

Hanging Rock Creek and Tributary Stream Restoration

NCEEP Project Number: 00165

Monitoring Year 4 of 5

2007 Annual Monitoring Report



Submitted to: NCDENR-Ecosystem Enhancement Program
1619 Mail Service Center
Raleigh, NC 27699-1619



HANGING ROCK CREEK - 2007 MONITORING REPORT (MY4)

TABLE OF CONTENTS

I.	General	
II.	Title Page	
III.	Table of Contents	Page 2
IV.	Executive Summary / Project Abstract	Page 4
V.	Project Background	Page 4
	A. Project Objectives	Page 4
	B. Project Structure	Page 5
	C. Location and Setting	Page 5
	D. History and Background	Page 6
	E. Monitoring Plan View	Page 7
VI.	Project Condition and Monitoring Results	Page 11
	A. Vegetation Assessment	Page 11
	1. Vegetation Problem Areas	Page 11
	2. Vegetation Problem Area Plan View	Appendix D
	B. Stream Assessment	Page 12
	1. Procedural Items	Page 12
	2. Problem Areas Plan View (Stream)	Appendix D
	3. Problem Areas Table	Appendix B
	4. Numbered Issues Photo Stations	Appendix B
	5. Fixed Photo Station Photos	Appendix B
	6. Stability Assessment	Appendix B
	7. Quantitative Measures Tables (Morphology and Hydrology)	Page 15
	C. Wetland Assessment	
	1. Problem Areas Plan View (Wetland) Exhibit	N/A
	2. Wetland Criteria Attainment	N/A
VII.	Methodology Section	Page 16
VIII.	Report and Data Submittal Format	Page 16
IX.	References	Page 16

FIGURES

Figure 1.	Vicinity Map	Page 7
Figure 2.	Monitoring Plan View	Page 8

TABLES

Exhibit Table I.	Project Structure Table	Page 5
Exhibit Table II.	Project Activity and Reporting History	Page 6
Exhibit Table III.	Project Contact Table	Page 9
Exhibit Table IV.	Project Background Table	Page 9
Exhibit Table V.	Hydrological (Bankfull) Verifications	Page 14
Exhibit Table VI.	BEHI and Sediment Export Estimates	N/A
Exhibit Table VII.	Categorical Stream Feature Visual Stability Assessment	N/A
Exhibit Table VIIIa.	Baseline Morphology and Hydraulic Summary	Appendix B
Exhibit Table VIIIb.	Baseline Morphology and Hydraulic Summary	Appendix B
Exhibit Table IXa.	Morphology and Hydraulic Monitoring Summary	Appendix B

Exhibit Table IXb. Morphology and Hydraulic Monitoring Summary
Exhibit Table X. Wetland Criteria Attainment

Appendix B
N/A

Appendix A Vegetation Raw Data

1. Vegetation Survey Data Tables
2. Vegetation Problem Area Photos
3. Vegetation Monitoring Plot Photos

Appendix B Geomorphic Raw Data

1. Table VIIIa. – Baseline Morphological and Hydraulic
2. SummaryTable IXa. – Morphological and Hydraulic Monitoring
3. SummaryTable IXb. – Morphological and Hydraulic Monitoring
4. SummaryTable VIIIb. – Baseline Morphological and Hydraulic
5. Exhibit Table B.1 - Stream Problem Areas Table
6. Representative Stream Problem Area Photos
7. Stream Photo-station Photos
8. Exhibit Table B.2 – Qualitative Visual Stability Assessment
9. Annual Overlays of Cross-Section Plots
10. Annual Overlays of Longitudinal Plots
11. Annual Overlays of Pebble Count Frequency Distribution Plots

Appendix C Wetland Raw Data (*Not Applicable for Hanging Rock Creek Project*)

Appendix D Combined Problem Areas Plan View

IV. Executive Summary/Project Abstract

In 2001 the North Carolina Department of Transportation (NC DOT) proposed restoration on 3,687 linear feet (lf) of Hanging Rock Creek and an unnamed tributary for the purpose of obtaining stream mitigation credit. These two streams are located in Avery County, North Carolina, within the Watauga River Basin. The Hanging Rock Creek watershed comprises three square miles and is part of the Elk River drainage, eight-digit hydrologic unit code 06010103. According to the 2001 Mitigation Plan, both Hanging Rock Creek and its unnamed tributary were characterized as Rosgen C4 channels prior to restoration. Previous riparian vegetation had been cleared along the channelized streams, and uncontrolled grazing was occurring in and around the channels. For these reasons, the streams had become eroded and over-widened, and there was a loss of channel bed form diversity. Estimated sediment load of the stream was approximately 25 tons per year.

Streams

The 2007 monitoring effort (Monitoring Year 4 [MY4]) illustrated general success in achieving the goals of this restoration project. The main Hanging Rock stream channel appears stable, the aquatic habitat appears good, most streambanks are well vegetated, and few problem areas were observed. The unnamed tributary stream channel appears to have undergone some changes in profile since last year's MY3 monitoring period. This year's profile depicts a "smoothed over" profile with little definition of pool and riffle sequence.

During last year's MY3 monitoring effort two "imminent failure" risk, problem areas were identified. These problem areas located around stations 14+00 and 18+00 were re-evaluated during MY4. The MY4 effort again recognized these areas as potential problems but not in risk of immediate, "imminent failure." Scouring has occurred around several rock structures but good vegetation appears to be holding the adjacent banks in place. These areas should be closely observed during future monitoring efforts.

Wetland

There were no wetland restoration components of the Hanging Rock Creek project. Therefore, no wetland monitoring or assessment was conducted as part of the MY4 monitoring effort.

Vegetation

Woody and herbaceous vegetation within the riparian buffer of this stream is moderate in coverage. The stream banks are generally well-covered with vegetation (forbs, grasses, sedges and rushes). Canopy cover has not yet formed due to the immaturity of vegetation on site. Planted trees and shrubs are present throughout the riparian buffer, but have experienced some mortality since the previous monitoring year. The decrease in the total number of planted woody species was also attributed to unrecorded (missing) stems. The vigor and survivorship of the planted woody seedlings were primarily affected by unauthorized mowing activities within the riparian buffer. The plot disturbance included plant crushing, plot marker destruction, and planted species cutting. Finally, invasive species were infrequent at the site.

V. Project Background

1. Project Objectives

The NC DOT proposed stream restoration along 2,808 lf of Hanging Rock Creek and along 879 lf of an unnamed tributary, for the purpose of obtaining mitigation credit for TIP R-2237WM. Prior to restoration, Hanging Rock Creek exhibited unstable gravel beds with bank height ratios ranging from 1.3-1.6 ft. Past land uses involved clearing of riparian vegetation, stream channelization, and uncontrolled grazing in and around the channels. The result was an over-widened channel, loss of channel bed form

diversity, and an estimated sediment load of 25 tons per year to the stream. The restoration goal was to provide NC DOT with the following:

- Sufficient mitigation credits to offset impacts within the same watershed.
- Stabilize the channels and reduce streambank erosion (sediment pollution).
- Establish woody plants along the stream riparian corridor to aid in channel stabilization and reduce erosion and sediment.
- Improved stream aquatic habitat diversity
- Improved water quality.
- A more natural aesthetic quality to the stream corridor.

2. Project Structure

Prior to restoration, both Hanging Rock Creek and its tributary were characterized as Rosgen C4 channels (see Table I). The two streams had become eroded and over-widened, and there was a loss of channel bed form diversity. MACTEC understands that the general mitigation strategy for these channels involved Priority 1 restoration and riparian buffer re-vegetation. Pre-construction channel lengths were approximately 2,311 lf (Hanging Rock Creek) and 817 lf (unnamed tributary). The proposed stream restoration effort was intended to restore approximately 2,808 lf of channel along Hanging Rock Creek and approximately 879 lf of channel along the unnamed tributary. MY4 data suggest that actual restoration lengths were approximately 2,529 lf along Hanging Rock Creek and approximately 238 lf along the unnamed tributary.

Exhibit Table I. Project Structure Table						
Project Number and Name: 00165 (Hanging Rock Creek)						
Project Segment or Reach ID	Existing Length (lf)	Type	Approach	Restored Length (lf)	Stationing	Comment
Hanging Rock Creek	2,311	R	P1	2,808	22+00	Includes riparian buffer restoration
Unnamed Tributary	817	E1	E1	879	2+25	Includes riparian buffer restoration

R= Restoration

E2 = Enhancement II

P1 = Priority I

P3 = Priority III

E1 = Enhancement I

S = Stabilization

P2 = Priority II

SS = Streambank Stabilization

3. Location and Setting

The two restored streams are located in Avery County, North Carolina, within the Watauga River Basin. The Hanging Rock Creek watershed comprises three square miles and is part of the Elk River drainage, eight-digit hydrologic unit code 06010103. The project site itself is 0.8 mile southeast of downtown Banner Elk, North Carolina (Figure 1). Hanging Rock Creek crosses North Carolina Highway 184 approximately 160 feet south of the intersection with Dobbins Road (SR 1337). The Hanging Rock Creek restoration reach extends from Dobbins Road to the North Carolina Highway 184 bridge, while the unnamed tributary reach is located in the southeastern portion of the site.

The project is part of a 45-acre tract that includes residential and commercial low-density development, and a 12.6 acre conservation easement containing the floodplain of the restoration project (as measured to the regulated 100-year floodplain elevation). The site was previously in use for agriculture. The project is divided into two reaches, Hanging Rock Creek (Reach 1) which starts at Dobbins Road and continues

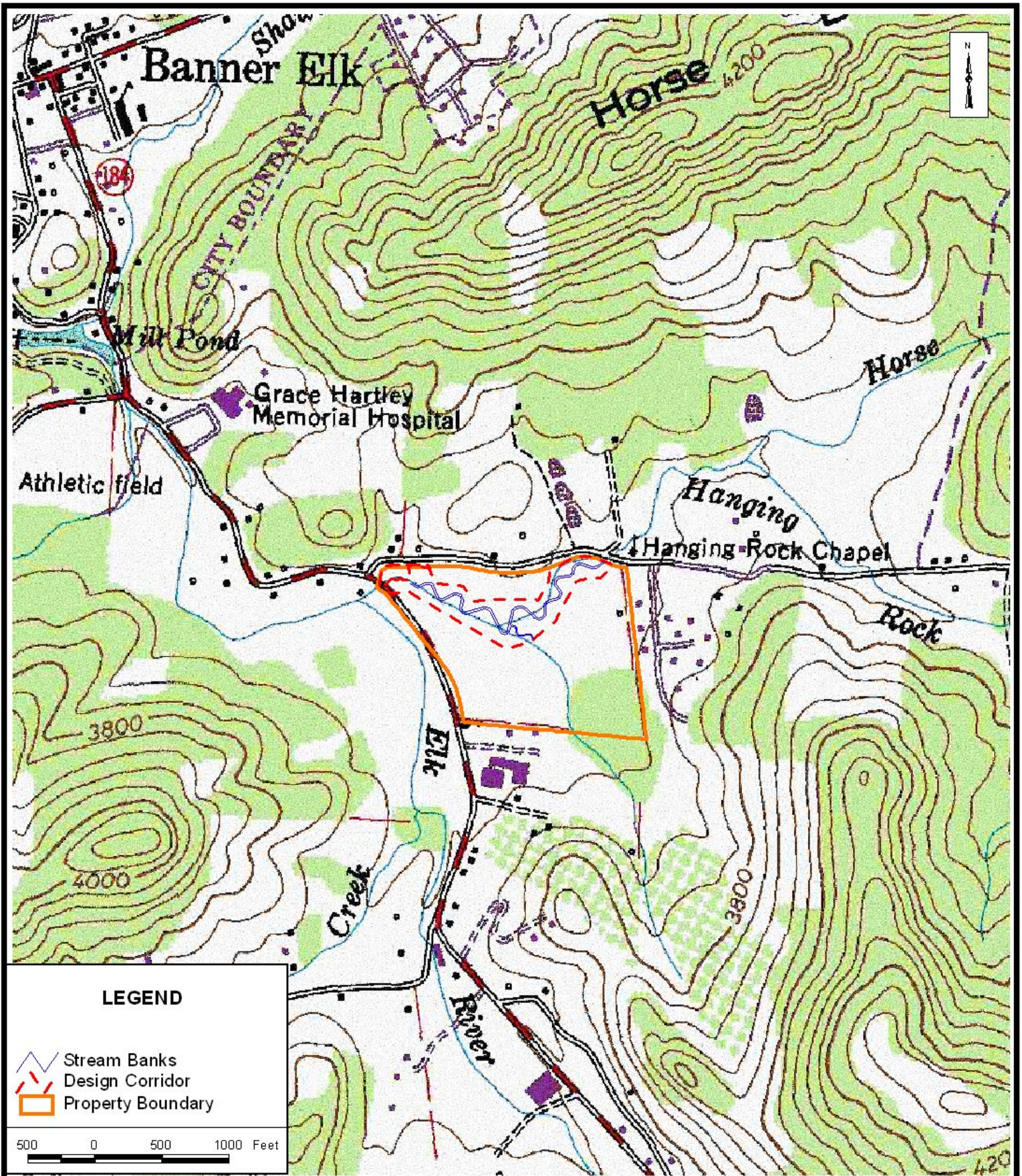
to North Carolina Highway 184 and the unnamed tributary (Reach 2) which starts at a fence line along the southeast portion of the property and flows northwest into the middle of Reach 1.

4. *History and Background*

Project planning by the North Carolina Department of Transportation (NCDOT) for the Hanging Rock Creek mitigation/restoration project began in 2001. Detailed environmental assessments and engineering studies were conducted to come up with a mitigation Plan. The project was constructed in September of 2003 with the permanent seed mix, live staked and other vegetation installed by March 2004. A destructive rainfall event occurred in September 2004 resulting in Hanging Rock Creek reaching stages above bankfull. These events caused the erosion of stream banks and undermined rock structures throughout the restored channel, principally in a section of the main channel immediately downstream of the Dobbins Road culvert. Action to correct the damage was completed by the time of monitoring year 1.

Table II presents information on project activity and reporting history for the monitoring program. Table III provides general information on project personnel contacts. Table IV presents information on the background components of the project, such as stream order, physiographic region, ecoregion, Rosgen classification, soil type, and drainage basin classification.

Exhibit Table II. Project Activity and Reporting History		
Project Number and Name: 00165 (Hanging Rock Creek)		
Activity or Report	Calendar Year of Completion or Planned Completion	Actual Completion Date
Restoration Plan	June 2001	August 2001
Mitigation Plan	June 2001	November 2001
Construction	June 2003	September 2003
Temporary S&E mix applied to entire project area	June 2003	September 2003
As-Built report	June 2004	September 2004
Permanent seed mix applied to reach	June 2003	Fall 2003
Structural maintenance (Streambank repair and revegetation)	2004	March 2004
Initial – Year 1 monitoring	June 2004	March 2005
Year 2 Monitoring	June 2005	April 2006
Year 3 Monitoring	June 2006	April 2007
Year 4 Monitoring	June 2007	April 2008
Year 5 Monitoring	June 2008	



Scale: 1" = 1,000'
 Source: NCEP, USGS (VALLE CRUCIS, NC TOPOGRAPHIC QUADRANGLE)

Prepared / Date:
 Checked / Date:



HANGING ROCK CREEK & TRIBUTARY
 YEAR 4 MONITORING
 AVERY COUNTY, NORTH CAROLINA

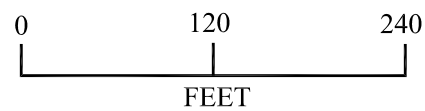
VICINITY MAP
 Project: 6470-06-1410/04
 Figure 1



LEGEND:

- - - Veg Plot
- As-Built Centerline
- As-Built Stream Bank
- Design Corridor
- ▨ Existing Wetland
- Bridge

Scale: 1" = 120'
 Source: ECOLOGIC, NC EEP, NCDA (2005 Aerial Photo)



Prepared by / Date: R.R./11-15-07
 Checked by/ Date: R.S./11-15-07



HANGING ROCK CREEK & TRIBUTARY RESTORATION
 YEAR 4 MONITORING
 AVERY COUNTY, NORTH CAROLINA

REFERENCES

1) BASE MAP TAKEN FROM DIGITAL FILE "HANGING ROCK MAP.DGN" PROVIDED BY NC EEP, DATE UNKNOWN.

GENERAL MONITORING PLAN VIEW
 FIGURE 2

NC EEP Project : 165
 Project: 6470-06-1410

Exhibit Table III. Project Contact Table	
Project Number and Name: 00165 (Hanging Rock Creek)	
Designer	Buck Engineering (Michael Baker Corporation)
	1152 Executive Circle, Suite 100
	Cary, North Carolina 27511
Primary project design POC	William A. Harmon
Construction Contractor	North State Environmental
Construction contractor POC	Darrell T. Westmoreland
Planting Contractor	N/A*
Planting contractor POC	
Seeding Contractor	N/A*
Planting contractor point of contact	
Seed Mix Sources	N/A*
Nursery Stock Suppliers	N/A*
Monitoring Performers	MACTEC Engineering and Consulting, Inc.
	3301 Atlantic Avenue
	Raleigh, North Carolina 27604
	(919) 876-0416
Stream Monitoring POC	Richard Harmon (919) 876-0416
Vegetation Monitoring POC	Jim Cutler (336) 294-4221

* Historical project documents necessary to provide these data were unavailable at the time of report submittal.

Exhibit Table IV. Project Background Table	
Project Number and Name: 00165 (Hanging Rock Creek)	
Project County	Avery, North Carolina
Drainage Area	3.0 sq. mi. (0.26 sq. mi.- tributary)
Drainage impervious cover estimate (%)	Estimated at <3%
Stream Order	3 rd order for main channel
	1 st order for tributary
Physiographic Region	High Mountain (66i)
Ecoregion	Oak Hickory Forest
Rosgen Classification of As-built	C4 / C4 - Stream Type
Cowardin Classification	N/A*
Dominant soil types	Cullowhee
Reference site ID	Long Creek in Virginia
USGS HUC for Project and Reference	6010103
NCDWQ Sub-basin for Project and Reference	NEW01 9-22-5
NCDWQ classification for Project and Reference	C: Trout
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	N/A
% of project easement fenced	50% (one side)

* Historical project documents necessary to provide these data were unavailable at the time of report submittal.

VI. Project Condition and Monitoring Results

Results of the 2007 monitoring, conducted in July 2007, are summarized below.

A. Vegetation Assessment

Using the protocols specified in the *Content, Format and Data Requirements for EEP Monitoring Report*, (dated November 16, 2006), eight vegetation monitoring plots were established and surveyed within the riparian buffer of the Hanging Rock Creek and the Unnamed Tributary to Hanging Rock Creek project area on July 17 and 18, 2007. A location map of the vegetation plots is presented in Appendix D.

Woody and herbaceous vegetation within the riparian buffer of this stream is moderate in coverage. The streambanks are generally well-covered with vegetation (forbs, grasses, sedges and rushes). Complete canopy cover has not yet formed due to the immaturity of woody vegetation on site. Planted trees and shrubs are present throughout the riparian buffer, but have experienced some mortality since the previous monitoring year (MY3). Sycamore (*Platanus occidentalis*) and sweet birch (*Betula lenta*) continue to dominate the planted woody stem count, with a total of 26 stems in the eight plots. A decrease in the total stem number of these two species has occurred, however, since the previous monitoring year; i.e., from 75 to 26 total stems. The decrease is attributed to mortality and unrecorded (missing) stems. The vigor and survivorship of the planted seedlings were primarily affected by unauthorized mowing activities within the riparian buffer. Sycamore and sweet birch were impacted the most by the mowing activities. Invasive species were infrequent at the site. Vegetation plot data are summarized in Appendix A Tables 1 through 5. Photographic documentation of site conditions at the vegetative sample plots is presented in Appendix A

1. Vegetative Problem Areas

One significant Problem Areas was identified during the MY4 monitoring effort. Problem areas are defined as either lacking vegetation or containing exotic vegetation, and are categorized as Bare Bank, Bare Bench, Bare Floodplain, or Invasive Population. The primary vegetative problem at Hanging Rock Creek is the introduction of mowing activities within portions of the riparian buffer between MY3 and MY4. Bare Floodplain areas have been created by bush-hogging/mowing traffic through the vegetation plots. Plot disturbance has included plant crushing, plot marker destruction, and planted species cutting.

2. Vegetative Problem Area Plan View

The approximate location of the mow path that occurs within the riparian buffer of the project site was mapped during June 2007 of MY4. Figure 2 (Problem Area Plan View) depicts the location of the mow path, the affected sample plots, and other problem areas. During the June 2007 site review, plot Nos. 3 and 6 were impacted by the mowing activity. Based on visual evidence of vegetation destruction during the MY4 sampling event (July 17 and 18, 2007), the mowing activity encompassed plot Nos. 1, 2, 3, 4, 5, 7, and 8. The extent of the mow path (i.e., areal coverage) ranged from 30% to 85% among the impacted plots. Plot Nos. 1 and 4 were impacted the most. With regard to other site impacts, isolated streambank scour areas are present along the reach; however, these areas are currently being protected by vegetation. Finally, a wooden foot bridge was constructed, as an unauthorized activity, across the restored stream channel within the western portion of the project site. Photographic documentation of the unauthorized mowing activity and the aforementioned wooden foot bridge is presented in Appendix A.

B. Stream Assessment

1. Procedural Items

MACTEC personnel, while conducting a review of historical monitoring information, discovered that Barbara Mulkey Engineers (BME) had conducted monitoring services for Hanging Rock Creek during MY1. Other historical information reviewed indicated that EcoLogic Associates conducted the MY2 services, and MACTEC provided monitoring services for MY3. Historical information gathered indicates that this is MY4 for the stream restoration of HRC and its tributary. In March 2008 the EEP provided some new data and indicated that often NCDOT Year 1 reports and As-Built reports were one in the same; and now a complete timeline of the monitoring events for HRC is complete.

a. Morphometric Criteria

In the 2006 monitoring report some areas in the Hanging Rock Creek stream channel showed evidence of instability along the outside of meander bends, primarily upstream of installed J-hook vanes and single vanes. During this year's assessment former instability was evident but vegetation appears to have abated instability. Areas of concern include chunks of soil and debris found in some up stream portions of the Hanging Rock creek. These chunks of soil and debris piles have likely floated downstream into the project, having initiated from up stream properties.

In 2007 (MY4), the stream pattern, profile, and dimension were monitored for approximately 2,529 linear feet along Hanging Rock Creek and approximately 239 lf along the unnamed tributary. Data provided by the NC EEP indicate that seven cross-sections were initially monitored during MY2 (2005), but these do not correlate to the MY2 plan view drawing provided by the previous monitoring firm (EcoLogic) and the NC EEP.

Hanging Rock Creek Proper:

The MY4 channel profile of Hanging Rock Creek proper remained similar to the MY2 and MY3 surveys. Streambed elevations appear to have generally been maintained during the period between monitoring events. Width-to-Depth ratios in the riffle cross-sections remained similar to those observed for MY3. Channel cross-sections appeared to be generally stable, when compared to MY3 measurements (see Cross-Section Summary Table below). Planted and naturally-recruited vegetation along the streambanks are helping to maintain this stability. Consistent cross-sectional area has generally been maintained in the six surveyed cross-sections. Maximum depth is consistent to the previous MY3 condition and the entire reach appears to be functioning properly. Cross-section graphs are located in Appendix B.

Cross-Section Summary Table		
Project Number and Name: 165 (Hanging Rock Creek)		
Cross-Section	Station	Observations / Comments
1	0 + 82.7	No significant change from MY3.
2	1 + 94.8	Disturbed. Missing left streambank monument/marker. Rebar missing. Left streambank monument/marker location extrapolated for MY3 and MY4. Some horizontal/lateral migration of this deep pool is occurring. Right streambank minor scour behind rootwad. Cross-section orientation has been affected. Area changed from 92.3 sq ft in MY2 to 87.5 sq ft in MY3; back to 84.7 sq ft in MY4. Bankfull area decreased.
3	2 + 19.5	No significant change from MY3.
4	3 + 58.4	No significant change from MY3.
5	5 + 26.5	No significant change from MY3.
6	15 +03	No significant change from MY3.
7	1 + 58.2	MY4 measurements were collected slightly downstream of MY2 and MY3 comparison.

MY4 riffle length observations remain generally consistent with MY3 data (see Profile Summary Table below). For example, MY3 data indicates the median riffle length was approximately 42.7 lf (range: 18.5 – 89.8 lf). MY4 data indicate a median riffle length of approximately 38.0 lf (range: 18.1 – 98.9 lf). Pool lengths appeared to have changed slightly between MY3 and MY4, in that MY3 data showed a median pool length of 75.3 lf (range: 22.5 – 215.2 lf). MY3 data indicated that median pool length has decreased slightly to approximately 70.0 lf (range: 25.0 – 190.0 lf). This observation may indicate continued progression towards stability. At some locations within the channels, gradual bed transitions made it difficult to distinguish pools from glides. In most cases, any change in bed profile indicating a pool feature was considered a pool for the sake of subsequent calculations. The expectation is that these bed features will ultimately become features of glides or new pools.

Pool-to-pool spacing remained similar between MY3 and MY4. MY4 data indicated a median pool-to-pool spacing of approximately 110.0 lf (range: 40.0 – 205.0 lf). In comparison, MY3 data suggested a median pool-to-pool spacing of approximately 113.4 lf (range 26.0 – 205.8 lf). MY4 riffle slopes appear to be less steep than those observed in MY3. The MY4 median riffle slope was 0.50 percent (0.0050 ft/ft), while MY3 data indicated a median slope of 0.70 percent (0.0070 ft/ft). Riffle channel materials have generally remained consistent between MY3 and MY4. Gravel-sized material is dominant throughout the reach. Pool channel materials were also generally similar between MY3 and MY4, with some fining observed in MY4. Overall, the channel appears to be transporting the sediment load delivered to it by the watershed.

Profile Summary Table	
Project Number and Name: 165 (Hanging Rock Creek)	
Feature	Observations / Comments
Median Riffle Length	Decreased to 38 lf in MY4 (from 42.7 in MY3)
Median Pool Length	Decreased to 70 lf in MY4 (from 75.3 in MY3)
Pool-to-Pool Spacing	Similar between MY4 (110 lf) and MY3 (113.4 lf)
Median Riffle Slope	Less steep in MY4 (0.005) than in MY3 (0.007)
Riffle Channel Material	Consistant in range between MY3 and MY4

The channel pattern appears to have maintained shape since construction, with similar measurements collected in MY2, MY3 and MY4. Vegetation density along the streambanks is variable to good. In dense areas, this vegetation is providing excellent root mass to help stabilize the streambanks. However, there is some evidence of lateral meander migration along with associated streambank scour. In these areas, the functional effects of installed structures have been reduced, as pools have become longer and deeper immediately upstream and downstream of the rock vanes.

Unnamed tributary to Hanging Rock Creek:

The MY4 channel profile for the unnamed tributary to Hanging Rock Creek appears to have undergone some significant change in bed profile. A layer of fine sediment was observed throughout the length of the tributary channel. Pools appeared to have filled in and riffles lengthened running along the top of this material. Riffle slopes lessened considerably and a small head-cut may be forming around station 0+80.

In summary, Hanging Rock Creek appears to be stable, though a few areas of moderate scour or erosion have developed. Ineffective structures and isolated scour are present in some areas of Hanging Rock Creek and are documented in Appendix B. The unnamed tributary has experienced significant siltation. The unnamed tributary is maintaining overall pattern and dimension, but is aggrading due to off-site (upstream) sediment input, which is filling some in-stream pool areas. This filling in and siltation may be more significant this year due to drought conditions. Monitoring data for the unnamed tributary are also provided in Appendix B. Overall, stream length for the unnamed tributary was approximately 234 lf and the length of Hanging Rock Creek was approximately 2,526 lf. The mitigation plan called for the restoration of 2,808 lf of Hanging Rock Creek and 879 lf of the unnamed tributary.

b. Hydrologic Criteria

A minimum of two bankfull events must be documented within the five-year monitoring period in order for the monitoring period to be considered complete. Since no crest gauges are installed at this site, bankfull events have been documented using U.S. Geological Survey (USGS) data from stream gage station #03479000. This USGS station is located on the Watauga River near Sugar Grove, NC (approximately six miles from the project site). It is in the same watershed as the Hanging Rock Stream restoration project, and has a drainage area of 92 square miles.

An estimate of the number of bankfull events in 2005 and 2006 was made by comparing peak stream discharges from the USGS data (in cubic feet per second [cfs]) against the bankfull discharge estimated from the drainage area on the NC Rural Piedmont Regional Curve. According to this regional curve, a bankfull event occurs on a stream with a 92-square mile drainage area when the discharge reaches approximately 2,300 cfs. Based on this assumption, one peak discharge in excess of bankfull occurred in the subject watershed prior to the MY2 monitoring event (see Exhibit Table V, below), while three additional discharge events exceeded the bankfull threshold between the MY2 and MY4 monitoring events.

Exhibit Table V. Hydrological (Bankfull) Verifications			
Project Number and Name: 00165 (Hanging Rock Creek)			
Date of Data Collection	Date of Occurrence	Method*	Photo # (if available)
April 2007	1/14/2005 (4,000 cfs)	USGS Station 03479000	N/A
April 2007	11/29/05 (6,620 cfs)	USGS Station 03479000	N/A
April 2007	1/18/06 (2,680 cfs)	USGS Station 03479000	N/A
April 2007	11/16/06 (2,540 cfs)	USGS Station 03479000	N/A

* No on-site data available. Based on comparison to NC Rural Piedmont regional curve data

a. Streambank Stability Assessments

Historical documentation of this project stated that Hanging Rock Creek, prior to restoration, was producing 25 tons of sediment annually. This before project information may be useful for future comparison of streambank stability. Streambank stability assessment may be performed during MY5 as indicated in the protocols specified in the *Content, Format and Data Requirements for EEP Monitoring Reports* (dated November 11, 2006). It is anticipated that the Bank Erosion Hazard Index (BEHI) protocol and sediment transport calculations will be used as a component of this stability assessment.

2. Combined Problem Areas Plan View (Stream)

See Appendix D.

3. Problem Areas Table

See Appendix B.

4. Numbered Issues Photo Stations

See Appendix B.

5. Photo Station Photos

See Appendix B

6. Stability Assessment

See Appendix B

7. Quantitative Measures Tables (Morphology and Hydrology)

A minimum of two bankfull events must be documented within the five-year monitoring period in order for the monitoring period to be considered complete. Since no crest gauges are installed at this site, bankfull events have been documented using USGS data from stream gage station #03479000 (as described previously and in Table V).

C. Wetland Assessment

Not applicable for this project.

VII. Methodology Section

Monitoring methods used are based on a combination of those established in the post-construction monitoring plan and standard regulatory guidance and procedures documents (see below)

VIII. Report and Data Submittal Format

Version 1.2 of the NCDENR *Content, Format and Data Requirements for EEP Monitoring Reports* (dated November 16, 2006) guidance document format was used for the preparation of this monitoring report.

IX. References

1. USACOE (2003) *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ
2. DENR (2006). *Content, Format, and Data Requirements for EEP Monitoring Reports*, Version 1.2. Raleigh, North Carolina.
3. Lee, M.T. , R.K. Peet, S.D. Roberts, T.R. Wentworth (2007). *CVS –EEP Protocol for Recording Vegetation: Level 1-3 Plot Sampling Only*, Version 4.1. Raleigh, North Carolina.
4. Rosgen, D L. (1996) *Applied River Morphology*. Wildland Hydrology Books, Pagosa Springs, CO.
5. Rosgen, D L. (2006) *Watershed Assessment of River Stability and Sediment Supply (WARSSS)*. Wildland Hydrology Books, Fort Collins, CO.

APPENDIX A

Vegetation Raw Data

1. Vegetation Survey Data Tables
2. Vegetation Problem Area Photos
3. Vegetation Monitoring Plot Photos

Table 1: Vegetation Metadata	
Project Number and Name: 00165 (Hanging Rock Creek)	
Report Prepared By	Lori Saal
Date Prepared	8/2/2007 15:17
Database name	CVS_EEP_EntryTool_v220.mdb
Database location	L:\6470 Environmental\Databases\Natural Resources\Ecology\Vegetation\CVS EEP\2007
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	00165
Project Name	Hanging Rock Creek & Tributary
Description	Vegetation monitoring of selected portions along 3,687 lf stream restoration of Hanging Rock Creek and UT
Length(ft)	3687
Stream-to-edge width (ft)	
Area (sq m)	
Required Plots (calculated)	8
Sampled Plots	8

Table 2: Vegetation Vigor by Species							
Project Number and Name: 00165 (Hanging Rock Creek)							
	Species	4	3	2	1	0	Missing
	<i>Cornus amomum</i>						1
	<i>Diospyros virginiana</i>		1	2		1	4
	<i>Juglans nigra</i>		5	1		1	14
	<i>Nyssa sylvatica</i>					1	1
	<i>Rosa micrantha</i>						
	<i>Betula lenta</i>	1	6	1	1	6	24
	<i>Platanus occidentalis</i>	6	7	4		9	22
TOTAL:	7	7	19	8	1	18	66



Table 3: Vegetation Damage by Species						
Project Number and Name: 00165 (Hanging Rock Creek)						
	Species	All Damage Categories	No Damage	Mowing	Unknown	Other Damage
	<i>Betula lenta</i>	44	6	20	18	
	<i>Cornus amomum</i>	2	1	1		
	<i>Diospyros virginiana</i>	11	3	1	7	
	<i>Juglans nigra</i>	27	6	4	17	
	<i>Nyssa sylvatica</i>	4	2		2	
	<i>Platanus occidentalis</i>	55	13	19	22	1
	<i>Rosa micrantha</i>	1	1			
TOTAL:	7	144	32	45	66	1

Table 4: Vegetation Damage by Plot						
Project Number and Name: 00165 (Hanging Rock Creek)						
	Plot	All Damage Categories	No Damage	Mowing	Unknown	Other Damage
	00165-01-HR1P2	30	5	20	5	
	00165-01-HR2P4	21	7	8	6	
	00165-01-HR3P6	11	3		8	
	00165-01-HR4P5	18	3	11	3	1
	00165-01-HR5P9	7	1	1	5	
	00165-01-HR6P10	17	6		11	
	00165-01-HR7P18	16	4		12	
	00165-01-HR8P16	24	3	5	16	
TOTAL:	8	144	32	45	66	1

Table 5: Vegetation Stem Count by Plot and Species
Project Number and Name: 00165 (Hanging Rock Creek)

	Species	Total Stems	# plots	avg# stems	plot 00165-01-HR1P2	plot 00165-01-HR2P4	plot 00165-01-HR3P6	plot 00165-01-HR4P5	plot 00165-01-HR5P9	plot 00165-01-HR6P10	plot 00165-01-HR7P18	plot 00165-01-HR8P16
	<i>Betula lenta</i>	9	4	2.3	1	3			4		1	
	<i>Diospyros virginiana</i>	3	3	1						1	1	1
	<i>Juglans nigra</i>	6	4	1.5	1	3	1			1		
	<i>Platanus occidentalis</i>	17	7	2.4	3	2	4	2	1	3	2	
TOTAL:	4	35	4		5	8	5	2	5	5	4	1

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**

	<p>PHOTOLOG SHEET</p> <p>Site: Hanging Rock Creek Station 14+20</p> <p>Avery County, North Carolina</p> <p>Project No: 6470-06-1410.07</p> <p>Date: June 2007</p> <p>Photo #: 3</p> <p>Photographed by: R.E. Spears</p> <p>Description: Mowed path throughout riparian buffer. View is to the East.</p>
	<p>Site: Hanging Rock Creek Station 20+25</p> <p>Avery County, North Carolina</p> <p>Project No: 6470-06-1410.07</p> <p>Date: June 2007</p> <p>Photo #: 4</p> <p>Photographed by: R.E. Spears</p> <p>Description: Mowed path along riparian buffer near pond. Two new home construction sites. View is to the West.</p>

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**



PHOTOLOG SHEET

Site: Hanging Rock Creek
Station 20+25

Avery County, North
Carolina

Project No: 6470-06-1410.07

Date: June 2007

Photo #: 6

Photographed by: R.E. Spears

Description:
View of one of three
constructed foot bridges built
within the restoration
corridor.



Site: Hanging Rock Creek
Near Station 07+00

Avery County, North
Carolina

Project No: 6470-06-1410.07



Date: June 2007

Photo #: 8

Photographed by: R.E. Spears

Description:
Bare area within the riparian
buffer of HRC.

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**

	<p>PHOTOLOG SHEET</p>
	<p>Site: Hanging Rock Creek Near Station 14+00</p>
	<p>Avery County, North Carolina</p>
	<p>Project No: 6470-06-1410.07</p>
	<p>Date: May 2007</p>
	<p>Photo #: 9</p>
<p>Photographed by: R.E. Spears</p> <p>Description: Mowed path near Vegetation Plot BBP-7 between constructed pond and stream channel.</p>	
	<p>Site: Hanging Rock Creek</p>
	<p>Avery County, North Carolina</p>
	<p>Project No: 6470-06-1410.07</p>
	<p>Date: June 2007</p>
	<p>Photo #: 10</p>
	<p>Photographed by: N/A</p> <p>Description: Mowed path on left stream bank. View is to the east and to the south.</p>

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**



PHOTOLOG SHEET	
Site:	Hanging Rock Creek
	Avery County, North Carolina
	Project No: 6470-06-1410.07
Date:	May 2007
Photo #:	11
Photographed by:	R.E. Spears
Description:	Mowed path near Vegetation Plot BBP-8.



Site:	Hanging Rock Creek
	Avery County, North Carolina
	Project No: 6470-06-1410.07
Date:	June 2007
Photo #:	12
Description:	Construction of two homesites along the restoration corridor. View is to the south.

North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina
 Vegetation Photographic Log – Hanging Rock Creek – NC EEP # 00165



PHOTOLOG SHEET
Site: Hanging Rock Creek
Avery County, North Carolina
Project No: 6470-06-1410.04
Date: July 2007
Photo #: 1
Photographed by: J. Cutler
Description: HR1-P2



Site: Hanging Rock Creek
Avery County, North Carolina
Project No: 6470-06-1410.04
Date: July 2007
Photo #: 2
Photographed by: J. Cutler
Description: HR2-P4


North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina
 Vegetation Photographic Log – Hanging Rock Creek – NC EEP # 00165

	PHOTOLOG SHEET
	Site: Hanging Rock Creek
	Avery County, North Carolina
	Project No: 6470-06-1410.04
	Date: July 2007
	Photo #: 3
Photographed by: J. Cutler	
Description: Plot HR3-P6	
	Site: Hanging Rock Creek
	Avery County, North Carolina
	Project No: 6470-06-1410.04
	Date: July 2007
	Photo #: 4
	Photographed by: J. Cutler
Description: Plot HR4-P5	

North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina
 Vegetation Photographic Log – Hanging Rock Creek – NC EEP # 00165

	PHOTOLOG SHEET
	Site: Hanging Rock Creek
	Avery County, North Carolina
	Project No: 6470-06-1410.04
	Date: July 2007
	Photo #: 5
	Photographed by: J. Cutler
Description: Plot HR5-P9	
	Site: Hanging Rock Creek
	Avery County, North Carolina
	Project No: 6470-06-1410.04
	Date: July 2007
	Photo #: 6
	Photographed by: J. Cutler
	Description: Plot HR6-P10

North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina
 Vegetation Photographic Log – Hanging Rock Creek – NC EEP # 00165

PHOTOGRAPH NOT TAKEN	PHOTOLOG SHEET
	Site: Hanging Rock Creek
	Avery County, North Carolina
	Project No: 6470-06-1410.04
	Date: July 2007
	Photo #: 7
	Photographed by: J. Cutler
Description: Plot HR7-P18	
	Site: Hanging Rock Creek
	Avery County, North Carolina
	Project No: 6470-06-1410.04
	Date: July 2007
	Photo #: 8
	Photographed by: J. Cutler
	Description: Plot HR8-P16

APPENDIX B

Geomorphic Raw Data

1. Table VIIIa. – Baseline Morphological and Hydraulic Summary
2. Table IXa. – Morphological and Hydraulic Monitoring Summary
3. Table IXb. – Morphological and Hydraulic Monitoring Summary
4. Table VIIIb. – Baseline Morphological and Hydraulic Summary
5. Exhibit Table B.1. - Stream Problem Areas Table
6. Representative Stream Problem Area Photos
7. Stream Photo-station Photos
8. Exhibit Table B.2. - Qualitative Visual Stability Assessment
9. Annual Overlays of Cross-section Plots
10. Annual Overlays of Longitudinal Plots
11. Annual Overlays of Pebble Count Frequency Distribution Plots

Table VIIIa. Baseline Morphology and Hydraulic Summary

Project Number: 00165

Segment/Reach: Hanging Rock Creek

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built			
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	
				NC Rural Piedmont						North Fork New River									
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	
BF Width (ft)									28			52			22			*	
Floodprone Width (ft)									300			**			300			*	
BF Cross Sectional Area									41			169			35			*	
BF Mean Depth (ft)									1.4			3.2			1.6			*	
BF Max Depth (ft)									2.9			**			2.3			*	
Width/Depth Ratio									20			16			13			*	
Entrenchment Ratio									11			**			14			*	
Wetted Perimeter(ft)									23.3			**			24.7			*	
Hydraulic radius (ft)									1.4			**			1.5			*	
Pattern																			
Channel Beltwidth (ft)									<120	192	300	**	74	120	**			*	
Radius of Curvature (ft)									100	42	69	**	30	60	**			*	
Meander Wavelength (ft)									600	60	112	**	60	112	**			*	
Meander Width ratio									**	3.7	5.7	**	3.7	6	**			*	
Profile																			
Riffle length (ft)									**			**			**			*	
Riffle slope (ft/ft)									**			**			**			*	
Pool length (ft)									**			**			**			*	
Pool spacing (ft)									**			**			**			*	
Substrate												**			**			*	
d50 (mm)									30			**			**			*	
d84 (mm)									52			**			**			*	
Additio*1 Reach Parameters																			
Valley Length (ft)									1687			**			1687			1687	
Channel Length (ft)									1826			**			2808			*	
Sinuosity									1.4			**			1.5			*	
Water Surface Slope (ft/ft)									**			**			0.0048			*	
BF slope (ft/ft)									0.006			**			**			*	
Rosgen Classification									C4			C3			C4			*	
Number of Bankfull Events																			
Extent of BF floodplain (acres)																			
BEHI																			
Habitat Index																			
Macrobenthos																			

*NOTE = Channel Cross-Section locations were re-established after Monitoring Year 1; historical project data for As-Built/ MY1 is not comparable and has been purposely left out.

** = Not Available (Background project data unavailable at time of MY4 report preparation).

Table IXa. Morphology and Hydraulic Monitoring Summary

Project Number: 00165

Segment/Reach: Hanging Rock Creek

Parameter	Cross Section 1			Cross Section 2			Cross Section 3			Cross Section 4			Cross Section 5			Cross Section 6			Cross Section 7			
	Riffle			Glide	*P-G	*P-G	Riffle			Riffle	Pool		Pool			Glide			Riffle			
Dimension	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	
	MY2	MY3	MY4	MY2	MY3	MY4	MY2	MY3	MY4	MY2	MY3	MY4	MY2	MY3	MY4	MY2	MY3	MY4	MY2	MY3	MY4	
BF Width (ft)	22.6	37.5	32.8	49.9	41.9	38.8	23.4	24.4	22.2	21.89	35.3	37	19.1	30.5	27.2	*	47.2	45.2	12.9	7.8	13.1	
Floodprone Width (ft)	>100	>100	>100	>100	>100	>100	>100	>100	>100	44.35	>100	>100	76.75	>100	>100	*	>100	>100	>100	>100	>100	
BF Cross Sectional Area (ft ²)	43.4	44.6	46.68	92.3	87.48	84.74	56.22	49.19	53.8	36.65	51.34	51.42	43.97	64.44	65.62	*	38.74	38.17	8.22	5.58	17	
BF Mean Depth (ft)	1.6	1.2	1.4	1.8	2.1	2.2	2.4	2	2.4	1.68	1.5	1.4	2.3	2.1	2.4	*	0.8	0.8	0.6	0.7	1.3	
BF Max Depth (ft)	2.69	2.8	3	5.3	5.3	5	3	2.6	3.4	2.79	4.2	4.2	4.19	4.7	4.7	*	2.4	2.4	1.4	1.9	2.2	
Width/Depth Ratio	13.27	13.4	23	27.72	19.952	17.636	9.7	12.1	9.2	13.01	23.5	26.43	8.29	14.5	11.3	*	*	*	*	*	*	
Entrenchment Ratio	3.62	2.7	3	*	*	*	4.3	4.1	4.5	*	*	*	*	*	*	*	*	*	*	*	*	
Wetted Perimeter(ft)	22.48	23.5	23.5	*	*	*	48	49.8	49.8	*	*	*	*	*	*	*	*	*	*	*	*	
Hydraulic radius (ft)	1.56	1.6	1.6	*	*	*	1.2	1.3	1.3	*	*	*	*	*	*	*	*	*	*	*	*	
Substrate																						
d50 (mm)	27.7	33.7	29.1	25.3	11.5	<2	23.1	26.5	14.9	29.6	20	20.3	22.6	29.3	35.7	*	24.3	30	*	*	*	
d84 (mm)	58.8	71	69.2	74.8	32	72.8	45	54	46.3	67.7	47	66.2	46.7	51	86.6	*	66.6	66.3	*	*	*	
Parameter	MY-02 (2005)			MY-03 (2006)			MY-04 (2007)			MY-05 (2008)												
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med										
Channel Beltwidth (ft)	57	230	120	56.5	234	145.25	56	234	145													
Radius of Curvature (ft)	26	86	55	25	86	55.5	25	86	55													
Meander Wavelength (ft)	170	350	202.5	170	348.5	202	170	350	202													
Meander Width ratio	1.62	6.57	3.42	1.6	6.5	3.42	1.6	6.5	3.4													
Profile																						
Riffle length (ft)	15.8	97	15	18.5	89.8	42.7	18.1	98.9	38													
Riffle slope (ft/ft)	0.0051	0.0028	0.0011	0.001	0.020	0.007	0.0027	0.019	0.005													
Pool length (ft)	13.2	97	43.5	22.5	215.2	75.3	25	190	70													
Pool spacing (ft)	44	211	112	26	205.8	113.4	40	205	110													
Additional Reach Parameters																						
Valley Length (ft)			1685			1700			1700													
Channel Length (ft)			2583			2530.5			2526													
Sinuosity			1.5			1.5			1.5													
Water Surface Slope (ft/ft)			0.0054			0.0054			0.0054													
BF slope (ft/ft)			0.0052			0.005			0.00531													
Rosgen Classification			B			B/C			B/C													
Number of Bankfull Events			2			1			0													
Extent of BF floodplain (area)			300			300			300													
BEHI*			*			*			*													
Habitat Index*			*			*			*													
Macrobenthos*			*			*			*													

* = Historical project documents necessary to provide this data were unavailable at the time of this report submission.
 NOTE = Channel Cross-Section locations were re-established after Monitoring Year 1; historical project data for As-Built/ MY1 is not comparable and has been purposely left out.
 *P-G = Feature likely transitioning from Pool to Glide.
 ** Feature may have been disturbed.

Table IXb. Morphology and Hydraulic Monitoring Summary																
Project Number: 00165																
Segment/Reach: UT to Hanging Rock Creek																
Parameter	Cross Section 1 of 1 Riffle															
Dimension	MY1	MY2	MY3	MY4	MY5	MY+										
BF Width (ft)	7.5	12.9	7.8	13.1**										* = Historical project documents necessary to provide this data were unavailable at the time of this report submission.		
Floodprone Width (ft)	45	45	50	50										** = Cross-Section datum taken at different angle to stream than in previous monitoring years.		
BF Cross Sectional Area (ft ²)	6.7	6.7	5.58	17**										NOTE = Channel Cross-Section locations were re-established after Monitoring Year 1; historical project data for As-Built/ MY1 is not comparable and has been purposely left out.		
BF Mean Depth (ft)	0.89	0.89	0.7	1.3												
BF Max Depth (ft)	1.4	1.4	1.9	2.2												
Width/Depth Ratio	8.5	8.5	11.14	10.1												
Entrenchment Ratio	6	6	<2	6												
Wetted Perimeter(ft)	8.2	8.2	12.2	15												
Hydraulic radius (ft)	0.82	0.82	0.7	0.6												
Substrate																
d50 (mm)	13.0	13.01	33.7	4.1												
d84 (mm)	30.3	30.34	71	14.6												
Parameter	MY-01			MY-02			MY-03			MY-04 (2007)			MY-05			
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	
Channel Beltwidth (ft)	45	45	45	45	45	45	45	47	46	45	47	46				
Radius of Curvature (ft)	20	30	28	20	30	28	20	30	28	20	30	28				
Meander Wavelength (ft)	145	145	145	145	145	145	145	145	145	145	145	145				
Meander Width ratio	*	*	19.3	*	*	19.3	*	*	19.3	*	*	19.3				
Profile																
Riffle length (ft)	3.2	17.7	6.8	3.2	17.7	6.8	2	12	6	15	70	32				
Riffle slope (ft/ft)	0.0119	0.04717	0.0269	0.012	0.04717	0.0269	0.010	0.039	0.025	0.007	0.042	0.007				
Pool length (ft)	7.5	27	13	7.5	27	13	12	21	16.5	2	10	8				
Pool spacing (ft)	20	76	37	20	76	37	13	76	32	65	120	90				
Additional Reach Parameters																
Valley Length (ft)	210			210			221			221						
Channel Length (ft)	238			238			238			238						
Sinuosity	1			1.1			1.1			1.1						
Water Surface Slope (ft/ft)	0.007			0.0068			0.006			0.006						
BF slope (ft/ft)	0.013			0.01295			0.013			0.013						
Rosgen Classification	E			E			E			E						
Number of Bankfull Events	2 est			2 est			1			1						
Extent of BF floodplain (area)	15			15												
BEHI*	*			*			*			*						
Habitat Index*	*			*			*			*						
Macrobenthos*	*			*			*			*						

Table VIIIb. Baseline Morphology and Hydraulic Summary

Project Number: 00165

Segment/Reach: UT to Hanging Rock Creek

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Watauga			NC Rural Piedmont														
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)									12			*			*			*
Floodprone Width (ft)									*			*			*			*
BF Cross Sectional Area									7			*			*			*
BF Mean Depth (ft)									0.06			*			*			*
BF Max Depth (ft)									*			*			*			*
Width/Depth Ratio									20			*			*			*
Entrenchment Ratio									*			*			*			*
Wetted Perimeter(ft)									*			*			*			*
Hydraulic radius (ft)									*			*			*			*
Pattern																		
Channel Beltwidth (ft)									*			*			*			*
Radius of Curvature (ft)									*			*			*			*
Meander Wavelength (ft)									*			*			*			*
Meander Width ratio									*			*			*			*
Profile																		
Riffle length (ft)									*			*			*			*
Riffle slope (ft/ft)									*			*			*			*
Pool length (ft)									*			*			*			*
Pool spacing (ft)									*			*			*			*
Substrate																		
d50 (mm)									*			*			*			*
d84 (mm)									*			*			*			*
Additio*1 Reach Parameters																		
Valley Length (ft)									*			*			*			*
Channel Length (ft)									825			*			*			*
Sinuosity									1.2			*			*			*
Water Surface Slope (ft/ft)									*			*			*			*
BF slope (ft/ft)									*			*			*			*
Rosgen Classification									*			*			*			*
Number of Bankfull Events									*			*			*			*
Extent of BF floodplain									*			*			*			*
*BEHI									*			*			*			*
*Habitat Index									*			*			*			*
*Macrobenthos									*			*			*			*

* = Not Available (Background project data unavailable at time of MY4 report preparation).

NOTE = Channel Cross-Section locations were re-established after Monitoring Year 1; historical project data for As-Built/ MY1 is not comparable and has been purposely left out.

Exhibit Table B.1. Stream Problem Areas
Project Number and Name: 165 (Hanging Rock Creek)

Issue	Station	Suspected Cause	Photo
Engineered Structures	5+15	Vane slumping into pool	2
	14+25	Possible thalweg migration has occurred	2
	18+05	Possible thalweg migration has occurred	5
Bank Scour	1+25	Bank scour possibly due to downstream structure	1
	4+90	Bank scour possibly due to downstream structure	1
	7+70	Bank scour possibly due to downstream structure	1
	10+25	Bank scour possibly due to downstream structure	1
	14+15	Scour possibly due to thalweg migration	1
	17+80	Stressed bank possibly due to thalweg migration	1
Aggradation/Bar	6+25	Drainage ditches in floodplain	7

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**



PHOTOLOG SHEET

Site: Hanging Rock Creek
Station 05+08

Avery County, North
Carolina

Project No: 6470-06-1410.07

Date: June 2007

Photo #: 1

Photographed by: R.E. Spears

Description:
Problem Area # 2 and #3 with
observed bank scour on the
outside meander bend.



Site: Hanging Rock Creek
Station 07+56

Avery County, North
Carolina

Project No: 6470-06-1410.07

Date: June 2007

Photo #: 2

Photographed by: R.E. Spears

Description:
Problem Area #4 with
observed bank scour on the
outside meander bend behind
rock-vane.

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**



PHOTOLOG SHEET
Site: Hanging Rock Creek Station 18+05
Avery County, North Carolina
Project No: 6470-06-1410.07
Date: June 2007
Photo #: 5
Photographed by: R.E. Spears
Description: Problem Area #7 indicating active bank scour on the outside of the meander bend.



Site: Hanging Rock Creek
Avery County, North Carolina
Project No: 6470-06-1410.07
Date: May 2007
Photo #: 7
Photographed by: R.E. Spears

Description: Drainage ditch coming from Horse pasture to the east. Constructed road crossing with culvert constructed across drainage ditch.

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**





PHOTOLOG SHEET
Site: Hanging Rock Creek Station 00+00
Avery County, North Carolina
Project No: 6470-06-1410
Date: December 2007
Photo #: 1
Photographed by: R.L. Sain
Description: Photo taken facing down stream. Location downstream of road bridge, and up stream of cross-section number 1.





Site: Hanging Rock Creek Station 01+90
Avery County, North Carolina
Project No: 6470-06-1410
Date: December 2007
Photo #: 2
Photographed by: R.L. Sain
Description: Photo taken facing upstream. Location is in between cross-section number 2 and 3. Depicts heavily silted cross-section 2.

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**

	<p>PHOTOLOG SHEET</p>
	<p>Site: Hanging Rock Creek Station 02+25</p>
	<p>Avery County, North Carolina</p>
	<p>Project No: 6470-06-1410</p>
	<p>Date: December 2007</p>
	<p>Photo #: 3</p>
<p>Photographed by: R.L. Sain</p>	
<p>Description: Photo taken facing down stream. Location is just up stream of cross-section number 3.</p>	
	<p>Site: Hanging Rock Creek Station 03+75</p>
	<p>Avery County, North Carolina</p>
	<p>Project No: 6470-06-1410</p>
	<p>Date: December 2007</p>
	<p>Photo #: 4</p>
	<p>Photographed by: R.L. Sain</p>
<p>Description: Photo taken facing upstream. Location just down stream of cross-section 4.</p>	

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**

	<p>PHOTOLOG SHEET</p>
	<p>Site: Hanging Rock Creek Station 05+25</p>
	<p>Avery County, North Carolina</p>
	<p>Project No: 6470-06-1410</p>
	<p>Date: December 2007</p>
	<p>Photo #: 5</p>
<p>Photographed by: R.L. Sain</p>	
<p>Description: Photo taken facing upstream. Location just down stream of cross-section 5.</p>	
	<p>Site: Hanging Rock Creek Station 15+50</p>
	<p>Avery County, North Carolina</p>
	<p>Project No: 6470-06-1410</p>
	<p>Date: December 2007</p>
	<p>Photo #: 6</p>
	<p>Photographed by: R.L. Sain</p>
<p>Description: Photo taken facing upstream. Location just down stream of cross-section 6.</p>	

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**

PHOTOLOG SHEET



Site: Hanging Rock Creek
UT Station 01+75

Avery County, North
Carolina

Project No: 6470-06-1410

Date: December 2007

Photo #: 7

Photographed by: R.L. Sain

Description:
Photo taken facing upstream.
Location just down stream of
cross-section 1 of 1 in the
unnamed tributary channel.



Site: Hanging Rock Creek
Station 11+00

Avery County, North
Carolina

Project No: 6470-06-1410

Date: December 2007

Photo #: 8

Photographed by: R.L. Sain

Description:
Photo taken facing upstream.
Location just upstream of
where the small tributary
enters from left bank.

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**



PHOTOLOG SHEET
Site: Hanging Rock Creek Station 13+50
Avery County, North Carolina
Project No: 6470-06-1410
Date: December 2007
Photo #: 9
Photographed by: R.L. Sain
Description: Photo taken facing down stream.



Site: Hanging Rock Creek Station 14+00
Avery County, North Carolina
Project No: 6470-06-1410
Date: December 2007
Photo #: 10
Photographed by: R.L. Sain
Description: Photo taken facing upstream.

**North Carolina Ecosystem Enhancement Program (NC EEP)
Banner Elk, Avery County, North Carolina**



PHOTOLOG SHEET
Site: Hanging Rock Creek Station 21+50
Avery County, North Carolina
Project No: 6470-06-1410
Date: December 2007
Photo #: 11
Photographed by: R.L. Sain
Description: Photo taken facing upstream. Location just downstream of final cross-section of the restoration project.



Site: Hanging Rock Creek Station 23+00
Avery County, North Carolina
Project No: 6470-06-1410
Date: December 2007
Photo #: 12
Photographed by: R.L. Sain
Description: Photo taken facing downstream. Location just upstream of state highway NC-184.

Table B.2.a. Qualitative Visual Stability Assessment
Project Number #165
Segment/Reach: Hanging Rock Creek (2,808 ft)

Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	20	20	0	100	
	2. Armor stable (e.g. no displacement)?	20	20	0	100	
	3. Facet grade appears stable?	20	20	0	100	
	4. Minimal evidence of embedding/ fining?	20	20	0	100	
	5. Length Appropriate?	20	20	0	100	100
B. Pools	1. Present? (e.g not subject to severe aggradation or migration?)	20	20	0	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf >1.6?)	20	20	0	100	
	3. Length Appropriate?	20	20	0	100	100
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	20	20	0	100	
	2. Downstream of meander (glide/inflection) centering?	20	20	0	100	100
D. Meanders	1. Outer bend in state of limited/controlled erosion?	20	20	0	100	
	2. Of those eroding, # w/concomitant point bar formation?	0	NA	0	NA	
	3. Apparent Rc within spec?	20	20	0	100	
	4. Sufficient floodplain access and relief?	20	20	0	100	100
E. Bed General	1. General channel bed aggradation areas (bar formation)	0	0	0	100	
	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	NA	NA	NA	100	100
F. Banks	1. Actively eroding, wasting, or slumping bank	All	NA	None	100	100
G. Vanes	1. Free of back or arm scour?	16	16	0	100	
	2. Height appropriate?	16	16	0	100	
	3. Angle and geometry appear appropriate?	16	16	0	100	
	4. Free of piping or other structural failures?	16	16	0	100	100
H. Wads/ Boulders	1. Free of scour?	10	10	0	100	
	2. Footing stable?	10	10	0	100	100

Project Name Hanging Rock Creek
Cross Section #1
Feature Riffle at STA 0+82.7
Date 12/19/2007
Crew R.E.Spears, J. Brock (Cav.)

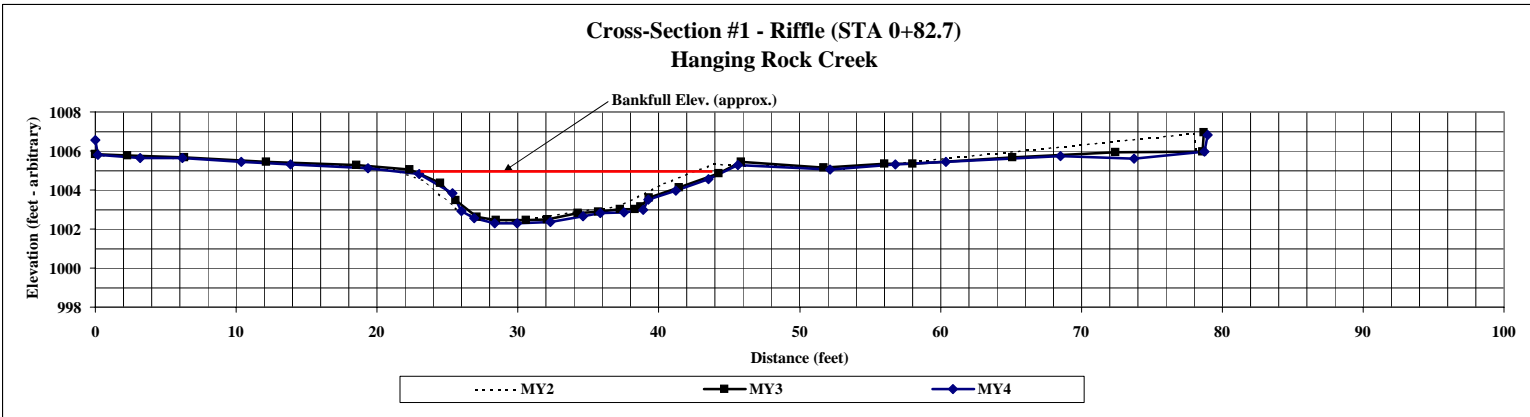
2004 As-Built Survey **			11/15/2005 MY2			11/15/2006 MY3			6/26/2007 MY4			2008 MY5		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
** Available only in text report	0.0	1005.77	0.0	1005.77	xsl lp	0.0	1005.83	xsl lp	0	1006.56728	xsl1 rp1n			
	13.4	1005.42	2.3	1005.77	xsl1 gs	0.19969691	1005.80085	xsl1 gs						
	21.2	1005.03	6.3	1005.68	xsl1 gs	3.16496529	1005.64914	xsl1 gs						
	23.3	1004.50	12.1	1005.44	xsl1 gs	6.17854207	1005.64008	xsl1 gs						
	25.5	1003.11	18.5	1005.28	bkf	10.3423725	1005.4452	xsl1 gs						
	27.0	1002.60	22.3	1005.05	xsl1 gs	13.8576638	1005.31373	xsl1 gs						
	29.3	1002.32	24.5	1004.36	xsl1 gs	19.3719037	1005.12205	xsl1 gs						
	34.1	1002.88	25.6	1003.47	xsl1 gs	23.0035797	1004.82959	xsl1 gs						
	37.2	1003.15	27.1	1002.61	xsl1 bed	25.3294942	1003.84218	xsl1 ltob						
	40.1	1004.22	28.5	1002.46	xsl1 bed	25.9666318	1002.92358	xsl1 lew						
	43.8	1005.30	30.6	1002.45	xsl1 bed	26.8857598	1002.56825	xsl1 bed						
	53.2	1005.08	32.1	1002.51	xsl1 bed	28.3459857	1002.30717	xsl1 bed						
	78.0	1006.89	34.3	1002.82	xsl1 bed	29.9473467	1002.28972	xsl1 bed						
	78.1	1006.03	35.7	1002.89	xsl1 bed	32.2938872	1002.36641	xsl1 bed						
			37.3	1003.00	xsl1 bed	34.6155019	1002.65245	xsl1 bed						
			38.3	1003.02	xsl1 bed	35.8282395	1002.80633	xsl1 bed						
			38.7	1003.14	xsl1 rew	37.526497	1002.86275	xsl1 bed						
			39.3	1003.61	xsl1 gs	38.8739355	1002.99688	xsl1 rew						
			41.4	1004.12	xsl1 gs	39.2	1003.50123	xsl1 rtob						
			44.3	1004.86	xsl1 gs	41.1886629	1003.96351	xsl1 gs						
			45.8	1005.46	xsl1 gs	43.5064794	1004.5552	xsl1 bkf						
			51.7	1005.15	bkf	45.6213481	1005.26683	xsl1 gs						
			56.0	1005.35	xsl1 gs	52.2	1005.04001	xsl1 gs						
			58.0	1005.34	xsl1 gs	56.8	1005.30587	xsl1 gs						
			65.1	1005.69	xsl1 gs	60.4	1005.45254	xsl1 gs						
			72.4	1005.93	xsl1 gs	68.5	1005.72383	xsl1 gs						
			78.6	1005.97	xsl1 rp	73.7	1005.59264	xsl1 gs						
			78.7	1006.95	xsl1 rp	78.8	1005.96074	xsl1 gs						
						78.9	1006.80941	xsl1 rp1n						



Photo of Cross-Section #1 - Looking Downstream

	Bankfull Area				
	As-Built	MY2	MY3	MY4	MY5
Area	37.4	43.41	44.66	46.68	
Width	24.9	22.6	37.5	32.8	
Mean Depth	1.5	1.9	1.2	1.4	
Max Depth	2.7	3.0	2.8	3.0	
w/d ratio	16.6	11.8	31.4	23.0	
FPW			>100		
ER (greater than)	5.0	4.4	2.7	3.0	

* Data exists for the As-built but at a different station, station number 3+66.6



Project Name	Hanging Rock Creek
Cross Section	#2
Feature	Pool at STA 1+94.8
Date	12/19/2007
Crew	R. Spears, J. Brock (Cav.)

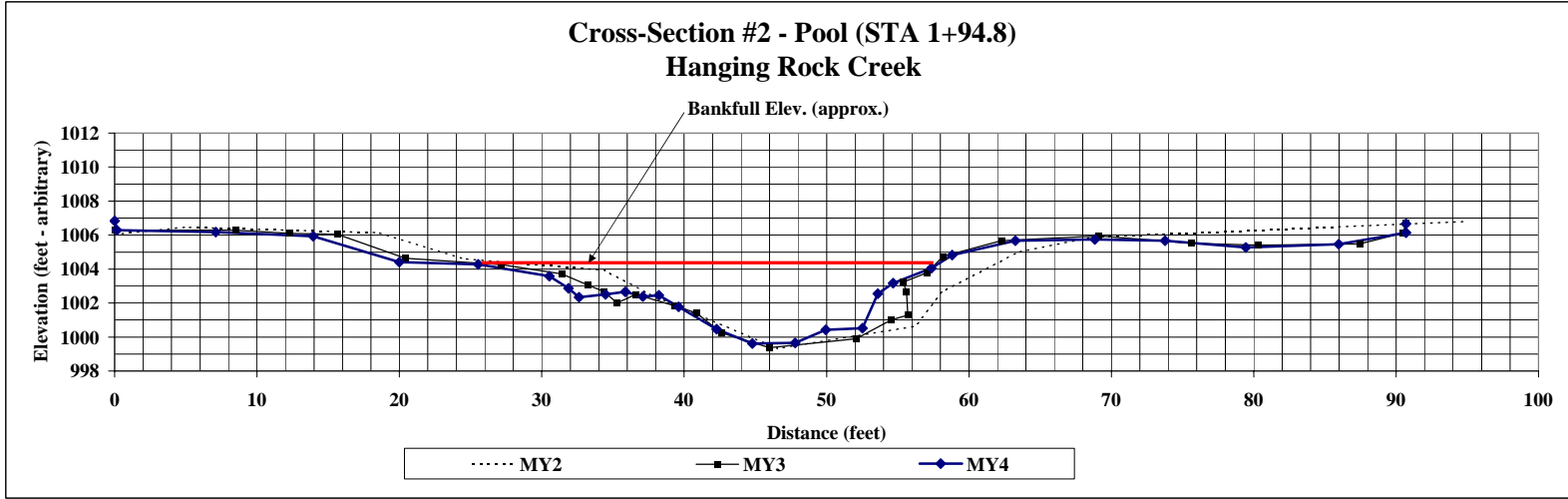
2004 As-Built Survey **			11/15/2005 MY2			11/15/2006 MY3			6/26/2007 MY4			2008 MY5		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
** Available only in text report			0.0	1006.04		0.0	1006.28	xs2 lp	0	1006.83768	xs2 lpin			
	4.9	1006.46		8.5	1006.29		8.5	1006.29	xs2 gs	0.14988482	1006.27924		0.14988482	1006.27924
	18.6	1006.13		12.3	1006.10		12.3	1006.10	xs2 gs	7.09905039	1006.17421		7.09905039	1006.17421
	24.5	1004.61		15.7	1006.04	bkf	15.7	1006.04	xs2 gs	13.9362434	1005.928		13.9362434	1005.928
	34.5	1003.91		20.4	1004.63		20.4	1004.63	bkf	20.0054303	1004.408		20.0054303	1004.408
	37.3	1002.63		27.2	1004.26		27.2	1004.26	xs2 gs	25.5224702	1004.27247		25.5224702	1004.27247
	46.5	999.32		31.4	1003.72		31.4	1003.72	xs2 gs	30.5336269	1003.58591		30.5336269	1003.58591
	56.2	1000.64		33.3	1003.05		33.3	1003.05	xs2 gs	31.87458	1002.86697		31.87458	1002.86697
	58.2	1002.69		34.4	1002.69		34.4	1002.69	xs2 lew	32.6169561	1002.34114		32.6169561	1002.34114
	63.4	1004.98		35.3	1002.00	bkf	35.3	1002.00	xs2 bed	34.4828725	1002.50927		34.4828725	1002.50927
	68.5	1005.85		36.6	1002.51		36.6	1002.51	xs2 bed	35.8703974	1002.65349		35.8703974	1002.65349
	94.8	1006.80		39.3	1001.84		39.3	1001.84	xs2 bed	37.1009993	1002.37424		37.1009993	1002.37424
				40.8	1001.41		40.8	1001.41	xs2 bed	38.2208902	1002.45696		38.2208902	1002.45696
				42.6	1000.23		42.6	1000.23	xs2 bed	39.6055487	1001.77445		39.6055487	1001.77445
				46.0	999.37		46.0	999.37	xs2 bed	42.275612	1000.4694		42.275612	1000.4694
				52.1	999.89		52.1	999.89	xs2 bed	44.7772298	999.61656		44.7772298	999.61656
				54.5	1001.02		54.5	1001.02	xs2 bed	47.7971927	999.65973		47.7971927	999.65973
				55.7	1001.28		55.7	1001.28	xs2 bed	49.9340991	1000.42872		49.9340991	1000.42872
				55.6	1002.68		55.6	1002.68	xs2 rew	52.5171381	1000.51975		52.5171381	1000.51975
				55.4	1003.22		55.4	1003.22	xs2 gs	53.5889723	1002.5506		53.5889723	1002.5506
				57.1	1003.79		57.1	1003.79	xs2 gs	54.6711183	1003.17252		54.6711183	1003.17252
				58.2	1004.75		58.2	1004.75	bkf	57.358174	1004.05344		57.358174	1004.05344
				62.3	1005.67		62.3	1005.67	xs2 gs	58.8194668	1004.82094		58.8194668	1004.82094
				69.1	1005.94		69.1	1005.94	xs2 gs	63.254639	1005.66534		63.254639	1005.66534
				75.6	1005.51		75.6	1005.51	xs2 gs	68.8380092	1005.74498		68.8380092	1005.74498
				80.4	1005.41		80.4	1005.41	xs2 gs	73.7643442	1005.6746		73.7643442	1005.6746
				87.4	1005.48		87.4	1005.48	xs2 gs	79.4335876	1005.27385		79.4335876	1005.27385
				90.5	1006.11		90.5	1006.11	xs2 rp	85.9777834	1005.46352		85.9777834	1005.46352
				90.7	1006.70		90.7	1006.70	xs2 rp	90.6900467	1006.14083		90.6900467	1006.14083
										90.7071656	1006.65654		90.7071656	1006.65654



Photo of Cross-Section #2 - Looking Downstream

	Bankfull Area				
	As-Built	MY2	MY3	MY4	MY5
Area	91.8	92.27	87.48	84.74	
Width	34.0	49.9	41.9	38.8	
Mean Depth	2.7	1.8	2.1	2.2	
Max Depth	5.8	5.3	5.3	5.0	

* Data exists for the As-built but at a different station, station number 4+72.6



Project Name	Hanging Rock Creek
Cross Section	#3
Feature	Riffle at STA 2+19.5
Date	12/20/2007
Crew	R. Spears, J. Brock (Cav.)

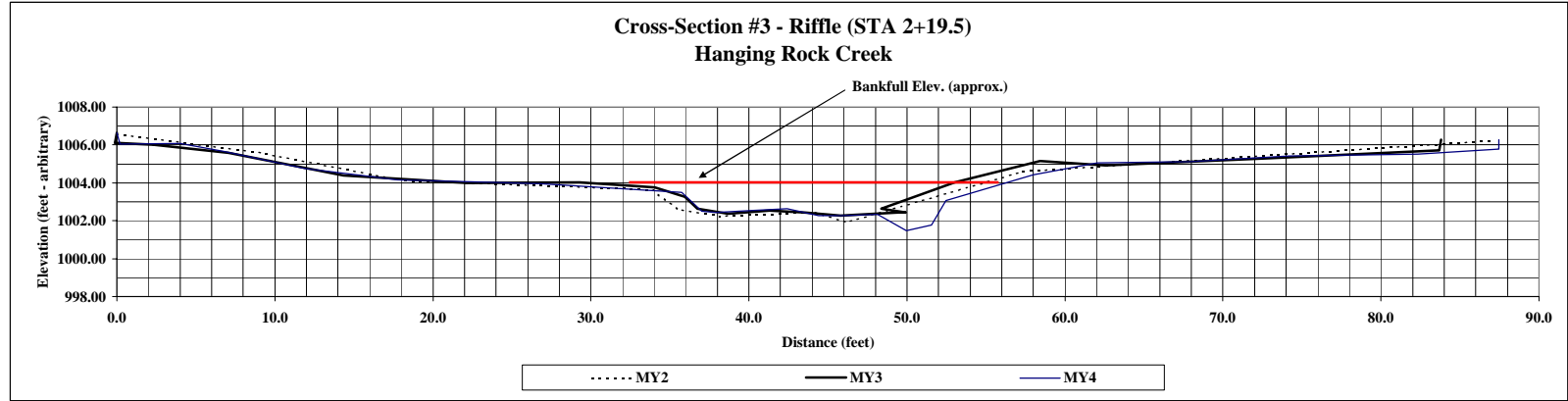
2004 As-Built Survey **	11/15/2005 MY2			11/15/2006 MY3			6/26/2007 MY4			2008 MY5		
	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
** Available only in text report	0.0	1006.58		0.0	1006.64	xs3 lp	0	1006.65784	xs3 lpin			
	9.1	1005.57		-0.1	1006.10	xs3 lp	0.18225205	1006.0525	xs3 gs			
	18.0	1004.12		2.3	1006.02	xs3 gs	4.02809711	1006.06524	xs3 gs			
	33.9	1003.62	bkf	7.1	1005.59	xs3 gs	6.82696824	1005.65832	xs3 gs			
	35.5	1002.61		14.3	1004.39	xs3 gs	11.9083256	1004.75992	xs3 gs			
	38.2	1002.23		22.2	1004.01	xs3 gs	17.7528153	1004.16744	xs3 gs			
	44.2	1002.43		29.3	1004.01	xs3 gs	26.7153914	1003.95205	xs3 gs			
	46.2	1001.90		34.0	1003.75	xs3 bkf	35.7553506	1003.48896	xs3 llob			
	57.3	1004.58	bkf	35.9	1003.27	xs3 gs	37.0191455	1002.50882	xs3 lew			
	64.5	1004.99		36.7	1002.62	xs3 lew	37.946351	1002.43912	xs3 bed			
	86.9	1006.21		38.7	1002.38	xs3 bed	40.0772966	1002.53955	xs3 bed			
				41.3	1002.54	xs3 bed	42.4038076	1002.62626	xs3 bed			
				43.5	1002.45	xs3 bed	44.3959735	1002.28142	xs3 bed			
				45.8	1002.28	xs3 bed	45.9362798	1002.26157	xs3 bed			
				49.5	1002.45	xs3 bed	48.1268706	1002.32153	xs3 bed			
				49.9	1002.45	xs3 rew	49.9615567	1001.49174	xs3 bed			
				48.4	1002.65	xs3 gs	51.5474885	1001.78321	xs3 rew			
				53.0	1004.03	xs3 bkf	52.4725939	1003.0588	xs3 rtob			
				58.4	1005.14	xs3 gs	57.9876334	1004.41761	xs3 gs			
				62.6	1004.91	xs3 gs	62.1	1005.05925	xs3 gs			
				72.6	1005.29	xs3 gs	67.9	1005.12027	xs3 gs			
				83.7	1005.71	xs3 rp	74.2	1005.42743	xs3 gs			
				83.8	1006.29	xs3 rp	82.3	1005.52334	xs3 gs			
							87.4	1005.78155	xs3 gs			
							87.5	1006.28319	xs3 rpin			



Photo of Cross-Section #3 - Looking Downstream

	Bankfull Area				
	As-Built	MY2	MY3	MY4	MY5
Area	44.7	56.22	49.19	53.80	
Width	40.6	23.4	24.4	22.2	
Mean Depth	1.1	2.4	2.0	2.4	
Max Depth	2.9	3.0	2.6	3.4	
w/d ratio	36.9	9.7	12.1	9.2	
FPW			>100		
ER (greater than)	5.0	4.3	4.1	4.5	

* Data exists for the As-built but at a different station, station number 4+95.6
 ** Datum for MY4 may have been surveyed at a slightly different angle than in former years.



Project Name Hanging Rock Creek
Cross Section #4
Feature Pool at STA 3+58.4
Date 12/20/2007
Crew R. Spears, J. Brock (Cav.)

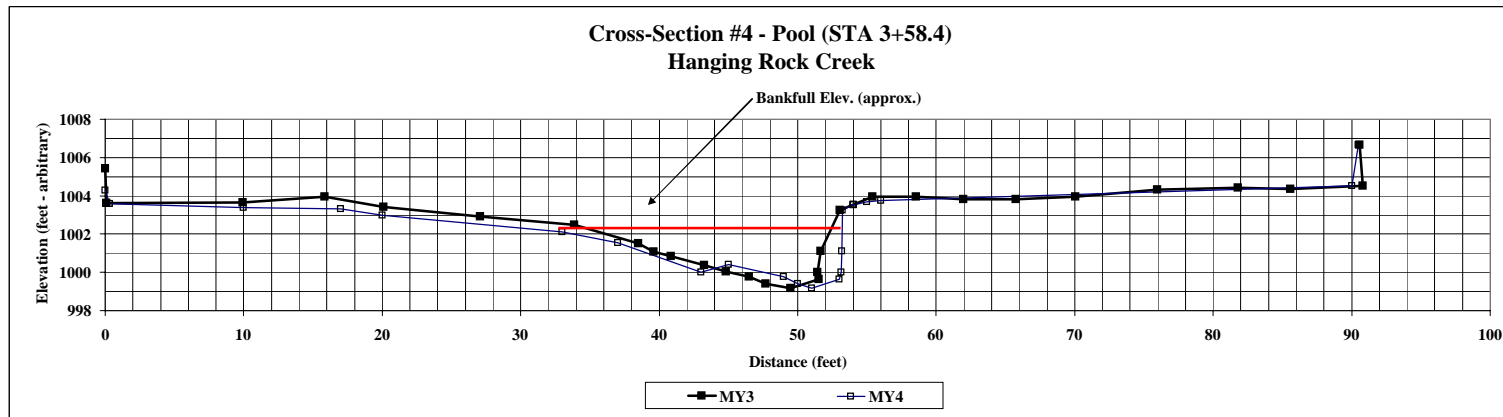
2004 As-Built Survey **			11/15/2005 MY2			11/15/2006 MY3			6/26/2007 MY4			2008 MY5		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
** Available only in text report														
0.0	1005.42	xs4 lp				0.0	1004.30323	xs4 lpin						
0.1	1003.63	xs4 lp				0.3	1003.59135	xs4 gs						
9.9	1003.67	xs4 gs				10.0	1003.39969	bkf						
15.9	1003.95	xs4 gs				17.0	1003.3111	xs4 gs						
20.1	1003.40	bkf				20.0	1002.99749	xs4 gs						
27.1	1002.92	xs4 gs				33.0	1002.1099	xs4 gs						
33.9	1002.47	xs4 gs				37.0	1001.53858	xs4 ltob						
38.5	1001.51	xs4 gs				43.0	999.99703	xs4 lew						
39.6	1001.09	xs4 lew				45.0	1000.4063	xs4 bed						
40.8	1000.83	xs4 bed				49.0	999.77184	xs4 bed						
43.3	1000.36	xs4 bed				50.0	999.39606	xs4 bed						
44.8	1000.03	xs4 bed				51.0	999.1722	xs4 bed						
46.5	999.77	xs4 bed				53.0	999.62274	xs4 bed						
47.7	999.40	xs4 bed				53.2	999.99848	xs4 bed						
49.5	999.17	xs4 bed				53.2	1001.11816	xs4 rew						
51.5	999.62	xs4 bed				53.3	1003.25333	xs4 rtob						
51.4	1000.00	xs4 bed				54.0	1003.55715	xs4 gs						
51.7	1001.12	xs4 rew				54.0	1003.52586	xs4 gs						
53.1	1003.25	bkf				55.0	1003.67429	xs4 gs						
55.4	1003.96	xs4 gs				56.0	1003.74395	xs4 gs						
58.6	1003.97	xs4 gs				90.0	1004.53338	xs4 gs						
62.0	1003.82	xs4 gs				90.5	1006.66079	xs4 rpin						
65.8	1003.83	xs4 gs												
70.0	1003.96	xs4 gs												
76.0	1004.32	xs4 gs												
81.8	1004.42	xs4 gs												
85.6	1004.34	xs4 gs												
90.8	1004.53	xs4 rp												
90.6	1006.66	xs4 rp												



Photo of Cross-Section #4 - Looking Upstream

Bankfull Area					
	As-Built	MY2	MY3	MY4	MY5
Area	41.6		51.34	51.42	
Width	20.8		35.3	37.0	
Mean Depth	2.0		1.5	1.4	
Max Depth	3.9		4.2	4.2	

* Data exists for the As-built but at a different station, station number 6+26.6



Project Name	Hangin Rock Creek
Cross Section	#5
Feature	Riffle at 5+26.5
Date	12/20/2007
Crew	R. Spears, J. Brock (Cav.)

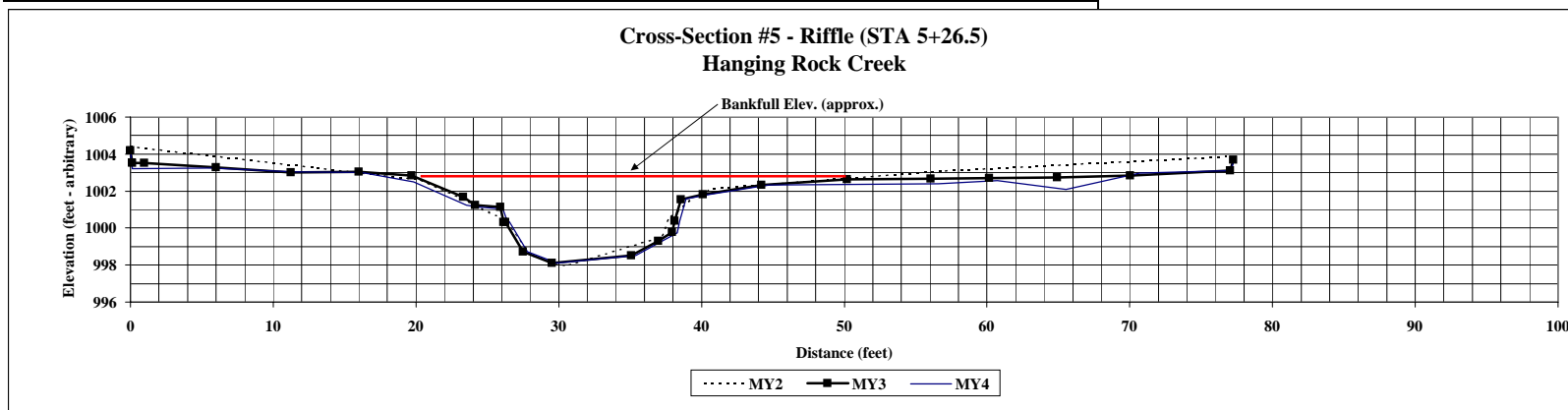
2004 As-Built Survey **			11/15/2005 MY2			11/15/2006 MY3			6/26/2007 MY4			2008 MY5		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
** Available only in text report														
	0.0	1004.39	Lb	0.0	1004.21	xs4A lp	0.0	1004.21	xs5lp					
	13.1	1003.25		0.1	1003.52	xs4A lp	0.1	1003.21	xs5lp					
	20.3	1002.60	bkf	1.0	1003.52	xs4A gs	5.7	1003.25						
	23.7	1001.40		6.0	1003.27	xs4A gs	11.3	1003.04						
	26.2	1000.44	lew	11.2	1003.01	xs4A gs	16.2	1003.02						
	28.0	998.54		16.0	1003.03	xs4A gs	19.8	1002.51	bkf					
	30.5	997.93	tw	19.7	1002.84	bkf	23.6	1001.25						
	37.3	999.55		23.3	1001.70	xs4A bkf	24.4	1001.15						
	37.7	1000.46	rew	24.1	1001.24	xs4A gs	26.1	1001.05						
	39.3	1001.62		25.9	1001.13	xs4A ltob	26.4	1000.34						
	40.8	1002.12	bkf	26.1	1000.32	xs4A gs	26.5	1000.37						
	56.8	1003.06		26.3	1000.32	xs4A lew	27.8	998.71						
	76.8	1003.85	rb	27.5	998.70	xs4A bed	29.9	998.10						
				29.5	998.12	xs4A bed	35.4	998.53						
				35.1	998.52	xs4A bed	37.3	999.32						
				37.0	999.31	xs4A bed	38.3	999.75						
				37.9	999.77	xs4A bed	38.5	1000.39						
				38.1	1000.38	xs4A rev	38.9	1001.58						
				38.6	1001.54	xs4A rtob	40.6	1001.82						
				40.1	1001.82	xs4A gs	44.7	1002.31	bkf					
				44.2	1002.33	bkf	50.8	1002.36						
				50.2	1002.64	xs4A gs	56.6	1002.40						
				56.1	1002.67	xs4A gs	60.7	1002.58						
				60.2	1002.69	xs4A gs	65.5	1002.10						
				64.9	1002.72	xs4A gs	70.7	1002.98						
				70.0	1002.83	xs4A gs	77.1	1003.11	xs5rp					
				77.1	1003.12	xs4A rp	77.3	1003.68	xs5rp					
				77.3	1003.68	xs4A rp								



Photo of Cross-Section #5 - Looking Upstream

	Bankfull Area				
	As-Built	MY2	MY3	MY4	MY5
Area	37.0	69.97	64.44	65.62	
Width	14.8	36.5	30.5	27.2	
Mean Depth	2.5	1.9	2.1	2.4	
Max Depth	3.8	0.7	4.7	4.7	
w/d ratio	*	19.0	14.5	11.3	
FPW			>100		
ER (greater than)		2.7	3.3	3.7	

* Data exists for the As-built but at a different station, station number 7+89.6
 *MY2 data adjusted by 1000 feet in elevation to correlate with 2006 data



Project Name Hanging Rock Creek
Cross Section #6 (Cross-section 7 from 2005 Monitoring, MY2)
Feature Pool at STA 15+03
Date 12/20/2007
Crew R. Spears, J. Brock (Cav.)

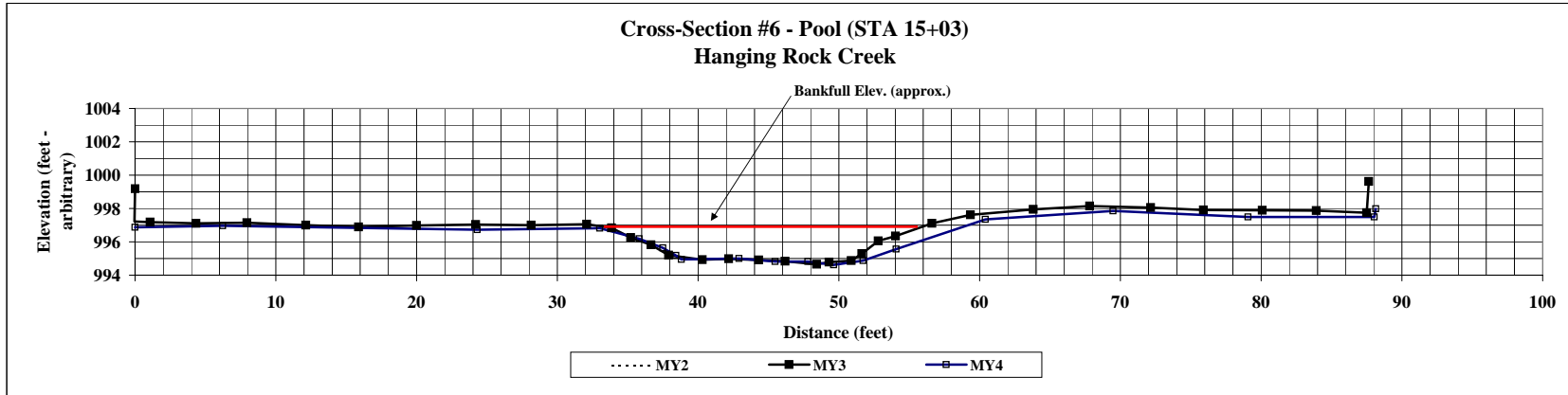
2004 As-Built Survey **			11/15/2005 MY2			11/15/2006 MY3			6/26/2007 MY4			2008 MY5		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
** Available only in text report														
			0.0	999.19	xs6 lp	0	996.87087	xs6 gs						
			-0.1	997.23	xs6 lp	6.22	996.97	xs6 gs						
			1.1	997.18	xs6 gs	24.32	996.73	bkf						
			4.3	997.11	xs6 gs	33.03	996.81	xs6 gs						
			8.0	997.15	xs6 gs	35.82	996.18	xs6 gs						
			12.1	997.00	bkf	37.50	995.63	xs6 gs						
			15.9	996.88	xs6 gs	38.43	995.17	xs6 gs						
			20.0	996.97	xs6 gs	38.81	994.95	xs6 lew						
			24.2	997.04	xs6 gs	42.90	995.01	xs6 bed						
			28.1	997.00	xs6 gs	45.47	994.82	xs6 bed						
			32.1	997.05	xs6 gs	47.80	994.81	xs6 bed						
			33.8	996.83	xs6 lto	49.64	994.62	xs6 bed						
			35.2	996.26	xs6 gs	51.72	994.88	xs6 bed						
			36.6	995.82	xs6 gs	54.08	995.56	xs6 rtob						
			37.9	995.20	xs6 gs	60.40	997.34	xs6 gs						
			40.3	994.93	xs6 bed	69.48	997.85	xs6 gs						
			42.2	994.98	xs6 bed	79.08	997.49	xs6 gs						
			44.3	994.91	xs6 bed	88.05	997.50	xs6 gs						
			46.2	994.83	xs6 bed	88.15	997.98	xs6 rpin						
			48.4	994.65	xs6 bed									
			49.3	994.78	xs6 twg									
			50.9	994.87	xs6 bed									
			51.6	995.29	xs6 rew									
			52.8	996.05	xs6 gs									
			54.0	996.34	xs6 gs									
			56.6	997.11	bkf									
			59.4	997.62	xs6 rtob									
			63.8	997.94	xs6 gs									
			67.8	998.14	xs6 gs									
			72.2	998.06	xs6 gs									
			75.9	997.91	xs6 gs									
			80.1	997.89	xs6 gs									
			83.9	997.87	xs6 gs									
			87.5	997.74	xs6 rp									
			87.7	999.62	xs6 rp									



Photo of Cross-Section #6 - Looking Downstream

	Bankfull Area				
	As-Built	MY2	MY3	MY4	MY5
Area	30.3		38.74	38.17	
Width	27.5		47.2	45.2	
Mean Depth	1.1		0.8	0.8	
Max Depth	2.2		2.4	2.4	

* Data exists for the As-built but at a different station, station number 13+38.6
 * Cross-section 6 field indicators were not present during survey. The 2005 plan also indicated only six cross-sections.
 ** This cross-section is actually Cross-section 7 (MY 2005). For MY3, 2006 it is labelled as Cross-section 6.



Project Name UT to Hanging Rock Creek
Cross Section #UT1
Feature Riffle at STA 1+58.2
Date 12/20/2007
Crew R. Spears, J. Brock (Cav.)

2004 As-Built Survey **	11/15/2005 MY2			11/15/2006 MY3			6/26/2007 MY4			2008 MY5		
	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
** Available only in text report	0.0	1000.10	lb	0.0	999.90	utxs1 lp	0	999.75819	xa lpin			
	13.5	1000.27		0.5	999.47	utxs1 lp	0.3	999.25884	xa gs			
	17.9	999.90		4.1	999.64	bkf	7.9	999.62405	xa gs			
	20.2	999.65	bkf	8.0	999.76	utxs1 gs	15.6	999.98794	xa gs			
	22.2	998.66	lew	12.0	999.93	utxs1 gs	19.4	999.4749	xa gs			
	23.7	998.26	tw	15.7	1000.15	utxs1 gs	21.7	999.20227	bkf			
	26.4	998.62	rew	19.7	999.53	utxs1 gs	24.1	997.98854	xa lew			
	27.8	999.70		22.7	999.17	utxs1 bkf	24.6	997.8062	xa bed			
	33.0	1000.61	bkf	23.4	998.30	utxs1 lew	25.7	997.49322	xa bed			
	49.3	1001.16	rb	22.8	997.90	utxs1 bed	26.3	997.59994	xa bed			
				23.8	997.89	utxs1 bed	27.3	998.04913	xa rew			
				24.5	997.74	utxs1 bed	29.7	998.46515	xa ltob			
				25.0	997.86	utxs1 bed	33.0	998.9376	xa rtob			
				25.7	997.85	utxs1 bed	34.8	999.54212	xa gs			
				25.7	998.44	utxs1 rew	38.9	1000.05571	xa gs			
				26.0	998.94	utxs1 gs	44.5	1000.21422	xa gs			
				25.4	999.44	utxs1 bkf	50.5	1000.08042	xa gs			
				27.5	999.69	utxs1 gs	55.3	1000.20481	xa gs			
				31.3	1000.25	utxs1 gs						
				37.0	1000.29	utxs1 gs						
				42.1	1000.19	utxs1 gs						
				47.3	1000.36	utxs1 rp						
				47.1	1000.95	utxs1 rp						

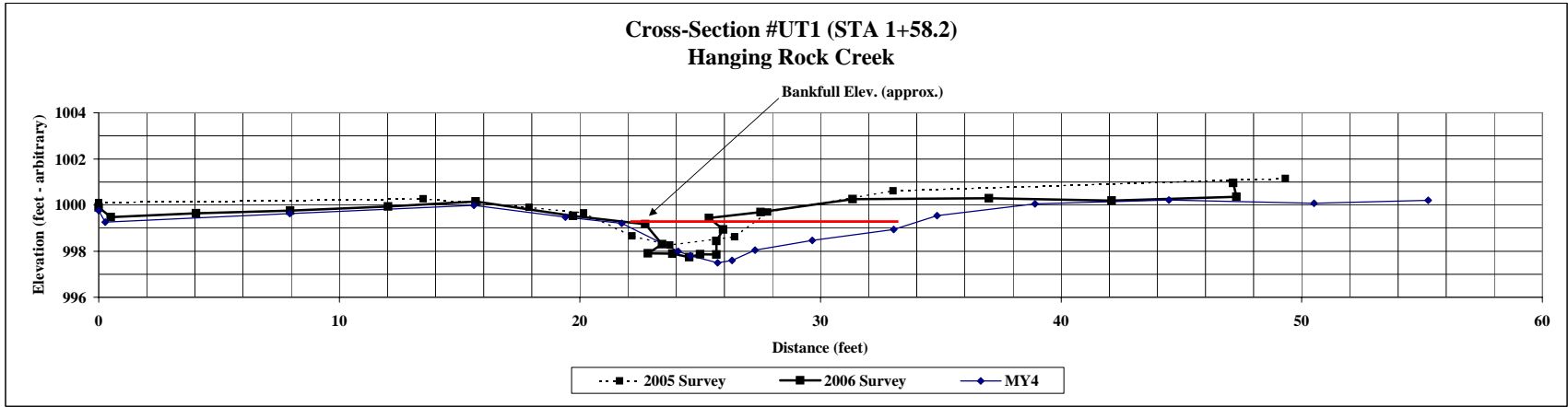


Note: Cross-Section data taken downstream of tape shown in photograph

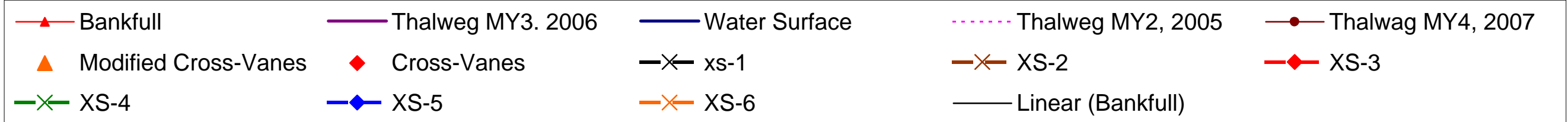
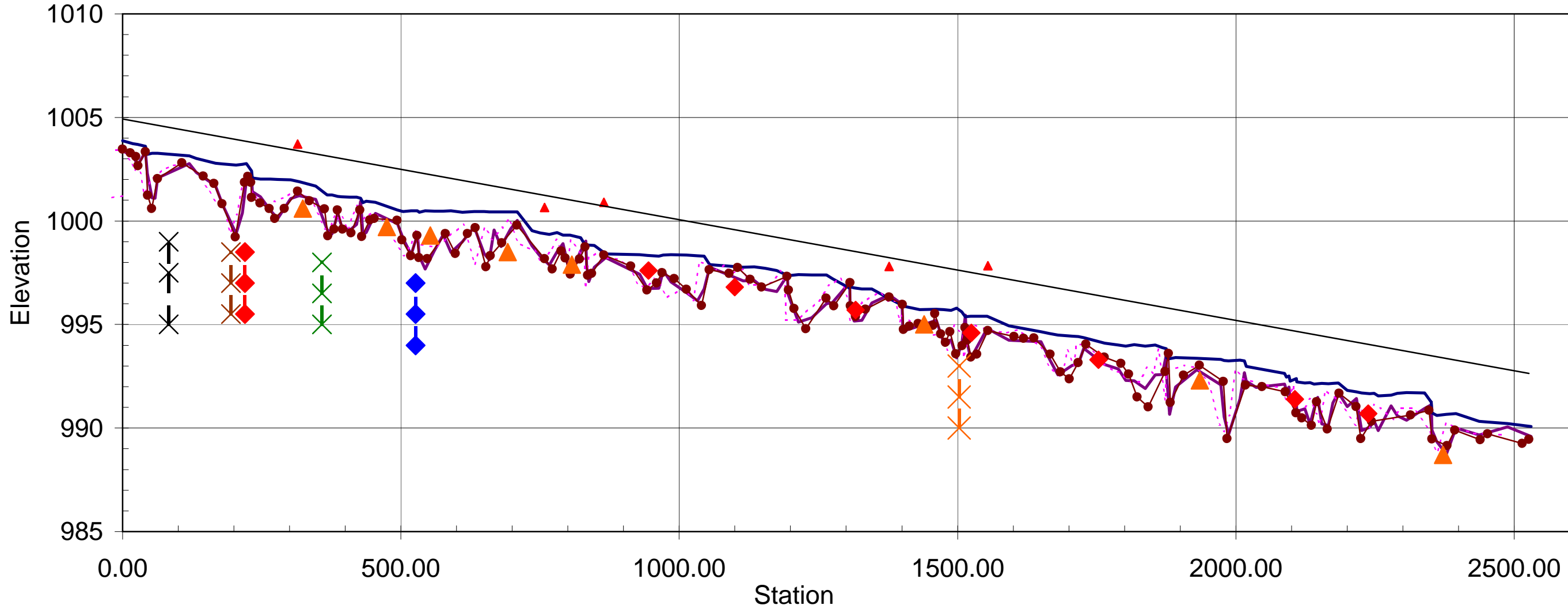
Photo of Cross-Section #UT1 - Looking Downstream

	As-Built	MY2	MY3	MY4	MY5
Bankfull Area					
Area	3.6	8.22	5.58	17.01	
Width	5.1	12.9	7.8	13.1	
Mean Depth	0.7	0.6	0.7	1.3	
Max Depth	1.1	1.4	1.9	2.2	

* Data exists for the As-built but at a different station, station number 8+74.4
 **MY4 datum may have been taken at a different angle than in previous years

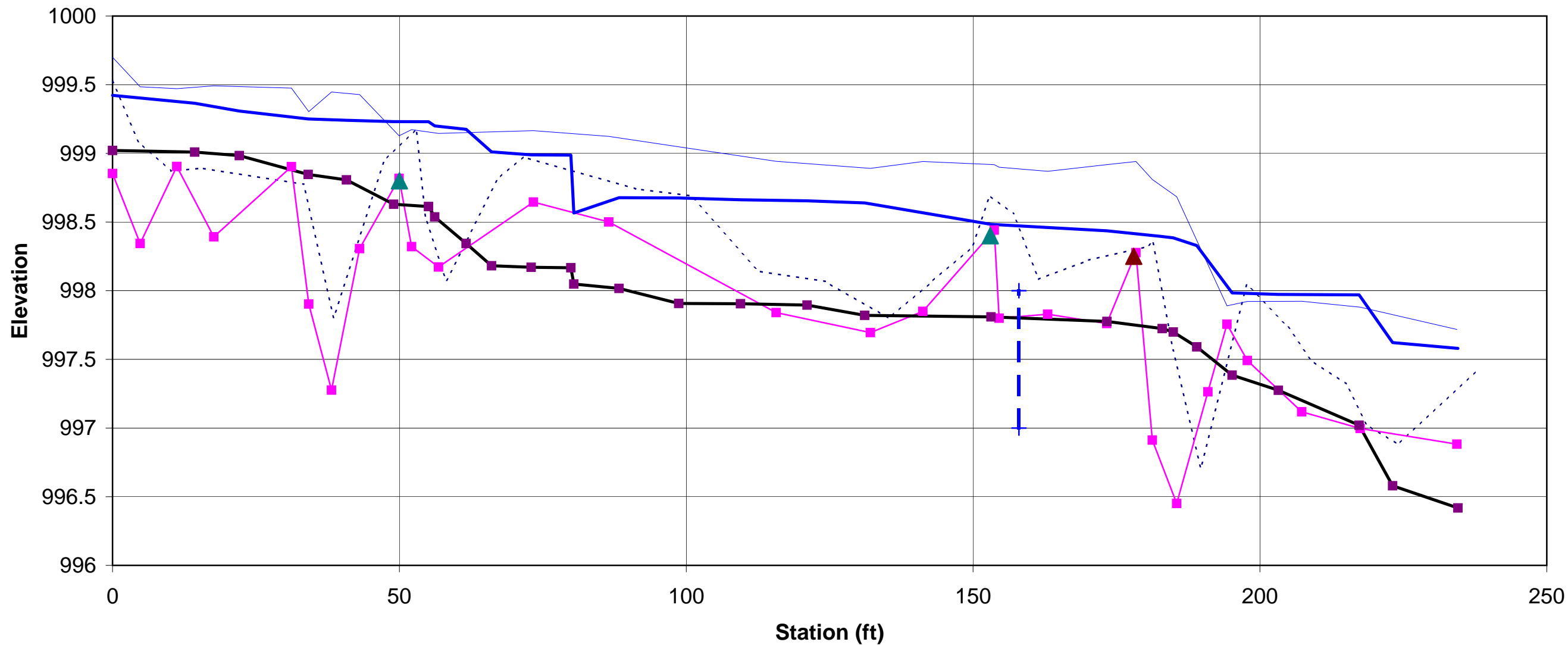


Hanging Rock Creek - Longitudinal Profile MY4, 2007



* NOTE: Rendered Structure Elevations are arbitrary, provided for reference purposes only.

Unnamed Hanging Rock Tributary - Longitudinal Profile MY4, 2007



* NOTE: Rendered Structure Elevations are arbitrary, provided for reference purposes only.

Hanging Rock Creek			
Cross Section 1			
Baseline			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2		0.0%	0%
2-4		0.0%	0%
4-8		0.0%	0%
8-16		0.0%	0%
16-32		0.0%	0%
32-64		0.0%	0%
64-128		0.0%	0%
128-256		0.0%	0%
256-512		0.0%	0%
512-1024		0.0%	0%
1024-2048		0.0%	0%
2048-4096		0.0%	0%
Bedrock	0	0.0%	0%
Total	0	0%	0%

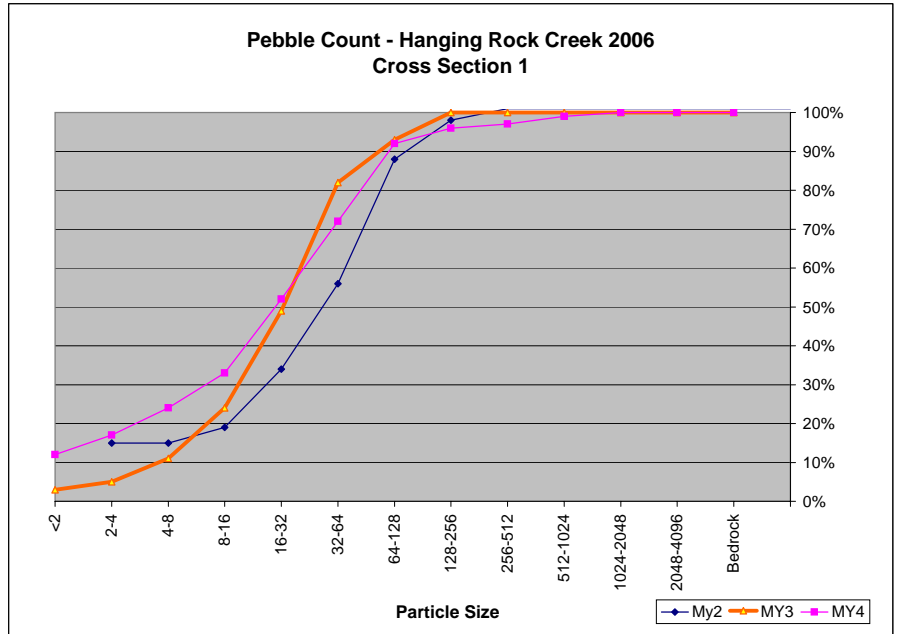
d50 = 0 mm, d84 = 0 mm

Hanging Rock Creek			
Cross Section 1			
2005 Monitoring, MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	15	15.0%	15%
2-4	0	0.0%	15%
4-8	4	4.0%	19%
8-16	15	15.0%	34%
16-32	22	22.0%	56%
32-64	32	32.0%	88%
64-128	10	10.0%	98%
128-256	3	3.0%	101%
256-512		0.0%	101%
512-1024		0.0%	101%
1024-2048		0.0%	101%
2048-4096		0.0%	101%
Bedrock	0	0.0%	101%
Total	101	101%	101%

d50 = 26.7 mm, d84 = 58 mm

Hanging Rock Creek			
Cross Section 1			
2006 Monitoring, MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	3	3.0%	3%
2-4	2	2.0%	5%
4-8	6	6.0%	11%
8-16	13	13.0%	24%
16-32	25	25.0%	49%
32-64	33	33.0%	82%
64-128	11	11.0%	93%
128-256	7	7.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock	0	0.0%	100%
Total	100	100%	100%

d50 = 33.7 mm, d84 = 71 mm

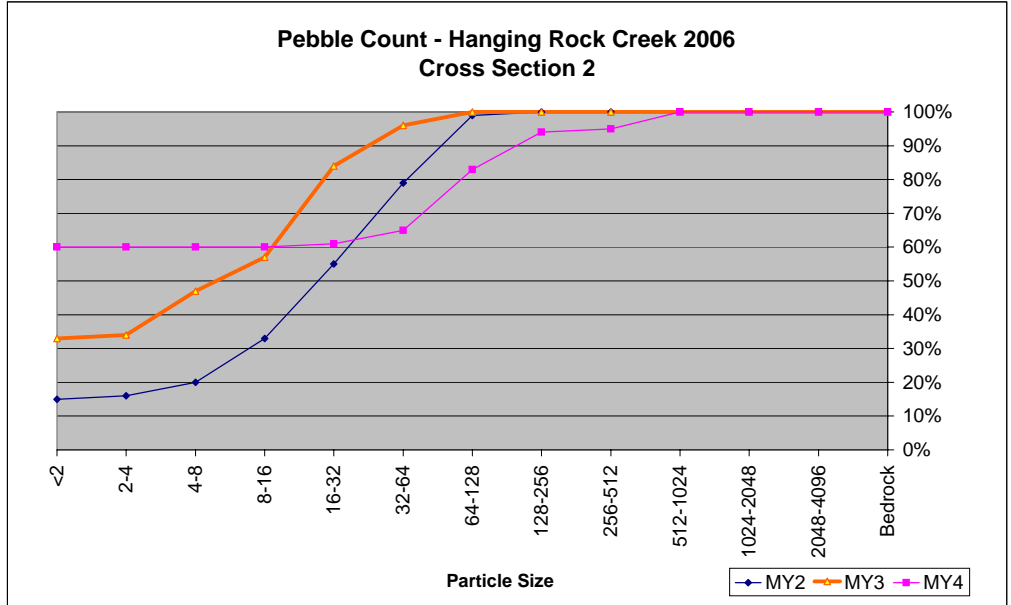


Hanging Rock Creek			
Cross Section 1			
2007 Monitoring, MY4			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	12	12.0%	12%
2-4	5	5.0%	17%
4-8	7	7.0%	24%
8-16	9	9.0%	33%
16-32	19	19.0%	52%
32-64	20	20.0%	72%
64-128	20	20.0%	92%
128-256	4	4.0%	96%
256-512	1	1.0%	97%
512-1024	2	2.0%	99%
1024-2048	1	1.0%	100%
2048-4096		0.0%	100%
Bedrock	0	0.0%	100%
Total	100	100%	100%

d50 = 29.1 mm, d84 = 69.2 mm

Hanging Rock Creek			
Cross Section 2			
Baseline			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2		0.0%	0%
2-4		0.0%	0%
4-8		0.0%	0%
8-16		0.0%	0%
16-32		0.0%	0%
32-64		0.0%	0%
64-128		0.0%	0%
128-256		0.0%	0%
256-512		0.0%	0%
512-1024		0.0%	0%
1024-2048		0.0%	0%
2048-4096		0.0%	0%
Bedrock		0.0%	0%
Total	0	0%	0%

d50 = mm, d84 = mm



Hanging Rock Creek			
Cross Section 2			
2005 Monitoring, MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	15	15.0%	15%
2-4	1	1.0%	16%
4-8	4	4.0%	20%
8-16	13	13.0%	33%
16-32	22	22.0%	55%
32-64	24	24.0%	79%
64-128	20	20.0%	99%
128-256	1	1.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 24.5 mm, d84 = 74 mm

Hanging Rock Creek			
Cross Section 2			
2007 Monitoring, MY4			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	60	60.0%	60%
2-4	0	0.0%	60%
4-8	0	0.0%	60%
8-16	0	0.0%	60%
16-32	1	1.0%	61%
32-64	4	4.0%	65%
64-128	18	18.0%	83%
128-256	11	11.0%	94%
256-512	1	1.0%	95%
512-1024	5	5.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	100	100%	100%

d50 = <2 mm, d84 = 72.8 mm

Hanging Rock Creek			
Cross Section 2			
2006 Monitoring, MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	33	33.0%	33%
2-4	1	1.0%	34%
4-8	13	13.0%	47%
8-16	10	10.0%	57%
16-32	27	27.0%	84%
32-64	12	12.0%	96%
64-128	4	4.0%	100%
128-256		0.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 11.5 mm, d85 = 32 mm

Hanging Rock Creek			
Cross Section 3			
Baseline			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2		0.0%	0%
2-4		0.0%	0%
4-8		0.0%	0%
8-16		0.0%	0%
16-32		0.0%	0%
32-64		0.0%	0%
64-128		0.0%	0%
128-256		0.0%	0%
256-512		0.0%	0%
512-1024		0.0%	0%
1024-2048		0.0%	0%
2048-4096		0.0%	0%
Bedrock		0.0%	0%
Total	0	0%	0%

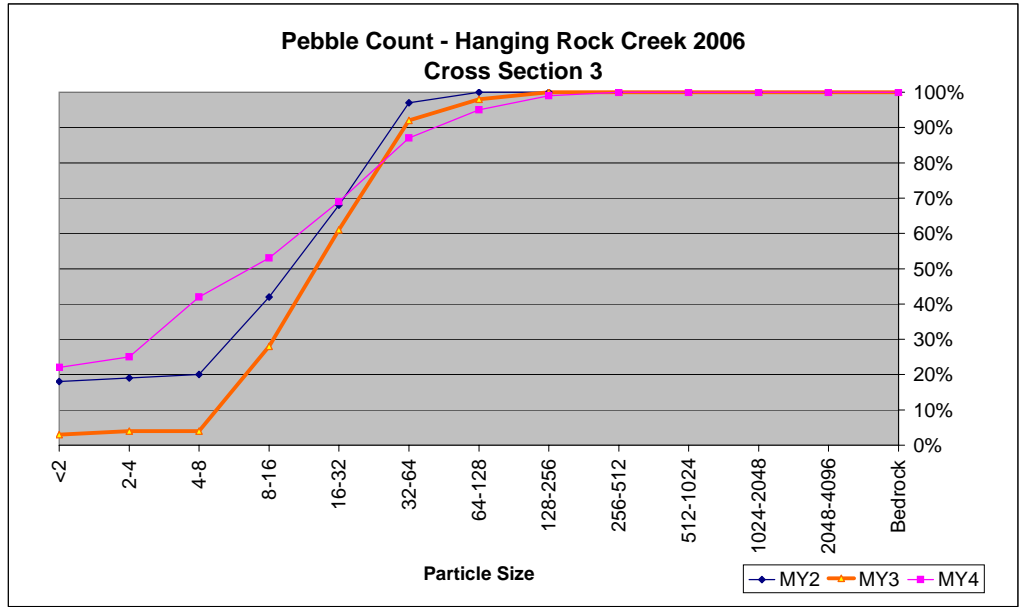
d50 = 0 mm, d85 = 0 mm

Hanging Rock Creek			
Cross Section 3			
2005 Monitoring, MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	18	18.0%	18%
2-4	1	1.0%	19%
4-8	1	1.0%	20%
8-16	22	22.0%	42%
16-32	26	26.0%	68%
32-64	29	29.0%	97%
64-128	3	3.0%	100%
128-256		0.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 22 mm, d84 = 45 mm

Hanging Rock Creek			
Cross Section 3			
2006 Monitoring, MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	3	3.0%	3%
2-4	1	1.0%	4%
4-8	0	0.0%	4%
8-16	24	24.0%	28%
16-32	33	33.0%	61%
32-64	31	31.0%	92%
64-128	6	6.0%	98%
128-256	2	2.0%	100%
256-512	0	0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 26.5 mm, d845 = 54 mm



Hanging Rock Creek			
Cross Section 3			
2007 Monitoring, MY4			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	22	22.0%	22%
2-4	3	3.0%	25%
4-8	17	17.0%	42%
8-16	11	11.0%	53%
16-32	16	16.0%	69%
32-64	18	18.0%	87%
64-128	8	8.0%	95%
128-256	4	4.0%	99%
256-512	1	1.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 14.9 mm, d84 = 46.3 mm

Hanging Rock Creek			
Cross Section 4			
Baseline			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2		0.0%	0%
2-4		0.0%	0%
4-8		0.0%	0%
8-16		0.0%	0%
16-32		0.0%	0%
32-64		0.0%	0%
64-128		0.0%	0%
128-256		0.0%	0%
256-512		0.0%	0%
512-1024		0.0%	0%
1024-2048		0.0%	0%
2048-4096		0.0%	0%
Bedrock		0.0%	0%
Total	0	0%	0%

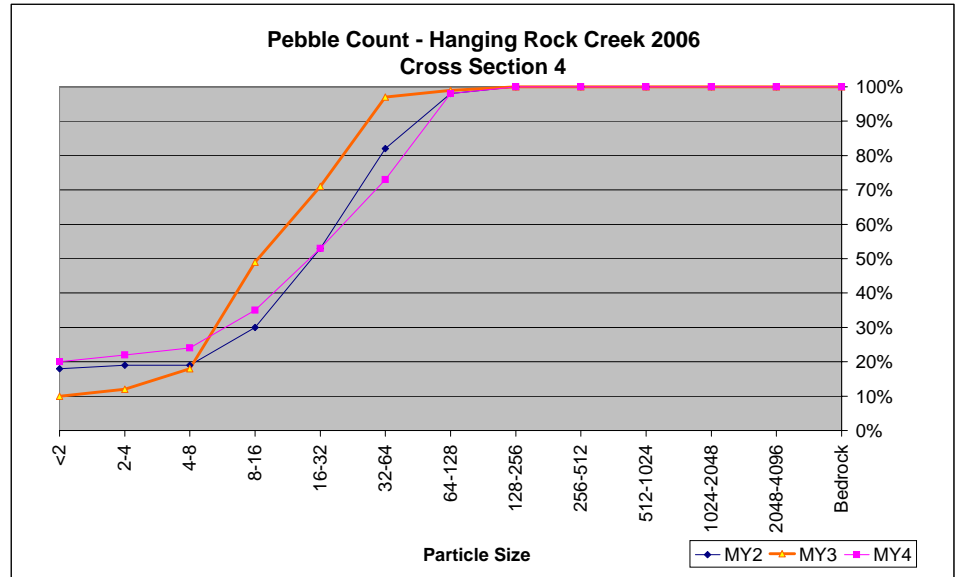
d50 < 2 mm, d84 = 5.8 mm

Hanging Rock Creek			
Cross Section 4			
2005 Monitoring, MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	18	18.0%	18%
2-4	1	1.0%	19%
4-8	0	0.0%	19%
8-16	11	11.0%	30%
16-32	23	23.0%	53%
32-64	29	29.0%	82%
64-128	16	16.0%	98%
128-256	2	2.0%	100%
256-512		0.0%	100%
512-1024	0	0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock	0	0.0%	100%
Total	100	100%	100%

d50 = 20 mm, d84 = 47 mm

Hanging Rock Creek			
Cross Section 4			
2006 Monitoring, MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	10	10.0%	10%
2-4	2	2.0%	12%
4-8	6	6.0%	18%
8-16	31	31.0%	49%
16-32	22	22.0%	71%
32-64	26	26.0%	97%
64-128	2	2.0%	99%
128-256	1	1.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 16.4 mm, d84 = 43 mm

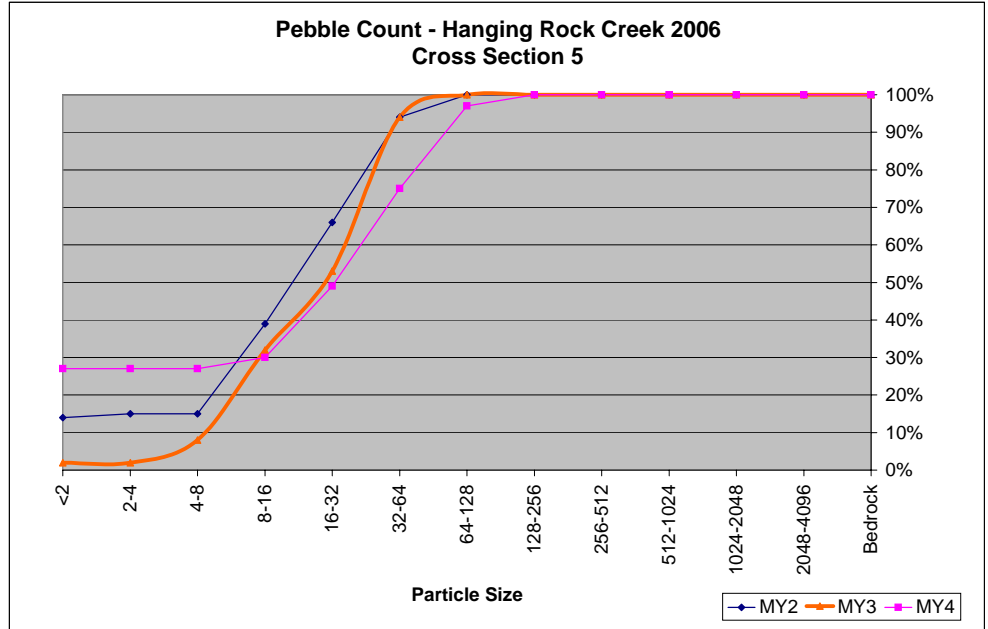


Hanging Rock Creek			
Cross Section 4			
2007 Monitoring, MY4			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	20	20.0%	20%
2-4	2	2.0%	22%
4-8	2	2.0%	24%
8-16	11	11.0%	35%
16-32	18	18.0%	53%
32-64	20	20.0%	73%
64-128	25	25.0%	98%
128-256	2	2.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 20.3 mm, d84 = 66.2 mm

Hanging Rock Creek			
Cross Section 5			
Baseline			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2		0.0%	0%
2-4		0.0%	0%
4-8		0.0%	0%
8-16		0.0%	0%
16-32		0.0%	0%
32-64		0.0%	0%
64-128		0.0%	0%
128-256		0.0%	0%
256-512		0.0%	0%
512-1024		0.0%	0%
1024-2048		0.0%	0%
2048-4096		0.0%	0%
Bedrock		0.0%	0%
Total	0	0%	0%

d50 = 0.22 mm, d84 = 46 mm



Hanging Rock Creek			
Cross Section 5			
2005 Monitoring, MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	14	14.0%	14%
2-4	1	1.0%	15%
4-8	0	0.0%	15%
8-16	24	24.0%	39%
16-32	27	27.0%	66%
32-64	28	28.0%	94%
64-128	6	6.0%	100%
128-256		0.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 22 mm, d84 = 46 mm

Hanging Rock Creek			
Cross Section 5			
2007 Monitoring, MY4			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	27	27.0%	27%
2-4		0.0%	27%
4-8		0.0%	27%
8-16	3	3.0%	30%
16-32	19	19.0%	49%
32-64	26	26.0%	75%
64-128	22	22.0%	97%
128-256	3	3.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

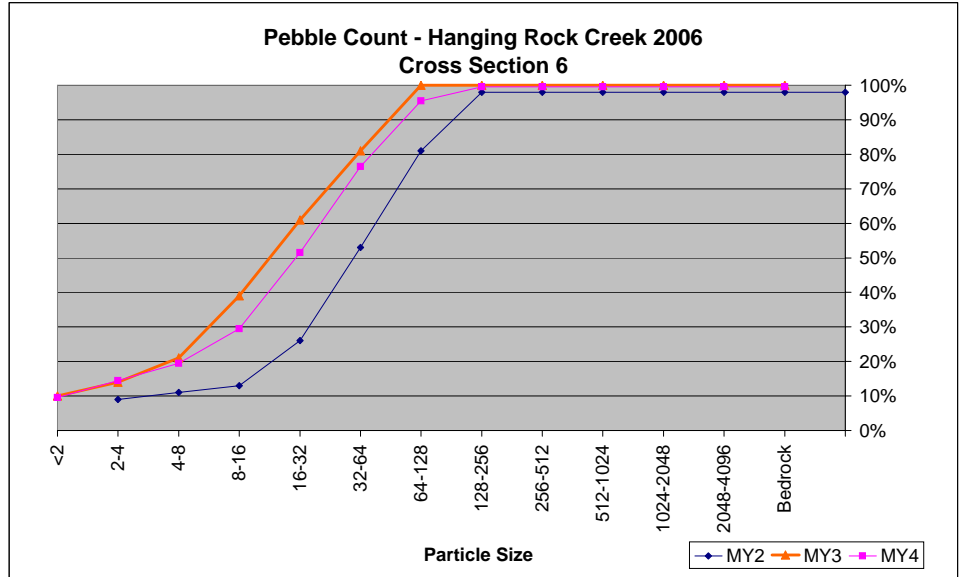
d50 = 35.7 mm, d84 = 86.6 mm

Hanging Rock Creek			
Cross Section 5			
2006 Monitoring, MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	2	2.0%	2%
2-4		0.0%	2%
4-8	6	6.0%	8%
8-16	24	24.0%	32%
16-32	21	21.0%	53%
32-64	41	41.0%	94%
64-128	6	6.0%	100%
128-256		0.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 29.3 mm, d84 = 51.0 mm

Hanging Rock Creek			
Cross Section 6			
Baseline			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2		0.0%	0%
2-4		0.0%	0%
4-8		0.0%	0%
8-16		0.0%	0%
16-32		0.0%	0%
32-64		0.0%	0%
64-128		0.0%	0%
128-256		0.0%	0%
256-512		0.0%	0%
512-1024		0.0%	0%
1024-2048		0.0%	0%
2048-4096		0.0%	0%
Bedrock		0.0%	0%
Total	0	0%	0%

d50 = 29.1 mm, d84 = 77.5 mm



Hanging Rock Creek			
Cross Section 6			
2005 Monitoring, MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	9	9.0%	9%
2-4	2	2.0%	11%
4-8	2	2.0%	13%
8-16	13	13.0%	26%
16-32	27	27.0%	53%
32-64	28	28.0%	81%
64-128	17	17.0%	98%
128-256		0.0%	98%
256-512		0.0%	98%
512-1024		0.0%	98%
1024-2048		0.0%	98%
2048-4096		0.0%	98%
Bedrock		0.0%	98%
Total	98	98%	98%

d50 = 28.8 mm, d84 = 66.0 mm

Hanging Rock Creek			
Cross Section 6			
2007 Monitoring, MY4			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	10	9.5%	10%
2-4	5	5.0%	15%
4-8	5	5.0%	20%
8-16	10	10.0%	30%
16-32	22	22.0%	52%
32-64	25	25.0%	77%
64-128	19	19.0%	96%
128-256	4	4.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

d50 = 30 mm, d84 = 66.3 mm

Hanging Rock Creek			
Cross Section 6			
2006 Monitoring, MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
<2	10	10.0%	10%
2-4	4	4.0%	14%
4-8	7	7.0%	21%
8-16	18	18.0%	39%
16-32	22	22.0%	61%
32-64	20	20.0%	81%
64-128	19	19.0%	100%
128-256		0.0%	100%
256-512		0.0%	100%
512-1024		0.0%	100%
1024-2048		0.0%	100%
2048-4096		0.0%	100%
Bedrock		0.0%	100%
Total	100	100%	100%

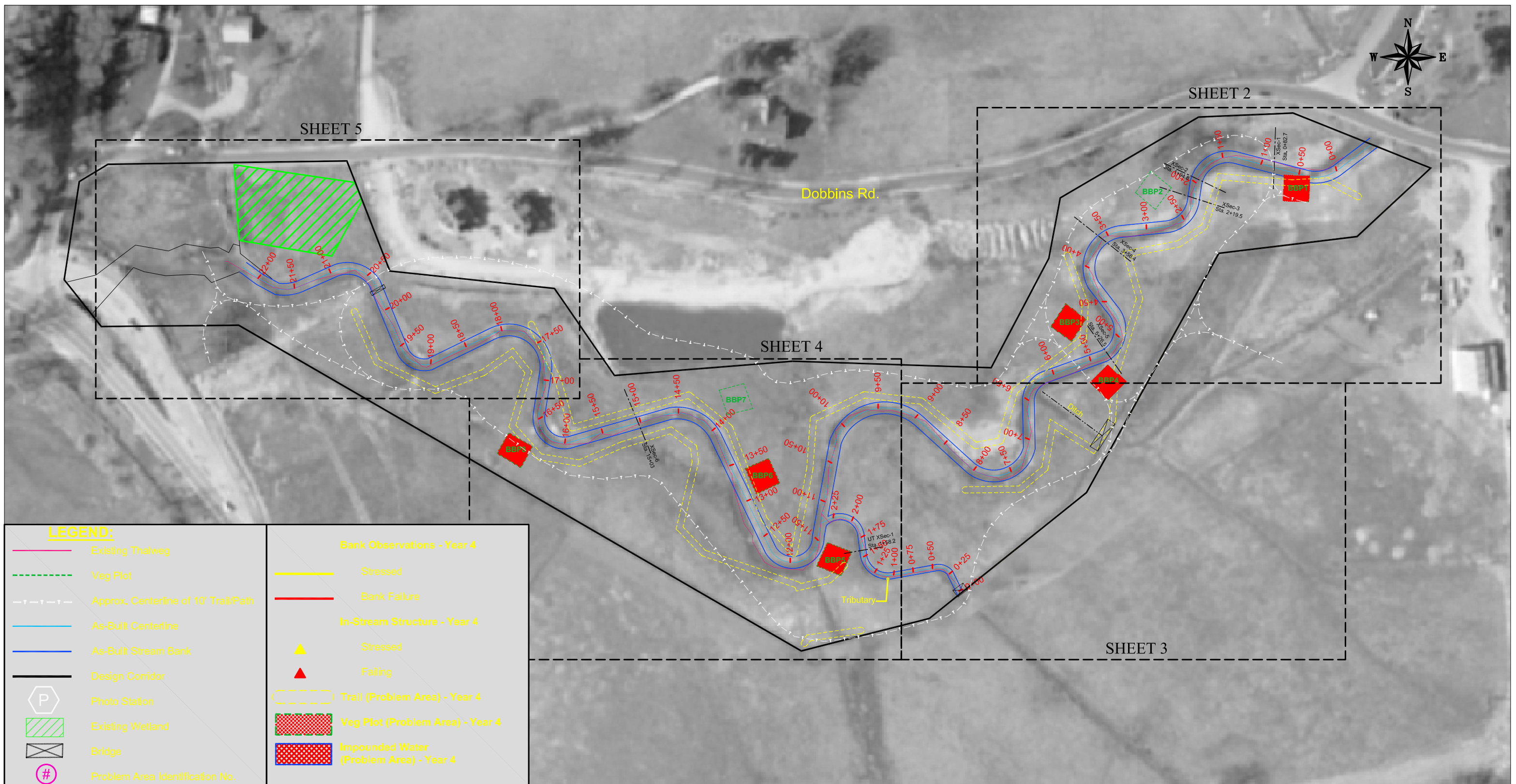
d50 = 22.7 mm, d84 = 69.0 mm

APPENDIX C

Wetland Data (Not Applicable for this project)

APPENDIX D

1. Combined Problem Area Plan View



SHEET 5

SHEET 2

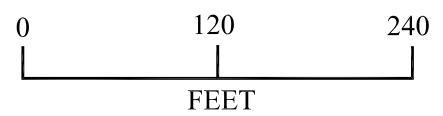
Dobbins Rd.

SHEET 4

SHEET 3

LEGEND:

	Existing Thalweg		Bank Observations - Year 4
	Veg Plot		Stressed
	Approx. Centerline of 10' Trail/Path		Bank Failure
	As-Built Centerline		In-Stream Structure - Year 4
	As-Built Stream Bank		Stressed
	Design Corridor		Failing
	Photo Station		Trail (Problem Area) - Year 4
	Existing Wetland		Veg Plot (Problem Area) - Year 4
	Bridge		Impounded Water (Problem Area) - Year 4
	Problem Area Identification No.		



Prepared by / Date: R.R./11-15-07
 Checked by/ Date: R.S./11-15-07

Scale: 1" = 120'
 Source: ECOLOGIC, NC EEP, NCDA (2005 Aerial Photo)



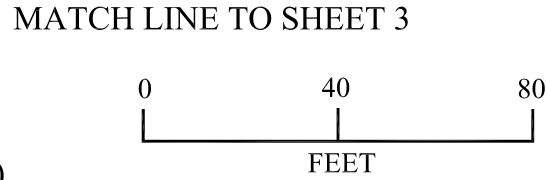
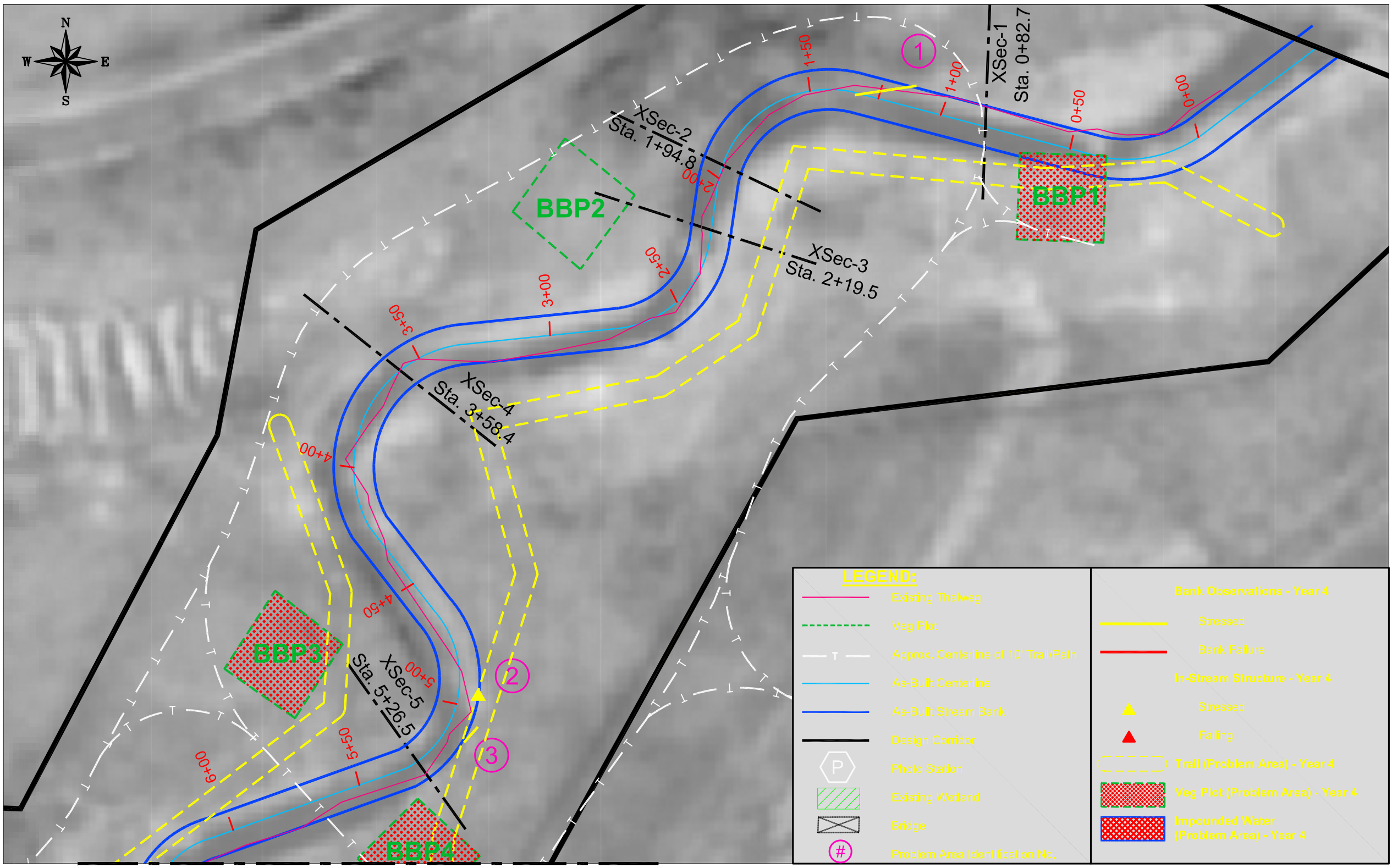
**HANGING ROCK CREEK & TRIBUTARY RESTORATION
 YEAR 4 MONITORING
 AVERY COUNTY, NORTH CAROLINA**

REFERENCES

1) BASE MAP TAKEN FROM DIGITAL FILE "HANGING ROCK MAP.DGN" PROVIDED BY NC EEP, DATE UNKNOWN.

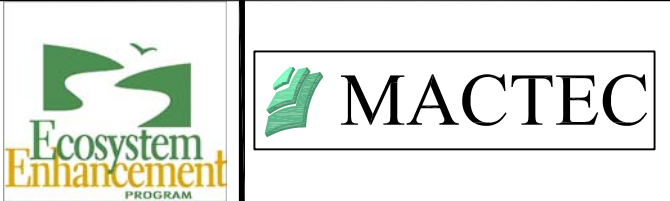
**CURRENT CONDITION PLAN VIEW-
 JULY 2007**

NC EEP Project : 165
 Project: 6470-06-1410
 Sheet 1 of 5



Scale: 1" = 40'
Source: ECOLOGIC, NC EEP, NCDA (2005 Aerial Photo)

Prepared by / Date: R.R./11-15-07
Checked by/ Date: R.S./11-15-07

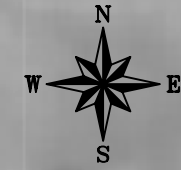


HANGING ROCK CREEK & TRIBUTARY RESTORATION
YEAR 4 MONITORING
AVERY COUNTY, NORTH CAROLINA

REFERENCES
1) BASE MAP TAKEN FROM DIGITAL FILE "HANGING ROCK MAP.DGN" PROVIDED BY NC EEP, DATE UNKNOWN.

CURRENT CONDITION PLAN VIEW-
JULY 2007
NC EEP Project : 165
Project: 6470-06-1410
Sheet 2 of 5

MATCH LINE TO SHEET 4

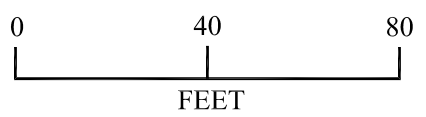


MATCH LINE TO SHEET 2



LEGEND:	
	Existing Thalweg
	Veg Plot
	Approx. Centerline of 10' Trail/Path
	As-Built Centerline
	As-Built Stream Bank
	Design Corridor
	Photo Station
	Existing Wetland
	Bridge
	Problem Area Identification No.
Bank Observations - Year 4	
	Stressed
	Bank Failure
In-Stream Structure - Year 4	
	Stressed
	Failing
	Trail (Problem Area) - Year 4
	Veg Plot (Problem Area) - Year 4
	Impounded Water (Problem Area) - Year 4

Scale: 1" = 40'
Source: ECOLOGIC, NC EEP, NCDA (2005 Aerial Photo)



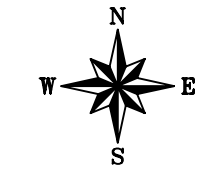
Prepared by / Date: R.R./11-15-07
Checked by/ Date: R.S./11-15-07



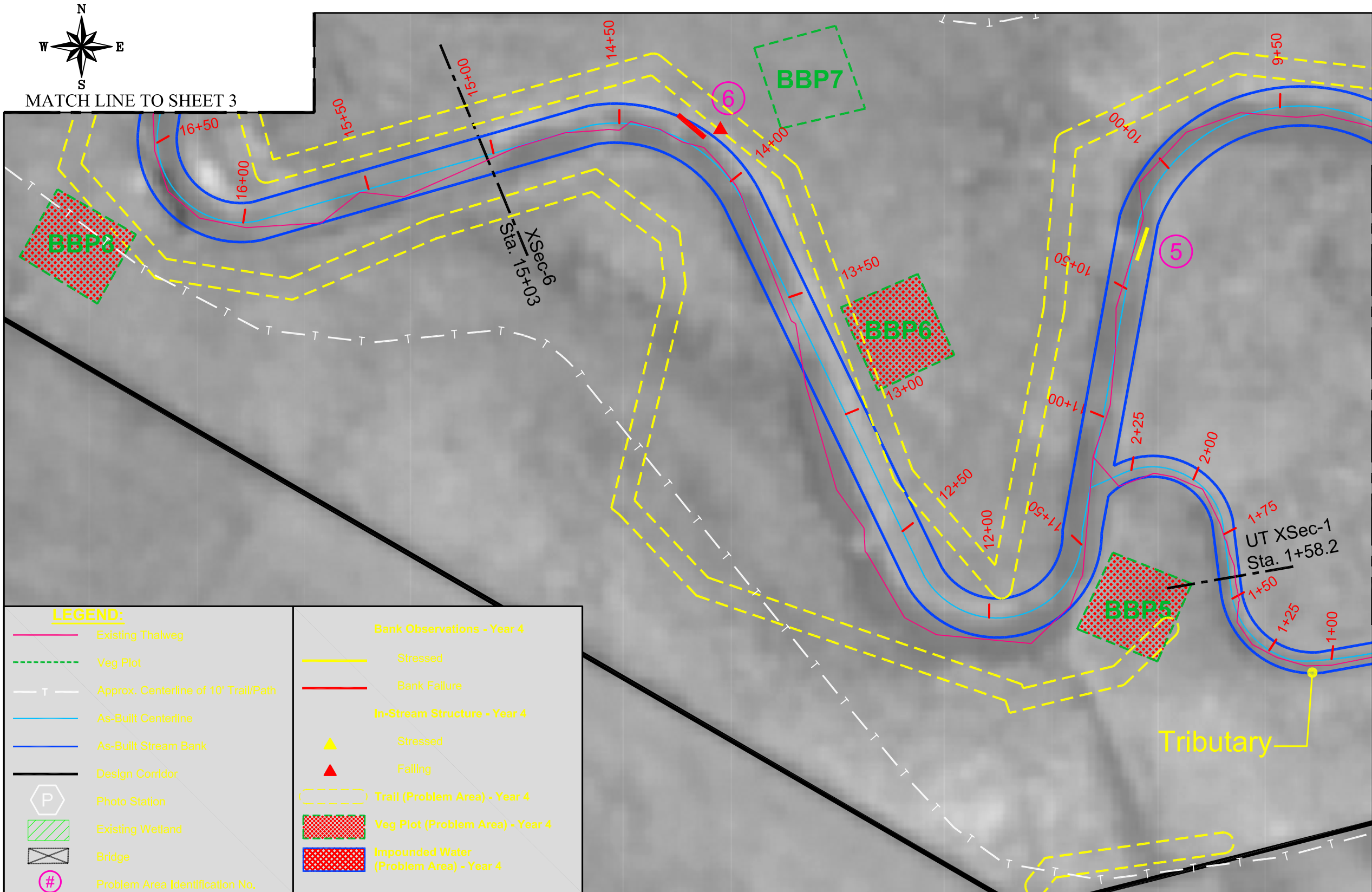
HANGING ROCK CREEK & TRIBUTARY RESTORATION
YEAR 4 MONITORING
AVERY COUNTY, NORTH CAROLINA

REFERENCES
1) BASE MAP TAKEN FROM DIGITAL FILE "HANGING ROCK MAP.DGN" PROVIDED BY NC EEP, DATE UNKNOWN.

CURRENT CONDITIONS PLAN VIEW-
JULY 2007
NC EEP Project : 165
Project: 6470-06-1410
Sheet 3 of 5

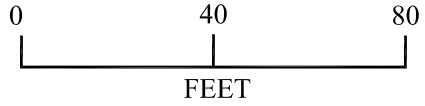


MATCH LINE TO SHEET 3



LEGEND:

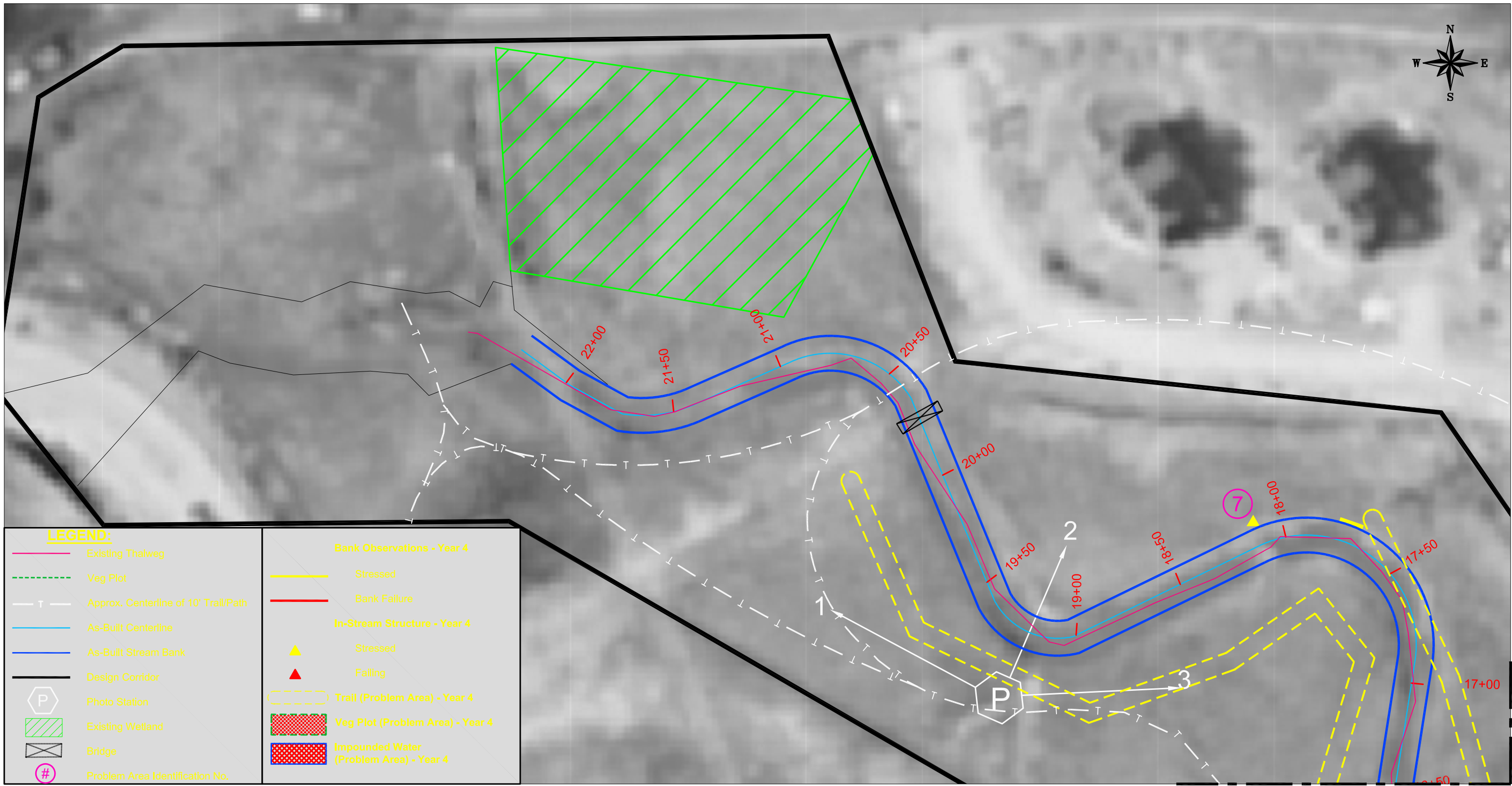
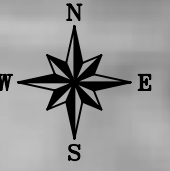
	Existing Thalweg		Bank Observations - Year 4
	Veg Plot		Bank Failure
	Approx. Centerline of 10' Trail/Path		In-Stream Structure - Year 4
	As-Built Centerline		Stressed
	As-Built Stream Bank		Failing
	Design Corridor		Trail (Problem Area) - Year 4
	Photo Station		Veg Plot (Problem Area) - Year 4
	Existing Wetland		Impounded Water (Problem Area) - Year 4
	Bridge		
	Problem Area Identification No.		



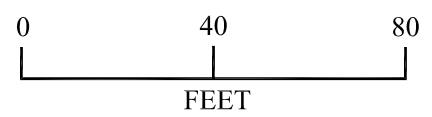
Scale: 1" = 40'
 Source: ECOLOGIC, NC EEP, NCDA (2005 Aerial Photo)

Prepared by / Date: R.R./11-15-07
 Checked by/ Date: R.S./11-15-07

		<p>HANGING ROCK CREEK & TRIBUTARY RESTORATION YEAR 4 MONITORING AVERY COUNTY, NORTH CAROLINA</p>	<p>REFERENCES 1) BASE MAP TAKEN FROM DIGITAL FILE "HANGING ROCK MAP.DGN" PROVIDED BY NC EEP, DATE UNKNOWN.</p>	<p>CURRENT CONDITION PLAN VIEW- JULY 2007 NC EEP Project : 165 Project: 6470-06-1410 Sheet 4 of 5</p>
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LEGEND:	
	Existing Thalweg
	Veg Plot
	Approx. Centerline of 10' Trail/Path
	As-Built Centerline
	As-Built Stream Bank
	Design Corridor
	Photo Station
	Existing Wetland
	Bridge
	Problem Area Identification No.
Bank Observations - Year 4	
	Stressed
	Bank Failure
In-Stream Structure - Year 4	
	Stressed
	Failing
	Trail (Problem Area) - Year 4
	Veg Plot (Problem Area) - Year 4
	Impounded Water (Problem Area) - Year 4



Scale: 1" = 40'
 Source: ECOLOGIC, NC EEP, NCDA (2005 Aerial Photo)

MATCH LINE TO SHEET 4

Prepared by / Date: R.R./11-15-07
 Checked by/ Date: R.S./11-15-07



HANGING ROCK CREEK & TRIBUTARY RESTORATION
 YEAR 4 MONITORING
 AVERY COUNTY, NORTH CAROLINA

REFERENCES
 1) BASE MAP TAKEN FROM DIGITAL FILE "HANGING ROCK MAP.DGN" PROVIDED BY NC EEP, DATE UNKNOWN.

CURRENT CONDITION PLAN VIEW-
 JULY 2007
 NC EEP Project : 165
 Project: 6470-06-1410
 Sheet 5 of 5