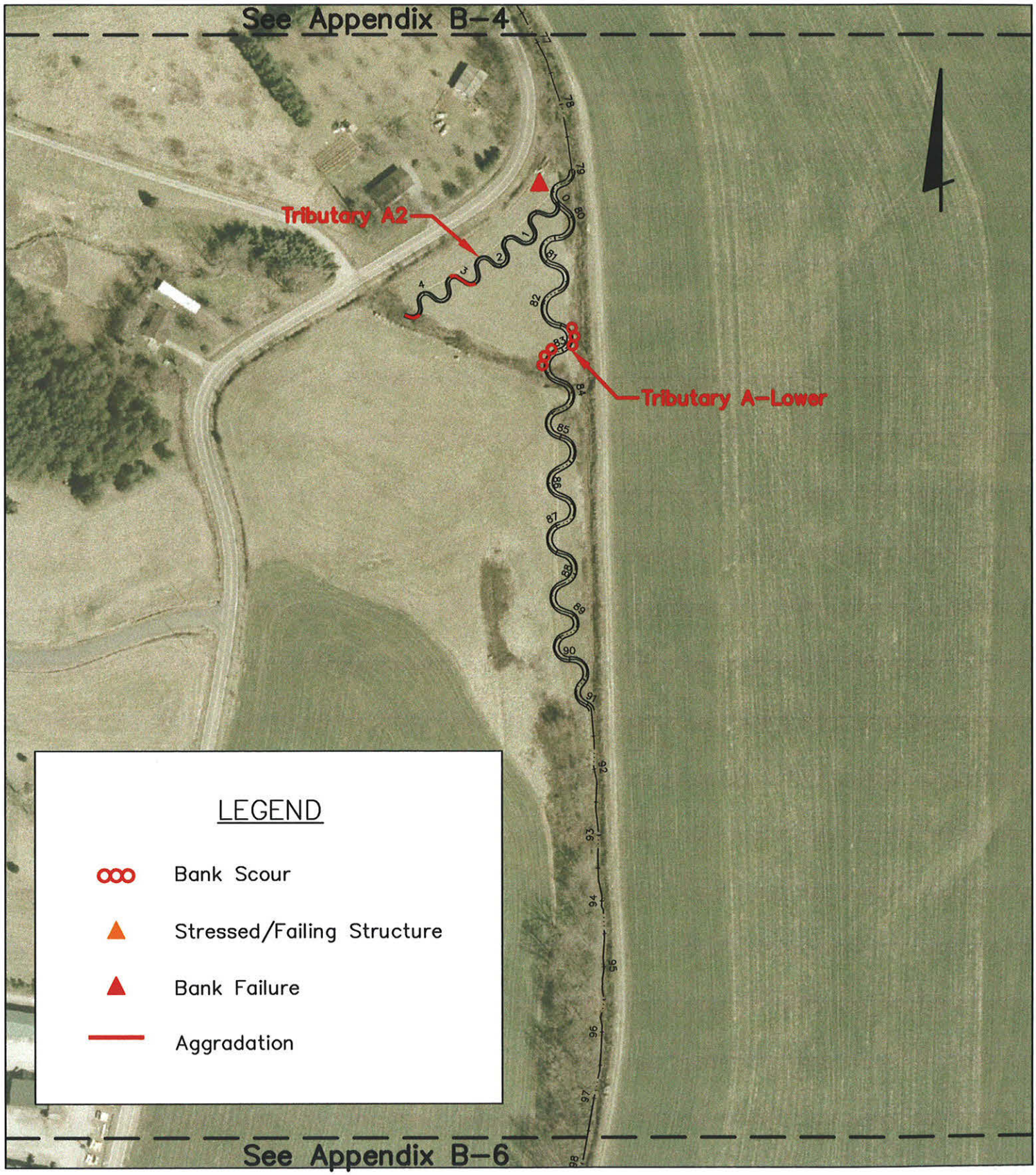
SOUTH MUDDY CREEK TRIBUTARIES

MONITORING

APPENDIX B-5

TRIBUTARY A-MIDDLE AND TRIBUTARY A2

Date:	September, 2007	Job No.	2006-1627	Scale:	1" = 500'



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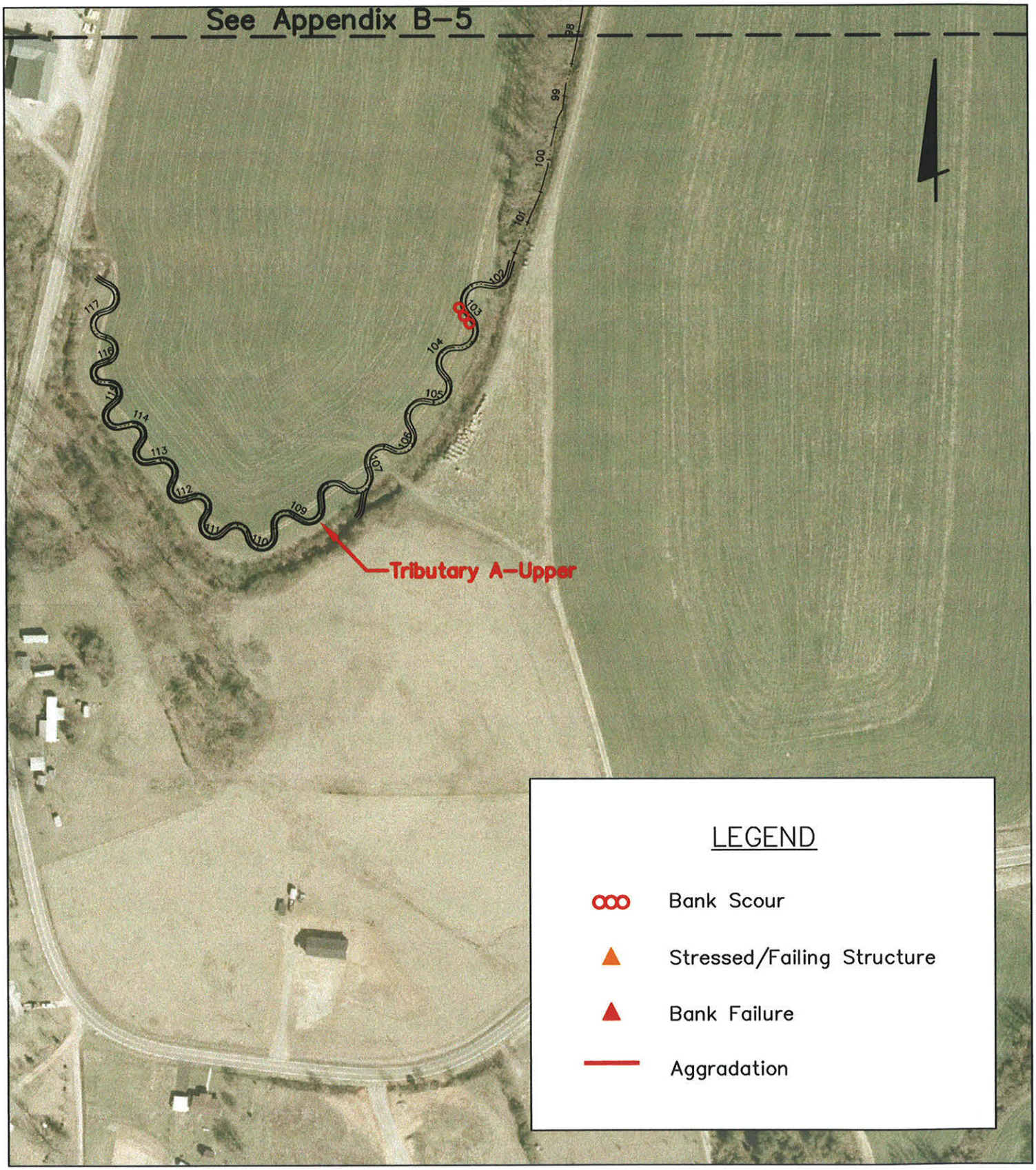
SOUTH MUDDY CREEK TRIBUTARIES

MONITORING

APPENDIX B-6

TRIBUTARY A-UPPER

Date:	September, 2007	Job No.	2006-1627	Scale:	1" = 500'



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 Stability Assessment
South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01
Segment/Reach: A (upper)

Feature Category	Metric (per As-built and reference baselines	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	24	24	N/A	100	
	2. Armor stable (e.g. no displacement)?	24	24	N/A	100	
	3. Facet grade appears stable?	24	24	N/A	100	
	4. Minimal evidence of embedding/fining?	24	24	N/A	100	
	5. Length appropriate?	24	24	N/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	25	0	100	
	3. Apparent Rc within spec?	25	25	0	100	
	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	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

Table B1. Visual Morphological Stability Assessment
South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01
Segment/Reach: A (middle)

Feature Category	Metric (per As-built and reference baselines	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	18	18	N/A	100	
	2. Armor stable (e.g. no displacement)?	18	18	N/A	100	
	3. Facet grade appears stable?	18	18	N/A	100	
	4. Minimal evidence of embedding/fining?	18	18	N/A	100	
	5. Length appropriate?	18	18	N/A	100	**100%**
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	19	19	N/A	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	19	19	N/A	100	
	3. Length appropriate?	19	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	0	100	
	3. Apparent Rc within spec?	19	19	0	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	
	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	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

Table B1. Visual Morphological Stability Assessment
South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01
Segment/Reach: A (lower)

Feature Category	Metric (per As-built and reference baselines	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	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	95	N/A	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	95	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	95	0	100	
	3. Apparent Rc within spec?	95	95	0	100	
	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	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

Table B1. Visual Morphological Stability Assessment
South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01
Segment/Reach: C

Feature Category	Metric (per As-built and reference baselines	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	33	33	N/A	100	
	2. Armor stable (e.g. no displacement)?	33	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	34	N/A	100	
	3. Length appropriate?	34	34	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?	32	34	2	94	
	2. Of those eroding, # w/concomitant point bar formation?	34	34	0	100	
	3. Apparent Rc within spec?	34	34	0	100	
	4. Sufficient floodplain access and relief?	34	34	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	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

Table B1. Visual Morphological Stability Assessment
South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01
Segment/Reach: B

Feature Category	Metric (per As-built and reference baselines	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	22	23	1	96	
	2. Armor stable (e.g. no displacement)?	23	23	0	100	
	3. Facet grade appears stable?	23	23	0	100	
	4. Minimal evidence of embedding/fining?	23	23	0	100	
	5. Length appropriate?	23	23	0	100	**99%**
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	23	23	0	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	23	23	0	100	
	3. Length appropriate?	23	23	0	100	**100%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	36	36	0	100	
	2. Downstream of meander (glide/inflection) centering?	36	36	0	100	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	32	36	4	89	
	2. Of those eroding, # w/concomitant point bar formation?	35	36	1	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 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	
	2. Minimal evidence of sedimentation in adjacent pool?	14	14	0	100	**97%**

Table B1. Visual Morphological Stability Assessment
South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01
Segment/Reach: A2

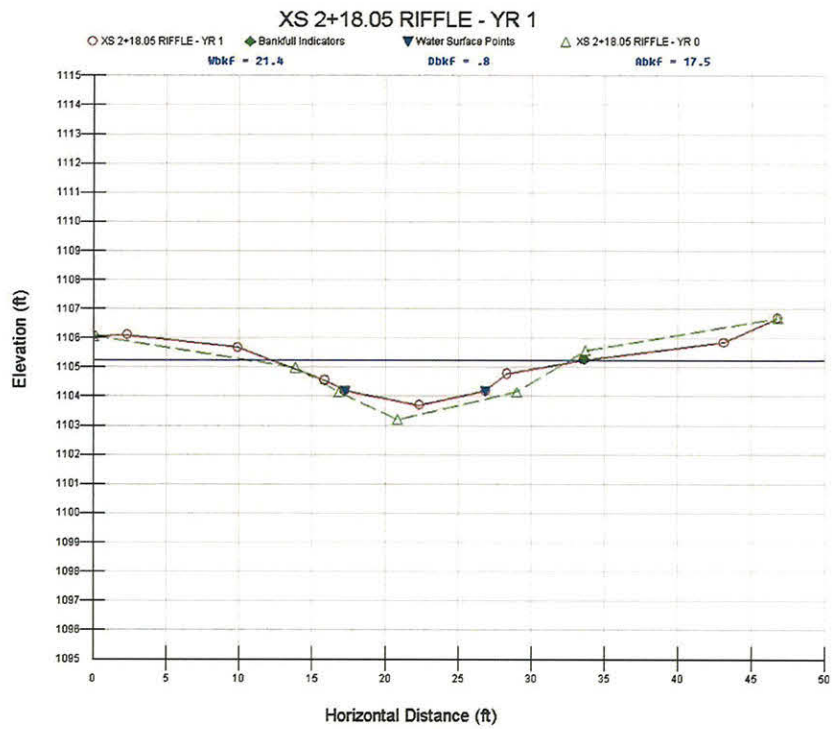
Feature Category	Metric (per As-built and reference baselines	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	7	7	0	100	
	2. Armor stable (e.g. no displacement)?	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	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

Summary Data
All dimensions in feet.

Bankfull Area	17.52
Bankfull Width	21.43
Mean Depth	0.82
Maximum Depth	1.55
Width/Depth Ratio	26.13
Entrenchment Ratio	2.18
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A2
DATE	4/27/07
CROSS SECTION:	2+18
FEATURE:	Riffle

Cross-section photo – looking downstream

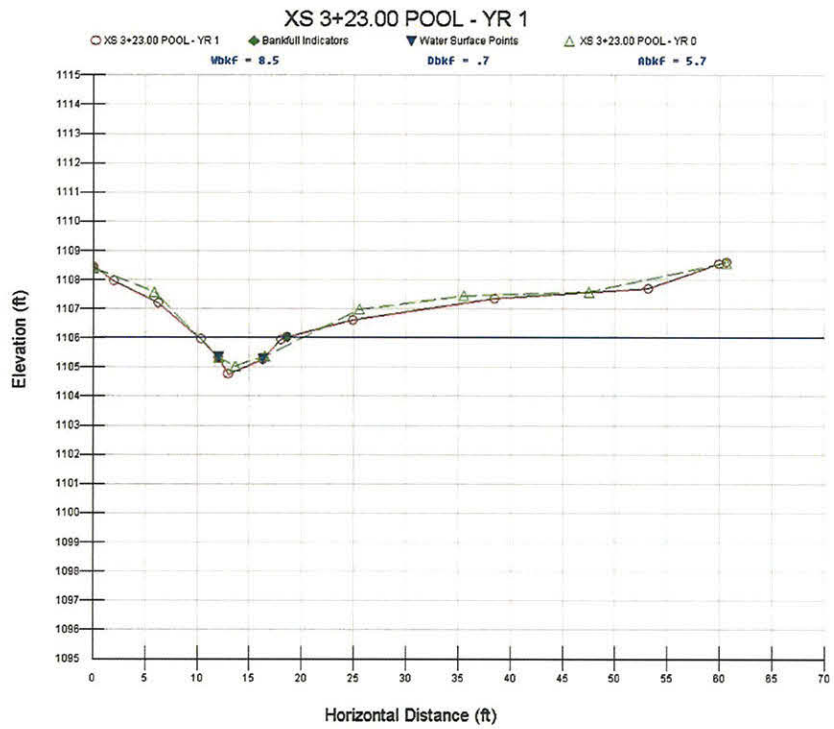


Summary Data
All dimensions in feet.

Bankfull Area	5.7
Bankfull Width	8.47
Mean Depth	0.67
Maximum Depth	1.27
Width/Depth Ratio	12.64
Entrenchment Ratio	3.78
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A2
DATE	4/27/07
CROSS SECTION:	3+23
FEATURE:	Pool

Cross-section photo – looking upstream

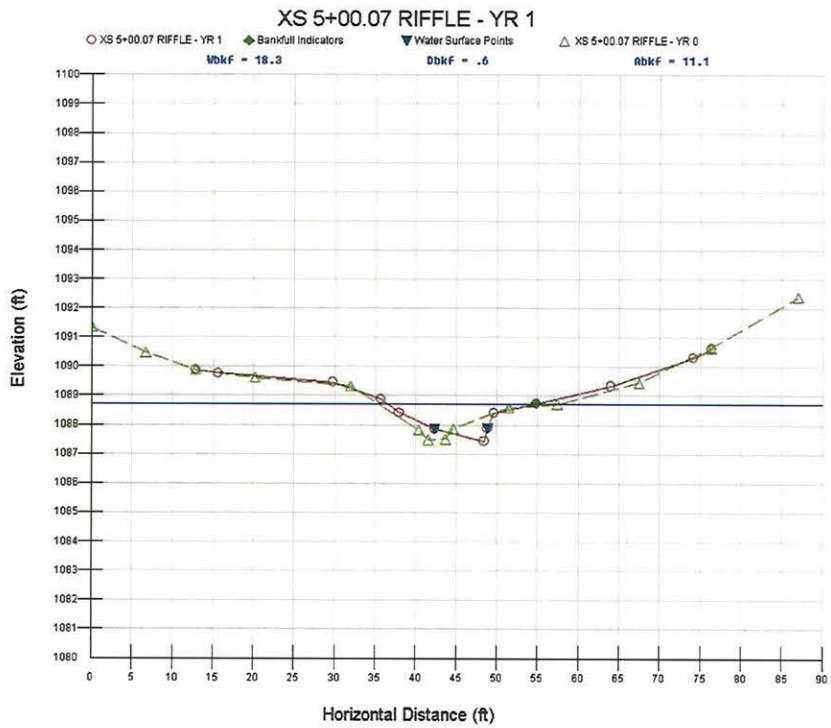


Summary Data
All dimensions in feet.

Bankfull Area	11.12
Bankfull Width	18.34
Mean Depth	0.61
Maximum Depth	1.3
Width/Depth Ratio	30.07
Entrenchment Ratio	3.18
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	B
DATE	4/27/07
CROSS SECTION:	5+00
FEATURE:	Riffle

Cross-section photo – looking downstream

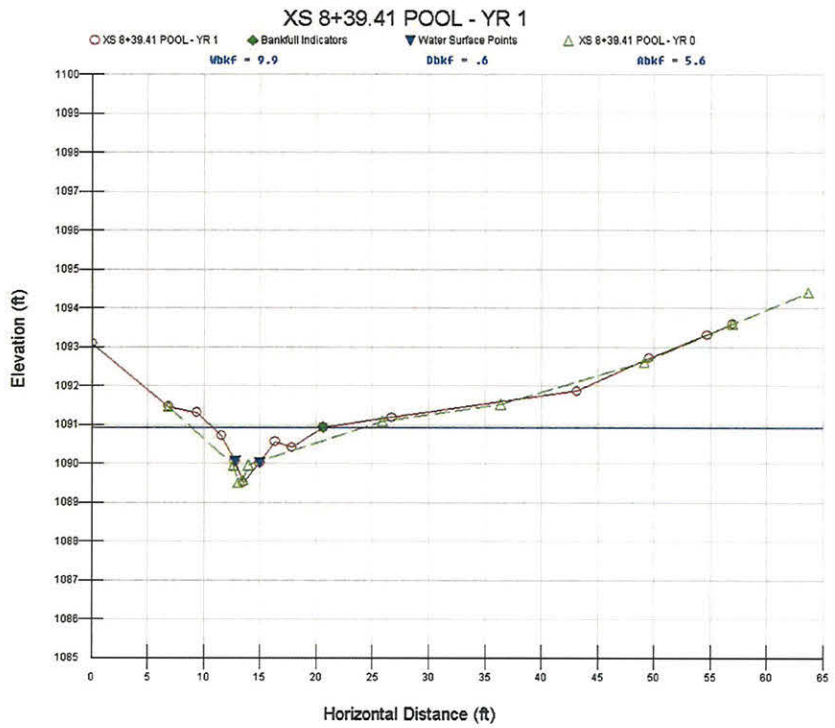


Summary Data
All dimensions in feet.

Bankfull Area	5.57
Bankfull Width	9.93
Mean Depth	0.56
Maximum Depth	1.42
Width/Depth Ratio	17.73
Entrenchment Ratio	4.41
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	B
DATE	4/27/07
CROSS SECTION:	8+39
FEATURE:	Pool

Cross-section photo – looking upstream

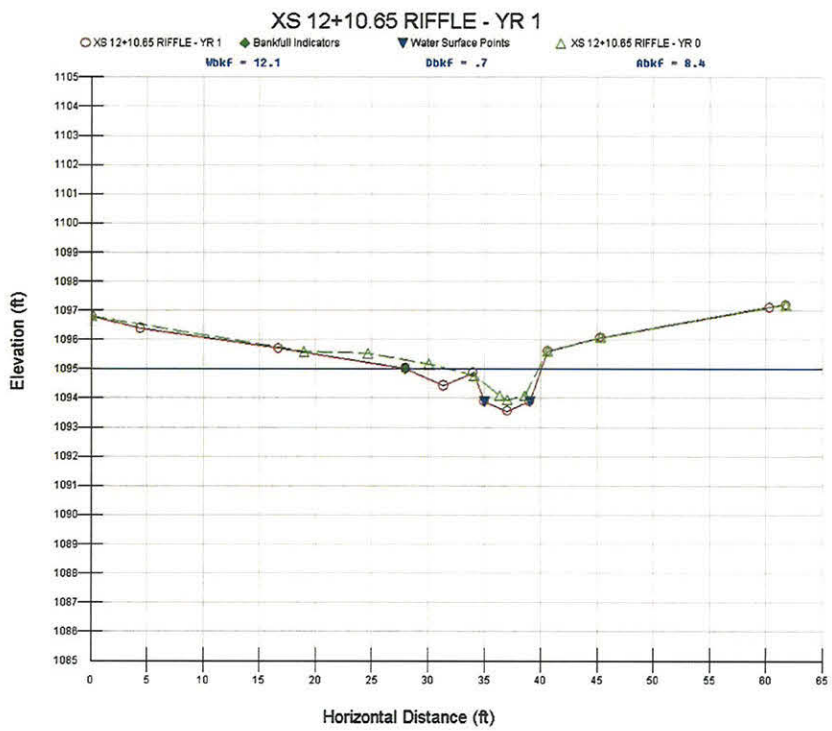


Summary Data
All dimensions in feet.

Bankfull Area	8.37
Bankfull Width	12.11
Mean Depth	0.69
Maximum Depth	1.46
Width/Depth Ratio	17.55
Entrenchment Ratio	3.92
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	B
DATE	4/27/07
CROSS SECTION:	12+10
FEATURE:	Riffle

Cross-section photo – looking upstream

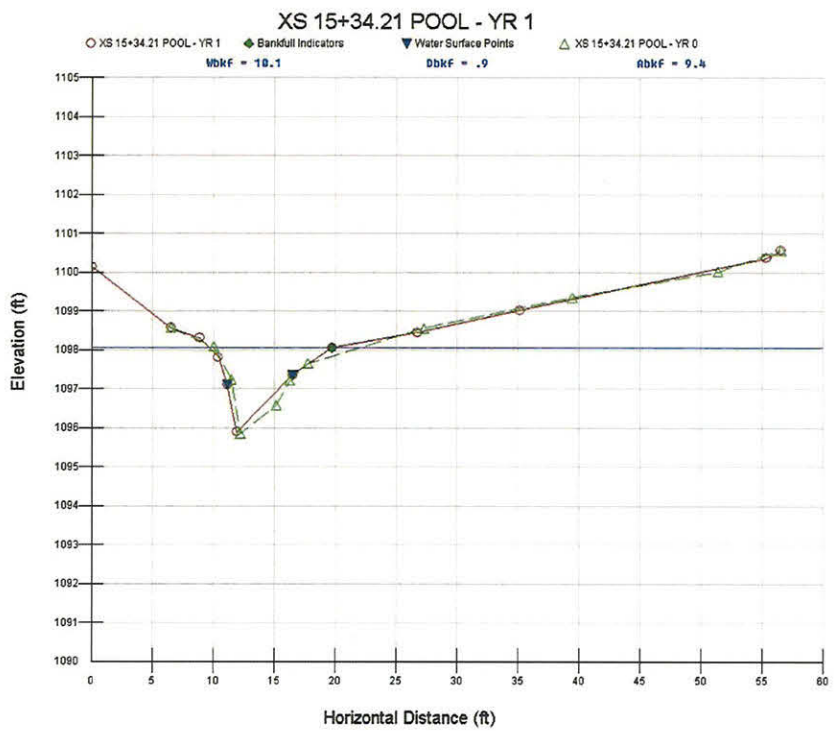


Summary Data
All dimensions in feet.

Bankfull Area	9.41
Bankfull Width	10.08
Mean Depth	0.93
Maximum Depth	2.16
Width/Depth Ratio	10.84
Entrenchment Ratio	5.25
Classification	E

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	B
DATE	4/27/07
CROSS SECTION:	15+34
FEATURE:	Pool

Cross-section photo – looking upstream

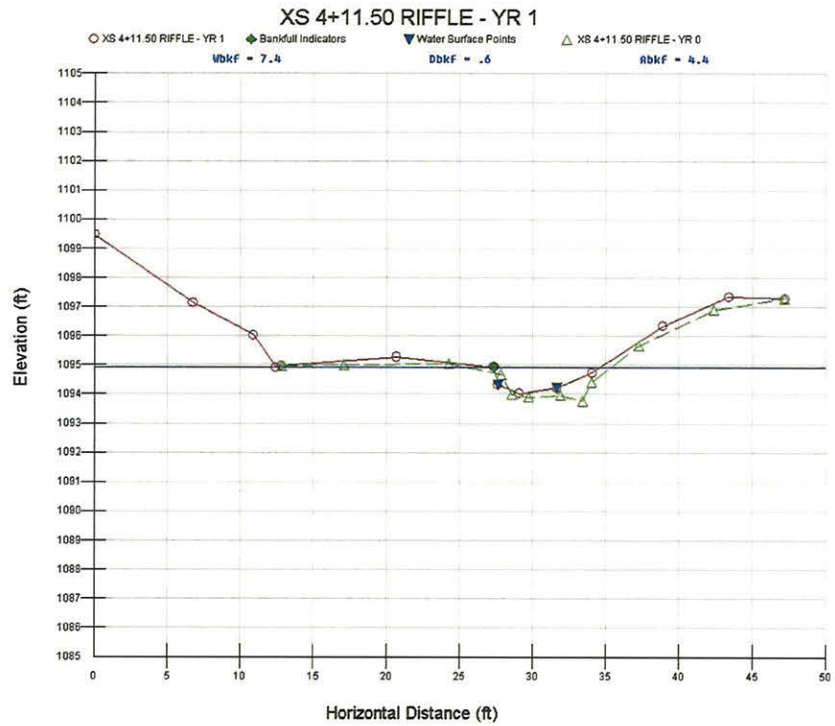


Summary Data
All dimensions in feet.

Bankfull Area	4.41
Bankfull Width	7.45
Mean Depth	0.59
Maximum Depth	0.91
Width/Depth Ratio	12.63
Entrenchment Ratio	3.52
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	C
DATE	4/27/07
CROSS SECTION:	4+11
FEATURE:	Riffle

Cross-section photo – looking downstream

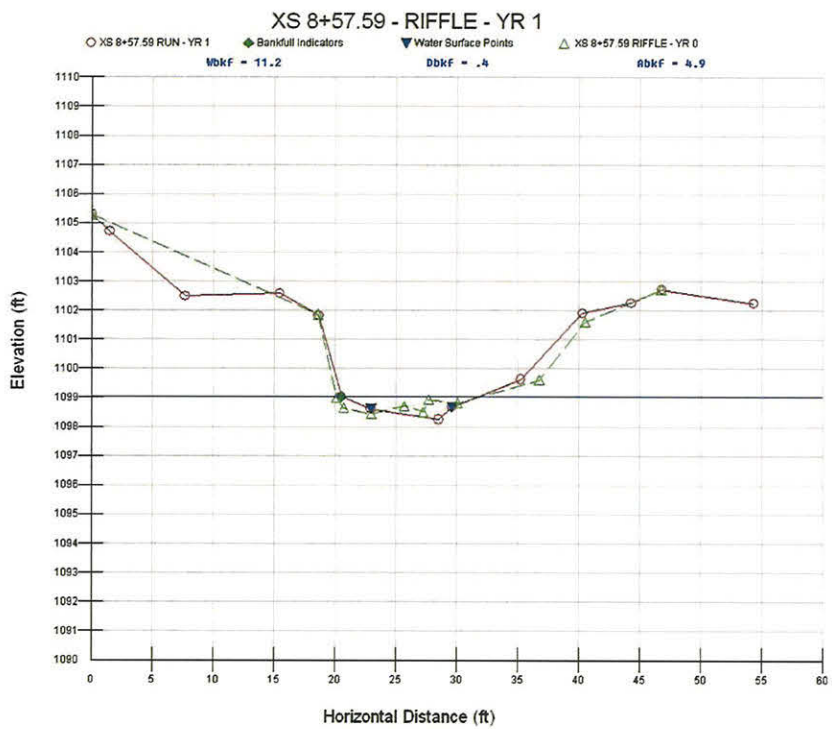


Summary Data
All dimensions in feet.

Bankfull Area	4.91
Bankfull Width	11.25
Mean Depth	0.44
Maximum Depth	0.79
Width/Depth Ratio	25.57
Entrenchment Ratio	1.4
Classification	B

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	C
DATE	4/27/07
CROSS SECTION:	8+57
FEATURE:	Riffle

Cross-section photo – looking downstream

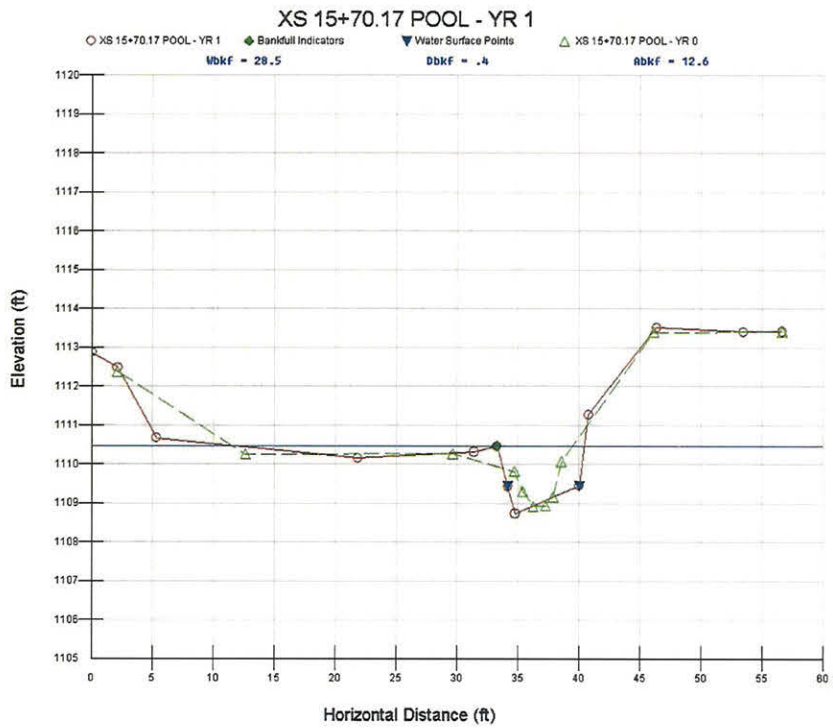


Summary Data
All dimensions in feet.

Bankfull Area	12.58
Bankfull Width	28.47
Mean Depth	0.44
Maximum Depth	1.73
Width/Depth Ratio	64.7
Entrenchment Ratio	1.42
Classification	B

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	C
DATE	4/27/07
CROSS SECTION:	15+70
FEATURE:	Pool

Cross-section photo – looking downstream

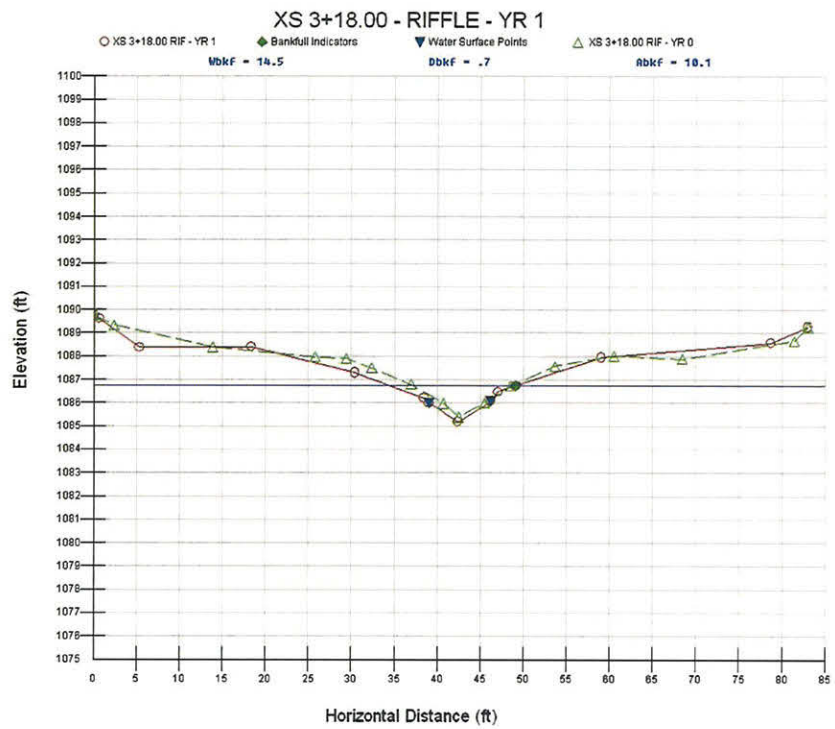


Summary Data
All dimensions in feet.

Bankfull Area	10.09
Bankfull Width	14.52
Mean Depth	0.70
Maximum Depth	1.55
Width/Depth Ratio	20.74
Entrenchment Ratio	3.40
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	3+18
FEATURE:	Riffle

Cross section photo – looking downstream

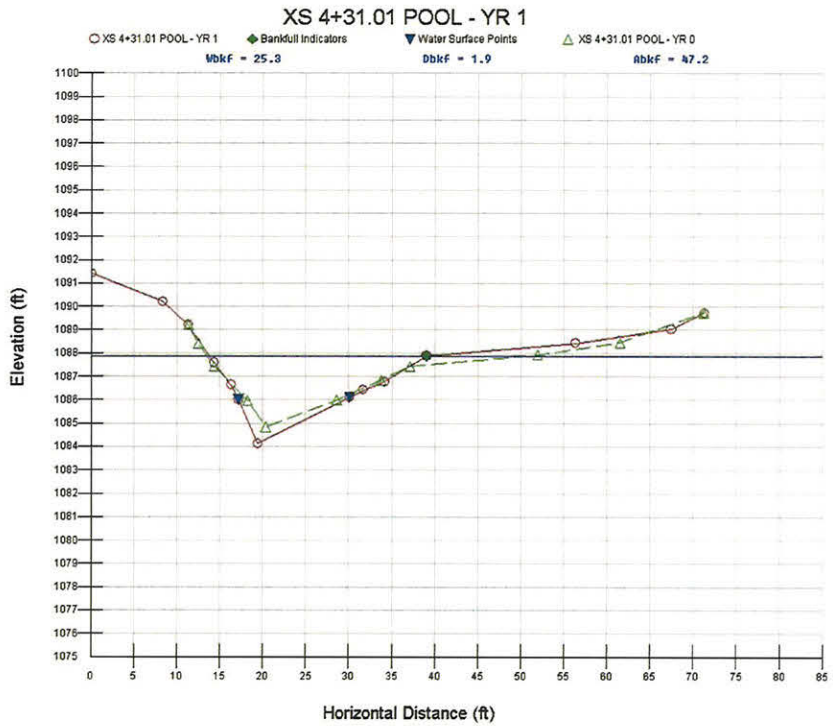


Summary Data
All dimensions in feet.

Bankfull Area	47.21
Bankfull Width	25.28
Mean Depth	1.87
Maximum Depth	3.75
Width/Depth Ratio	13.52
Entrenchment Ratio	2.82
Classification	E

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	4+31
FEATURE:	Pool

Cross section photo – looking upstream

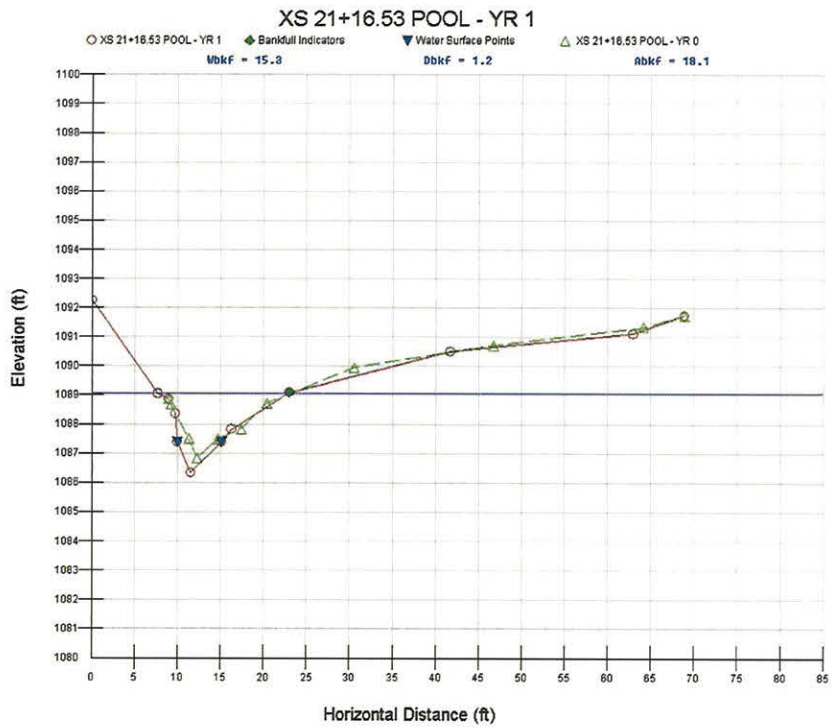


Summary Data
All dimensions in feet.

Bankfull Area	18.13
Bankfull Width	15.34
Mean Depth	1.18
Maximum Depth	2.74
Width/Depth Ratio	13
Entrenchment Ratio	4.42
Classification	E

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	21+16
FEATURE:	Pool

Cross section photo – looking downstream

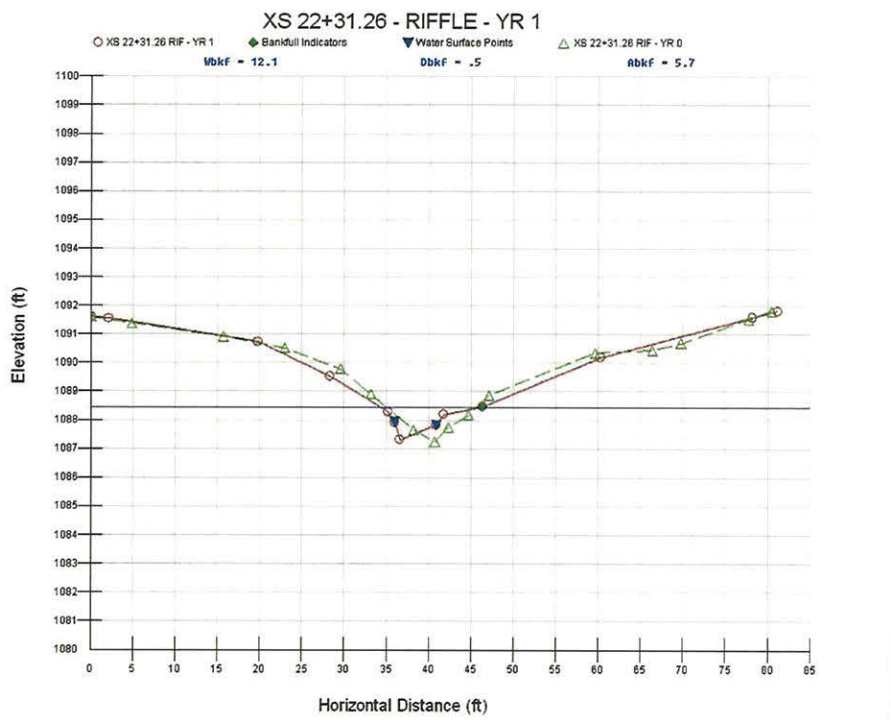


Summary Data
All dimensions in feet.

Bankfull Area	5.67
Bankfull Width	27.84
Mean Depth	0.47
Maximum Depth	1.14
Width/Depth Ratio	25.72
Entrenchment Ratio	2.30
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	22+31
FEATURE:	Riffle

Cross section photo – looking downstream

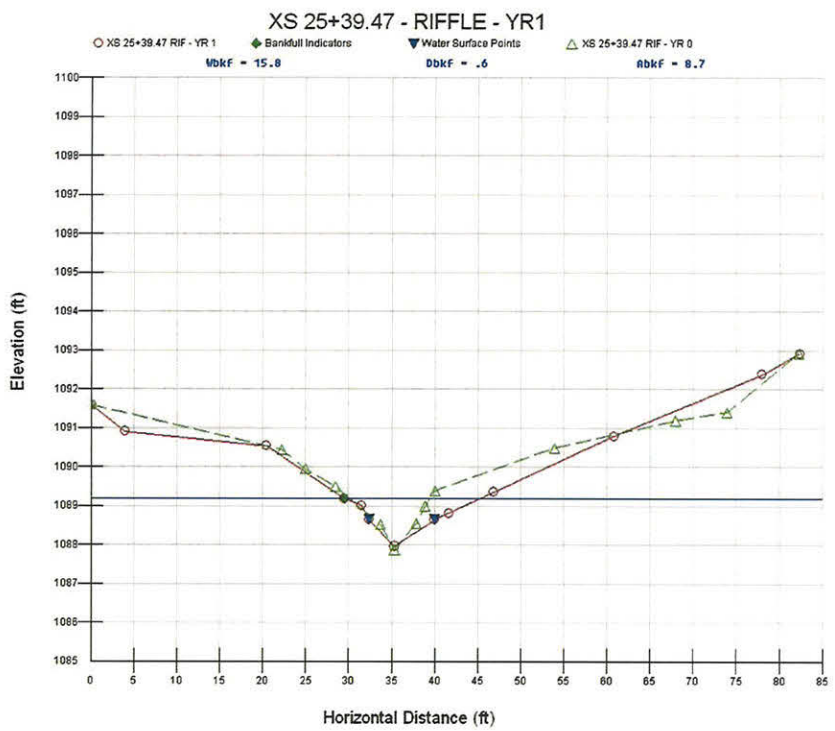


Summary Data
All dimensions in feet.

Bankfull Area	8.72
Bankfull Width	36.07
Mean Depth	0.55
Maximum Depth	1.23
Width/Depth Ratio	28.78
Entrenchment Ratio	2.28
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	25+39
FEATURE:	Riffle

Cross section photo – looking downstream



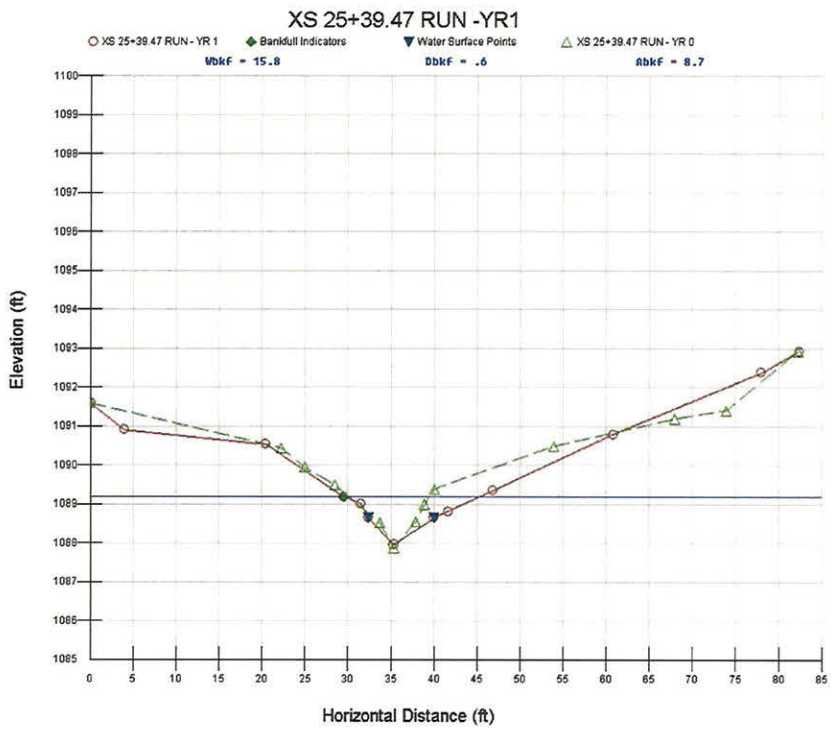
EMH&T

Summary Data
All dimensions in feet.

Bankfull Area	14.12
Bankfull Width	16.60
Mean Depth	0.85
Maximum Depth	2.13
Width/Depth Ratio	19.53
Entrenchment Ratio	3.48
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	28+23
FEATURE:	Pool

Cross section photo – looking upstream

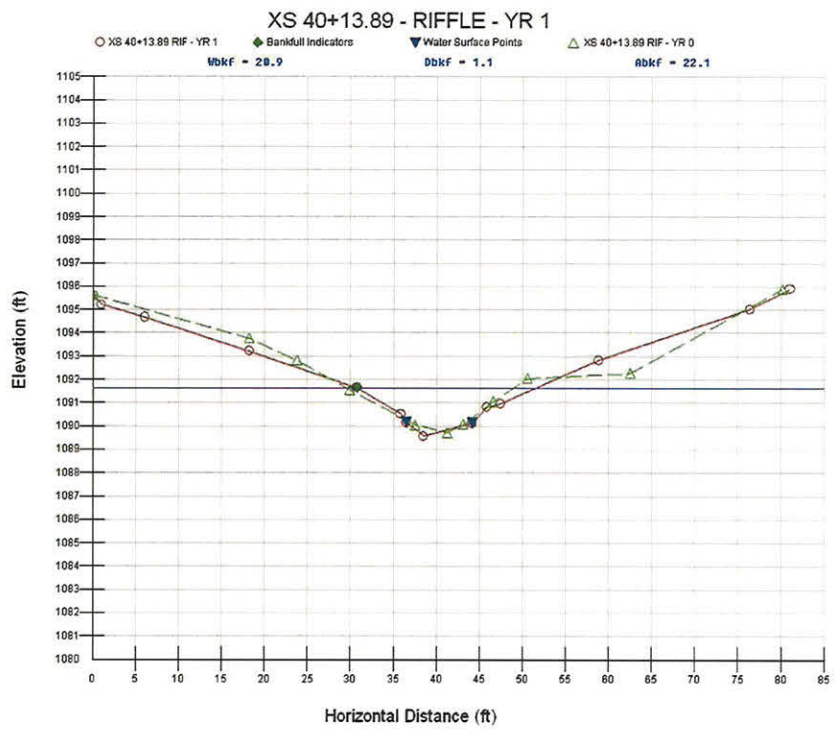


Summary Data
All dimensions in feet.

Bankfull Area	22.09
Bankfull Width	20.91
Mean Depth	1.06
Maximum Depth	2.07
Width/Depth Ratio	19.73
Entrenchment Ratio	2.48
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	40+13
FEATURE:	Riffle

Cross section photo – looking downstream

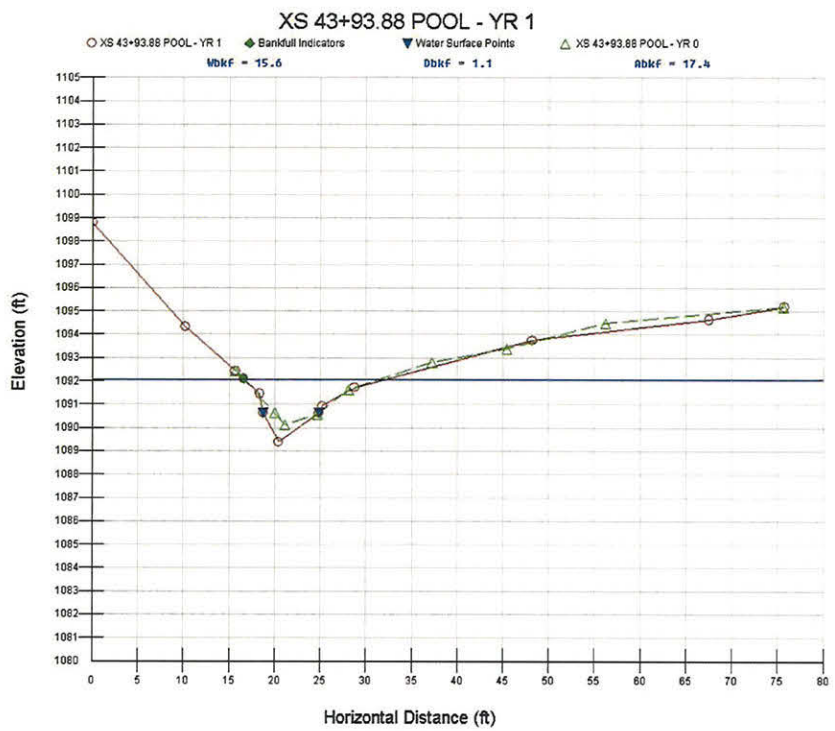


Summary Data
All dimensions in feet.

Bankfull Area	17.40
Bankfull Width	15.62
Mean Depth	1.11
Maximum Depth	2.68
Width/Depth Ratio	14.07
Entrenchment Ratio	3.85
Classification	E

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	43+93
FEATURE:	Pool

Cross section photo – looking downstream

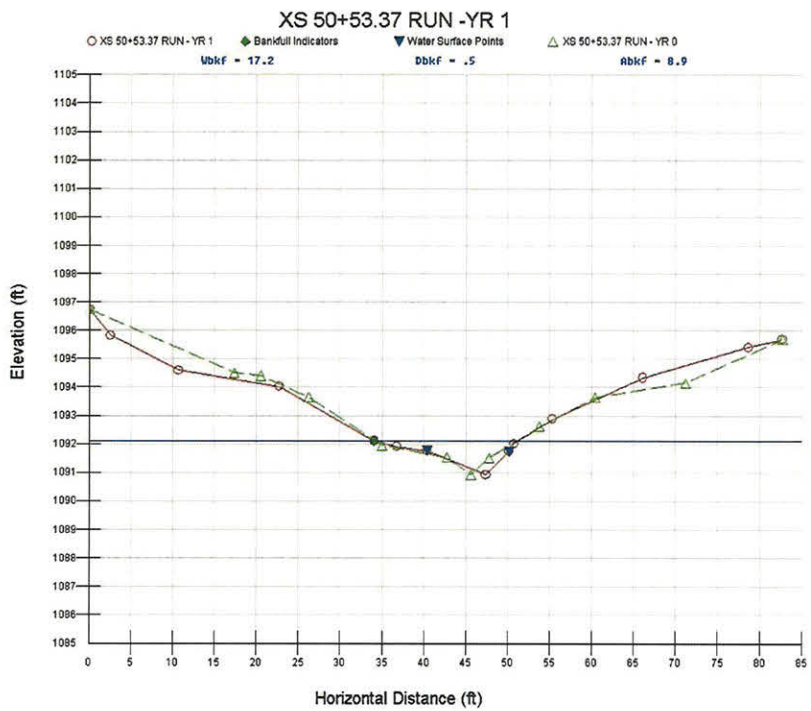


Summary Data
All dimensions in feet.

Bankfull Area	8.87
Bankfull Width	17.21
Mean Depth	0.52
Maximum Depth	1.17
Width/Depth Ratio	33.10
Entrenchment Ratio	1.82
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	50+53
FEATURE:	Riffle

Cross section photo – looking upstream

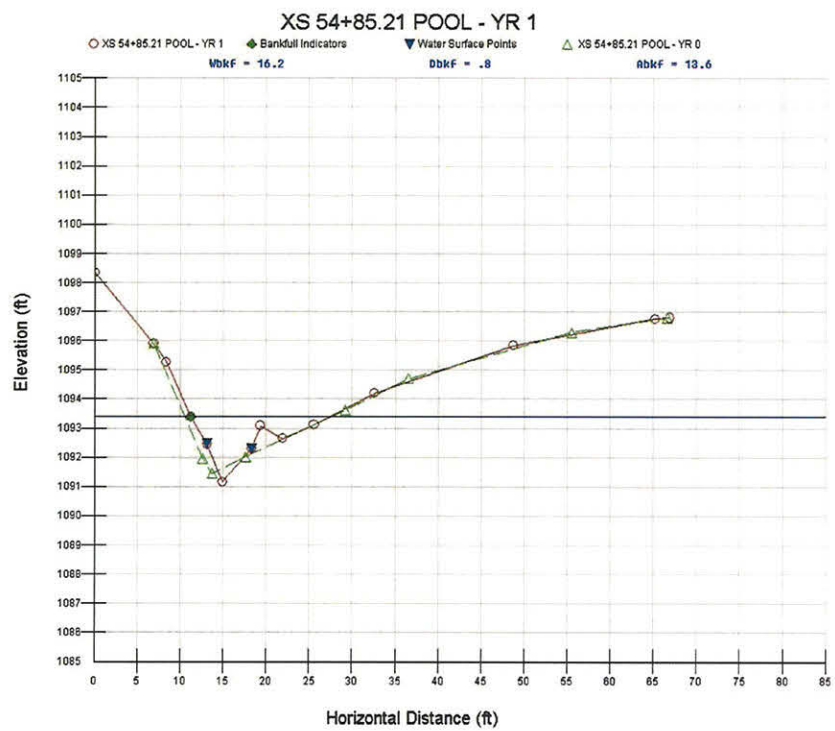


Summary Data
All dimensions in feet.

Bankfull Area	13.56
Bankfull Width	16.15
Mean Depth	0.84
Maximum Depth	2.23
Width/Depth Ratio	19.23
Entrenchment Ratio	2.42
Classification	B

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	54+85
FEATURE:	Pool

Cross section photo – looking downstream

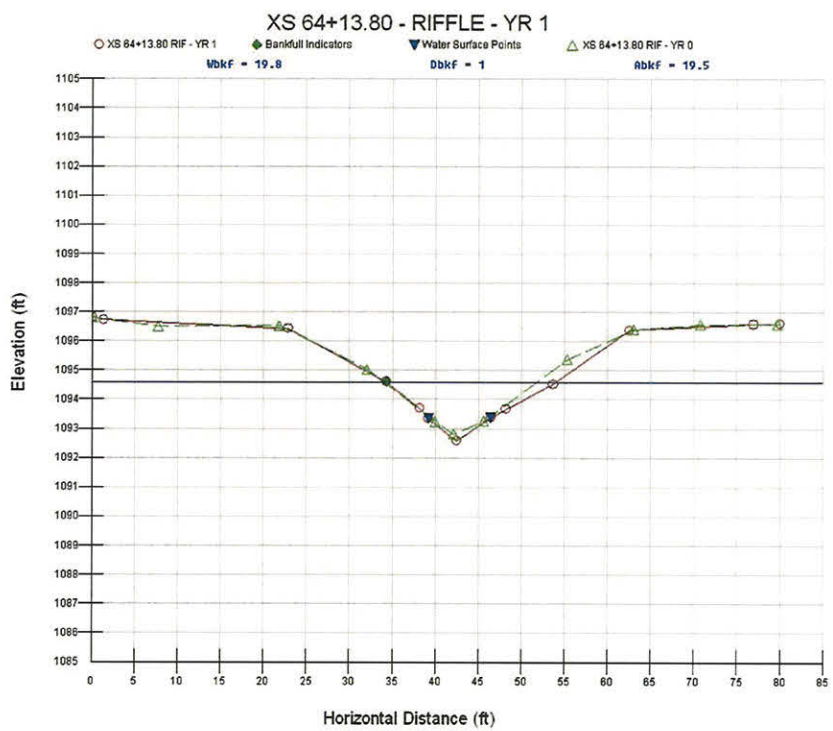


Summary Data
All dimensions in feet.

Bankfull Area	19.46
Bankfull Width	19.78
Mean Depth	3.60
Maximum Depth	2.02
Width/Depth Ratio	20.18
Entrenchment Ratio	3.60
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	64+13
FEATURE:	Riffle

Cross section photo – looking upstream

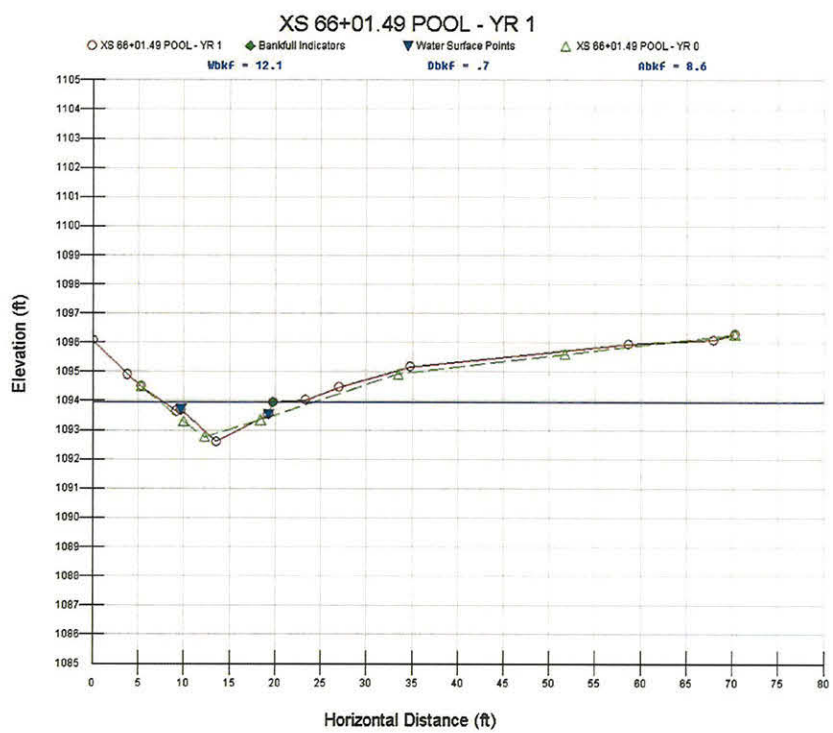


Summary Data
All dimensions in feet.

Bankfull Area	8.61
Bankfull Width	12.09
Mean Depth	0.71
Maximum Depth	1.34
Width/Depth Ratio	17.03
Entrenchment Ratio	2.99
Classification	E

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	4/27/07
CROSS SECTION:	66+01
FEATURE:	Pool

Cross section photo – looking downstream

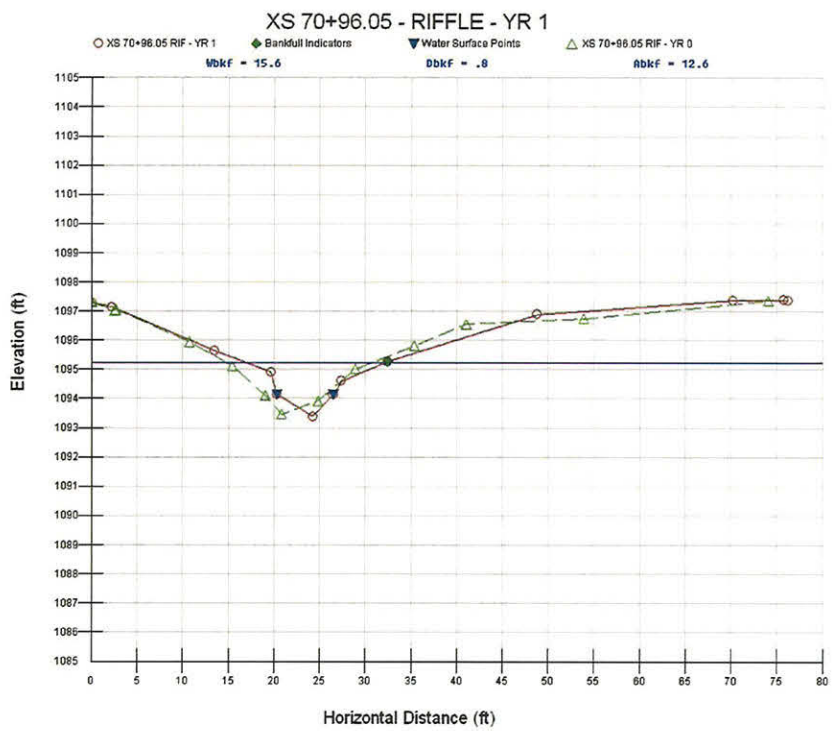


Summary Data
All dimensions in feet.

Bankfull Area	12.06
Bankfull Width	13.79
Mean Depth	0.87
Maximum Depth	1.6
Width/Depth Ratio	15.85
Entrenchment Ratio	7.98
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	11/13/06
CROSS SECTION:	70+96
FEATURE:	Riffle

Cross section photo – looking downstream

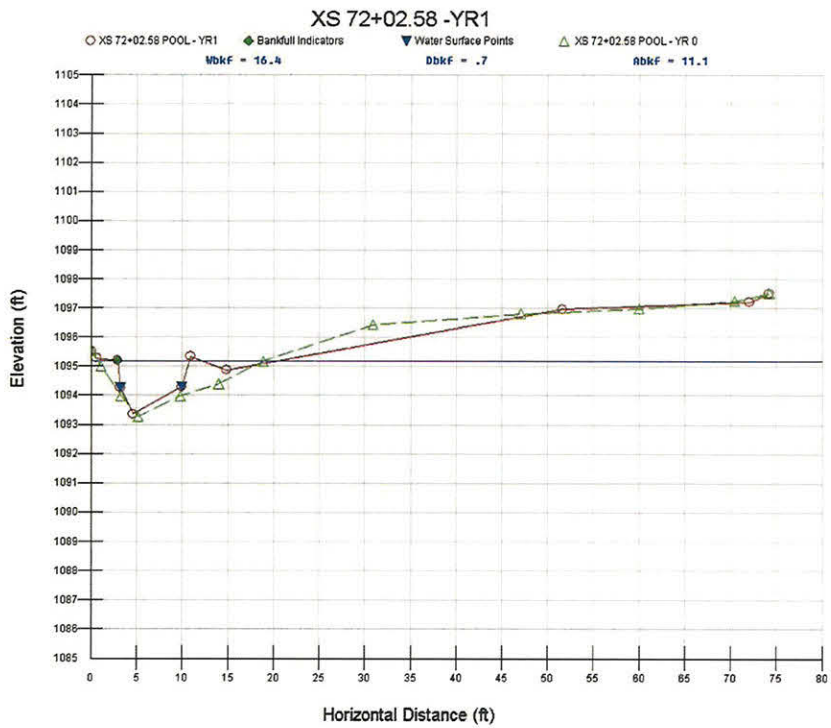


Summary Data
All dimensions in feet.

Bankfull Area	27.81
Bankfull Width	22.4
Mean Depth	1.24
Maximum Depth	2.54
Width/Depth Ratio	18.06
Entrenchment Ratio	4.91
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Lower
DATE	11/13/06
CROSS SECTION:	72+02
FEATURE:	Pool

Cross section photo – looking upstream

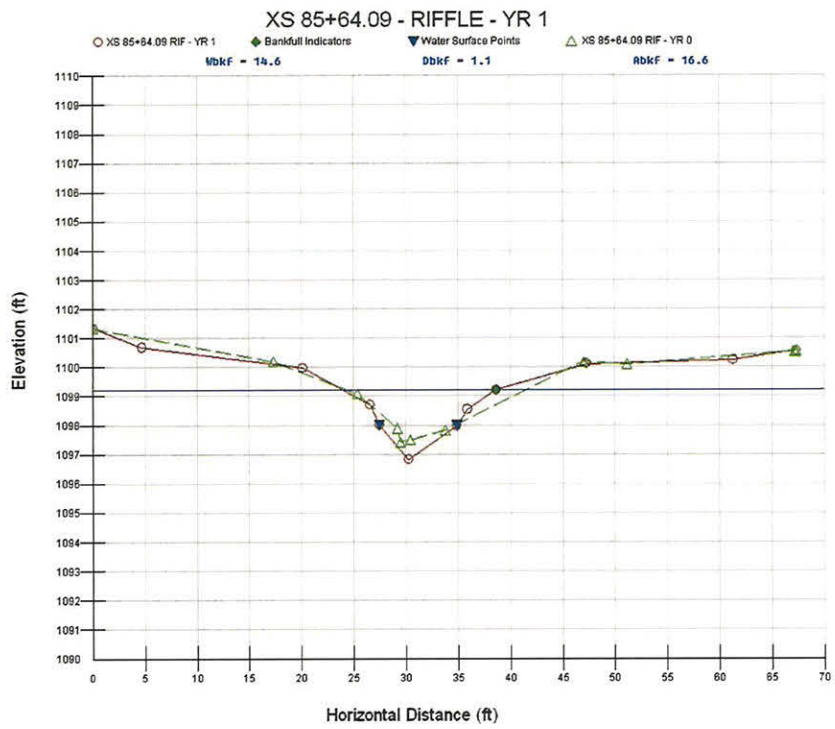


Summary Data
All dimensions in feet.

Bankfull Area	16.62
Bankfull Width	14.63
Mean Depth	1.14
Maximum Depth	2.38
Width/Depth Ratio	12.83
Entrenchment Ratio	4.60
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Middle
DATE	4/27/07
CROSS SECTION:	85+64
FEATURE:	Riffle

Cross section photo – looking upstream

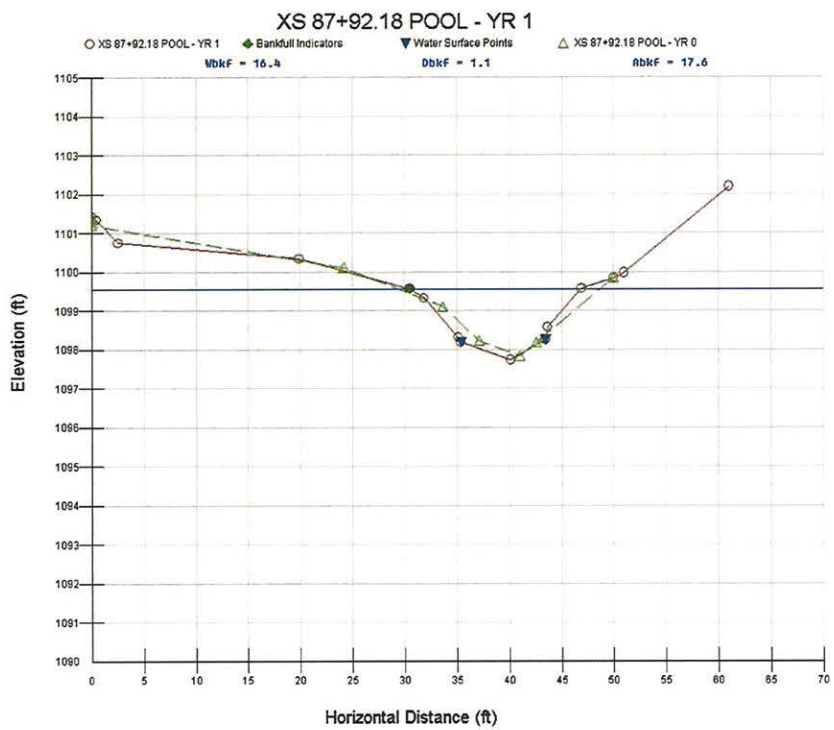


Summary Data
All dimensions in feet.

Bankfull Area	17.60
Bankfull Width	16.43
Mean Depth	1.07
Maximum Depth	1.83
Width/Depth Ratio	15.36
Entrenchment Ratio	3.48
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Middle
DATE	4/27/07
CROSS SECTION:	87+92
FEATURE:	Pool

Cross section photo – looking downstream

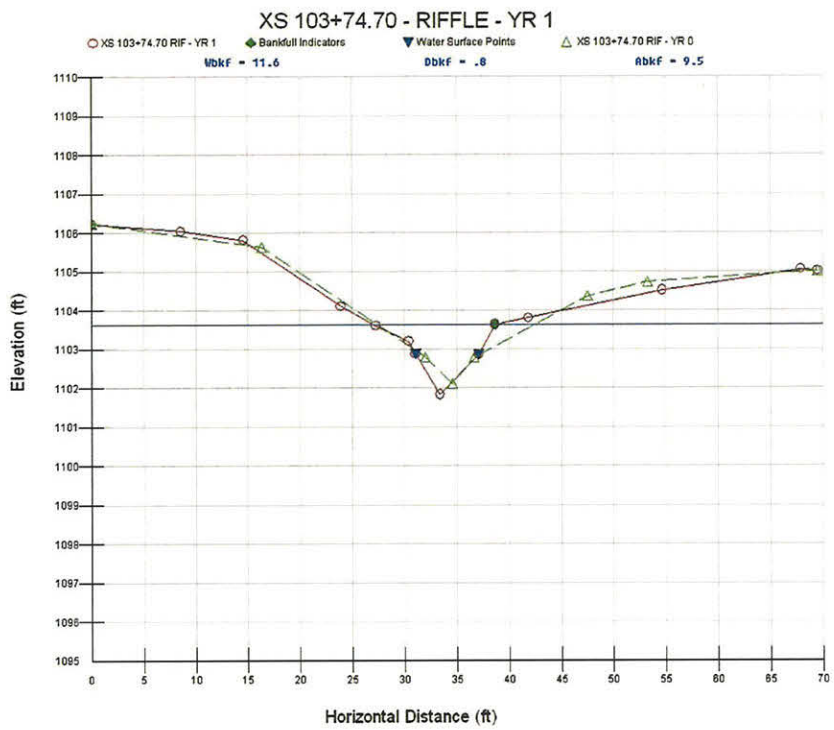


Summary Data
All dimensions in feet.

Bankfull Area	9.49
Bankfull Width	11.64
Mean Depth	0.82
Maximum Depth	1.80
Width/Depth Ratio	14.20
Entrenchment Ratio	4.54
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Upper
DATE	4/27/07
CROSS SECTION:	103+74
FEATURE:	Riffle

Cross-section photo – looking across the stream

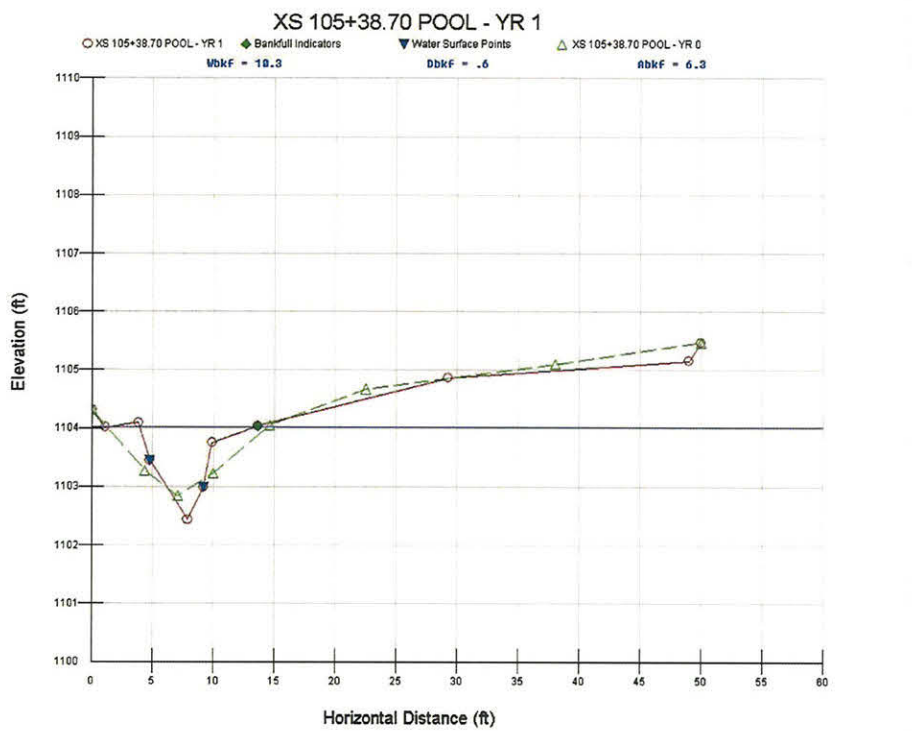


Summary Data
All dimensions in feet.

Bankfull Area	6.32
Bankfull Width	10.35
Mean Depth	0.61
Maximum Depth	1.59
Width/Depth Ratio	16.97
Entrenchment Ratio	4.83
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Upper
DATE	4/27/07
CROSS SECTION:	105+38
FEATURE:	Pool

Cross-section photo – looking downstream

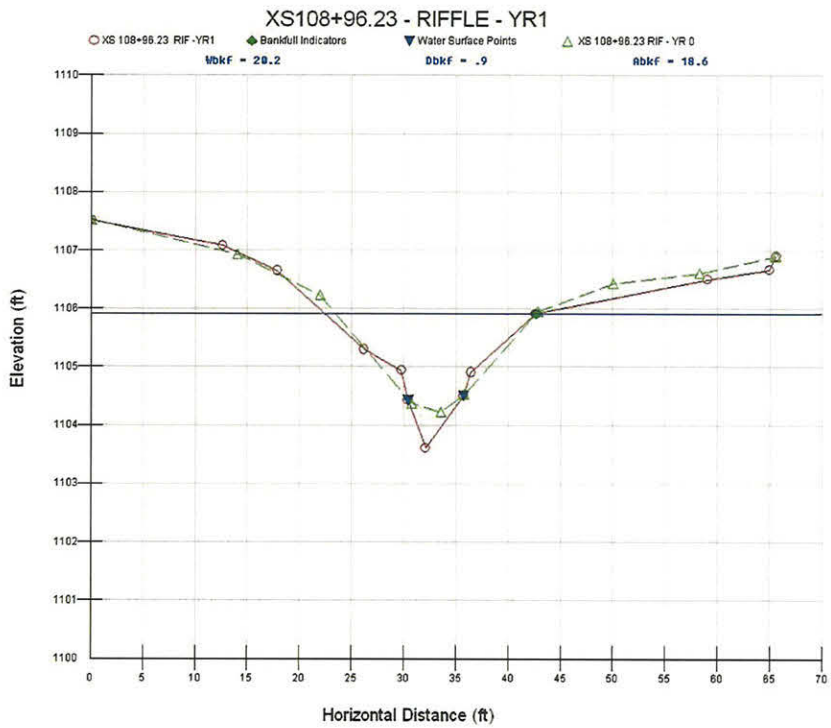


Summary Data
All dimensions in feet.

Bankfull Area	18.64
Bankfull Width	20.22
Mean Depth	0.92
Maximum Depth	2.30
Width/Depth Ratio	21.98
Entrenchment Ratio	3.25
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Upper
DATE	4/27/07
CROSS SECTION:	108+96
FEATURE:	Riffle

Cross-section photo – looking upstream

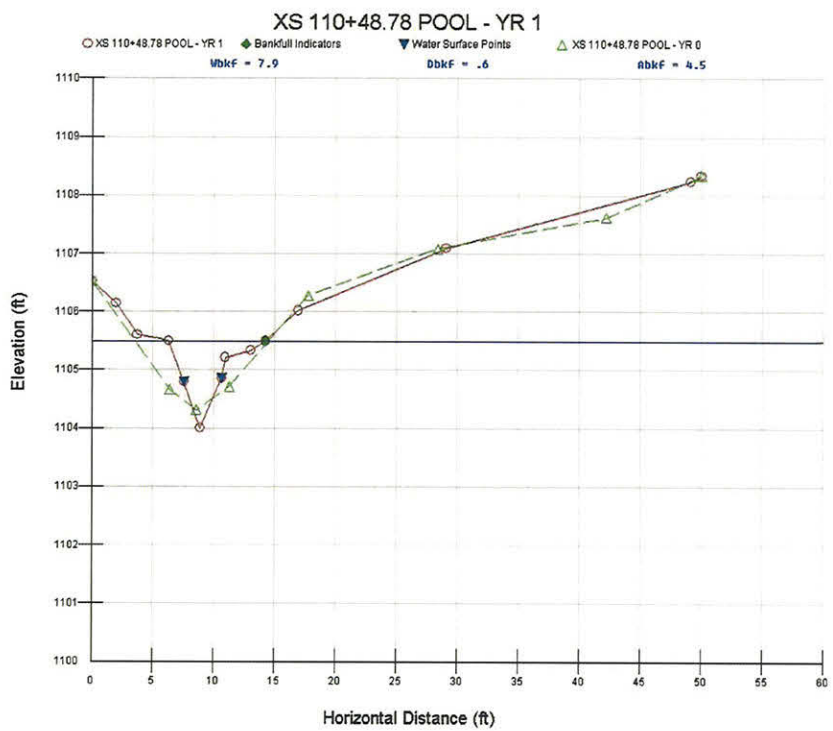


Summary Data
All dimensions in feet.

Bankfull Area	4.46
Bankfull Width	7.94
Mean Depth	0.56
Maximum Depth	1.49
Width/Depth Ratio	14.18
Entrenchment Ratio	3.50
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Upper
DATE	4/27/07
CROSS SECTION:	110+48
FEATURE:	Pool

Cross-section photo – looking downstream

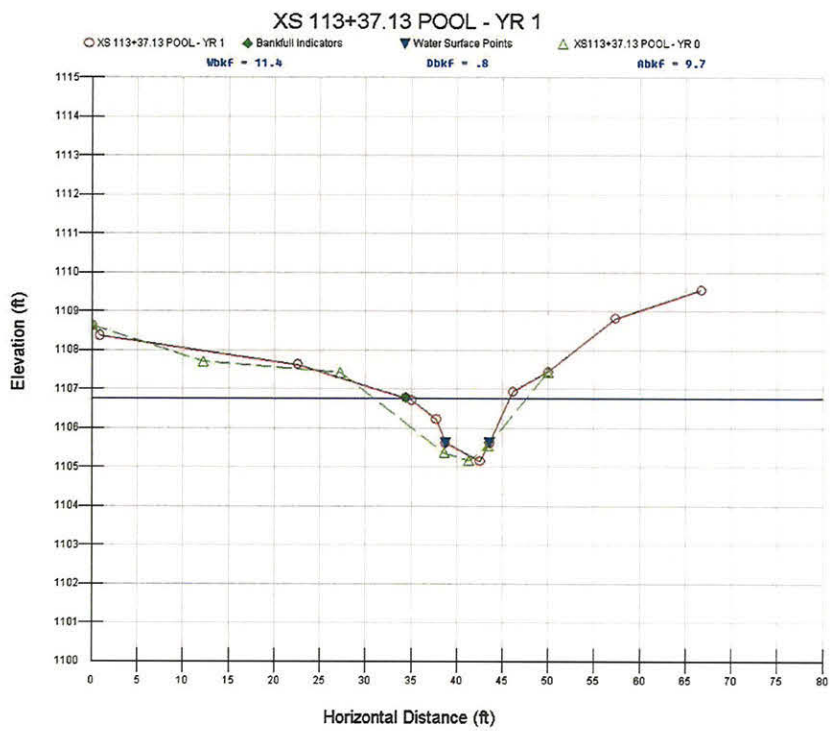


Summary Data
All dimensions in feet.

Bankfull Area	9.69
Bankfull Width	11.41
Mean Depth	0.85
Maximum Depth	1.63
Width/Depth Ratio	13.42
Entrenchment Ratio	4.76
Classification	C

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Upper
DATE	4/27/07
CROSS SECTION:	113+37
FEATURE:	Pool

Cross-section photo – looking upstream

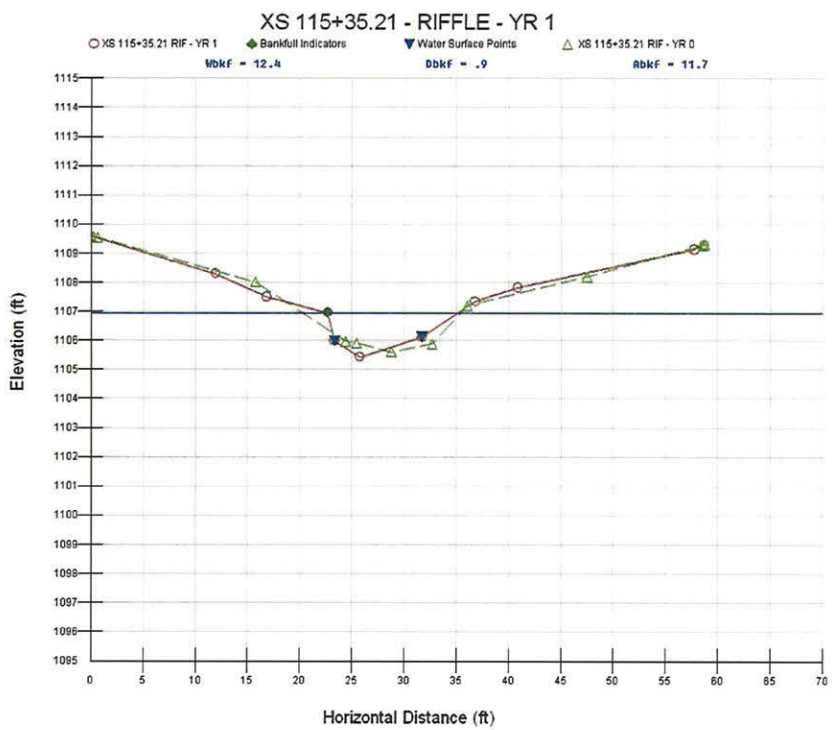


Summary Data
All dimensions in feet.

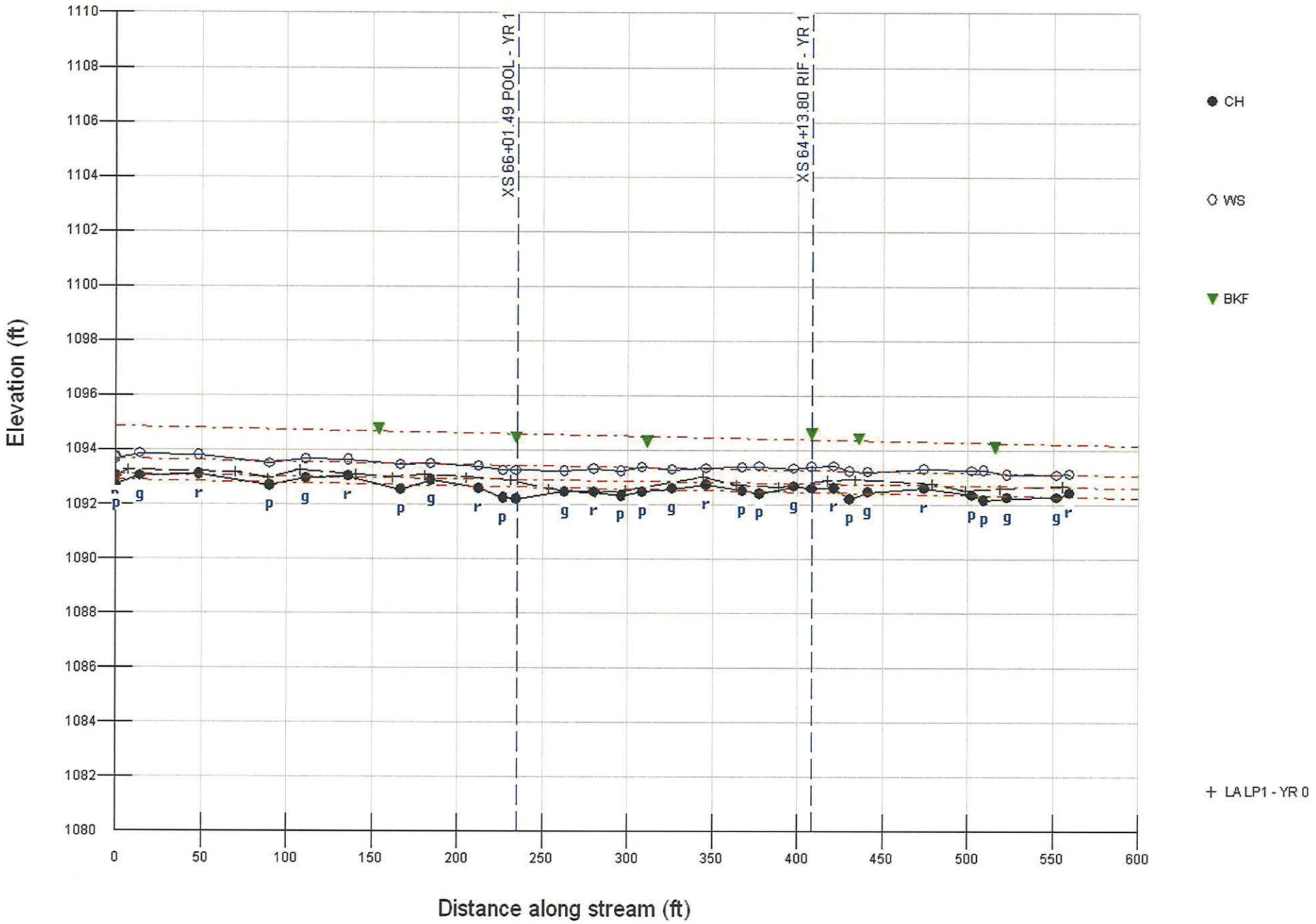
Bankfull Area	11.69
Bankfull Width	12.42
Mean Depth	0.94
Maximum Depth	1.52
Width/Depth Ratio	13.21
Entrenchment Ratio	3.13
Classification	E

PROJECT	South Muddy
	D04006-1
	1-YEAR
TASK	Cross-Section
REACH	A Upper
DATE	4/27/07
CROSS SECTION:	115+35
FEATURE:	Riffle

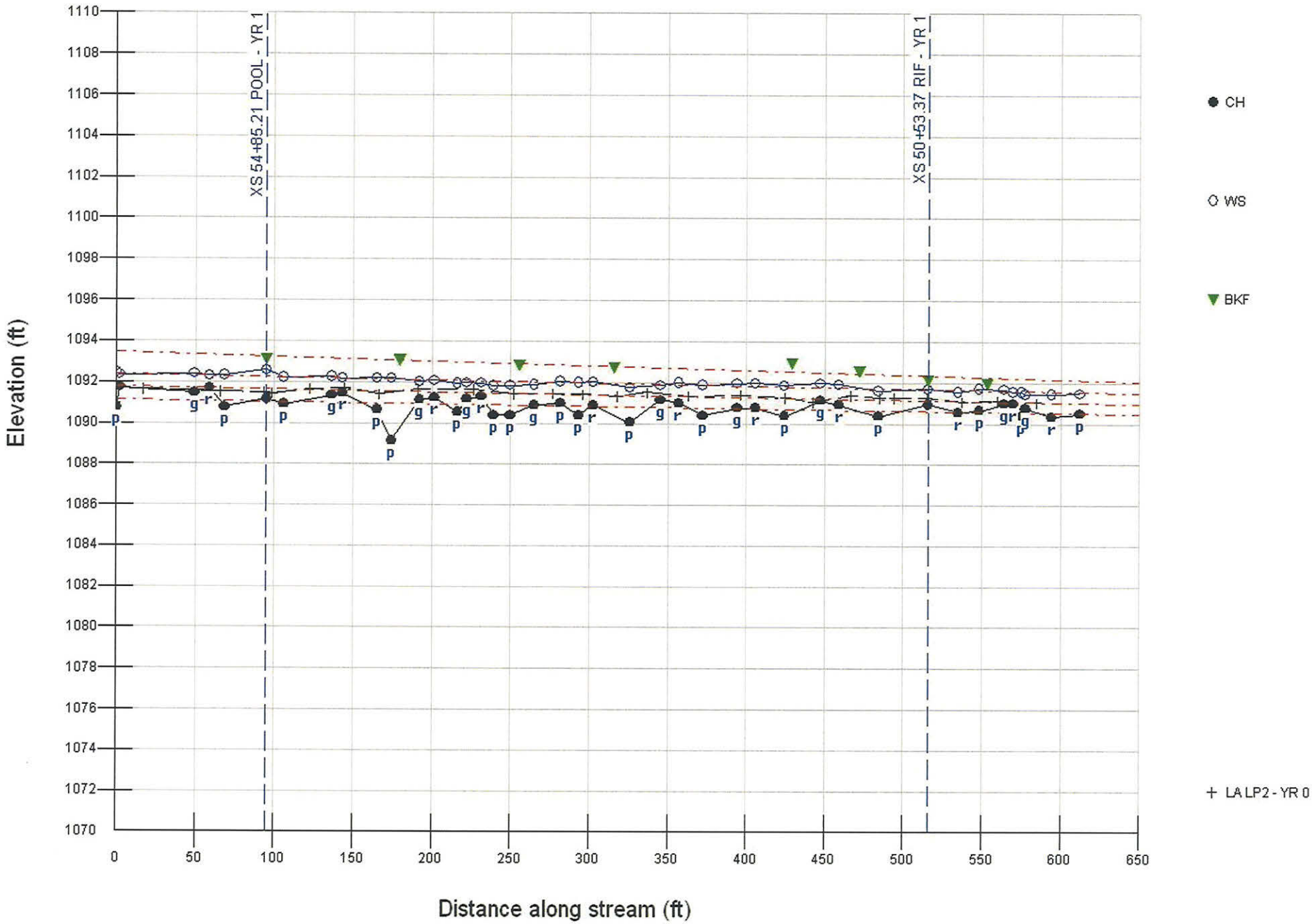
Cross-section photo – looking downstream



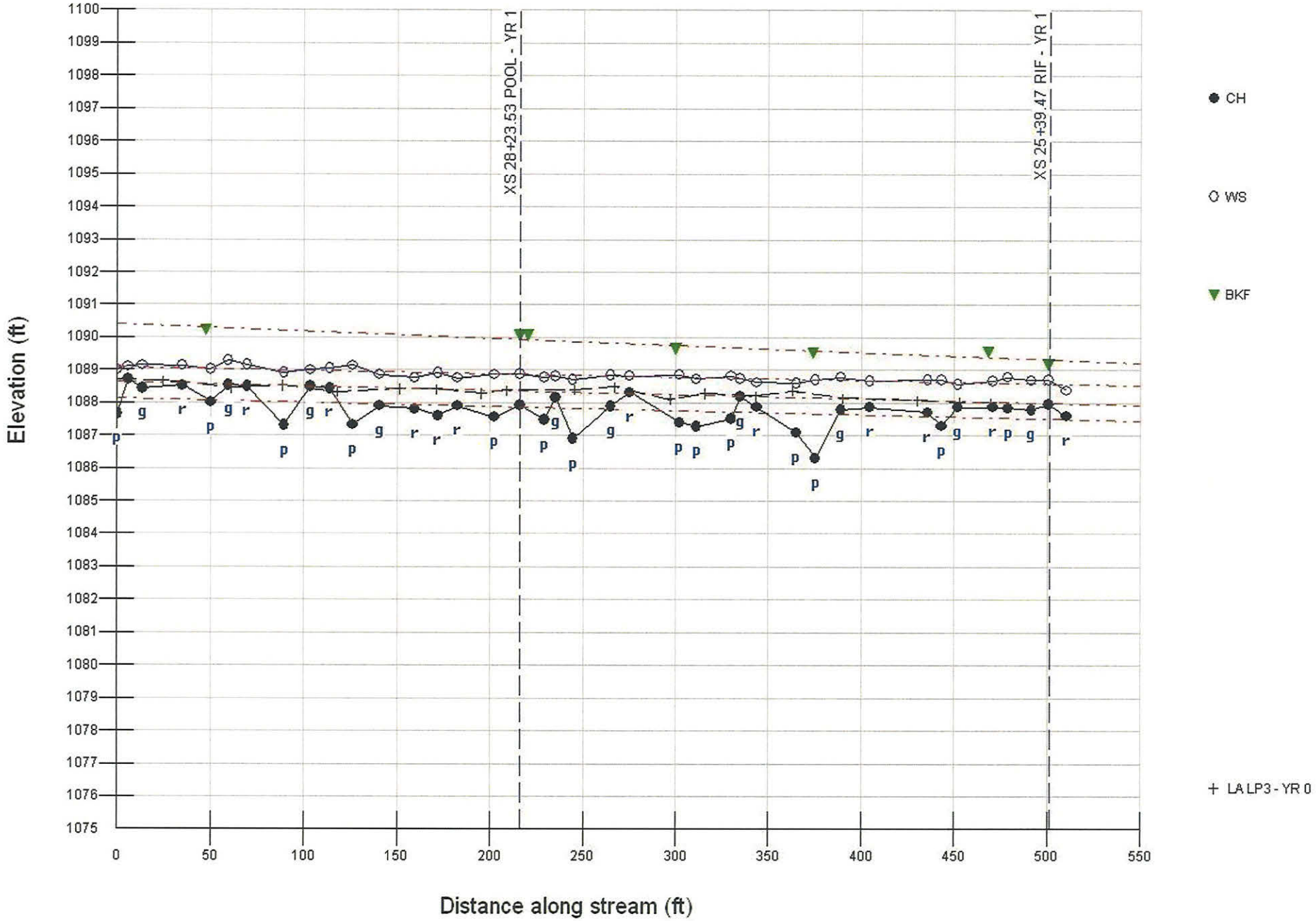
LOWER TRIB A - LONGITUDINAL PROFILE No. 1 - YR 1



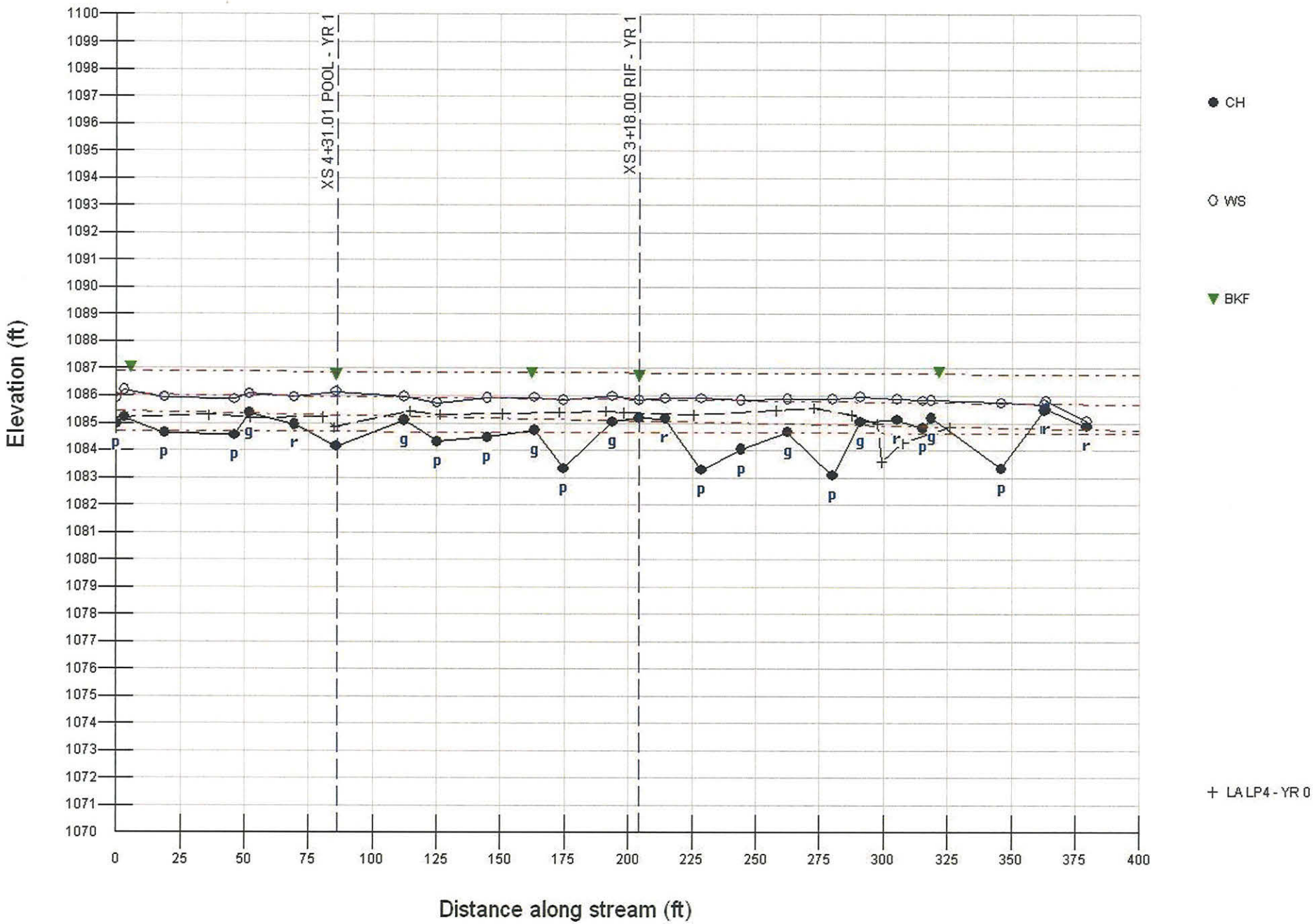
LOWER TRIB A - LONGITUDINAL PROFILE No. 2 - YEAR 1



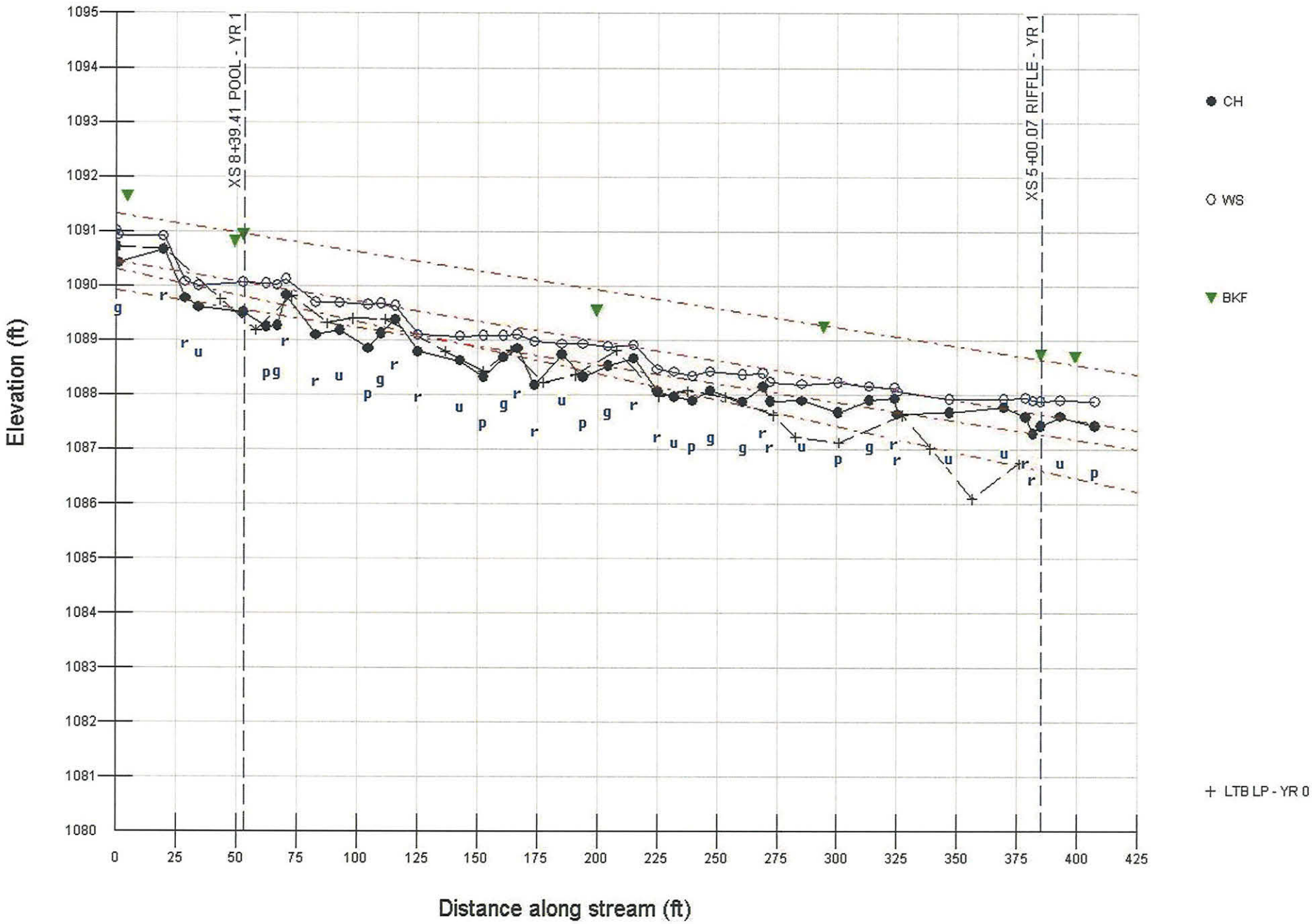
LOWER TRIB A - LONGITUDINAL PROFILE No. 3 - YEAR 1



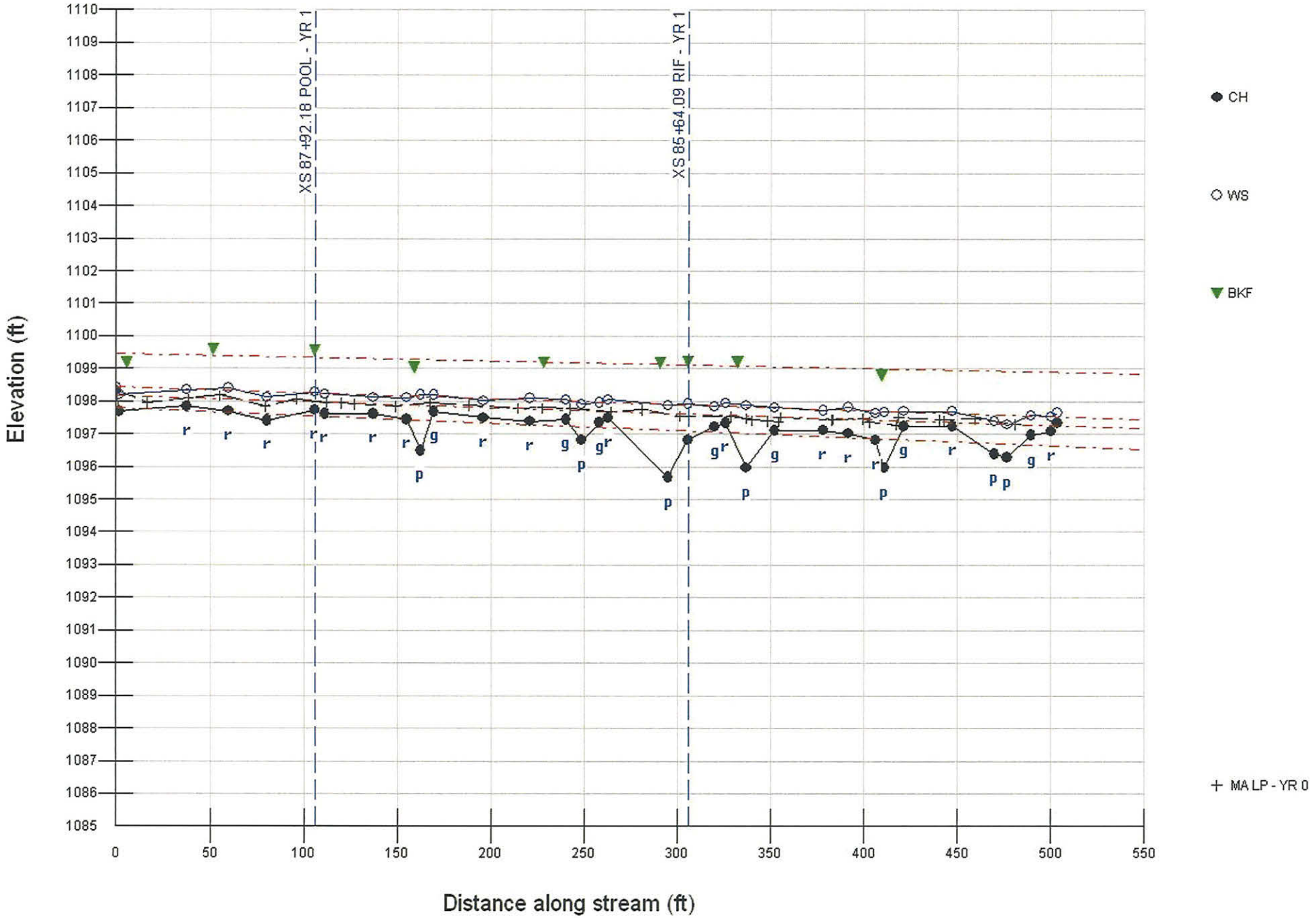
LOWER TRIB A - LONGITUDINAL PROFILE No. 4 - YEAR 1



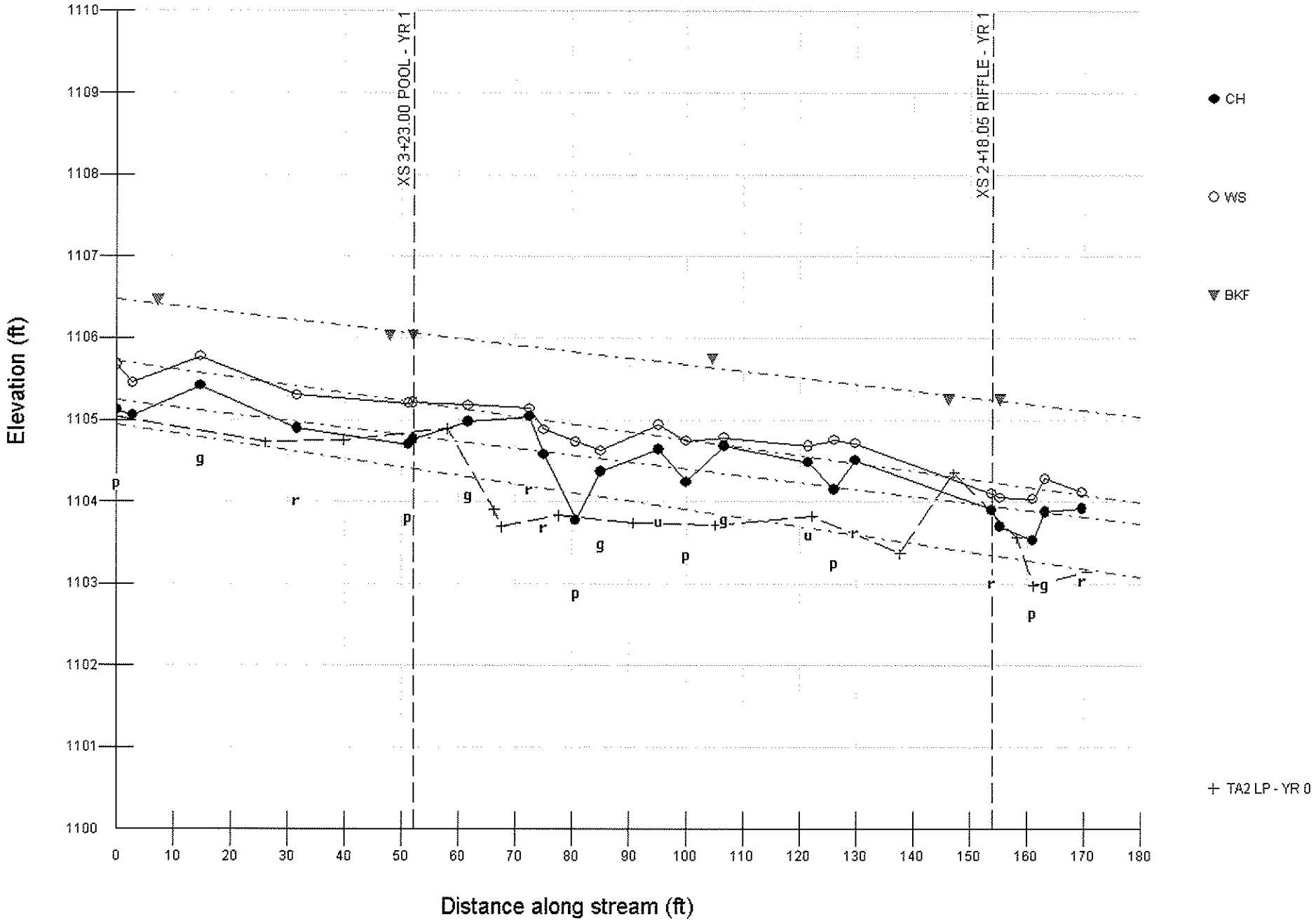
LOWER TRIB B - LONGITUDINAL PROFILE - YEAR 1



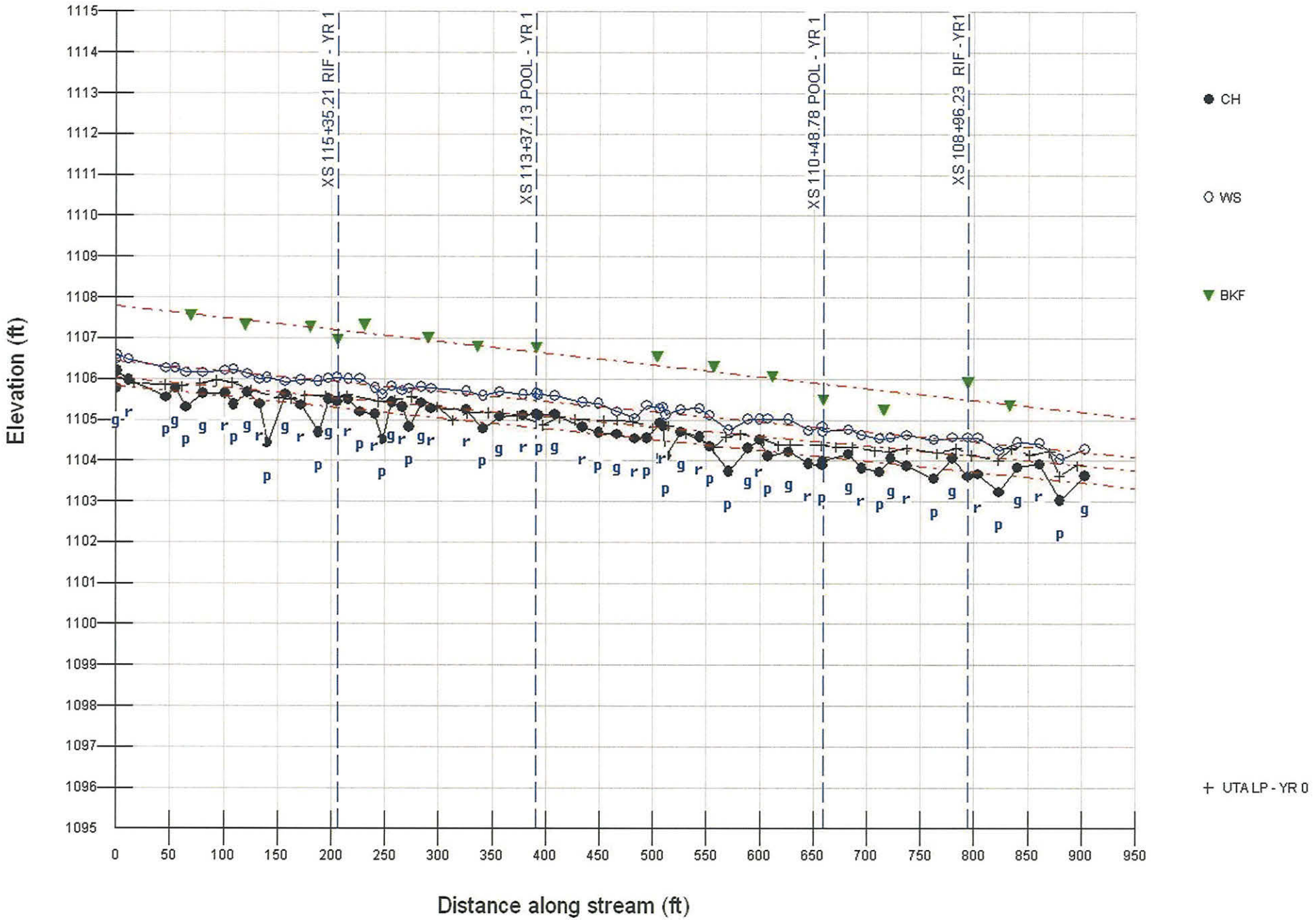
MIDDLE TRIB A - LONGITUDINAL PROFILE - YR 1



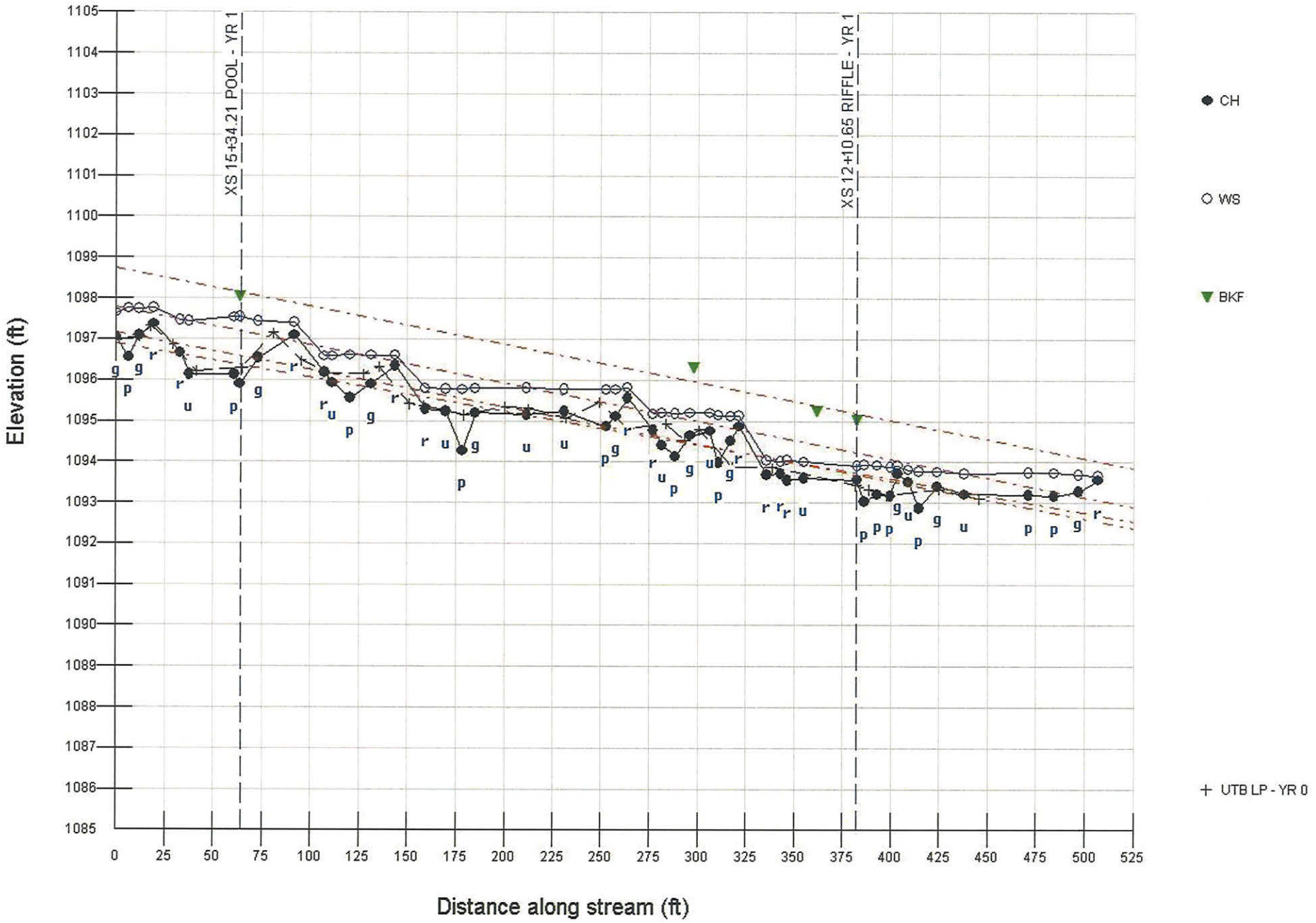
TRIB A2 LONGITUDINAL PROFILE - YEAR 1



UPPER TRIB A - LONGITUDINAL PROFILE - YEAR 1

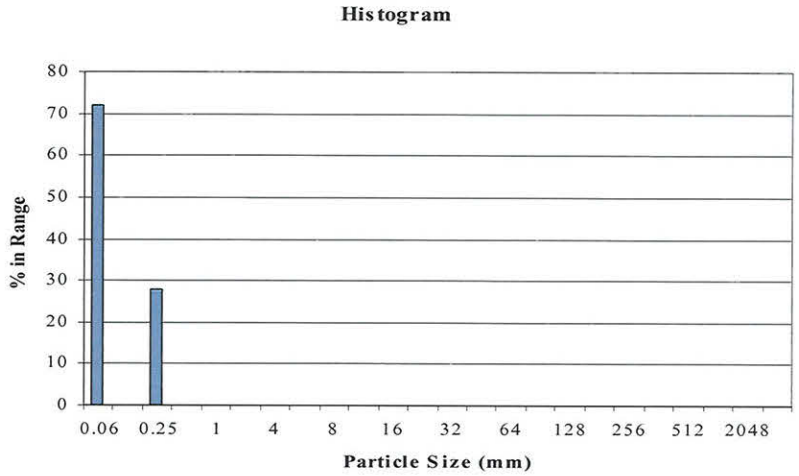


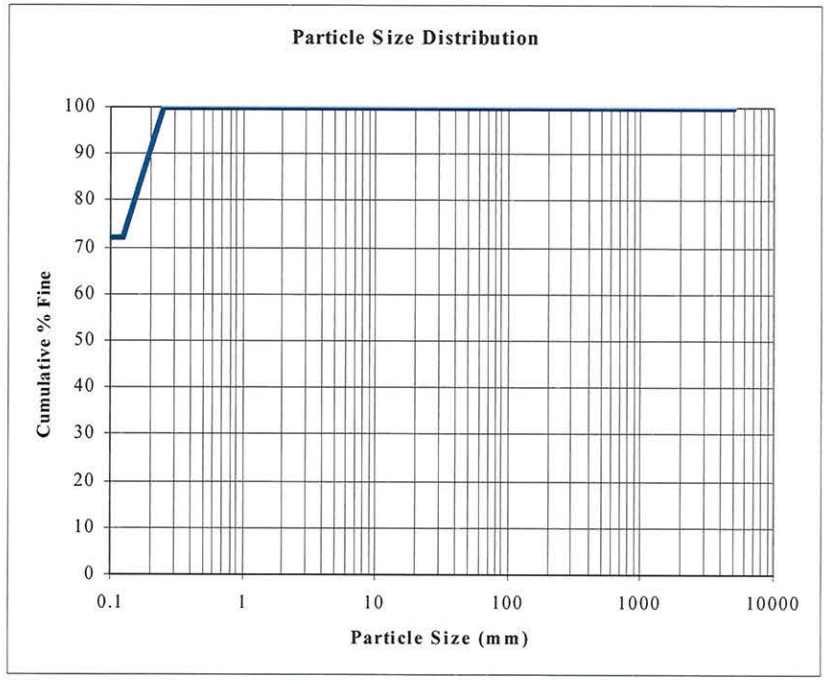
UPPER TRIB B - LONGITUDINAL PROFILE - YEAR 1



Pebble Count - Pool				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	72	72	72
Very Fine Sand	0.062-0.125	0	0	72
Fine Sand	0.125-0.25	28	28	100
Medium Sand	0.25-0.5	0	0	100
Coarse Sand	0.5-1.0	0	0	100
Very Coarse Sand	1.0-2.0	0	0	100
Very Fine Gravel	2.0-4.0	0	0	100
Fine Gravel	4.0-5.7	0	0	100
Fine Gravel	5.7-8.0	0	0	100
Medium Gravel	8.0-11.3	0	0	100
Medium Gravel	11.3-16.0	0	0	100
Coarse Gravel	16.0-22.6	0	0	100
Coarse Gravel	22.6-32	0	0	100
Very Coarse Gravel	32-45	0	0	100
Very Coarse Gravel	45-64	0	0	100
Small Cobble	64-90	0	0	100
Small Cobble	90-128	0	0	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		100	100	

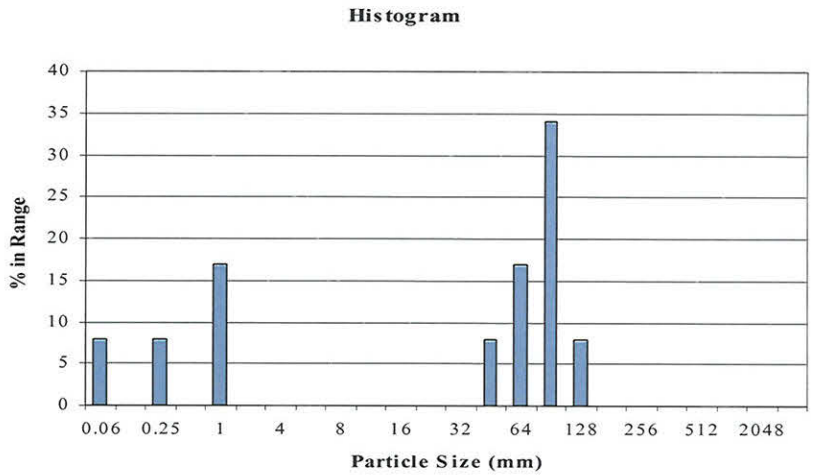
South Muddy Creek Tributaries Restoration EEP Project No. D04006-01			
Reach	B	**X Sec**	N/A
Date	9/19/2006	**Sta No.**	15+34

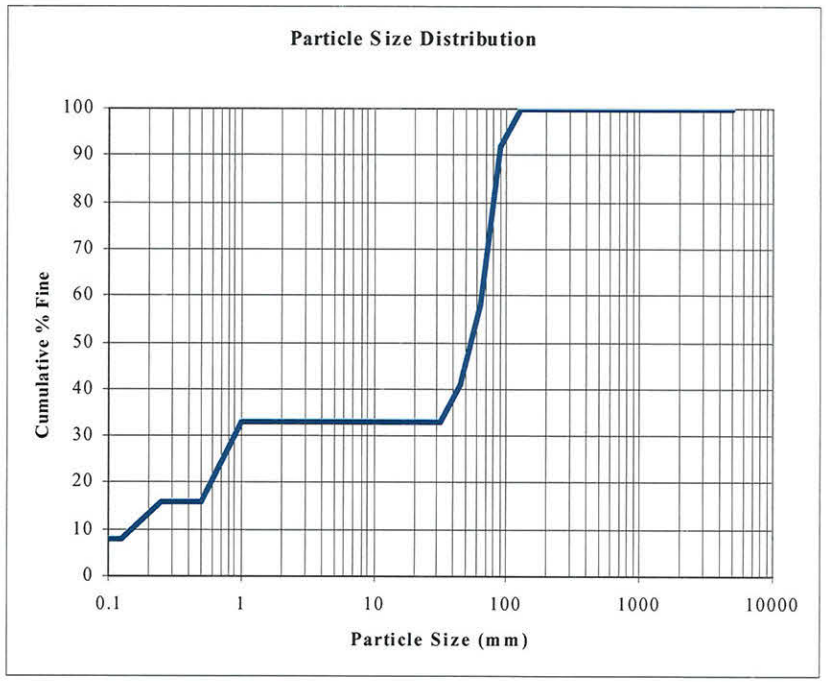




Pebble Count - Riffle				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	8	8	8
Very Fine Sand	0.062-0.125	0	0	8
Fine Sand	0.125-0.25	8	8	16
Medium Sand	0.25-0.5	0	0	16
Coarse Sand	0.5-1.0	17	17	33
Very Coarse Sand	1.0-2.0	0	0	33
Very Fine Gravel	2.0-4.0	0	0	33
Fine Gravel	4.0-5.7	0	0	33
Fine Gravel	5.7-8.0	0	0	33
Medium Gravel	8.0-11.3	0	0	33
Medium Gravel	11.3-16.0	0	0	33
Coarse Gravel	16.0-22.6	0	0	33
Coarse Gravel	22.6-32	0	0	33
Very Coarse Gravel	32-45	8	8	41
Very Coarse Gravel	45-64	17	17	58
Small Cobble	64-90	34	34	92
Small Cobble	90-128	8	8	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		100	100	

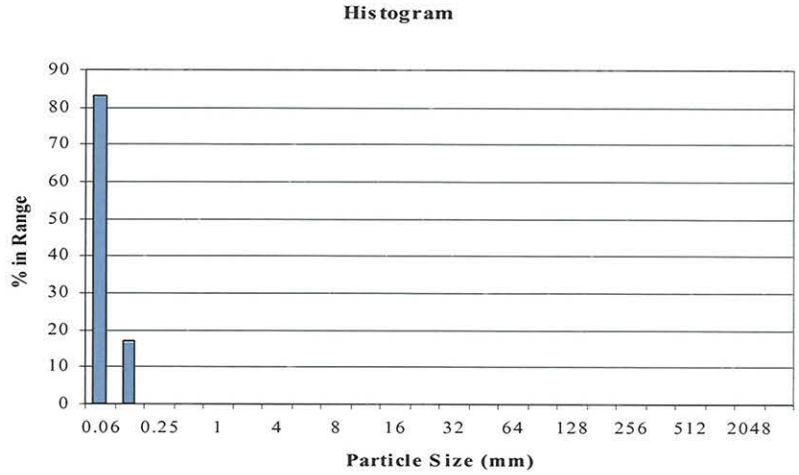
South Muddy Creek Tributaries Restoration EEP Project No. D04006-01			
Reach	B	**X Sec**	N/A
Date	9/19/2006	**Sta No.**	2+25

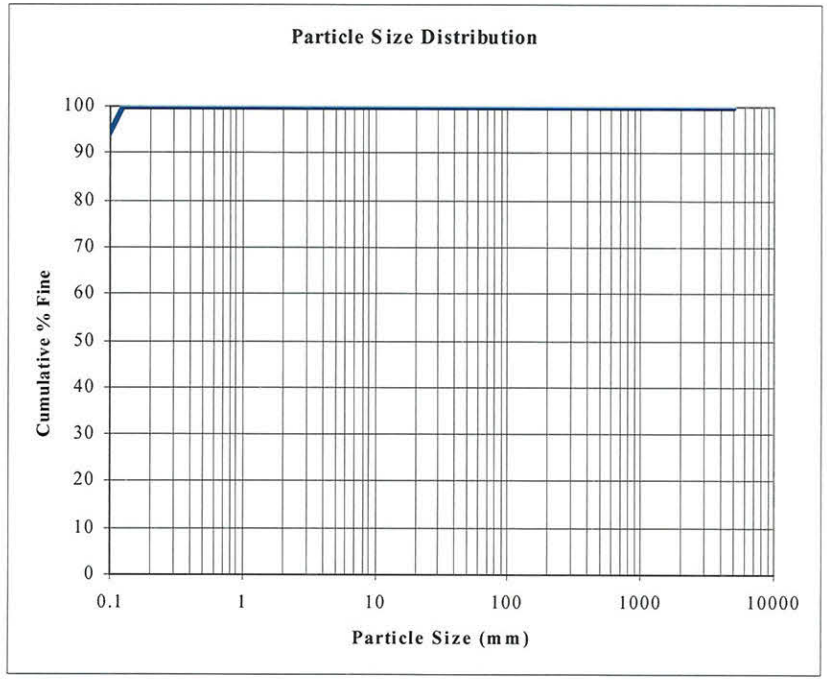




Pebble Count - Pool				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	83	83	83
Very Fine Sand	0.062-0.125	17	17	100
Fine Sand	0.125-0.25	0	0	100
Medium Sand	0.25-0.5	0	0	100
Coarse Sand	0.5-1.0	0	0	100
Very Coarse Sand	1.0-2.0	0	0	100
Very Fine Gravel	2.0-4.0	0	0	100
Fine Gravel	4.0-5.7	0	0	100
Fine Gravel	5.7-8.0	0	0	100
Medium Gravel	8.0-11.3	0	0	100
Medium Gravel	11.3-16.0	0	0	100
Coarse Gravel	16.0-22.6	0	0	100
Coarse Gravel	22.6-32	0	0	100
Very Coarse Gravel	32-45	0	0	100
Very Coarse Gravel	45-64	0	0	100
Small Cobble	64-90	0	0	100
Small Cobble	90-128	0	0	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		100	100	

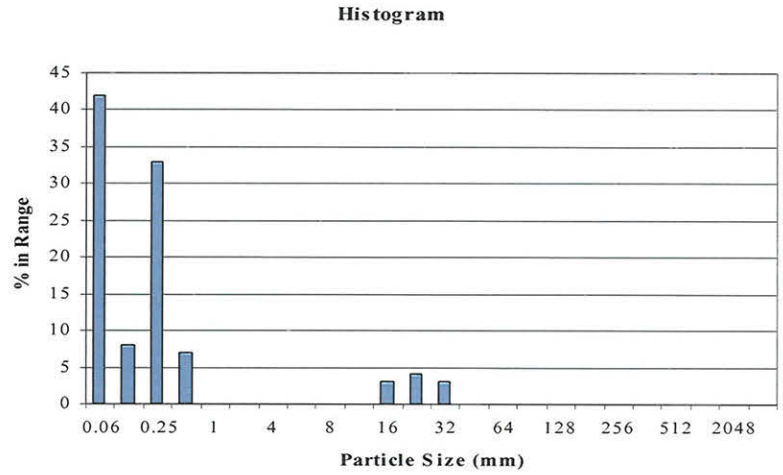
South Muddy Creek Tributaries Restoration EEP Project No. D04006-01			
Reach	A (lower)	**X Sec**	N/A
Date	9/19/2006	**Sta No.**	4+31

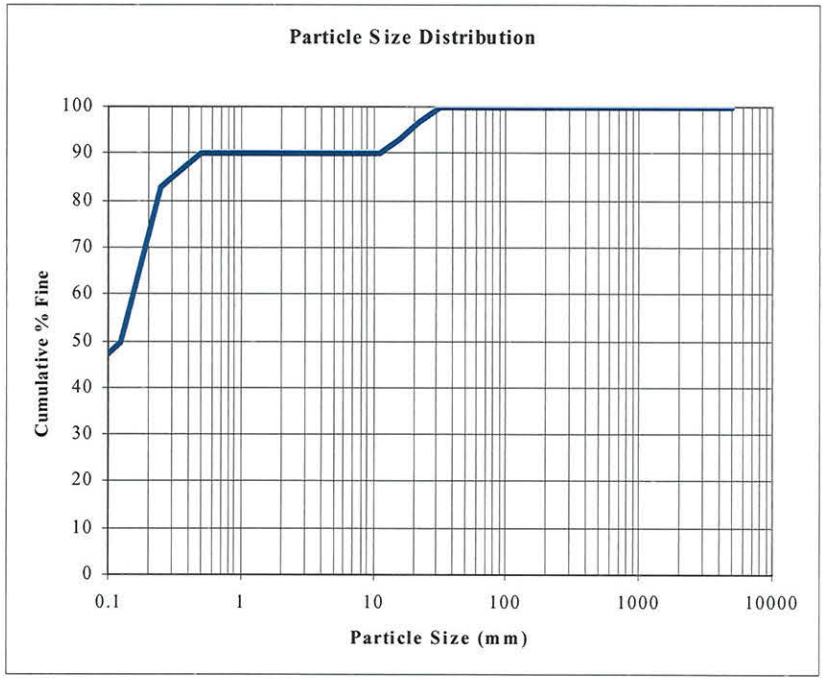




Pebble Count - Riffle				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	42	42	42
Very Fine Sand	0.062-0.125	8	8	50
Fine Sand	0.125-0.25	33	33	83
Medium Sand	0.25-0.5	7	7	90
Coarse Sand	0.5-1.0	0	0	90
Very Coarse Sand	1.0-2.0	0	0	90
Very Fine Gravel	2.0-4.0	0	0	90
Fine Gravel	4.0-5.7	0	0	90
Fine Gravel	5.7-8.0	0	0	90
Medium Gravel	8.0-11.3	0	0	90
Medium Gravel	11.3-16.0	3	3	93
Coarse Gravel	16.0-22.6	4	4	97
Coarse Gravel	22.6-32	3	3	100
Very Coarse Gravel	32-45	0	0	100
Very Coarse Gravel	45-64	0	0	100
Small Cobble	64-90	0	0	100
Small Cobble	90-128	0	0	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		100	100	

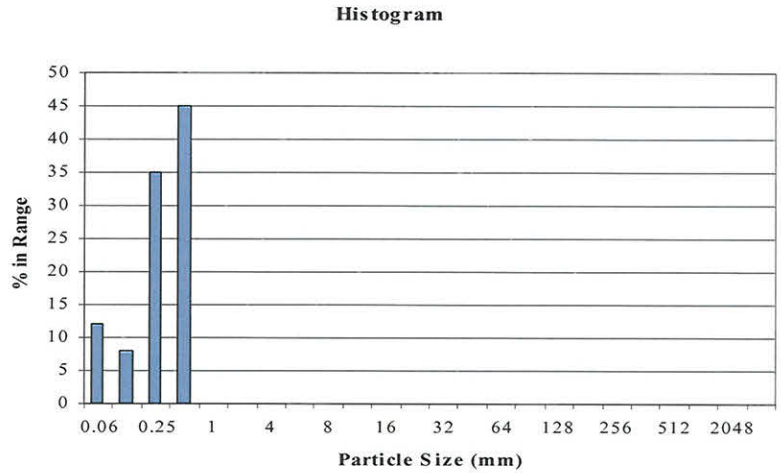
South Muddy Creek Tributaries Restoration EEP Project No. D04006-01			
Reach	A (lower)	**X Sec**	N/A
Date	9/19/2006	**Sta No.**	40+13

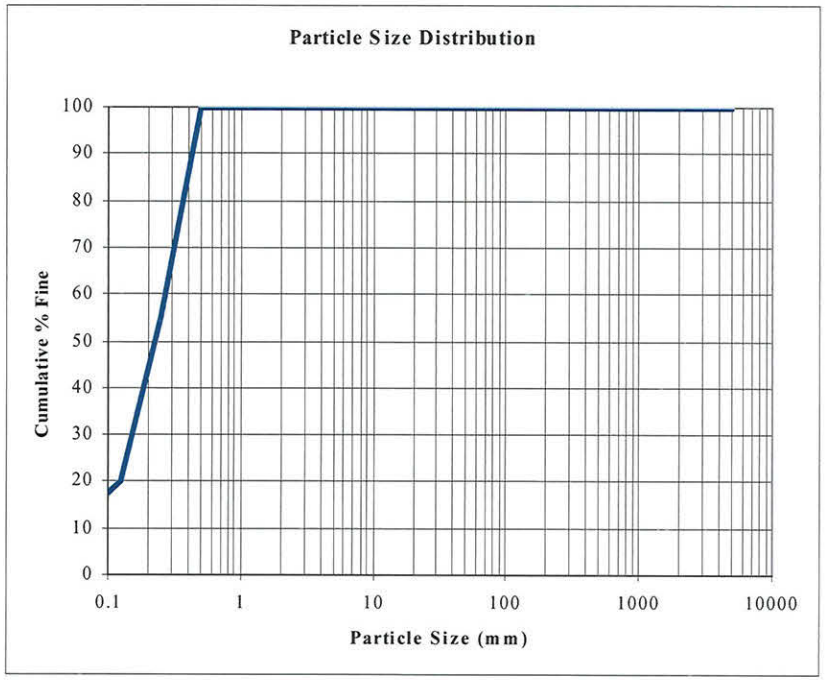




Pebble Count - Pool				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	12	12	12
Very Fine Sand	0.062-0.125	8	8	20
Fine Sand	0.125-0.25	35	35	55
Medium Sand	0.25-0.5	45	45	100
Coarse Sand	0.5-1.0	0	0	100
Very Coarse Sand	1.0-2.0	0	0	100
Very Fine Gravel	2.0-4.0	0	0	100
Fine Gravel	4.0-5.7	0	0	100
Fine Gravel	5.7-8.0	0	0	100
Medium Gravel	8.0-11.3	0	0	100
Medium Gravel	11.3-16.0	0	0	100
Coarse Gravel	16.0-22.6	0	0	100
Coarse Gravel	22.6-32	0	0	100
Very Coarse Gravel	32-45	0	0	100
Very Coarse Gravel	45-64	0	0	100
Small Cobble	64-90	0	0	100
Small Cobble	90-128	0	0	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		100	100	

South Muddy Creek Tributaries Restoration EEP Project No. D04006-01			
Reach	A (middle)	**X Sec**	N/A
Date	9/19/2006	**Sta No.**	87+92





Pebble Count - Riffle				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	20	20	20
Very Fine Sand	0.062-0.125	0	0	20
Fine Sand	0.125-0.25	0	0	20
Medium Sand	0.25-0.5	0	0	20
Coarse Sand	0.5-1.0	2	2	22
Very Coarse Sand	1.0-2.0	8	8	30
Very Fine Gravel	2.0-4.0	28	28	58
Fine Gravel	4.0-5.7	11	11	69
Fine Gravel	5.7-8.0	9	9	78
Medium Gravel	8.0-11.3	2	2	80
Medium Gravel	11.3-16.0	16	16	96
Coarse Gravel	16.0-22.6	3	3	99
Coarse Gravel	22.6-32	1	1	100
Very Coarse Gravel	32-45	0	0	100
Very Coarse Gravel	45-64	0	0	100
Small Cobble	64-90	0	0	100
Small Cobble	90-128	0	0	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		100	100	

South Muddy Creek Tributaries Restoration EEP Project No. D04006-01			
Reach	A (upper)	**X Sec**	N/A
Date	9/19/2006	**Sta No.**	108+96