ELLINGTON BRANCH STREAM RESTORATION SITE
FULL DELIVERY PROJECT
WARREN COUNTY, NORTH CAROLINA

EEP Project No. 16-D06045

Final Monitoring Report Year #2 (2009)

Prepared for:

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program
2728 Capital Boulevard, Suite 1H 103
Raleigh, NC 27604

August 2009

Prepared by:

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128 Raleigh Street
Holly Springs, NC 27540

Under Contract With:

Sungate Design Group, P.A.
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SECTION IV. EXECUTIVE SUMMARY

Sungate Design Group, PA (Sungate) entered into a design/build (full delivery) contract with the NC Department of Environment and Natural Resources, Ecosystem Enhancement Program (EEP) on June 21, 2006 to provide 5,000 Stream Mitigation Units (SMUs) in the Roanoke River Basin. The Ellington Branch Stream Restoration Site, hereinafter referred to as the "Project Site," was selected to meet these overall obligations (Figure 1). Ecological Engineering, LLP (Ecological Engineering) is under contract with Sungate to perform the remaining monitoring requirements.

The Project Site is situated in Warren County, North Carolina and includes a portion of Ellington Branch and one of its unnamed tributaries. Ellington Branch is a second order, perennial stream originating approximately one-half mile upstream (south) of the project area. The unnamed tributary (UT) is a first order, perennial stream that unites with Ellington Branch from the west. The project was identified by Sungate in 2005 and selected for full delivery restoration by EEP based its location, attributes, existing condition and overall likelihood for success.

Vegetation Monitoring

Vegetation monitoring for Year 1 was performed by determining density and survival of planted species, and individuals resulting from natural regeneration. Thirteen individual plot locations were established during the as-built surveys and will remain consistent throughout the monitoring period. Each plot covers $100m^2$ and is shaped in the form of a 10m x 10m square. Their locations were randomly selected.

Vegetation success criteria for the stream riparian areas are based on a minimum survival of 320 stems per acre of planted species through Year 3 and 260 stems per acre at the end of Year 5. Volunteer woody vegetation was not included in the survivability calculations. Based on the Year 1 surveys, all plots exhibited surviving planted and transplanted species in excess of 597 planted stems per acre. Year 2 results were slightly lower with the least number of surviving species calculated at approximately 526 planted stems per acre. Volunteer species were also observed in nearly all of the plots.

The Project Site met and exceeded the established success criteria for vegetation based on the survival of the planted species for Year 2 monitoring.

Stream Restoration Monitoring

Stream restoration success criteria for the two restored stream reaches were met during the Year 2 monitoring assessment. No significant changes to the dimension, pattern, profile or bed material were observed. Location surveys of the constructed features were conducted to verify the performance of both channels. Total station surveys were performed to compare the six previously determined stream longitudinal profiles and the 23 permanent stream cross-sections with as-built and Year 1 monitoring data. A modified Wolman pebble count and assessment of the constructed features was also undertaken as part of Year 2 monitoring efforts.

Based on the interpreted data, both Ellington Branch and its UT are stable. All of the structures are functioning as designed and bank erosion is non-existent. Drought conditions however, have become a factor at the Project Site. Ellington Branch was dry for the first half of 2008 while the UT maintained only a trickle of water. The same scenario occurred during the early summer months of 2009, particularly June and July. As a result, wetland and streamside vegetation has thrived within the bankfull channel areas.

Based on cross-section surveys, longitudinal profile surveys and visual observations, the channel dimensions and profiles have not significantly changed. Minor adjustments were noted, although these adjustments were more obvious based on data interpretations rather than visual observation.

In 2008, one bankfull event was recorded on September 5 and 6, 2008. It was associated with a two-day, tropical storm event that provided more than five inches of rainfall. During 2009, two bankfull events were recorded. These events were a result of normal storms with above average precipitation amounts. The periods were January 6 through 9 and March 1 through March 2. As per the USACE Draft Stream Mitigation Guidelines (2003), the project has successfully met the hydrology requirement of at least two bankfull events occurring in separate years within the monitoring period.

SECTION V. PROJECT BACKGROUND

A. Location and Setting

The Project Site is situated approximately four miles south of the Virginia/North Carolina state line in Warren County, North Carolina (Figure 1). SR 1200 (Drewry Road) is approximately 0.3 miles west of the project area, while SR 1221 (Culpepper Road) is approximately 0.2 miles to the east. It can be accessed by using the following directions from Exit 223 along Interstate 85:

- turn left (north) onto SR 1237 (Manson Road), travel approximately 2.5 miles;
- turn right (north) onto Drewry Road, travel approximately 3.0 miles; and
- turn right (east) onto Fleming Farm Road and proceed approximately ¼-mile past homestead and through gate.

Two streams, Ellington Branch and one of its unnamed tributaries, constitute the project. Ellington Branch is oriented in a south to north direction while its UT enters from the west. Both streams meet the NC Division of Water Quality (NCDWQ) perennial stream classification requirements.

B. Mitigation Structure and Objectives

Prior to restoration, Ellington Branch and its UT were severely degraded due to existing land uses and non-restricted cattle access. The existing stream banks on both channels were eroded and overall channel morphology was significantly altered. A total of 4,904 linear feet of existing stream channel was surveyed within the project area, specifically 4,051 linear feet along Ellington Branch and 853 linear feet along its UT.

The goals and objectives of the project were to ultimately create a continuous wooded stream corridor by restoring and re-vegetating the largest reach of disturbed channel and buffer along Ellington Branch. This in turn, would also improve the overall function and habitat associated with the stream channel and riparian areas. The restoration plan included restoration (dimension, pattern and profile parameters) of Ellington Branch and its UT, as well as the establishment and restoration of an active riparian buffer complex. In addition, the goals and objectives were also to restore the primary stream and buffer functions and values associated with nutrient removal and transformation, sediment reduction and retention, flood-flow attenuation, and wildlife (both aquatic and terrestrial) habitat. The Project Site provided an excellent opportunity to restore and preserve a substantial riparian zone on lands that were currently being utilized for pasture and cattle grazing.

Ellington Branch and its UT were restored with methodology consistent with the C stream type. According to Rosgen (1996), this stream type is a slightly entrenched, meandering, gravel dominated, riffle/pool channel with a well developed floodplain. C stream types have gentle gradients less than two percent, display a high width/depth ratio and exhibit sinuosities greater than 1.2. The riffle/pool sequence averages five to seven bankfull widths in length. Its associated stream banks are generally composed of unconsolidated, heterogeneous, non-cohesive, alluvial materials that are finer than the gravel-dominated bed material. Sediment supplies are generally moderate to high. This stream type is characterized by the presence of point bars and other depositional features (Rosgen, 1996). It was favored versus the E stream type since shear in the near bank region is greatly reduced, especially for newly constructed channels. Once the vegetation becomes established, the width/depth ratio may naturally reduce to the characteristic of an E stream type, which is a hydraulically efficient channel form that maintains a high sediment transport capacity.

According to as-built surveys completed during January 2008, a total of 5,063 linear feet of Ellington Branch and its UT were restored using natural channel design methods consistent with Priority Level II stream restoration protocols. This included 3,735 linear feet along Ellington Branch and 1,328 linear feet along its UT. Exhibit Table I denotes the achievements of the project.

Exhibit Table I. Project Structure Table
Ellington Branch Stream Restoration (Project No. 16-D06045)

Project Segment or Reach ID	Mitigation Type	Approach	Linear Footage	Stationing	Comment
Reach I – Ellington Br.	R	P2	1,934	10+00 to 29+34.0	Above Confluence with UT
Reach II – Ellington Br.	R	P2	1,801	29+34.0 to 47+35.0	Below Confluence with UT
Reach III – UT	R	P2	1,328	10+00 to 23+27.8	Entire Reach

R = Restoration
P2 = Priority Level II

Ecological benefits gained with the restoration of Ellington Branch and its UT include reduced nutrient loading, reduced sediment loading, improved habitat diversity (both terrestrial and aquatic) and improved water quality. By restricting cattle access and implementing riparian buffers along Ellington Branch and its UT, the project will reduce the overall amount of pollution (physical and chemical) leaving the Site and concentrating in the waters downstream. Restoration of the stream channels will ultimately increase foraging and spawning habitat for fish, and other species requiring flowing water. The project will provide an ecological uplift for the entire basin.

C. Project History and Background

The project is undergoing its second formal year of monitoring. Reporting and milestone history for the Project Site is provided in Exhibit Table II. Exhibit Table III provides contact information for all individuals responsible for implementation while relevant background information is provided in Exhibit Table IV.

Exhibit Table II. Project Activity and Reporting History
Ellington Branch Stream Restoration (Project No. 16-D06045)

Activity or Report	Scheduled Completion	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	January 2007	November 2006	January 2007
Final Design (90%)	February 2007		February 2007
Construction	June 2007		May 2007
Temporary S&E Mix Applied	June 2007		May 2007
Permanent Seed Mix Applied	June 2007		May 2007
Bare Root Seedling Installation	December 2007		November 2007
Mitigation Plan/ As-Built (Year 0 Monitoring- baseline)	March 2008	January 2008	February 2008
Year 1 Monitoring	November 2008	October 2008	December 2008
Year 2 Monitoring	August 2009	August 2009	August 2009
Year 3 Monitoring	August 2010		
Year 4 Monitoring	August 2011		
Year 5 Monitoring	August 2012		

Exhibit Table III. Project Contact Table Ellington Branch Stream Restoration (Project No. 16-D06045)	
Designer Ecological Engineering, LLP (current) Sungate Design Group, P.A. (previous)	Ms. Jenny S. Fleming, PE 128 Raleigh Street Holly Springs, NC 27540 (919) 557-0929
Construction Contractor Shamrock Environmental Corporation	Mr. Robert Lucas P.O. Box 14987 Greensboro, NC 27415 (336) 375-1989
Planting Contractor Winstead's Reforestation	Mr. David Winstead 536 Jackson Road Nashville, NC 27856 (252) 462-0305
Seeding Contractor Shamrock Environmental Corporation	Mr. Robert Lucas P.O. Box 14987 Greensboro, NC 27415 (336) 375-1989
Seed Mix Source	Mellow Marsh Farm, Inc. 1312 Woody Store Road Siler City, NC 27344 (919) 742-1200
Nursery Stock Suppliers	ArborGen (International Paper) SC Supertree Nursery 5594 Highway 38 South Blenheim, SC 29516 (843) 528-3203 Mellow Marsh Farm, Inc. 1312 Woody Store Road Siler City, NC 27344 (919) 742-1200
Monitoring Performer	Ecological Engineering, LLP 128 Raleigh Street Holly Springs, NC 27540 (919) 557-0929
Stream Monitoring POC	G. Lane Sauls Jr.
Vegetation Monitoring POC	G. Lane Sauls Jr.

Exhibit Table IV. Project Background Table Ellington Branch Stream Restoration (Project No. 16-D06045)	
Project County	Warren County
Drainage Area	1.1 sq. miles - Ellington Branch 0.1 sq. miles – Unnamed Tributary
Impervious Cover Estimate	Less than 5%
Stream Order	2 - Ellington Branch 1 – Unnamed Tributary
Physiographic Region	Piedmont
Ecoregion (Griffith and Omernik)	Northern Outer Piedmont
Rosgen Classification of As-built	C5 - Ellington Branch C5 – Unnamed Tributary
Cowardin Classification	RSB
Dominant Soil Types	Wedowee Sandy Loam
Reference Site ID	N/A
USGS HUC for Project and Reference	03010106
NCDWQ Sub-basin for Project and Reference	03-02-07
Any Portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment.	Yes
Reason for 303d listing or stressor	Low DO, Sedimentation & Nutrients
Percent of project easement fenced	100%

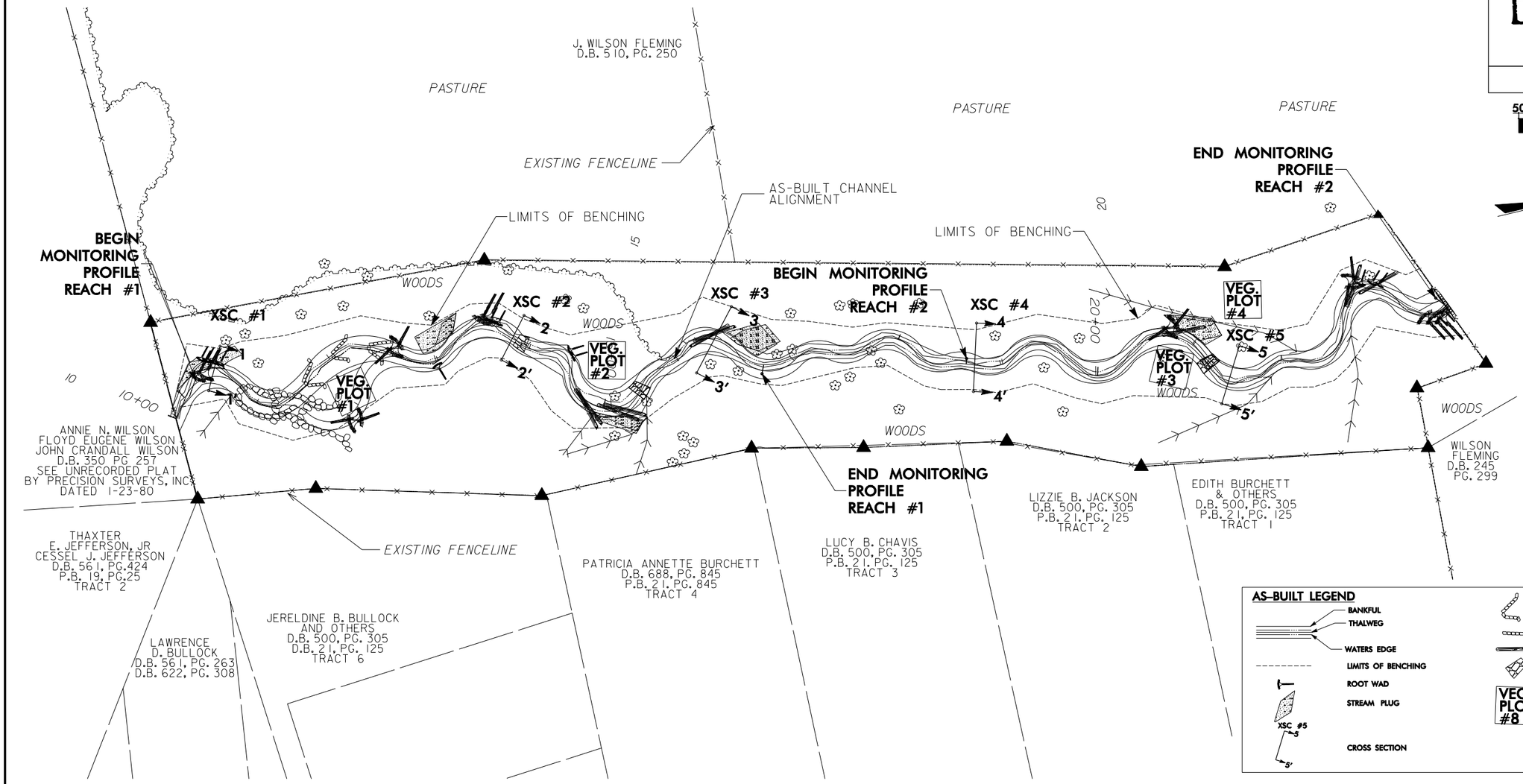
The following pages depict the Monitoring Plan View drawings for Ellington Branch and its UT.

PROJECT NUMBER	SHEET NUMBER
EEP#16-D06045	1
PROJECT NAME ELLINGTON BRANCH STREAM RESTORATION	
COUNTY WARREN	DATE 11/2008

Ecological Engineering LLP.
128 Raleigh Street
Holly Springs, NC 27540

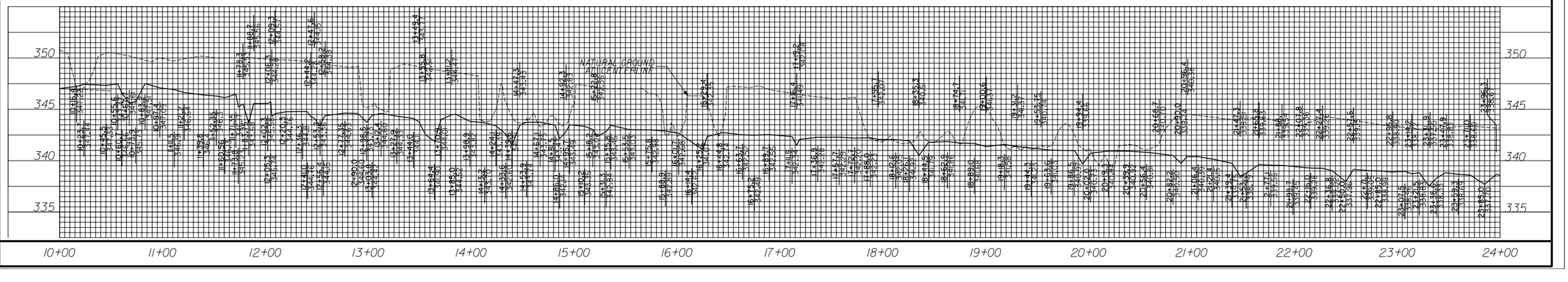
SHEET NAME
MONITORING PLAN VIEW

50 25 0 50 100
PLANS



AS-BUILT LEGEND

- BANKFUL
- THALWEG
- WATERS EDGE
- LIMITS OF BENCHING
- ROOT WAD
- STREAM PLUG
- XSC #5 / 5 / 5' — CROSS SECTION
- ROCK CROSS VANE
- ROCK VANE
- LOG VANE
- CONSTRUCTED RIFFLE
- VEG. PLOT #8 — VEGATATION PLOT AREA



PROJECT NUMBER	SHEET NUMBER
EEP#16-D06045	2
PROJECT NAME ELLINGTON BRANCH STREAM RESTORATION	
COUNTY WARREN	DATE 11/2008

Ecological Engineering LLP
128 Raleigh Street
Holly Springs, NC 27540

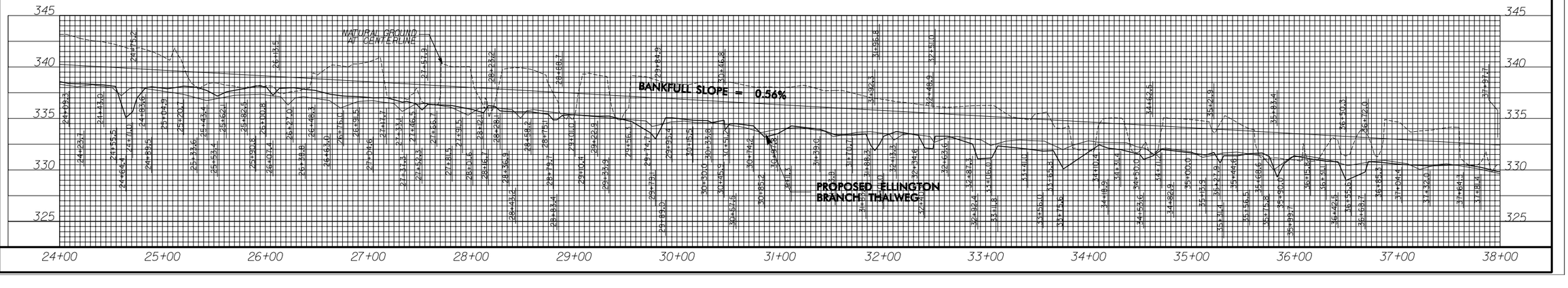
SHEET NAME
MONITORING PLAN VIEW

50 25 0 50 100
PLANS

PLOT #12
XSC #20
CE-40
CE-14
PASTURE
EXISTING WETLAND
J. WILSON FLEMING
D.B. 510, PG. 250
20 TRIB
UNNAMED TRIBUTARY
AS-BUILT CHANNEL
ALIGNMENT
CE-15
XSC #21
VEG. PLOT #13
XSC #22
XSC #23
VEG. PLOT #5
WOODS
XSC #6
CREST GAGE
25+00
ELLBRA- STA 24+00 SEE SHEET 4
CE-11
CE-10
CE-20
XSC #7
XSC #8
CE-9B
BEGIN MONITORING PROFILE REACH #3
LIMITS OF BENCHING
CE-9A
AS-BUILT CHANNEL ALIGNMENT
PASTURE
END MONITORING PROFILE REACH #3
CE-16
VEG. PLOT #6
VEG. PLOT #7
XSC #9
XSC #10
XSC #11
CE-17
ELLBRA- STA 38+00 SEE SHEET 6
CE-8
CE-9
WOODS
PASTURE

AS-BUILT LEGEND

- BANKFUL
- THALWEG
- WATERS EDGE
- LIMITS OF BENCHING
- ROOT WAD
- STREAM PLUG
- XSC #5 (5 / 5')
- CROSS SECTION
- ROCK CROSS VANE
- ROCK VANE
- LOG VANE
- CONSTRUCTED RIFFLE
- VEG. PLOT #8 — VEGATATION PLOT AREA

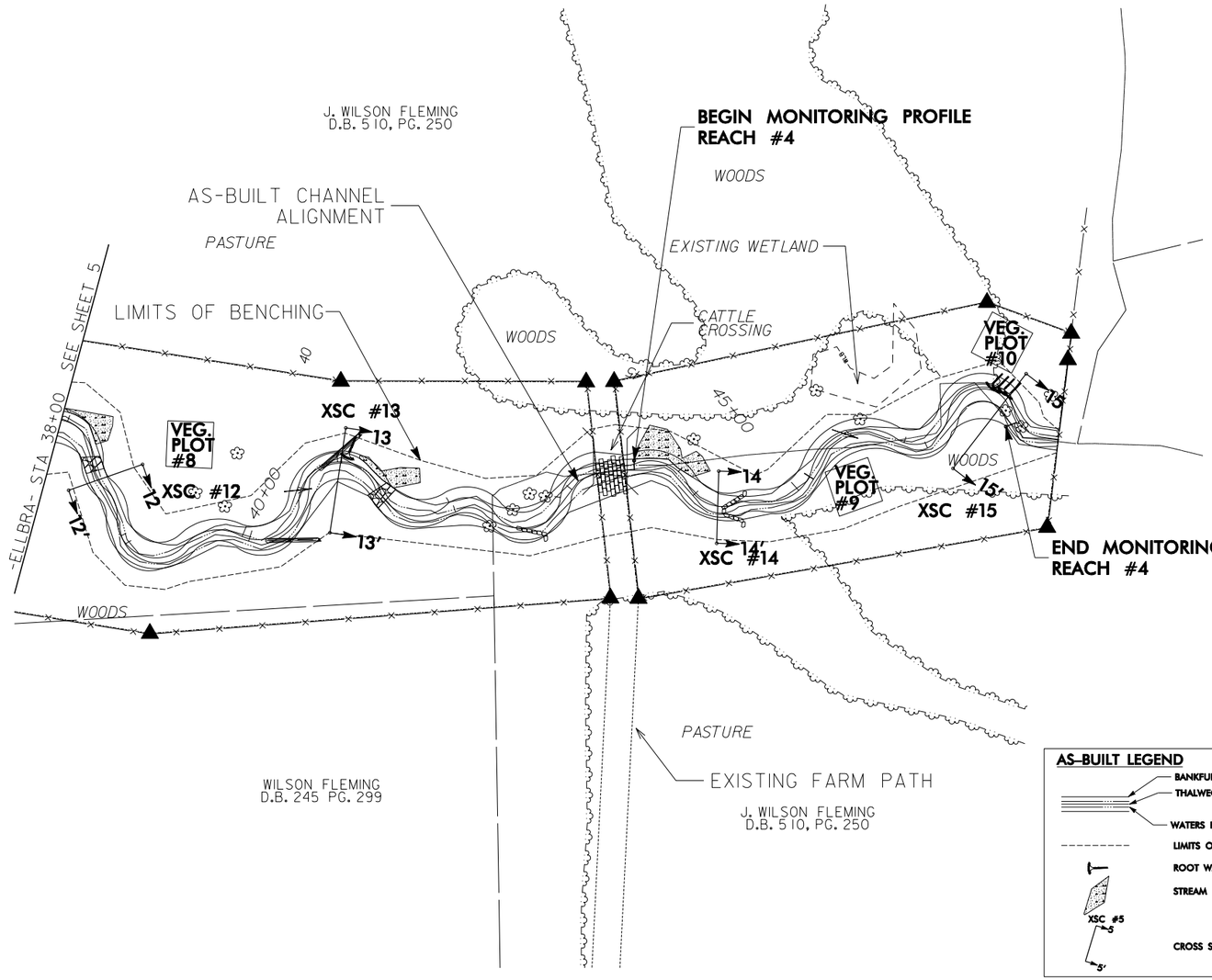


PROJECT NUMBER	SHEET NUMBER
EEP#16-D06045	3
PROJECT NAME ELLINGTON BRANCH STREAM RESTORATION	
COUNTY WARREN	DATE 11-20-08

Ecological Engineering LLP
128 Raleigh Street
Holly Springs, NC 27540

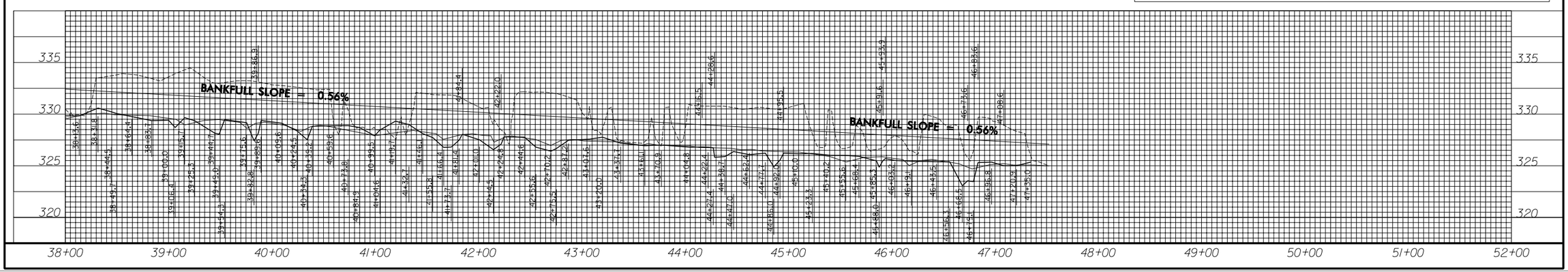
SHEET NAME
MONITORING PLAN VIEW

50 25 0 50 100
PLANS



AS-BUILT LEGEND

- BANKFUL
- THALWEG
- WATERS EDGE
- LIMITS OF BENCHING
- ROOT WAD
- STREAM PLUG
- XSC #5 (5' / 5')
- CROSS SECTION
- ROCK CROSS VANE
- ROCK VANE
- LOG VANE
- CONSTRUCTED RIFFLE
- VEG. PLOT #8 — VEGATATION PLOT AREA



PROJECT NUMBER	SHEET NUMBER
EEP#16-D06045	4
PROJECT NAME ELLINGTON BRANCH STREAM RESTORATION	
COUNTY WARREN	DATE 11-20-08

Ecological Engineering P.L.L.C.
128 Raleigh Street
Holly Springs, NC 27540

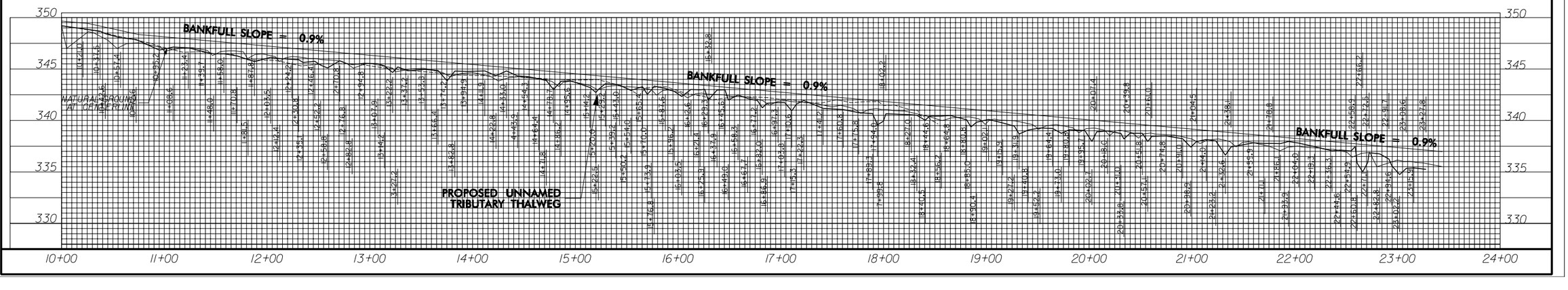
SHEET NAME
MONITORING PLAN VIEW

50 25 0 50 100
PLANS

AS-BUILT LEGEND

- BANKFUL
- THALWEG
- WATERS EDGE
- LIMITS OF BENCHING
- ROOT WAD
- STREAM PLUG
- XSC #5 (5' / 5')
- CROSS SECTION
- ROCK CROSS VANE
- ROCK VANE
- LOG VANE
- CONSTRUCTED RIFFLE
- VEG. PLOT #8
- VEGATATION PLOT AREA

FLEMING FARM ROAD
EXISTING FARM PATH
UNNAMED TRIBUTARY AS-BUILT CHANNEL ALIGNMENT
J. WILSON FLEMING D.B. 510, PG. 250
PASTURE
15' TRIB
10' TRIB
BEGIN MONITORING PROFILE REACH #5
XSC #16
XSC #17
XSC #18
XSC #19
XSC #20
VEG. PLOT #11
VEG. PLOT #12
10+00
15+00
WOODS
END MONITORING PROFILE REACH #5
EXISTING FARM PATH
PASTURE
EXISTING WETLAND
20' TRIB
END MONITORING PROFILE REACH #6
XSC #23
VEG. PLOT #5
VEG. PLOT #13
XSC #22
BEGIN MONITORING PROFILE REACH #6
XSC #21
AS-BUILT CHANNEL ALIGNMENT
CREST GAGE
25+00
5'
5'



SECTION VI. PROJECT CONDITION AND MONITORING RESULTS

A. Vegetation Assessment

1. Soil Data

Based on available mapping for Warren County (NRCS, 2006), Wedowee soils underlie the entire easement area associated with the Project Site. These soils range in slope from five to 25 percent, depending on their position in the landscape. The Natural Resources Conservation Service (NRCS) is currently in the process of remapping the county and this data was assembled based on mapping provided by the County Soil Scientist. This mapping is not yet available in a published format.

Wedowee soils are classified by the NRCS as clayey, kaolinitic, thermic Typic hapludults. These soils are deep, well drained, moderately permeable soils that formed in residuum from weathered acid crystalline rock of the Piedmont plateau. They occur on narrow sides of ridges with slopes ranging from 8 to 40 percent (Hicks, 1980). The typical pedon, taken approximately eight miles south of the project in Vance County, exhibits an O, Ap, Bt and C horizon. The O horizon varies up to nearly 2 inches in depth and consists primarily of organic material. The Ap horizon is approximately 7 inches in depth and consists of brown, sandy loam. The clayey Bt horizon is 10 to 24 inches in thickness. It is colored yellowish red and is made up of sandy clay. A B3 horizon exists, which is similar in color to the Bt horizon. Its texture is sandy clay loam, clay loam or loam. The C horizon is yellowish red, reddish yellow, pale brown or red saprolite that crushes to sandy loam or sandy clay loam (Hicks, 1980). Exhibit Table V depicts preliminary soil data.

Exhibit Table V. Preliminary Soil Data
Ellington Branch Stream Restoration (Project No. 16-D06045)

Series	Max Depth (in.)	% Clay on Surface	K	T	OM %
Wedowee sandy loam	72	0	0.24	2	0.5-1.5

2. Vegetative Problem Areas

Vegetative problem areas are defined as those areas either lacking vegetation or containing exotic vegetation and are generally categorized within the following categories: Bare Bank, Bare Bench, Bare Floodplain or Invasive Population. Based on the monitoring site assessment, no significant vegetation problem areas currently exist within the Project Site. There are however, isolated occurrences of invasive species. The occurrences consist mainly of scattered individuals, including Japanese grass (*Microstegium virmineum*) cattail (*Typha latifolia*) and Chinese privet (*Ligustrum sinense*). These areas are shown on the drawing entitled Problem Areas Plan View. Exhibit Table VI summarizes the observations for 2009. No other features or issues were identified during the surveys.

Japanese grass is present along the upstream portion of the UT, specifically in the vicinity of Cross Section #16 (Station Number 11+00). It has become established within the area either as a result from wind dispersal, bird dispersal or via soil disturbance. Additional shading will help to minimize the spread of this species. This area will continue to be monitored throughout the next several years. Spot treatment with herbicide will be performed as necessary.

Cattails were observed in seven separate locales within the Project Site, specifically Station Numbers 14+50, 16+25, 36+50, 43+25, 44+25 and 46+50 along Ellington Branch. It was also observed at Station Number 16+00 along the UT. The occurrences were all scattered and individual counts were minimal. It is apparent that the establishment of cattails is a result of wind and/or bird dispersal. No other cattails were observed on the property. Low water levels and limited floodflows have allowed this species to become established. These areas will continue to be closely monitored throughout the 2009 growing season. Spot treatments with an aquatic herbicide will be performed during 2010, as necessary.

Chinese privet was observed in limited numbers throughout the project area. A notable increase in individuals was noted between the 2008 and 2009 growing seasons. The majority of the individuals were spot treated during late April 2009. This treatment including lopping each stem and painting it with a concentrated systemic herbicide. Ecological Engineering will continue to monitor this species and will continue to perform spot treatments with herbicide as necessary.

Exhibit Table VI. Vegetative Problem Areas
Ellington Branch Stream Restoration (Project No. 16-D06045)

Feature/Issue	Station #/ Range	Probable Cause	Photo #
Bare Bank	N/A	N/A	N/A
Bare Bench	N/A	N/A	N/A
Bare Floodplain	N/A	N/A	N/A
Invasive/Exotic Populations	See Problem Area Plan View Drawing	Microstegium: upstream and surrounding seed sources	31 & 32
	See Problem Area Plan View Drawing	Typha: Surrounding seed sources	N/A
	See Problem Area Plan View Drawing	Ligustrum: Upstream and surrounding seed sources	N/A

3. Vegetative Problem Areas Plan View

The following plan view drawings depict the locations of the potential vegetative problem areas at the Project Site.

PROJECT NUMBER	SHEET NUMBER
EEP#16-D06045	1
PROJECT NAME ELLINGTON BRANCH STREAM RESTORATION	
COUNTY WARREN	DATE 8/1/09

Ecological Engineering LLP
128 Raleigh Street
Holly Springs, NC 27540

SHEET NAME
PROBLEM AREAS PLAN VIEW

50 25 0 50 100
PLANS

J. WILSON FLEMING
D.B. 510, PG. 250

PASTURE

EXISTING FENCELINE

AS-BUILT CHANNEL ALIGNMENT

LIMITS OF BENCHING

BEGIN MONITORING PROFILE REACH #1

BEGIN MONITORING PROFILE REACH #2

END MONITORING PROFILE REACH #2

END MONITORING PROFILE REACH #1

XSC #1

XSC #2

XSC #3

XSC #4

XSC #5

VEG. PLOT #1

VEG. PLOT #2

VEG. PLOT #3

VEG. PLOT #4

WOODS

POTENTIAL VEGETATION PROBLEM AREA (CATTAILS)

POTENTIAL VEGETATION PROBLEM AREA (CATTAILS)

ANNIE N. WILSON
FLOYD EUGENE WILSON
JOHN CRANDALL WILSON
D.B. 350 PG 257
SEE UNRECORDED PLAT
BY PRECISION SURVEYS, INC.
DATED 1-23-80

THAXTER
E. JEFFERSON, JR
CESSEL J. JEFFERSON
D.B. 561, PG.424
P.B. 19, PG.25
TRACT 2

LAWRENCE
D. BULLOCK
D.B. 561, PG. 263
D.B. 622, PG. 308

JERELDINE B. BULLOCK
AND OTHERS
D.B. 500, PG. 305
D.B. 21, PG. 125
TRACT 6

PATRICIA ANNETTE BURCHETT
D.B. 688, PG. 845
P.B. 21, PG. 845
TRACT 4

LUCY B. CHAVIS
D.B. 500, PG. 305
P.B. 21, PG. 125
TRACT 3

LIZZIE B. JACKSON
D.B. 500, PG. 305
P.B. 21, PG. 125
TRACT 2

EDITH BURCHETT
& OTHERS
D.B. 500, PG. 305
P.B. 21, PG. 125
TRACT 1

WILSON FLEMING
D.B. 245
PG. 299

10+00

20+00

AS-BUILT LEGEND

- BANKFUL
- THALWEG
- WATERS EDGE
- LIMITS OF BENCHING
- ROOT WAD
- STREAM PLUG
- XSC #5 (5 / 5')
- CROSS SECTION
- ROCK CROSS VANE
- ROCK VANE
- LOG VANE
- CONSTRUCTED RIFFLE
- VEG. PLOT #8 — VEGATATION PLOT AREA

NATURAL GROUND AT CENTERLINE

350
345
340
335

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00

PROJECT NUMBER	SHEET NUMBER
EEP#16-D06045	2
PROJECT NAME ELLINGTON BRANCH STREAM RESTORATION	
COUNTY WARREN	DATE 8/1/09

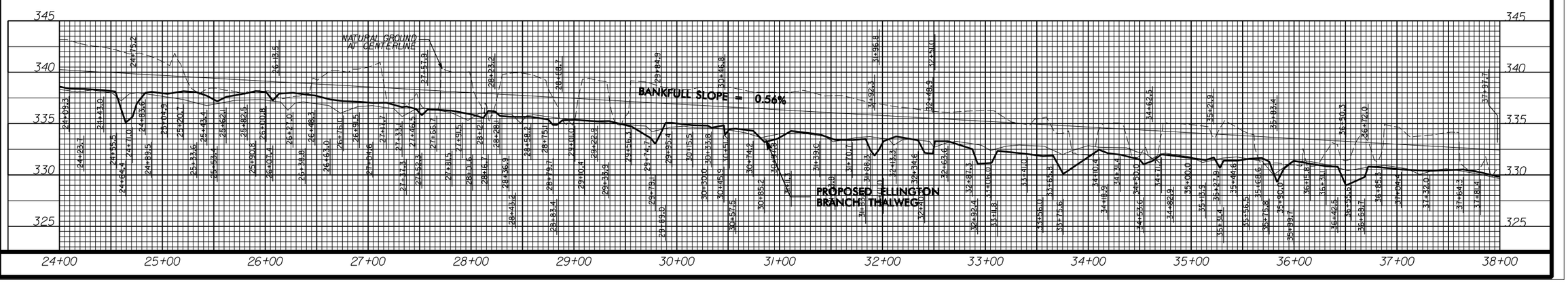
Ecological Engineering LLP
128 Raleigh Street
Holly Springs, NC 27540

SHEET NAME
PROBLEM AREAS PLAN VIEW

50 25 0 50 100
PLANS

PLOT #12
XSC #20
CE-40
CE-14
PASTURE
EXISTING WETLAND
J. WILSON FLEMING
D.B. 510, PG. 250
20 TRIB
UNNAMED TRIBUTARY
AS-BUILT CHANNEL
ALIGNMENT
CE-15
PASTURE
XSC #21
VEG. PLOT #13
XSC #22
XSC #23
VEG. PLOT #5
WOODS
XSC #6
CREST GAGE
25+00
ELLBRA- STA 24+00 SEE SHEET 4
CE-10
CE-11
CE-20
XSC #7
XSC #8
CE-9B
BEGIN MONITORING PROFILE
REACH #3
LIMITS OF BENCHING
CE-9A
AS-BUILT CHANNEL
ALIGNMENT
VEG. PLOT #6
XSC #9
VEG. PLOT #7
XSC #10
CE-16
END MONITORING
PROFILE
REACH #3
PASTURE
CE-17
XSC #11
ELLBRA- STA 38+00 SEE SHEET 6
CE-8
CE-9
WOODS
PASTURE
POTENTIAL VEGETATION PROBLEM AREA (PRIVET)
POTENTIAL VEGETATION PROBLEM AREA (CATTAILS)

AS-BUILT LEGEND
- BANKFUL
- THALWEG
- WATERS EDGE
- LIMITS OF BENCHING
- ROOT WAD
- STREAM PLUG
- XSC #5 (5' / 3')
- CROSS SECTION
- ROCK CROSS VANE
- ROCK VANE
- LOG VANE
- CONSTRUCTED RIFFLE
- VEG. PLOT #8 — VEGATATION PLOT AREA

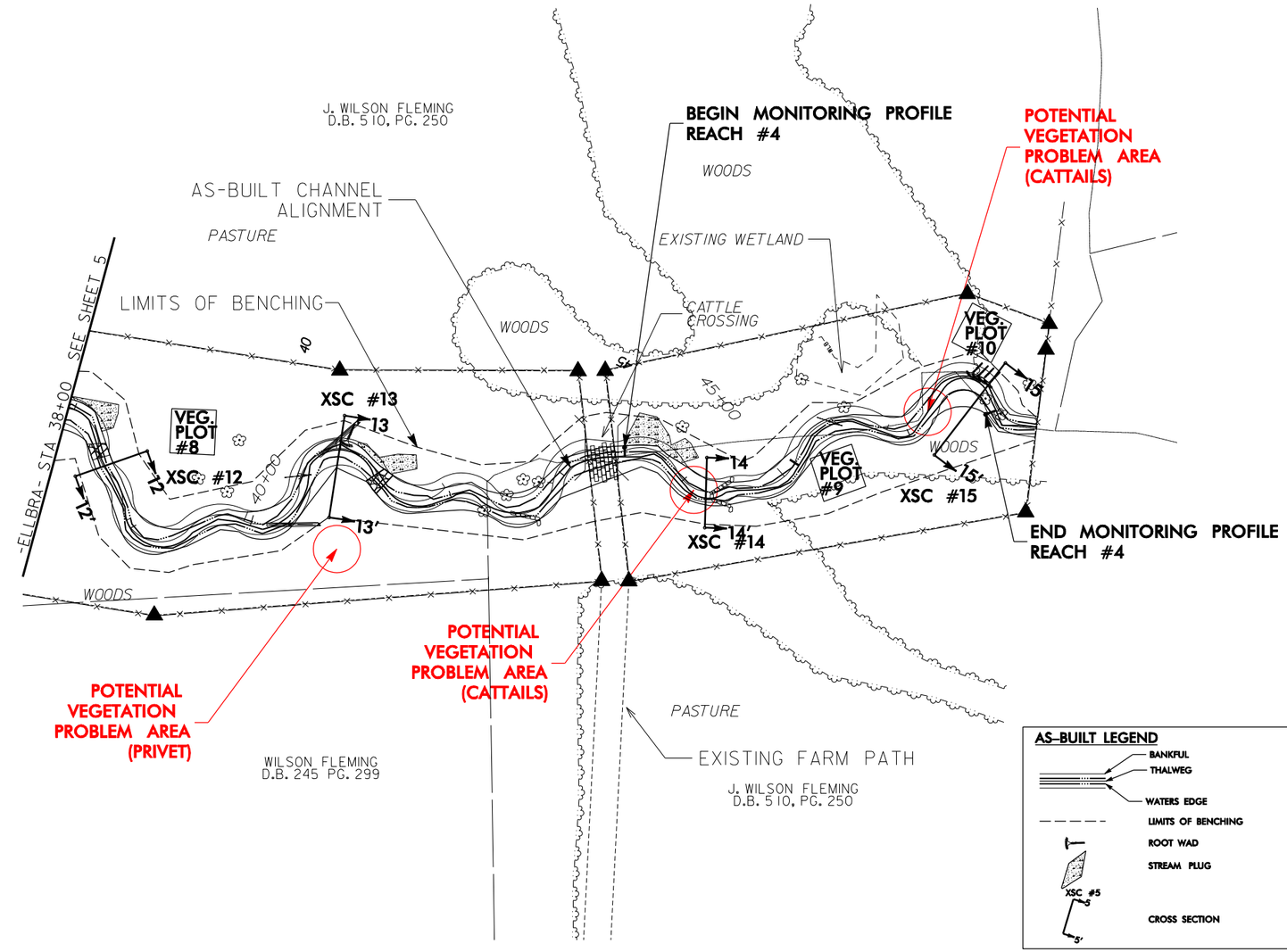


PROJECT NUMBER	SHEET NUMBER
EEP#16-D06045	3
PROJECT NAME ELLINGTON BRANCH STREAM RESTORATION	
COUNTY WARREN	DATE 8/11/09

Ecological Engineering LLP
128 Raleigh Street
Holly Springs, NC 27540

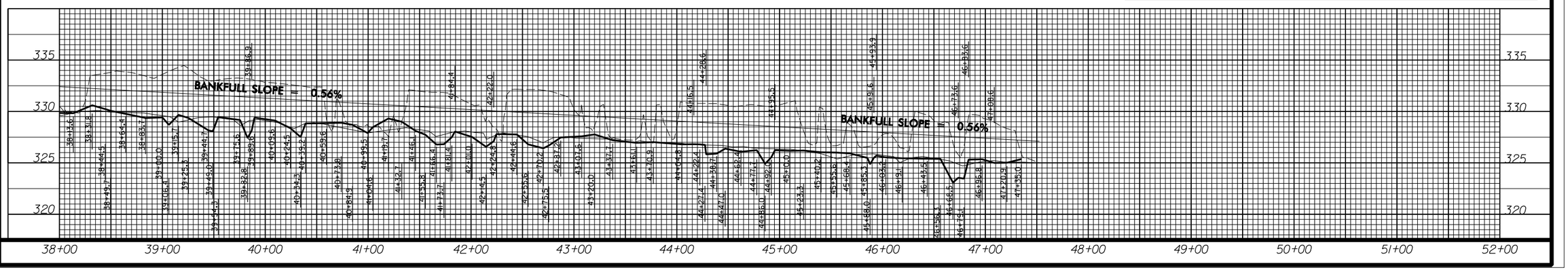
SHEET NAME
PROBLEM AREAS PLAN VIEW

50 25 0 50 100
PLANS



AS-BUILT LEGEND

- BANKFUL
- THALWEG
- WATERS EDGE
- LIMITS OF BENCHING
- ROOT WAD
- STREAM PLUG
- XSC #5 (5' / 5')
- CROSS SECTION
- ROCK CROSS VANE
- ROCK VANE
- LOG VANE
- CONSTRUCTED RIFFLE
- VEG. PLOT #8 — VEGATATION PLOT AREA



PROJECT NUMBER	SHEET NUMBER
EEP#16-D06045	4
PROJECT NAME ELLINGTON BRANCH STREAM RESTORATION	
COUNTY WARREN	DATE 8/1/09

Ecological Engineering L.L.P.
128 Raleigh Street
Holly Springs, NC 27540

SHEET NAME
PROBLEM AREAS PLAN VIEW

50 25 0 50 100
PLANS

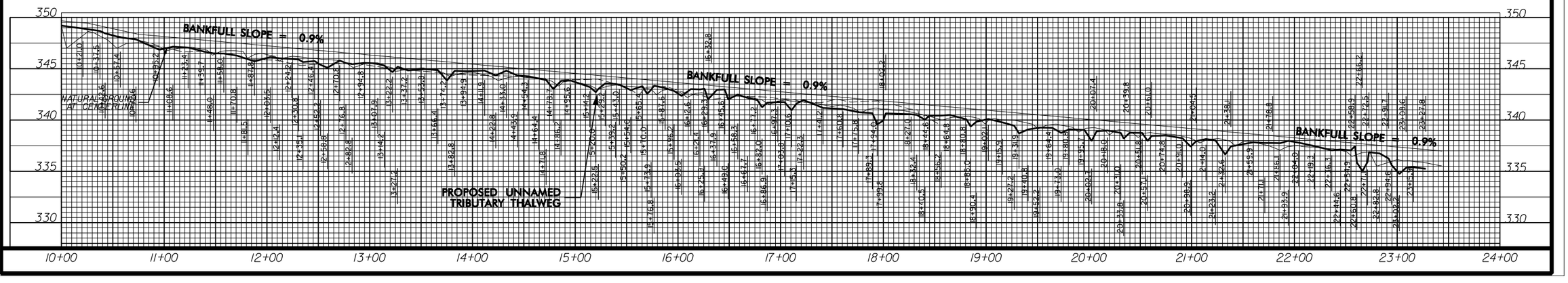
AS-BUILT LEGEND

- BANKFUL
- THALWEG
- WATERS EDGE
- LIMITS OF BENCHING
- ROOT WAD
- STREAM PLUG
- XSC #5 (5' / 5')
- CROSS SECTION
- ROCK CROSS VANE
- ROCK VANE
- LOG VANE
- CONSTRUCTED RIFFLE
- VEG. PLOT #8
- VEGATATION PLOT AREA

FLEMING FARM ROAD
EXISTING FARM PATH
UNNAMED TRIBUTARY AS-BUILT CHANNEL ALIGNMENT
J. WILSON FLEMING D.B. 510, PG. 250
PASTURE
10' TRIB
15' TRIB
20' TRIB
EXISTING WETLAND
WOODS
EXISTING FARM PATH
PASTURE
PASTURE

BEGIN MONITORING PROFILE REACH #5
XSC #16
XSC #17
XSC #18
VEG. PLOT #11
XSC #19
VEG. PLOT #12
POTENTIAL VEGETATION PROBLEM AREA (CATTAILS)
POTENTIAL VEGETATION PROBLEM AREA (MICROSTEGIUM)
END MONITORING PROFILE REACH #5

END MONITORING PROFILE REACH #6
XSC #23
VEG. PLOT #5
BEGIN MONITORING PROFILE REACH #6
XSC #21
XSC #22
VEG. PLOT #13
XSC #20
AS-BUILT CHANNEL ALIGNMENT
CREST GAGE
10+00
15+00
25+00
5'
5'



4. Stem Counts

Stem counts were conducted within 13 strategically placed 10 meter by 10 meter plots. The plots were located based on a representative sample of the entire area of disturbance. They are scattered throughout the project area in order to cover the majority of the habitat variations. The stem count procedure only applies to planted and transplanted woody vegetation. This vegetation is denoted by bio-degradable flagging, which is replaced every monitoring year.

According to initial planting counts, stem counts within each of the 13 plots ranged from approximately 1,053 to 1,215 individuals per acre. The high number was in anticipation of mortality via the continuing drought and the receipt of additional plantings. Monitoring counts for each plot are presented in Exhibit Tables VIIa and VIIb. As expected, mortality rates were heavy in the spring and summer months of 2008. Species such as redbud (*Cercis canadensis*), paw paw (*Asimina triloba*), hackberry (*Celtis laevigata*), flowering dogwood (*Cornus florida*), persimmon (*Diospyros virginiana*), blackgum (*Nyssa sylvatica*) and white oak (*Quercus alba*) were the most effected. In some cases, none of the above individuals survived within the plots. The drought was the single-most contributing factor to this decline in diversity. Other factors included limited browsing by wildlife and improper installation.

Based on the results of the 2009 vegetation assessment, survivability counts ranged from 526 stems per acre in Vegetation Plots 1 and 4 to 1,174 stems per acre in Vegetation Plots 7 and 8. A complete breakdown of this information is provided in Appendix A-1.Photographs of each plot are presented in Appendix A-2.

Exhibit Table VII. Planted Stem Counts For Each Species Arranged By Plot
Ellington Branch Stream Restoration (Project No. 16-D06045)

Species	Plots													Initial Totals	Year 1 (2008) Totals	Year 2 (2009) Totals	Year 3 (2010) Totals	Year 4 (2011) Totals	Year 5 (2012) Totals	Survival %*
	1	2	3	4	5	6	7	8	9	10	11	12	13							
Alnus serrulata			1											1	1	1				100
Asimina triloba														14	0	0				0
Betula nigra	6	7	4	1					23	7	21	13		86	84	82				95
Celtis laevigata														11	0	0				0
Cercis canadensis	3						1	2	1					11	7	7				64
Cornus florida														6	0	0				0
Diospyros virginiana			1		1	5	2							24	15	9				38
Fraxinus pennsylvanica		2	3				15	23				10		59	56	53				90
Nyssa sylvatica			1											13	1	1				8
Oxydendrum arboretum			7				4		2					15	13	13				87
Platanus occidentalis	4	3	4	2			6	3		8				36	32	30				83
Quercus alba					5	1							1	11	7	7				64
Quercus michauxii		5	1	10	6	15					2		2	51	46	41				80
Quercus phellos		2			5		1	1			1	1	11	26	25	22				85
Salix nigra			1											1	1	1				100

B. Stream Assessment

1. Procedural Items

Morphological criteria, including dimension and profile were assessed using the recommended procedures in the USACE Draft Stream Mitigation Guidelines (2003) document.

Cross sections were established in the vicinity of every 20 bankfull widths along both Ellington Branch and its UT. This resulted in a total of 15 cross sections along Ellington Branch and eight cross sections along its UT. Average distances between each cross section were approximately 250 and 150 linear feet for Ellington Branch and its UT, respectively. The cross sections were concentrated to riffle or pool locations along each channel. The chart below serves as a legend for each cross section. More detailed information is provided throughout the remainder of the report.

Ellington Branch

Cross Section Number	Morphologic Parameter	Station Number
1	Pool	10+67
2	Riffle	13+85
3	Pool	16+25
4	Riffle	18+74
5	Pool	21+47
6	Riffle	25+04
7	Riffle	28+23
8	Pool	29+74
9	Pool	31+88
10	Riffle	34+10
11	Pool	36+55
12	Riffle	38+49
13	Pool	40+99
14	Riffle	44+22
15	Pool	46+79

UT to Ellington Branch

Cross Section Number	Morphologic Parameter	Station Number
16	Pool	10+95
17	Riffle	12+35
18	Pool	13+75
19	Riffle	15+39
20	Pool	16+82
21	Riffle	18+64
22	Pool	19+73
23	Riffle	22+36

Restoration activities at the Project Site exceeded 3,000 linear feet. According to USACE (2003), profile surveys are to be conducted on only 3,000 linear feet or 30% of the project total, whichever is greater. Ecological Engineering established six total profile segments to be annually reviewed as part of this monitoring assessment. Two of the segments are situated along Ellington Branch upstream of its confluence with the UT, two are downstream and two are along the UT. Lengths vary from approximately 300 to 800 feet in length. A legend is provided for each profile segment in the chart below.

Segment	Location
Profile Reach 1	Ellington Branch Stations 10+20 to 16+75 (upstream of confluence with UT)
Profile Reach 2	Ellington Branch Stations 18+62 to 23+96 (upstream of confluence with UT)
Profile Reach 3	Ellington Branch Stations 29+33 to 36+85 (downstream of confluence with UT)
Profile Reach 4	Ellington Branch Stations 43+49 to 46+96 (downstream of confluence with UT)
Profile Reach 5	UT to Ellington Branch Stations 12+03 to 16+97
Profile Reach 6	UT to Ellington Branch Stations 19+02 to 21+93

2. Hydrologic Criteria

Bankfull events during the monitoring period are being documented via a crest gage. In order to meet hydrologic success criteria, a minimum of two events must occur during the five-year monitoring period. In addition, the events must occur in separate monitoring years. A crest gage was installed along Ellington

Branch at Cross Section #6 immediately after construction was completed in June 2007. The gage was visited monthly during the period leading up to the submittal this document. Based on our findings, two bankfull events have occurred to-date during 2009. Specific information regarding these events is depicted in Exhibit Table VIII. In addition, precipitation data from two nearby weather stations is presented in Appendix B.

Since bankfull events were recorded during both 2008 and 2009, the hydrologic requirements associated with mitigation have been fulfilled at the project site. Ecological Engineering will however, continue to monitor the hydrology throughout the subsequent monitoring years in order to provide a quantitative data comparison.

Exhibit Table VIII. Verification of Bankfull Events
Ellington Branch Stream Restoration (Project No. 16-D06045)

Date of Data Collection	Date(s) of Occurrence	Method	Calculated Bankfull Elevation	Measured High Water Elevation	Photo # (if available)
9/9/08	9/5/08 – 9/6/08	Crest gage	13 inches	17 inches	Not available
1/8/09	1/6/09 – 1/9/09	Crest gage	13 inches	17 inches	Not available
3/11/09	3/1/09 – 3/2/09	Crest gage	13 inches	20 inches	Not available

3. Bank Stability Assessments

EEP requires that detailed Bank Erosion Hazard Index (BEHI) and Near Bank Shear Stress (NBS) be performed in Years 3 and 5, post-construction which correlate to Years 2010 and 2012. The purpose is to describe the proportion of bank footage in the various hazard categories and to produce sediment export rates in tonnage per annum. Exhibit Table IX provides pre-construction BEHI and sediment export rate data. Data from Monitoring Years 3 and 5 will be entered, as appropriate.

Exhibit Table IX. BEHI and Sediment Export Estimates
Ellington Branch Stream Restoration (Project No. 16-D06045)

Time Point	Segment/ Reach	Linear Footage	Extreme		Very High		High		Moderate		Low		Very Low		Sediment Export
			ft	%	ft	%	ft	%	ft	%	ft	%	ft	%	Ton/y
Pre-construction	Ellington Branch – Upstream of Confluence	1,500					1,500	37							44.9
Pre-construction	Ellington Branch – Downstream of Confluence	2,550			2,550	63									682.8
														Total for Ellington Branch	**727.7**
Pre-construction	Unnamed Tributary of Ellington Branch	853	853	100											217.8
														Total for the Unnamed Tributary of Ellington Branch	**217.8**
Time Point	**Segment/ Reach**	**Linear Footage**	**Extreme**		**Very High**		**High**		**Moderate**		**Low**		**Very Low**		**Sediment Export**
			ft	**%**	**ft**	**%**	**ft**	**%**	**ft**	**%**	**ft**	**%**	**ft**	**%**	**Ton/y**
Year 3 Monitoring	Ellington Branch – Upstream of Confluence	1,500													N/A
Year 3 Monitoring	Ellington Branch – Downstream of Confluence	2,550													N/A
														Total for Ellington Branch	**N/A**
Year 3 Monitoring	Unnamed Tributary of Ellington Branch	853													N/A
														Total for the Unnamed Tributary of Ellington Branch	**217.8**
Time Point	**Segment/ Reach**	**Linear Footage**	**Extreme**		**Very High**		**High**		**Moderate**		**Low**		**Very Low**		**Sediment Export**
			ft	**%**	**ft**	**%**	**ft**	**%**	**ft**	**%**	**ft**	**%**	**ft**	**%**	**Ton/y**
Year 5 Monitoring	Ellington Branch – Upstream of Confluence	1,500													N/A
Year 5 Monitoring	Ellington Branch – Downstream of Confluence	2,550													N/A
														Total for Ellington Branch	**N/A**
Year 5 Monitoring	Unnamed Tributary of Ellington Branch	853													N/A
														Total for the Unnamed Tributary of Ellington Branch	**N/A**

4. Stream Problem Areas

No significant changes to the dimension, pattern, profile or bed material along either channel were observed. Location surveys of the constructed features were conducted to verify the performance of the two stream channels. Both Ellington Branch and its UT are stable. All of the structures are functioning as designed and bank erosion is non-existent. Lack of flow and lack of ongoing scouring events during 2008 and 2009 have contributed to dense vegetation establishment within both stream channels and their adjacent streambanks. Currently, these conditions have contributed to the overall success of the project; however, they may actually become a future deterrent for sediment transport. Ecological Engineering will continue to monitor this situation.

Based on the cross-section surveys, longitudinal profile surveys and visual observations, the channel dimensions and profiles have not significantly changed. Minor adjustments were noted, mainly with regard to the longitudinal profiles. Exhibit Table X is provided for future problem area identification and descriptions, if necessary. No data is currently available for insertion into the table. More overall information regarding issues with either of the stream channels is presented in the following sections. The Table in Appendix C-1 provides information pertaining to the visual assessment. This information is also summarized in Section VI.B.6.

Exhibit Table X. Stream Problem Areas
Ellington Branch Stream Restoration (Project No. 16-D06045)

Feature Issue	Station Numbers	Suspected Cause	Photo Number
N/A	N/A	N/A	N/A

Evidence of beaver (*Castor canadensis*) was observed during June and July along the extreme lower portion of Ellington Branch. This evidence included a small dam in the vicinity of Station 47+20. Ecological Engineering and Sungate coordinated with Mr. Anthony Steed, US Department of Agriculture Wildlife Services, to remove the beavers from the project area. Mr. Steed was able to successfully remove the beavers in their entirety in early August. A letter denoting his efforts is provided within Appendix D. No visual damage, other than the ponding of water was noted as a result of the dam. The location was immediately downstream of Reach Profile #4.

5. Fixed Station Photographs

Photographic documentation was taken at each of the 23 cross sections. This documentation included views across the actual cross section and views facing downstream. The photographs are provided in Appendix C-2 in sequential order.

6. Visual Stability Assessment

Exhibit Table XI provides a semi-qualitative summary of results from the visual inspection conducted over each of the three reaches. It provides a simple performance percentage depicting the state of stability as a proportion of the total amount of the morphological feature category. Based on the overall results, two pools along Reach 1, which included Monitoring Profiles 1 and 2, had filled with sediment and converted to riffle sections. Along Reach 2 (Monitoring Profiles 3 and 4), six pools had formed in addition to the four pools that were formed in 2008. Riffle sections were intact. The results along Reach 3 (Monitoring Profiles 5 and 6) were consistent and noted the filling of one pool in addition to the two pools observed during 2008. Visual evidences of instability were non-existent since the majority of both channels remain inundated with vegetation. Only the deeper pool areas allowed for a complete assessment

and no problems or potential problems were noted during the 2009 survey. Based on the assessment and interpreted data along all three reaches, the project is stable.

Exhibit Table XI. Categorical Stream Feature Visual Stability Assessment
Ellington Branch Stream Restoration (Project No. 16-D06045)

Reach 1 – Ellington Branch Upstream of Confluence with Unnamed Tributary (Profile Reaches 1 and 2)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	105%			
Pools	100%	95%	95%			
Thalweg	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	99%	99%			
Vanes	100%	100%	100%			
Rootwads and Boulders	100%	100%	100%			
Reach 2 – Ellington Branch Downstream of Confluence with Unnamed Tributary (Profile Reaches 3 and 4)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%			
Pools	100%	124%	142%			
Thalweg	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	96%	96%			
Vanes	100%	100%	100%			
Rootwads and Boulders	100%	100%	100%			
Reach 3 – Unnamed Tributary (Profile Reaches 5 and 6)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%			
Pools	100%	90%	85%			
Thalweg	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	97%	97%			
Vanes						
Rootwads and Boulders						

7. Stream Qualitative Measures

Qualitative summary data including cross-sectional survey, longitudinal profile survey and pebble count information is provided in Exhibit Tables XII and XIII. The associated raw data and plots are provided in Appendices C-3, C-4 and C-5.

Bankfull differences were noted during this monitoring assessment. A record drought during the spring and summer months of 2008 effected this and many surrounding areas. Ellington Branch and its UT did not have much opportunity for adjustment. Lack of normal channel flows allowed for an influx of wetland vegetation throughout both of these channels. The early months of 2009 witnessed more normal rain events and precipitation amounts. As a result, the two channels were able to continue the adjustment process, normally occurring during the first year after construction implementation. The summer of 2009 however, has been dry with lower than average precipitation amounts occurring in this area. Nearby irrigation activities have further depleted normal channel flows and current conditions appear similar to those observed during 2008. As previously described, our visual assessment of the cross sections revealed no instability or scour, although survey data noted minor changes with the bankfull widths at several cross sections. These changes can be attributed to differences in vegetation density, survey rod placement, lack of flow and normal channel adjustment processes. Bankfull elevations have remained consistent.

Exhibit Table XII. Baseline Morphology and Hydraulic Summary

Ellington Branch Stream Restoration (Project No. 16-D06045)

Reach 1 – Ellington Branch Upstream of Confluence with Unnamed Tributary

Parameter	Pre-Existing Condition			Project Reference Stream – UT Ellington			Project Reference Stream – Hawtree Creek			Design			As-Built		
Dimension	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**
BF Width (ft)	7.4	11.5	9.5	4.1	4.1	4.1	7.7	9.3	8.9			14.5	10.1	13.4	11.8
Floodprone Width (ft)	10.5	18.6	14.6	6.5	7.9	7.2	15.8	32.5	24.2			>50.0	33.0	50.0	42.0
BF Cross-Sect. Area (ft^2)	10.2	10.2	10.2	2.5	2.6	2.6	9.7	9.8	9.8			18.3	7.0	12.1	10.0
BF Mean Depth (ft)	0.9	1.4	1.1	0.6	0.6	0.6	1.0	1.3	1.1			1.3	0.6	1.0	0.9
BF Max. Depth (ft)	1.7	1.8	1.7	1.0	1.0	1.0	1.5	1.8	1.7			1.8	1.1	1.6	1.3
Width/Depth Ratio	5.4	12.9	8.6	6.5	6.7	6.6	6.1	10.3	8.1			11.2	11.6	20.2	13.9
Entrenchment Ratio	1.4	1.6	1.5	1.6	1.9	1.8	1.8	3.7	2.7			>3.0	2.8	4.2	3.6
Wetted Perimeter (ft)			12.9			5.3			11.5			17.1	9.3	13.8	11.4
Hydraulic Radius (ft)			1.4			0.5			0.9			1.1	0.7	0.9	0.8
Pattern															
Channel Beltwidth (ft)	19.9	90.5	42.1			19.1	15.5	39.1	28.8	23.7	74.0	41.8	33.5	92.0	62.0
Radius of Curvature. (ft)	8.4	70.0	26.0	1.4	7.2	3.4	4.0	10.6	7.6	24.0	50.0	30.8	18.0	47.0	30.8
Meander Wavelength (ft)	21.3	87.8	41.3	2.5	10.4	5.1	10.2	23.2	15.2	68.7	164.2	104.5	74.0	150.0	102.5
Meander Width Ratio	2.1	9.5	4.4			4.7	1.8	4.4	3.3	1.6	5.1	2.9	2.8	7.8	5.3
Profile															
Riffle Length (ft)	5.3	45.8	25.5	1.6	12.2	6.3	3.1	10.6	6.1			10.0			10.0
Riffle Slope (ft)	0.007	0.049	0.022	0.009	0.088	0.035	0.011	0.018	0.014			0.015	0.012	0.039	0.028
Pool Length (ft)	11.6	85.7	25.4			3.9	4.9	27.9	15.0	13.0	45.0	26.4	13.1	39.1	23.6
Pool Spacing (ft)	33.4	823.7	111.3			22.6	20.9	56.3	34.6	34.0	125.0	60.1	36.8	119.1	81.7
Substrate															
d50 (mm)			1.2			1.8			0.3			1.2			0.2
d84 (mm)			10.2			10.2			10.9			10.2			0.8
Additional Reach Parameters															
Valley Length (ft)			1119			33			156			1586			1586
Channel Length (ft)			1560			50			258			1943			1934
Sinuosity			1.4			1.5			1.7			1.3			1.2
Water Surface Slope (ft/ft)			0.004			0.013			0.007			0.006			0.006
BF Slope (ft/ft)			0.004			0.013			0.007			0.006			0.006
Rosgen Classification			G5			B4c			E5			C5			C5

Exhibit Table XII Continued. Baseline Morphology and Hydraulic Summary Continued
Ellington Branch Stream Restoration (Project No. 16-D06045)
Reach 2 – Ellington Branch Downstream of Confluence with Unnamed Tributary

Parameter	Pre-Existing Condition			Project Reference Stream – UT Ellington			Project Reference Stream – Hawtree Creek			Design			As-Built		
Dimension	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**
BF Width (ft)	9.2	11.9	10.6	4.1	4.1	4.1	7.7	9.3	8.9			15.5	11.6	16.6	14.9
Floodprone Width (ft)	27.7	193.0	110.3	6.5	7.9	7.2	15.8	32.5	24.2			>50.0	40.0	58.0	47.7
BF Cross-Sect. Area (ft^2)	12.4	13.8	13.1	2.5	2.6	2.6	9.7	9.8	9.8			21.6	11.6	16.6	14.3
BF Mean Depth (ft)	1.0	1.5	1.2	0.6	0.6	0.6	1.0	1.3	1.1			1.4	0.8	1.2	1.0
BF Max. Depth (ft)	2.1	2.2	2.2	1.0	1.0	1.0	1.5	1.8	1.7			2.0	1.6	1.9	1.7
Width/Depth Ratio	6.1	11.4	8.5	6.5	6.7	6.6	6.1	10.3	8.1			11.1	10.6	20.1	15.5
Entrenchment Ratio	2.3	20.8	10.4	1.6	1.9	1.8	1.8	3.7	2.7			>3.2	2.7	3.9	3.2
Wetted Perimeter (ft)			16.64			5.3			11.5			18.3	13.0	15.5	14.6
Hydraulic Radius (ft)			1.3			0.5			0.9			1.2	0.8	1.1	0.93
Pattern															
Channel Beltwidth (ft)	22.5	64.0	37.5			19.1	15.5	39.1	28.8	20.7	71.1	47.3	51.0	122.0	75.8
Radius of Curvature. (ft)	7.7	67.6	23.3	1.4	7.2	3.4	4.0	10.6	7.6	24.0	47.8	30.1	22.0	66.0	33.4
Meander Wavelength (ft)	14.0	90.2	34.9	2.5	10.4	5.1	10.2	23.2	15.2	70.5	151.9	110.0	83.8	168.0	111.4
Meander Width Ratio	2.1	6.0	3.5			4.7	1.8	4.4	3.3	1.3	4.6	3.1	3.4	8.2	5.1
Profile															
Riffle Length (ft)	4.5	47.9	25.5	1.6	12.2	6.3	3.1	10.6	6.1			10.0	10.0	10.0	10.0
Riffle Slope (ft)	0.007	0.052	0.022	0.009	0.088	0.035	0.011	0.018	0.014			0.015	0.016	0.035	0.024
Pool Length (ft)	11.6	85.7	25.4			3.9	4.9	27.9	15.0	9.0	50.0	23.1	14.3	32.2	24.1
Pool Spacing (ft)	33.4	823.7	111.3			22.6	20.9	56.3	34.6	40.0	103.0	72.9	38.3	147.4	75.6
Substrate															
d50 (mm)			0.41			1.8			0.3			0.4			0.2
d84 (mm)			4.0			10.2			10.9			10.0			4.5
Additional Reach Parameters															
Valley Length (ft)			1846			33			156			1370			1370
Channel Length (ft)			2476			50			258			1810			1801
Sinuosity			1.3			1.5			1.7			1.3			1.3
Water Surface Slope (ft/ft)			0.006			0.013			0.007			0.006			0.006
BF Slope (ft/ft)			0.006			0.013			0.007			0.006			0.006
Rosgen Classification			E5			B4c			E5			C5			C5

Exhibit Table XII. Baseline Morphology and Hydraulic Summary Continued

Ellington Branch Stream Restoration (Project No. 16-D06045)

Reach 3 – Unnamed Tributary to Ellington Branch

Parameter	Pre-Existing Condition			Project Reference Stream – UT Ellington			Project Reference Stream – Hawtree Creek			Design			As-Built		
Dimension	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**	**Med.**
BF Width (ft)	8.3	14.5	11.4	4.1	4.1	4.1	7.7	9.3	8.9			8.0	6.9	9.3	7.7
Floodprone Width (ft)	15.8	34.0	24.9	6.5	7.9	7.2	15.8	32.5	24.2			>30.0	22.0	29.0	27.0
BF Cross-Sect. Area (ft^2)	4.7	6.4	5.6	2.5	2.6	2.6	9.7	9.8	9.8			4.5	4.1	6.0	4.9
BF Mean Depth (ft)	0.4	0.6	0.5	0.6	0.6	0.6	1.0	1.3	1.1			0.6	0.6	0.7	0.7
BF Max. Depth (ft)	0.7	1.1	0.9	1.0	1.0	1.0	1.5	1.8	1.7			0.8	0.9	1.0	1.0
Width/Depth Ratio	14.7	32.9	23.8	6.5	6.7	6.6	6.1	10.3	8.1			13.3	10.5	14.4	11.8
Entrenchment Ratio	1.4	3.0	2.2	1.6	1.9	1.8	1.8	3.7	2.7			>3.7	2.9	3.8	3.5
Wetted Perimeter (ft)			12.4			5.3			11.5			9.2	6.5	8.4	7.6
Hydraulic Radius (ft)			0.5			0.5			0.9			0.5	0.4	0.6	0.53
Pattern															
Channel Beltwidth (ft)	19.8	67.0	40.0			19.1	15.5	39.1	28.8	11.4	42.5	23.3	36.7	60.0	47.7
Radius of Curvature (ft)	11.1	58.4	33.5	1.4	7.2	3.4	4.0	10.6	7.6	13.0	25.0	17.3	13.3	28.3	18.2
Meander Wavelength (ft)	23.7	87.0	44.1	2.5	10.4	5.1	10.2	23.2	15.2	29.7	97.8	61.7	44.0	95.0	56.0
Meander Width Ratio	1.7	5.9	3.5			4.7	1.8	4.4	3.3	1.4	5.3	2.9	4.8	7.8	6.2
Profile															
Riffle Length (ft)	13.8	58.0	27.4	1.6	12.2	6.3	3.1	10.6	6.1			5.0	5.0	5.0	5.0
Riffle Slope (ft)	0.005	0.029	0.019	0.009	0.088	0.035	0.011	0.018	0.014			0.02	0.012	0.039	0.025
Pool Length (ft)			17.2			3.9	4.9	27.9	15.0	10.0	21.0	14.0	9.2	36.0	15.7
Pool Spacing (ft)						22.6	20.9	56.3	34.6	27.0	89.0	51.0	19.7	86.3	44.2
Substrate															
d50 (mm)			0.4			1.8			0.3			0.4			0.3
d84 (mm)			11.8			10.2			10.9			11.8			0.6
Additional Reach Parameters															
Valley Length (ft)			702			33			156			1074			1074
Channel Length (ft)			854			50			258			1343			1328
Sinuosity			1.2			1.5			1.7			1.3			1.3
Water Surface Slope (ft/ft)			0.008			0.013			0.007			0.009			0.008
BF Slope (ft/ft)			0.008			0.013			0.007			0.009			0.008
Rosgen Classification			C5			B4c			E5			C5			C5

Exhibit Table XIII. Morphology and Hydraulic Monitoring Summary

Ellington Branch Stream Restoration (Project No. 16-D06045)

	Cross Section 1 Pool (Ellington Branch)					Cross Section 2 Riffle (Ellington Branch)					Cross Section 3 Pool (Ellington Branch)					Cross Section 4 Riffle (Ellington Branch)				
Dimension	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
BF Width (ft)	12.9	12.7				8.9	7.0				15.5	14.1				10.0	11.7			
Floodprone Width (ft)						33.0	30.8									50.0	52.1			
BF Cross-Sect. Area (ft^2)	21.6	13.6				6.4	5.2				24.9	22.5				7.7	9.6			
BF Mean Depth (ft)	1.7	1.1				0.7	0.7				1.6	1.6				0.8	0.8			
BF Max. Depth (ft)	3.3	2.4				1.0	1.2				3.2	3.1				1.2	1.5			
Width/Depth Ratio						12.7	10.0									12.5	14.6			
Entrenchment Ratio						3.7	4.4									5.0	4.5			
Wetted Perimeter (ft)	15.8	15.0				9.3	7.5				16.9	15.6				10.4	12.1			
Hydraulic Radius (ft)	1.4	0.9				0.7	0.7				1.5	1.4				0.7	0.8			
Substrate																				
d50 (mm)	0.2	0.2				0.3	0.3				0.3	0.3				0.3	0.2			
d84 (mm)	0.3	0.3				3.6	0.8				1.2	3.0				0.7	0.6			

	Cross Section 5 Pool (Ellington Branch)					Cross Section 6 Riffle (Ellington Branch)					Cross Section 7 Riffle (Ellington Branch)					Cross Section 8 Pool (Ellington Branch)				
Dimension	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
BF Width (ft)	22.2	22.1				11.6	11.5				13.4	13.2				16.6	18.1			
Floodprone Width (ft)						38.0	36.2				46.0	48.5								
BF Cross-Sect. Area (ft^2)	18.0	18.7				11.0	11.5				12.6	11.1				19.3	22.1			
BF Mean Depth (ft)	0.8	0.8				0.9	0.9				0.9	0.8				1.2	1.2			
BF Max. Depth (ft)	2.3	2.4				1.4	1.3				1.5	1.5				2.5	2.7			
Width/Depth Ratio						12.9	12.8				14.9	16.5								
Entrenchment Ratio						3.3	3.1				3.4	3.7								
Wetted Perimeter (ft)	23.6	23.4				12.2	12.0				13.8	13.6				18.1	19.8			
Hydraulic Radius (ft)	0.8	0.8				0.9	0.9				0.9	0.8				1.1	1.1			
Substrate																				
d50 (mm)	0.2	0.1				0.1	0.2				2.6	3.5				0.2	0.1			
d84 (mm)	0.6	0.2				0.2	0.3				6.8	7.8				0.3	0.3			

Exhibit Table XIII. Morphology and Hydraulic Monitoring Summary Continued

Ellington Branch Stream Restoration (Project No. 16-D06045)

Parameter	Cross Section 9 Pool (Ellington Branch)					Cross Section 10 Riffle (Ellington Branch)					Cross Section 11 Pool (Ellington Branch)					Cross Section 12 Riffle (Ellington Branch)				
Dimension	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
BF Width (ft)	15.2	13.3				14.9	14.8				25.5	21.6				12.0	11.3			
Floodprone Width (ft)						45.0	>50									58.0	>60			
BF Cross-Sect. Area (ft^2)	23.1	21.0				12.1	11.3				28.3	21.0				13.9	12.4			
BF Mean Depth (ft)	1.5	1.6				0.8	0.8				1.1	1.0				1.2	1.1			
BF Max. Depth (ft)	2.8	2.6				1.7	1.7				3.2	2.8				2.0	1.8			
Width/Depth Ratio						18.2	18.5									10.0	10.3			
Entrenchment Ratio						3.0	>3.4									4.8	>4.8			
Wetted Perimeter (ft)	16.6	14.6				15.5	15.6				27.8	24.2				13.0	11.9			
Hydraulic Radius (ft)	1.4	1.4				0.8	0.7				1.0	0.9				1.1	1.0			
Substrate																				
d50 (mm)	0.2	0.2				0.1	0.3				0.2	0.2				0.2	0.2			
d84 (mm)	0.4	0.4				2.0	0.4				0.3	0.3				1.5	0.3			

Parameter	Cross Section 13 Pool (Ellington Branch)					Cross Section 14 Riffle (Ellington Branch)					Cross Section 15 Pool (Ellington Branch)					Cross Section 16 Pool (Unnamed Tributary)				
Dimension	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
BF Width (ft)	23.6	23.4				14.1	12.6				18.9	21.5				13.7	17.6			
Floodprone Width (ft)						40.0	39.0													
BF Cross-Sect. Area (ft^2)	26.5	26.9				13.2	9.5				27.8	30.1				11.0	12.8			
BF Mean Depth (ft)	1.1	1.1				0.9	0.8				1.5	1.4				0.8	0.7			
BF Max. Depth (ft)	2.8	3.4				2.2	1.9				3.7	3.4				1.8	1.2			
Width/Depth Ratio						15.7	15.7													
Entrenchment Ratio						2.8	3.1													
Wetted Perimeter (ft)	24.6	25.7				15.2	13.8				20.8	23.0				14.6	17.9			
Hydraulic Radius (ft)	1.1	1.0				0.9	0.7				1.3	1.3				0.8	0.7			
Substrate																				
d50 (mm)	0.4	0.2				0.6	0.5				0.2	0.2				0.6	0.2			
d84 (mm)	1.1	0.5				1.9	0.8				0.3	0.2				1.8	0.3			

Exhibit Table XIII. Morphology and Hydraulic Monitoring Summary Continued

Ellington Branch Stream Restoration (Project No. 16-D06045)

Parameter	Cross Section 17 Riffle (Unnamed Tributary)					Cross Section 18 Pool (Unnamed Tributary)					Cross Section 19 Riffle (Unnamed Tributary)					Cross Section 20 Pool (Unnamed Tributary)				
Dimension	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
BF Width (ft)	6.2	6.7				9.4	8.2				6.8	7.9				9.2	7.9			
Floodprone Width (ft)	22.0	19.9									29.0	27.5								
BF Cross-Sect. Area (ft^2)	2.7	3.2				7.2	6.5				4.0	3.9				7.2	6.8			
BF Mean Depth (ft)	0.4	0.5				0.8	0.8				0.6	0.5				0.8	0.9			
BF Max. Depth (ft)	0.8	0.8				1.8	1.6				0.8	0.9				2.1	2.1			
Width/Depth Ratio	14.1	13.4									11.5	15.8								
Entrenchment Ratio	3.6	3.0									4.3	35								
Wetted Perimeter (ft)	6.5	7.3				10.8	9.7				7.1	8.2				10.6	9.5			
Hydraulic Radius (ft)	0.4	0.4				0.7	0.7				0.6	0.5				0.7	0.7			
Substrate																				
d50 (mm)	0.3	0.2				0.3	0.2				0.2	0.2				0.2	0.2			
d84 (mm)	0.6	0.3				0.5	0.3				0.4	0.3				0.4	0.4			

Parameter	Cross Section 21 Riffle (Unnamed Tributary)					Cross Section 22 Pool (Unnamed Tributary)					Cross Section 23 Riffle (Unnamed Tributary)									
Dimension	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
BF Width (ft)	7.9	11.9				14.5	15.6				8.0	9.4								
Floodprone Width (ft)	29.0	27.9									28.0	29.0								
BF Cross-Sect. Area (ft^2)	4.1	4.0				10.3	10.8				4.9	6.4								
BF Mean Depth (ft)	0.5	0.34				0.7	0.7				0.6	0.7								
BF Max. Depth (ft)	0.9	0.9				1.5	1.5				1.2	1.2								
Width/Depth Ratio	15.8	35.0									12.9	13.4								
Entrenchment Ratio	3.7	2.4									3.5	3.1								
Wetted Perimeter (ft)	8.3	12.1				14.9	16.1				8.4	9.8								
Hydraulic Radius (ft)	0.5	0.3				0.7	0.7				0.6	0.7								
Substrate																				
d50 (mm)	0.3	0.3				0.3	0.1				0.3	0.2								
d84 (mm)	1.5	0.4				0.6	0.2				0.4	0.4								

Exhibit Table XIII. Morphology and Hydraulic Monitoring Summary Continued
Ellington Branch Stream Restoration (Project No. 16-D06045)
Reach 1 – Ellington Branch Upstream of Confluence with Unnamed Tributary (Profile Reaches 1 and 2)

Parameter	MY 1 (2008)			MY 2 (2009)			MY 3 (2010)			MY 4 (2011)			MY 5 (2012)			MY + (2012)		
Pattern	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**
Channel Beltwidth (ft)	33.5	92.0	62.0	33.0	91.0	66.3												
Radius of Curvature (ft)	18.0	47.0	30.8	19.0	45.3	29.3												
Meander Wavelength (ft)	74.0	150.0	102.5	76.0	152.0	110.7												
Meander Width Ratio	2.8	7.8	5.3	2.7	7.5	5.5												
Profile																		
Riffle Length (ft)	9.5	20.0	15.8	9.5	21.8	13.5												
Riffle Slope (ft/ft)	0.004	0.028	0.01	0.004	0.020	0.009												
Pool Length (ft)	11.0	67.1	23.2	12.8	57.0	24.1												
Pool Slope (ft/ft)	0.000	0.006	0.001	0.000	0.007	0.002												
Additional Reach Parameters																		
Valley Length (ft)	1586			1586														
Channel Length (ft)	1934			1934														
Sinuosity	1.22			1.22														
Water Surface Slope (ft/ft)	0.007			0.007														
BF Slope (ft/ft)	0.007			0.007														
Rosgen Classification	C5			C5														

Exhibit Table XIII. Morphology and Hydraulic Monitoring Summary Continued

Ellington Branch Stream Restoration (Project No. 16-D06045)

Reach 2 – Ellington Branch Downstream of Confluence with Unnamed Tributary (Profile Reaches 3 and 4)

Parameter	MY 1 (2008)			MY 2 (2009)			MY 3 (2010)			MY 4 (2011)			MY 5 (2012)			MY + (2012)		
Pattern	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**
Channel Beltwidth (ft)	51.0	122.0	75.8	51.0	128.0	85.8												
Radius of Curvature (ft)	22.0	66.0	33.4	22.7	66.0	33.0												
Meander Wavelength (ft)	83.8	168.0	111.4	80.0	135.0	100.2												
Meander Width Ratio	3.4	8.2	5.1	3.9	9.9	6.7												
Profile																		
Riffle Length (ft)	9.1	23.6	14.5	11.6	23.0	16.1												
Riffle Slope (ft/ft)	0.003	0.028	0.011	0.004	0.018	0.010												
Pool Length (ft)	11.1	53.3	27.3	12.7	53.1	32.1												
Pool Slope (ft/ft)	0.000	0.003	0.001	0.000	0.004	0.001												
Additional Reach Parameters																		
Valley Length (ft)	1370			1370														
Channel Length (ft)	1801			1801														
Sinuosity	1.31			1.31														
Water Surface Slope (ft/ft)	0.006			0.006														
BF Slope (ft/ft)	0.006			0.006														
Rosgen Classification	C5			C5														

Exhibit Table XIII. Morphology and Hydraulic Monitoring Summary Continued
Ellington Branch Stream Restoration (Project No. 16-D06045)
Reach 3 – Unnamed Tributary to Ellington Branch (Profile Reaches 5 and 6)

Parameter	MY 1 (2008)			MY 2 (2009)			MY 3 (2010)			MY 4 (2011)			MY 5 (2012)			MY + (2012)		
Pattern	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**
Channel Beltwidth (ft)	36.7	60.0	47.7	36.0	60.0	48.6												
Radius of Curvature (ft)	13.3	28.3	18.2	12.6	26.5	16.8												
Meander Wavelength (ft)	44.0	95.0	56.0	42.2	90.0	59.6												
Meander Width Ratio	4.8	7.8	6.2	4.5	7.5	6.1												
Profile																		
Riffle Length (ft)	4.4	13.6	10.7	7.4	14.5	10.3												
Riffle Slope (ft/ft)	0.005	0.036	0.019	0.005	0.012	0.008												
Pool Length (ft)	7.5	24.9	15.4	13.0	29.5	18.8												
Pool Slope (ft/ft)	0.000	0.004	0.001	0.000	0.006	0.002												
Additional Reach Parameters																		
Valley Length (ft)	1074			1074														
Channel Length (ft)	1328			1328														
Sinuosity	1.24			1.24														
Water Surface Slope (ft/ft)	0.008			0.008														
BF Slope (ft/ft)	0.008			0.008														
Rosgen Classification	C5			C5														

SECTION VII. Methodology Section

This document employs methodologies according to the post-construction monitoring plan and standard regulatory guidance and procedures documents, including Stream Mitigation Guidelines (USACE, 2003), Corps of Engineers Wetland Delineation Manual (USACE, 1987) and Applied River Morphology (Rosgen, D.L., 1996). No other specifications were utilized in this monitoring assessment. References are provided below.

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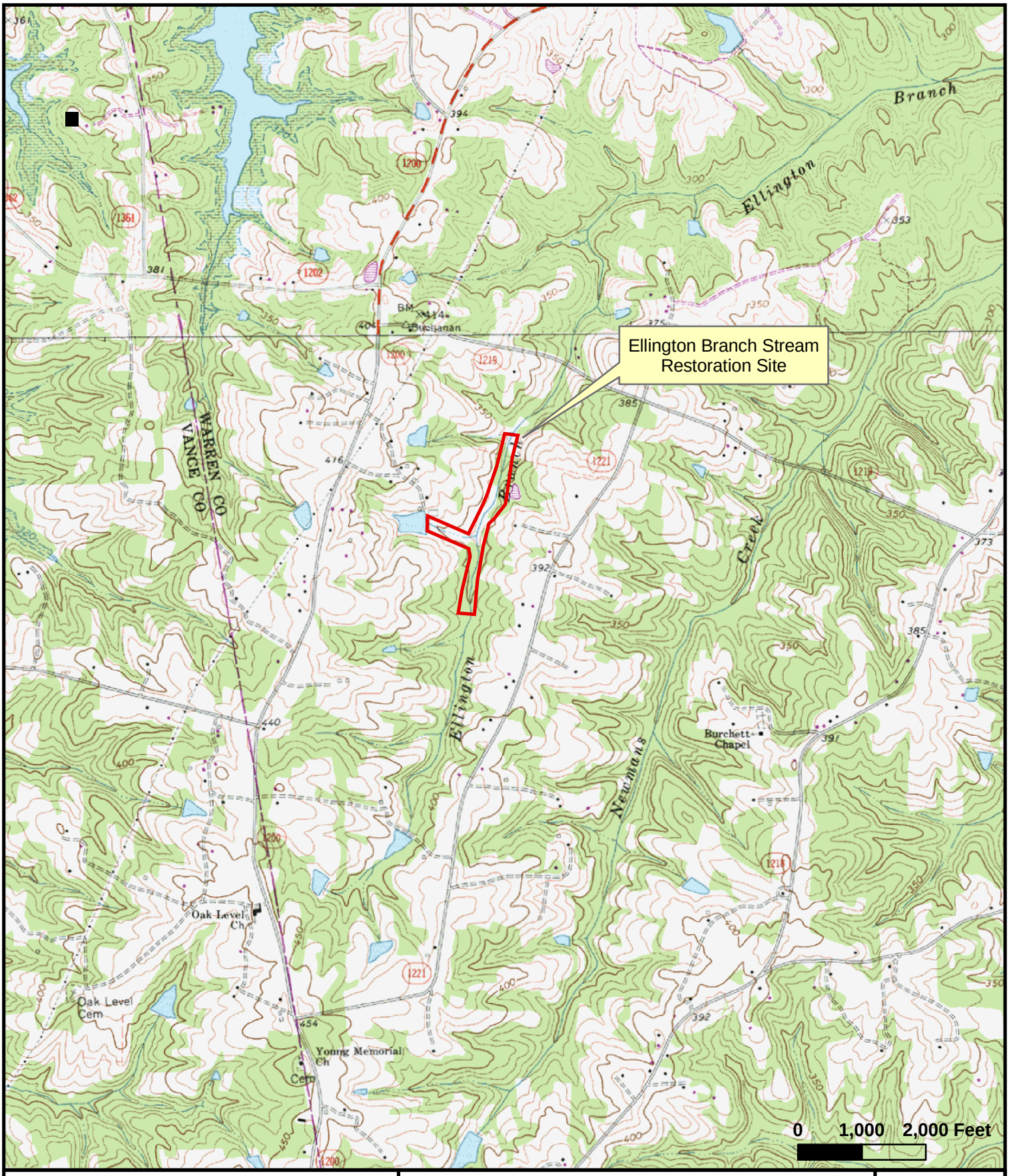

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Ellington Branch Stream Restoration
EEP # 16-D06045
Vicinity Map
Warren County, NC

October 16, 2006

Source: USGS Quadrangle Maps (John H Kerr Dam and Middleburg)

FIGURE 1

APPENDIX A-1: VEGETATION RAW DATA

COMMON NAME	SCIENTIFIC NAME	PLANTED STEM COUNTS													Initial (2007) Totals	Year 1 (2008) Totals	Year 2 (2009) Totals	Year 3 (2010) Totals	Year 4 (2011) Totals	Year 5 (2012) Totals	Surviv. %
		VP #1	VP #2	VP #3	VP #4	VP #5	VP #6	VP #7	VP #8	VP #9	VP #10	VP #11	VP #12	VP #13							
Tag alder	*Alnus serrulata*			1											1	1	1				100
Paw Paw	*Asimina triloba*														14	0	0				0
River birch	*Betula nigra*	6	7	4	1					23	7	21	13		86	84	82				95
Sugarberry	*Celtis laeviagata*														11	0	0				0
Red bud	*Cercis canadensis*	3						1	2	1					11	7	7				64
Flowering dogwood	*Cornus florida*														1	0	0				0
Persimmon	*Diospyros virginiana*			1		1	5	2							24	15	9				38
Green ash	*Fraxinus pennsylvanica*		2	3				15	23				10		59	56	53				90
Blackgum	*Nyssa sylvatica*			1											13	1	1				8
Sourwood	*Oxydendrum arboretum*			7				4		2					15	13	13				87
Sycamore	*Platanus occidentalis*	4	3	4	2			6	3		8				36	32	30				83
White oak	*Quercus alba*					5	1							1	11	7	7				64
Swamp chestnut oak	*Quercus michauxii*		5	1	10	6	15					2		2	51	46	41				80
Willow oak	*Quercus phellos*		2			5		1	1			1	1	11	26	25	22				85
Black willow	*Salix nigra*			1											1	1	1				100
														Totals	360	288	267	0	0	0	
Total Number of Individuals Planted		26	26	30	26	26	26	30	30	30	26	28	30	26							
Plot Size (square meters)		100	100	100	100	100	100	100	100	100	100	100	100	100							
Total Number of Individuals Observed (2008)		14	22	30	16	18	22	29	29	29	15	24	25	15							
Total Number of Individuals Observed (2009)		13	19	28	13	17	21	29	29	26	15	24	24	14							
Total Number of Individuals Observed (2010)																					
Total Number of Individuals Observed (2011)																					
Total Number of Individuals Observed (2012)																					
Plot Size (square meters)		100	100	100	100	100	100	100	100	100	100	100	100	100							
Stems/Acre (Initial)		1053	1053	1215	1053	1053	1053	1215	1215	1215	1053	1134	1215	1053							
Stems/Acre (2008)		567	891	1215	648	729	891	1174	1174	1174	607	972	1012	607							
Stems/Acre (2009)		526	769	1134	526	688	850	1174	1174	1053	607	972	972	567							
Stems/Acre (2010)																					
Stems/Acre (2011)																					
Stems/Acre (2012)																					

APPENDIX A-2: VEGETATION MONITORING PLOT PHOTOGRAPH SUMMARY

Photograph Number and Location	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009	Year 2010 Monitoring Photographs
Photo # VP-1 Facing north at Vegetation Plot #1			
Photo # VP-2 Facing north at Vegetation Plot #2			
Photo # VP-3 Facing north at Vegetation Plot #3			

APPENDIX A-2: VEGETATION MONITORING PLOT PHOTOGRAPH SUMMARY CONTINUED

Photograph Number and Location	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009	Year 2010 Monitoring Photographs
Photo # VP-4 Facing north at Vegetation Plot #4			
Photo # VP-5 Facing north at Vegetation Plot #5			
Photo # VP-6 Facing north at Vegetation Plot #6			

APPENDIX A-2: VEGETATION MONITORING PLOT PHOTOGRAPH SUMMARY CONTINUED

Photograph Number and Location	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009	Year 2010 Monitoring Photographs
Photo # VP-7 Facing north at Vegetation Plot #7			
Photo # VP-8 Facing north at Vegetation Plot #8			
Photo # VP-9 Facing north at Vegetation Plot #9			

APPENDIX A-2: VEGETATION MONITORING PLOT PHOTOGRAPH SUMMARY CONTINUED

Photograph Number and Location	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009	Year 2010 Monitoring Photographs
Photo # VP-10 Facing north at Vegetation Plot #10			
Photo # VP-11 Facing north at Vegetation Plot #11			
Photo # VP-12 Facing north at Vegetation Plot #12			

APPENDIX A-2: VEGETATION MONITORING PLOT PHOTOGRAPH SUMMARY CONTINUED

Photograph Number and Location	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009	Year 2010 Monitoring Photographs
Photo # VP-13 Facing north at Vegetation Plot #13			

APPENDIX B: RAINFALL DATA SUMMARY

2008 Rainfall Data Summary	
Dates of Observation	Henderson - Oxford Airport
January-08	0.65 in
February-08	1.74 in
March-08	3.69 in
April-08	2.86 in
May-08	1.63 in
June-08	1.07 in
July-08	3.82 in
August-08	2.56 in
September-08	4.58 in
October-08	0.46 in
November-08	3.14 in
December-08	2.58 in

Source Data: NC Cronos Database

Notes:

John H. Kerr Dam is approximately 7.2 miles N of the Project Site.

Henderson - Oxford Airport is approximately 14.4 miles SW of Project Site.

2009 Rainfall Data Summary		
Dates of Observation	John H. Kerr Dam	Henderson - Oxford Airport
1/2/2009		0.10 in
1/4/2009		0.16 in
1/6/09 - 1/9/09	1.20 in	1.53 in
1/20/2009	0.30 in	
1/27/09 - 1/29/09	1.20 in	0.56 in
2/2/09 - 2/3/09	0.06 in	0.05 in
2/16/2009		0.01 in
2/18/09 - 2/19/09	0.48 in	0.23 in
2/28/2009	0.04 in	0.56 in
3/1/09 - 3/2/09	2.30 in	0.60 in
3/13/09 - 3/17/09	2.22 in	1.63 in
3/19/09 - 3/20/09	0.06 in	0.10 in
3/26/09 - 3/30/09	0.62 in	0.97 in
4/2/09 - 4/4/09	0.50 in	0.07 in
4/6/09 - 4/7/09	0.06 in	0.09 in
4/9/09 - 4/11/09	0.28 in	0.09 in
4/14/09 - 4/16/09	0.27 in	0.02 in
4/18/2009		0.03 in
4/20/09 - 4/22/09	0.36 in	0.41 in
5/4/09 - 5/12/09	2.64 in	1.19 in
5/17/09 - 5/18/09	0.16 in	0.07 in
5/25/09 - 5/30/09	0.57 in	0.36 in
6/3/09 - 6/6/09	2.97 in	1.78 in
6/9/09 - 6/13/09	0.56 in	1.06 in
6/15/09 6/19/09	0.62 in	1.22 in
7/5/09 - 7/6/09	0.45 in	0.50 in
7/13/2009	0.30 in	
7/17/09 - 7/21/09	2.34 in	0.67 in
7/23/09 - 7/24/09	0.24 in	0.51 in
7/29/09 - 8/1/09	1.40 in	0.62 in
8/2/09 - 8/3/09	0.04 in	0.01 in
8/5/09 - 8/6/09	0.91 in	0.16 in

APPENDIX C-1: STREAM VISUAL ASSESSMENT TABLE

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[1]	% Perform. in Stable Condition[2]	Feature Perform. Mean or Total[3]
A. Riffles	1. Present?[4]	75	81	65	93	
	2. Armor stable (e.g. no displacement)?	75	81	N/A	93	
	3. Facet grade appears stable	75	81	50	93	
	4. Minimal evidence of embedding/fining?	75	81	65	93	
	5. Length appropriate?	73	81	75	90	**92%**
B. Pools	1. Present? (e.g. not subject to severe aggradation or migration?)[4]	79	77	10	103	
	2. Sufficiently deep (Dmax:Dmean >1.6?)	79	77	10	103	
	3. Length Appropriate?	75	77	10	97	**101%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?[5]	N/A	N/A	N/A	100	
	2. Downstream of meander (glide/inflection) centering?[5]	N/A	N/A	N/A	100	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	97	97	N/A	100	
	2. Of those eroding, # w/concomitant point bar formation?	97	97	N/A	100	
	3. Apparent Rc within spec?	97	97	N/A	100	
	4. Sufficient floodplain access and relief?[6]	97	97	N/A	100	**100%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	N/A	100	
	2. Channel bed degradation – areas of increasing down-cutting or head-cutting?	N/A	N/a	N/A	100	**100%**
F. Vanes	1. Free of back or arm scour?	5	5	N/A	100	
	2. Height appropriate?	5	5	N/A	100	
	3. Angle and geometry appear appropriate?	5	5	N/A	100	
	4. Free of piping or other structural failures	5	5	N/A	100	**100%**
G. Rootwads/ Boulders	1. Free of scour?	24	24	N/A	100	
	2. Footing stable?	24	24	N/A	100	**100%**

Footnotes:

1. Metrics that are spatial estimates should be entered as:
   The number of locales over the reach for which the failing condition is observed / followed by the total linear distance (feet) or area for which the failing or unstable condition is observed.
2. In the case of categorical metrics for which a feature count is involved, this is simply calculated as the number of functional features that are in a state of stability as a percentage of the total. In the case of those metrics based on footage or aerial extent, it is the amount in a state of failure or instability expressed as a proportion of the total amount of that feature. The resulting proportion is then subtracted from 1 and then multiplied by 100 to give a percentage that represents the proportion of that feature category in a state of apparent stability.
3. The mean of the metrics for a given feature category.
4. Was the feature actually present as compared to the As-built or has the feature been completely obscured (aggraded) or removed (degraded).
5. Is the thalweg centering up on the channel in between the meander bends?
6. Is the meander bend in a state of constriction?

APPENDIX C-2: MONITORING PHOTOGRAPH SUMMARY

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #1 Facing north (downstream) at Cross Section #1 along Ellington Branch			
Photo #2 Facing west across Cross Section #1 along Ellington Branch			
Photo #3 Facing north (downstream) at Cross Section #2 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #4 Facing west across Cross Section #2 along Ellington Branch			
Photo #5 Facing north (downstream) at Cross Section #3 along Ellington Branch	*No photograph available*		
Photo #6 Facing west across Cross Section #3 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #7 Facing north (downstream) at Cross Section #4 along Ellington Branch			
Photo #8 Facing west across Cross Section #4 along Ellington Branch			
Photo #9 Facing north (downstream) at Cross Section #5 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #10 Facing west across Cross Section #5 along Ellington Branch			
Photo #11 Facing north (downstream) at Cross Section #6 along Ellington Branch			
Photo #12 Facing west across Cross Section #6 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #13 Facing north (downstream) at Cross Section #7 along Ellington Branch			
Photo #14 Facing west across Cross Section #7 along Ellington Branch			
Photo #15 Facing north (downstream) at Cross Section #8 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #16 Facing west across Cross Section #8 along Ellington Branch			
Photo #17 Facing north (downstream) at Cross Section #9 along Ellington Branch			
Photo #18 Facing west across Cross Section #9 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #19 Facing north (downstream) at Cross Section #10 along Ellington Branch			
Photo #20 Facing west across Cross Section #10 along Ellington Branch			
Photo #21 Facing north (downstream) at Cross Section #11 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #22 Facing west across Cross Section #11 along Ellington Branch			
Photo #23 Facing north (downstream) at Cross Section #12 along Ellington Branch			
Photo #24 Facing west across Cross Section #12 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #25 Facing north (downstream) at Cross Section #13 along Ellington Branch			
Photo #26 Facing west across Cross Section #13 along Ellington Branch			
Photo #27 Facing north (downstream) at Cross Section #14 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #28 Facing west across Cross Section #14 along Ellington Branch			
Photo #29 Facing north (downstream) at Cross Section #15 along Ellington Branch			
Photo #30 Facing west across Cross Section #15 along Ellington Branch			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #31 Facing east (downstream) at Cross Section #16 along the Unnamed Tributary			
Photo #32 Facing north across Cross Section #16 along the Unnamed Tributary			
Photo #33 Facing east (downstream) at Cross Section #17 along the Unnamed Tributary			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #34 Facing north across Cross Section #17 along the Unnamed Tributary			
Photo #35 Facing east (downstream) at Cross Section #18 along the Unnamed Tributary			
Photo #36 Facing north across Cross Section #18 along the Unnamed Tributary			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #37 Facing east (downstream) at Cross Section #19 along the Unnamed Tributary			
Photo #38 Facing north across Cross Section #19 along the Unnamed Tributary			
Photo #39 Facing east (downstream) at Cross Section #20 along the Unnamed Tributary			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #40 Facing north across Cross Section #20 along the Unnamed Tributary			
Photo #41 Facing north (downstream) at Cross Section #21 along the Unnamed Tributary			
Photo #42 Facing west across Cross Section #21 along the Unnamed Tributary			

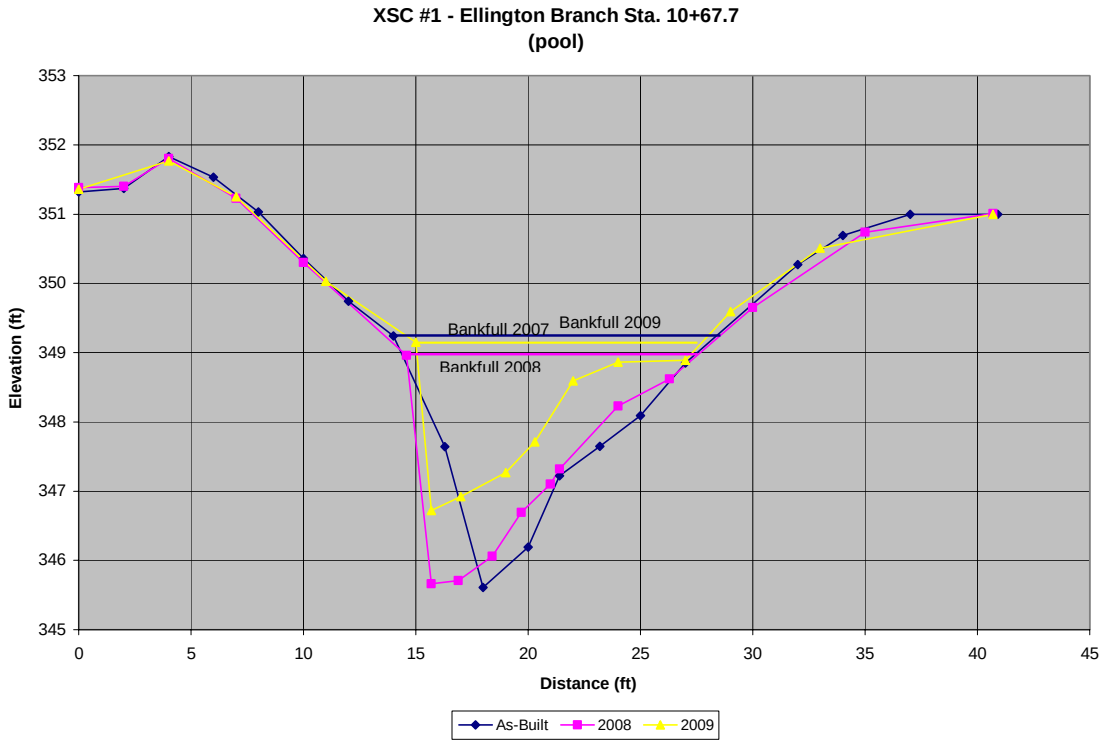
APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #43 Facing north (downstream) at Cross Section #22 along the Unnamed Tributary			
Photo #44 Facing west across Cross Section #22 along the Unnamed Tributary			
Photo #45 Facing north (downstream) at Cross Section #23 along the Unnamed Tributary			

APPENDIX C-2: MONITORING PHOTOGRAPHY SUMMARY CONTINUED

Photograph Number and Location	As-Built Photographs taken January 2008	Year 2008 Monitoring Photographs taken September 2008	Year 2009 Monitoring Photographs taken July 2009
Photo #46 Facing west across Cross Section #23 along the Unnamed Tributary			

APPENDIX C-3:
CROSS SECTION PLOTS AND RAW DATA TABLES – ELLINGTON BRANCH

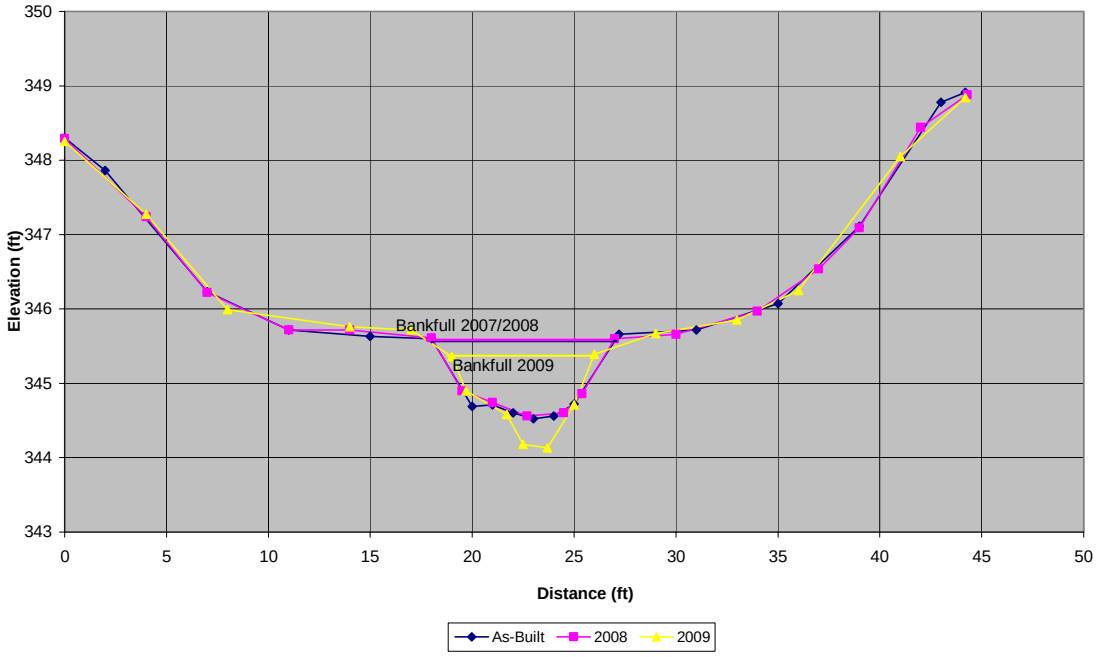


Facing downstream along Cross Section #1 (2009)

XSC #1 Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	351.32		0	351.38		0	351.36										
2	351.37		2	351.4		4	351.77										
4	351.83		4	351.8		7	351.25										
6	351.53		7	351.23		11	350.03	349.15									
8	351.03		10	350.3		15	349.15	349.15									
10	350.36		14.6	348.96	348.96	15.7	346.72	349.15									
12	349.74		15.7	345.66	348.96	17	346.92	349.15									
14	349.24	349.24	16.9	345.71	348.96	19	347.27	349.15									
16.3	347.64	349.24	18.4	346.06	348.96	20.3	347.71	349.15									
18	345.61	349.24	19.7	346.69	348.96	22	348.59	349.15									
20	346.19	349.24	21	347.1	348.96	24	348.86	349.15									
21.4	347.22	349.24	21.4	347.32	348.96	27	348.89										
23.2	347.65	349.24	24	348.23	348.96	29	349.59										
25	348.09	349.24	26.3	348.62	348.96	33	350.51										
27	348.85	349.24	30	349.65		40.7	351										
32	350.27	349.24	35	350.74													
34	350.69		40.7	351.01													
37	351																
40.9	351																

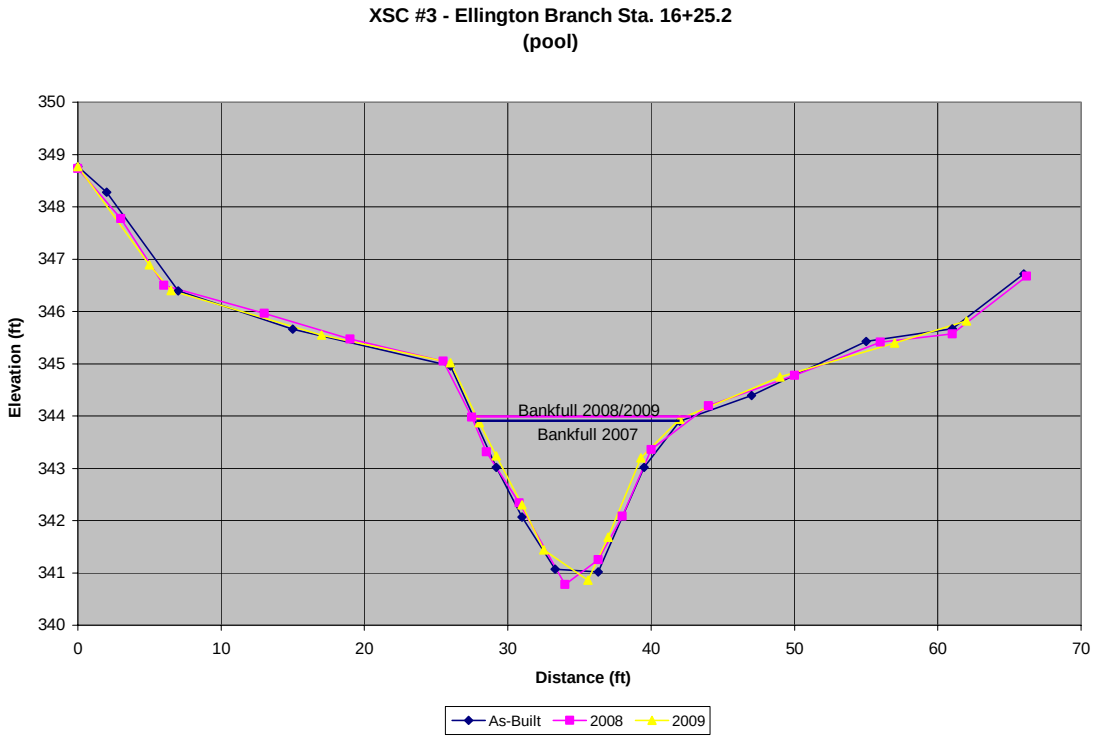
XSC #2 - Ellington Branch Sta. 13+85
(riffle)



Facing downstream at Cross Section #2 (2009)

XSC #2 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	348.3		0	348.29		0	348.25										
2	347.86		4	347.24		4	347.27										
7	346.23		7	346.22		8	345.99										
11	345.72		11	345.72		14	345.76										
15	345.63		14	345.72		17	345.72	345.72									
18	345.6	345.63	18	345.61	345.61	19	345.36	345.72									
20	344.69	345.63	19.5	344.9	345.61	19.7	344.9	345.72									
21	344.71	345.63	21	344.74	345.61	21.7	344.58	345.72									
22	344.6	345.63	22.7	344.56	345.61	22.5	344.18	345.72									
23	344.52	345.63	24.5	344.6	345.61	23.7	344.13	345.72									
24	344.56	345.63	25.4	344.86	345.61	25	344.71	345.72									
25	344.72	345.63	27	345.6	345.61	26	345.39	345.72									
27.2	345.66	345.63	30	345.66		29	345.67	345.72									
31	345.72		34	345.97		33	345.85	345.72									
35	346.07		37	346.54		36	346.25										
39	347.11		39	347.09		41	348.05										
43	348.78		42	348.44		44.2	348.84										
44.2	348.91		44.3	348.88													

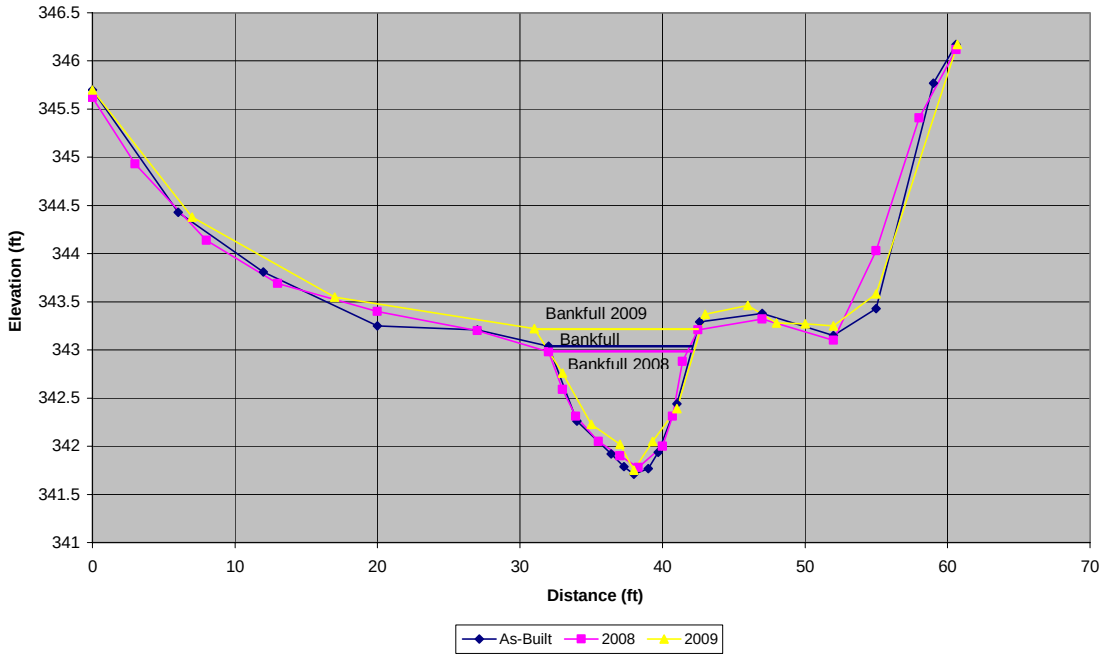


Facing downstream at Cross Section #3 (2009)

XSC #3 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	348.77		0	348.73		0	348.77										
2	348.28		3	347.77		5	346.89										
7	346.39		6	346.5		6.5	346.4										
15	345.66		13	345.96		17	345.55										
26	344.96	343.9	19	345.47		26	345.02	345.02									
29.2	343.02	343.9	25.5	345.05		28	343.87	345.02									
31	342.07	343.9	27.5	343.98	343.98	29.2	343.24	345.02									
33.3	341.07	343.9	28.5	343.31	343.98	31	342.3	345.02									
36.3	341.02	343.9	30.8	342.34	343.98	32.5	341.44	345.02									
39.5	343.02	343.9	34	340.78	343.98	35.6	340.86	345.02									
42	343.9	343.9	36.3	341.25	343.98	37	341.68	345.02									
47	344.39		38	342.08	343.98	39.3	343.2	345.02									
55	345.43		40	343.36	343.98	42	343.94	345.02									
61	345.67		44	344.2		49	344.75	345.02									
66	346.72		50	344.78		57	345.4	345.02									
			56	345.41		62	345.82										
			61	345.57													
			66.2	346.67													

XSC #4 - Ellington Branch Sta. 18+74.7
(riffle)

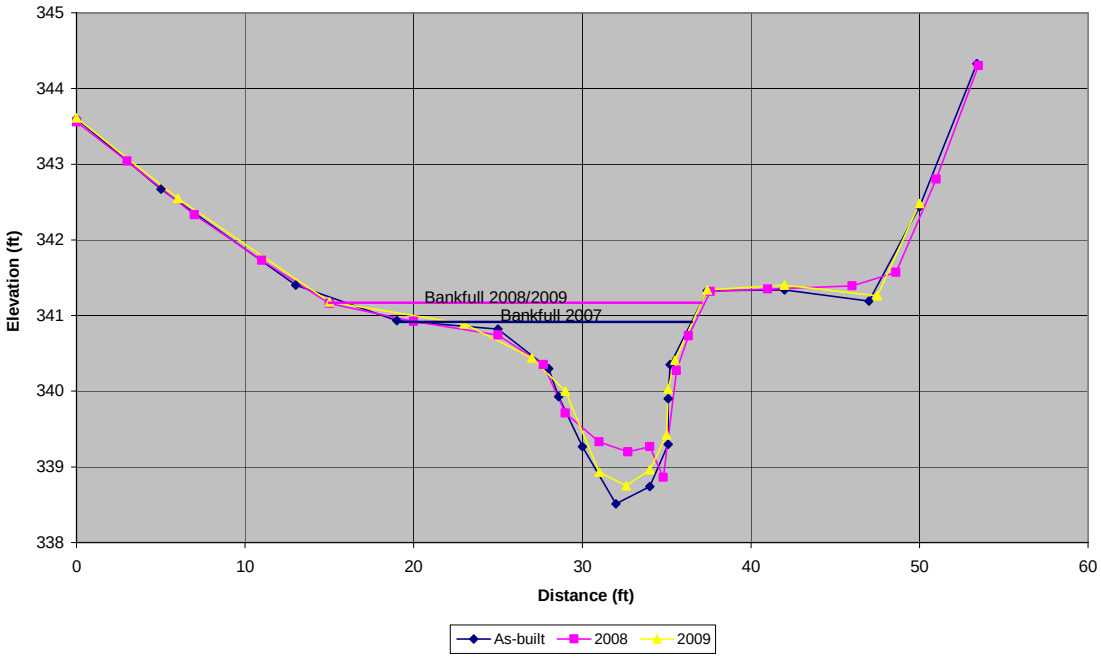


Facing downstream at Cross Section #4 (2009)

XSC #4 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	345.7		0	345.62		0	345.7										
6	344.43		3	344.93		7	344.38										
12	343.81		8	344.14		17	343.55										
20	343.25		13	343.69		31	343.22	343.22									
27	343.21		20	343.4		33	342.76	343.22									
32	343.04	343.04	27	343.2		35	342.23	343.22									
34	342.26	343.04	32	342.98	342.98	37	342.02	343.22									
36.4	341.92	343.04	33	342.59	342.98	38	341.75	343.22									
37.3	341.79	343.04	33.9	342.31	342.98	39.3	342.05	343.22									
38	341.71	343.04	35.5	342.05	342.98	41	342.39	343.22									
39	341.77	343.04	37	341.9	342.98	43	343.37	343.22									
39.7	341.94	343.04	38.3	341.78	342.98	46	343.46										
41	342.44	343.04	40	342	342.98	48	343.28										
42.6	343.29	343.04	40.7	342.31	342.98	50	343.27										
47	343.38		41.4	342.88	342.98	52	343.25										
52	343.15		42.5	343.21		55	343.58										
55	343.43		47	343.32		60.7	346.17										
59	345.77		52	343.1													
60.6	346.17		55	344.03													
			58	345.41													
			60.6	346.12													

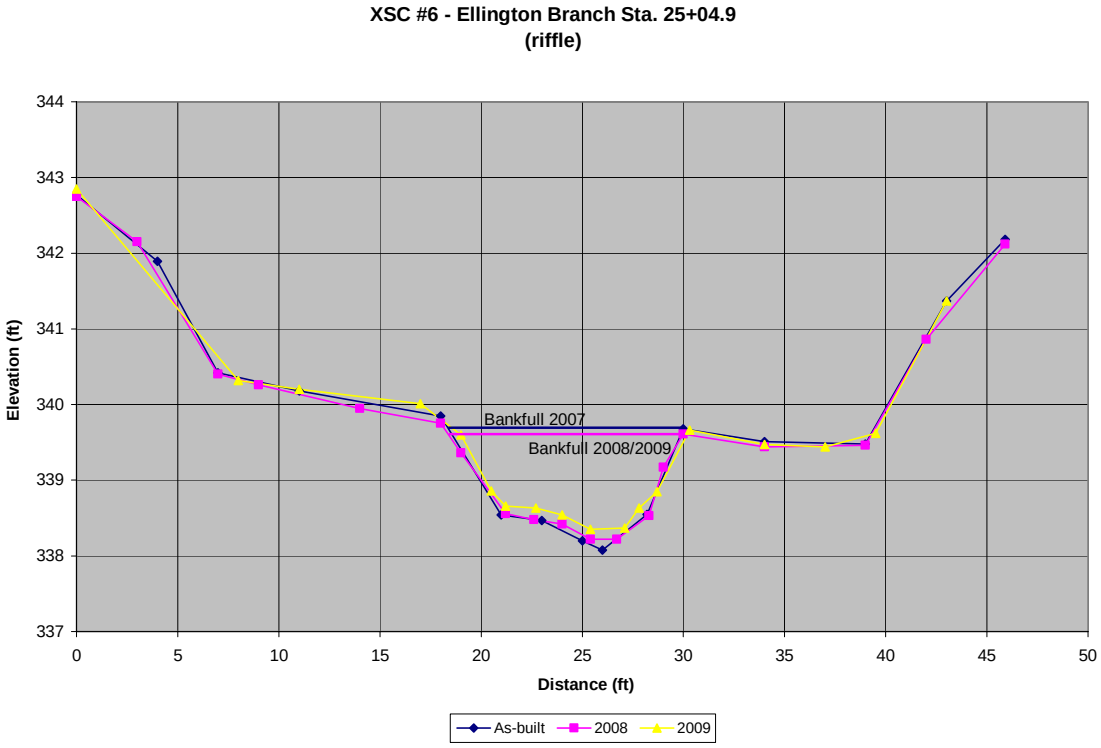
XSC #5 - Ellington Branch Sta. 21+47.3
(pool)



Facing downstream at Cross Section #5 (2009)

XSC #5 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	343.6		0	343.56		0	343.61										
5	342.67		3	343.04		6	342.55										
13	341.4		7	342.33		15	341.18										
19	340.93	340.93	11	341.73		23	340.89										
25	340.82	340.93	15	341.16	341.16	27	340.44										
28	340.3	340.93	20	340.92	341.16	29	340										
28.6	339.93	340.93	25	340.74	341.16	31	338.93										
30	339.27	340.93	27.7	340.35	341.16	32.6	338.75										
32	338.51	340.93	29	339.71	341.16	34	338.96										
34	338.74	340.93	31	339.33	341.16	35	339.42										
35.1	339.3	340.93	32.7	339.2	341.16	35.1	340.03										
35.1	339.9	340.93	34	339.27	341.16	35.5	340.41										
35.2	340.35	340.93	34.8	338.86	341.16	37.4	341.34										
37.4	341.33	340.93	35.6	340.27	341.16	42	341.4										
42	341.34		36.3	340.73	341.16	47.5	341.26										
47	341.19		37.6	341.32		50	342.48										
50	342.44		41	341.35													
53.4	344.33		46	341.39													
			48.6	341.57													
			51	342.8													
			53.5	344.3													

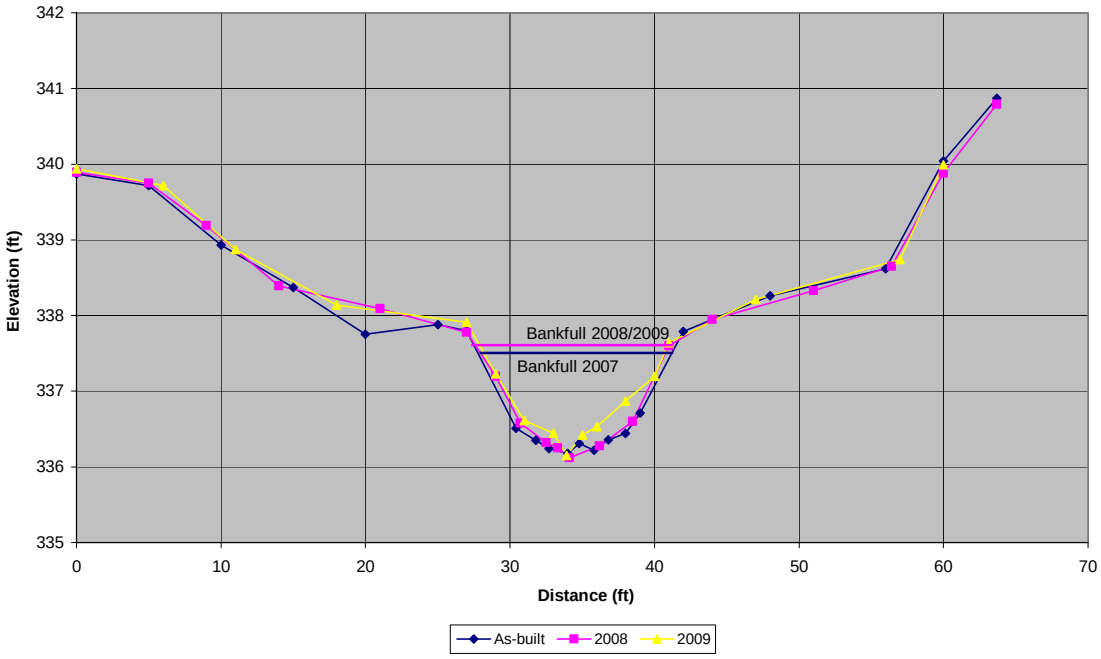


Facing downstream at Cross Section #6 (2009)

XSC #6 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	342.77		0	342.75		0	342.85										
4	341.89		3	342.15		8	340.32										
7	340.42		7	340.4		11	340.2										
11	340.18		9	340.26		17	340.01	339.66									
18	339.85	339.68	14	339.95		19	339.6	339.66									
21	338.54	339.68	18	339.75		20.5	338.86	339.66									
23	338.47	339.68	19	339.36	339.61	21.2	338.66	339.66									
25	338.2	339.68	21.2	338.56	339.61	22.7	338.63	339.66									
26	338.08	339.68	22.6	338.48	339.61	24	338.54	339.66									
28.2	338.55	339.68	24	338.42	339.61	25.4	338.35	339.66									
30	339.68	339.68	25.4	338.22	339.61	27.1	338.37	339.66									
34	339.51		26.7	338.22	339.61	27.8	338.63	339.66									
39	339.48		28.3	338.53	339.61	28.7	338.85	339.66									
43	341.37		29	339.17	339.61	30.3	339.66	339.66									
45.9	342.18		30	339.61	339.61	34	339.47										
			34	339.44		37	339.44										
			39	339.46		39.5	339.62										
			42	340.86		43	341.37										
			45.9	342.12													

XSC #7 - Ellington Branch Sta. 28+23.2
(riffle)

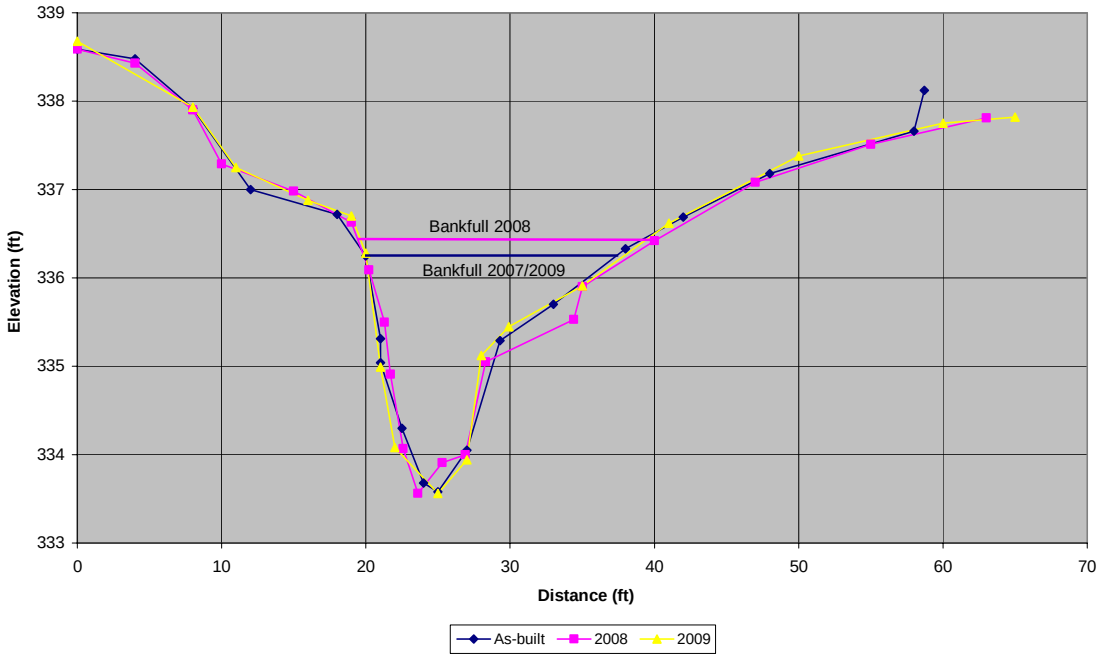


Facing downstream at Cross Section #7 (2009)

XSC #7 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	339.87		0	339.89		0	339.94										
5	339.72		5	339.75		6	339.72										
10	338.93		9	339.19		11	338.87										
15	338.37		14	338.39		18	338.14										
20	337.75		21	338.09		27	337.91	337.64									
25	337.88		27	337.78		29	337.23	337.64									
27	337.8	337.5	29	337.2	337.6	31	336.61	337.64									
30.4	336.51	337.5	30.7	336.58	337.6	33	336.45	337.64									
31.8	336.35	337.5	32.5	336.32	337.6	33.9	336.15	337.64									
32.7	336.24	337.5	33.3	336.25	337.6	35	336.42	337.64									
34	336.18	337.5	34.1	336.12	337.6	36	336.53	337.64									
34.8	336.31	337.5	36.2	336.28	337.6	38	336.87	337.64									
35.8	336.22	337.5	38.5	336.6	337.6	40	337.2	337.64									
36.8	336.36	337.5	41	337.6	337.6	41	337.64	337.64									
38	336.44	337.5	44	337.95		47	338.21										
39	336.71	337.5	51	338.33		57	338.74										
42	337.79	337.5	56.4	338.65		60	339.99										
48	338.26		60	339.88													
56	338.62		63.7	340.79													
60	340.04																
63.7	340.87																

XSC #8 - Ellington Branch Sta. 29+74.7
(pool)

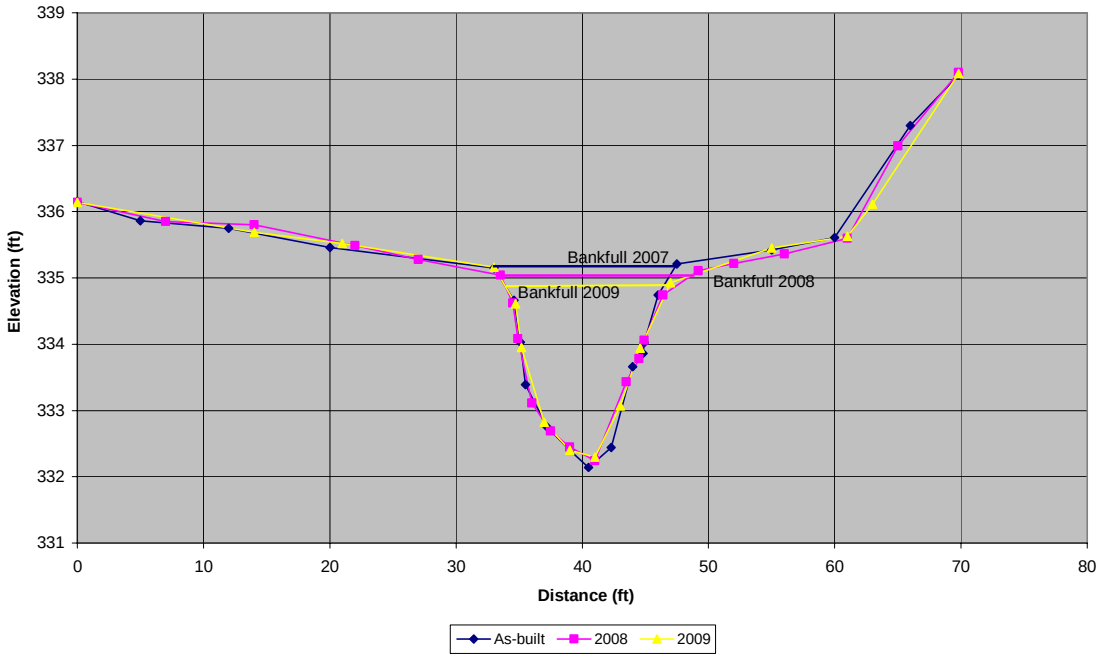


Facing downstream at Cross Section #8 (2009)

XSC #8 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	338.59		0	338.59		0	338.68										
4	338.48		4	338.43		8	337.93										
8	337.92		8	337.9		11	337.25										
12	337		10	337.29		16	336.88										
18	336.72		15	336.98		19	336.7	336.7									
20	336.25	336.25	19	336.63		20	336.28	336.7									
21	335.31	336.25	20.2	336.09	336.42	21	334.99	336.7									
21	335.04	336.25	21.3	335.5	336.42	22	334.08	336.7									
22.5	334.3	336.25	21.7	334.91	336.42	25	333.56	336.7									
24	333.68	336.25	22.6	334.07	336.42	27	333.94	336.7									
25	333.58	336.25	23.6	333.56	336.42	28	335.12	336.7									
27	334.05	336.25	25.3	333.91	336.42	29.9	335.45	336.7									
29.3	335.29	336.25	26.9	334	336.42	35	335.91	336.7									
33	335.7	336.25	28.3	335.05	336.42	41	336.62	336.7									
38	336.33	336.25	34.4	335.53	336.42	50	337.38										
42	336.69		35	335.9	336.42	60	337.75										
48	337.18		40	336.42	336.42	65	337.82										
58	337.66		47	337.08													
58.7	338.12		55	337.51													
			63	337.81													
			68.8	338.15													

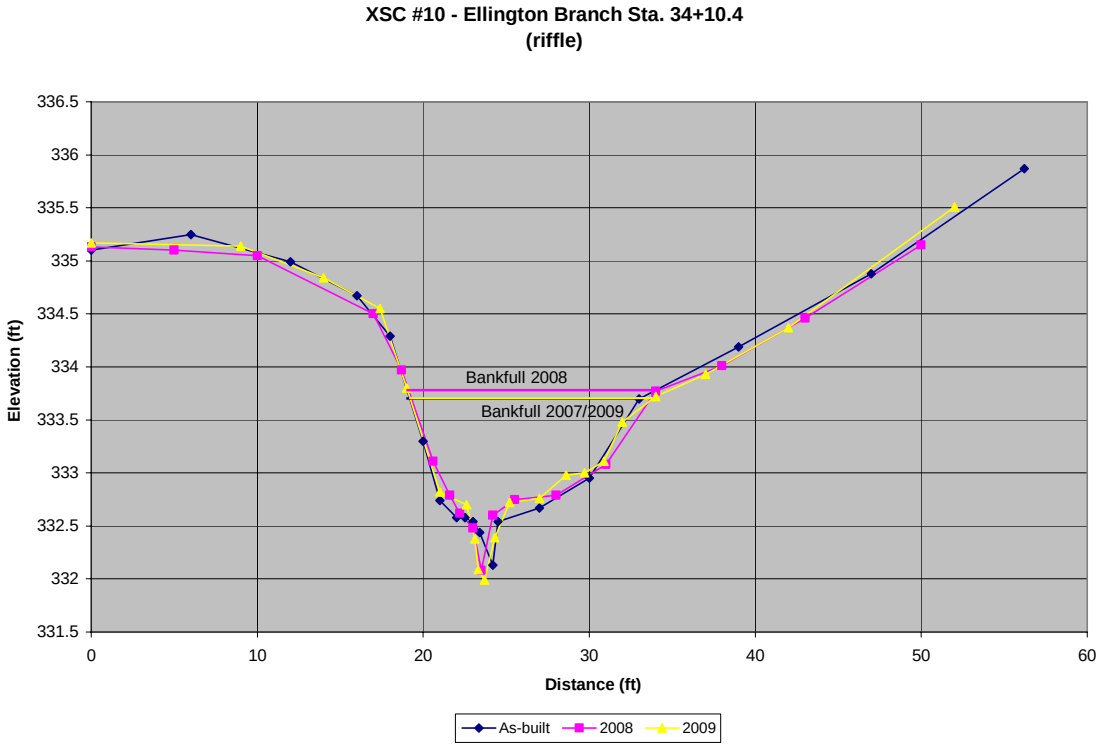
XSC #9 - Ellington Branch Sta. 31+88.3
(pool)



Facing downstream at Cross Section #9 (2009)

XSC #9 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	336.15		0	336.14		0	336.14										
5	335.86		7	335.85		14	335.69										
12	335.75		14	335.8		21	335.52										
20	335.46		22	335.49		33	335.16										
33	335.15	335.15	27	335.28		34.7	334.61										
34.6	334.66	335.15	33.5	335.04	335.04	35.2	333.95										
35.1	334.03	335.15	34.5	334.62	335.04	37	332.82										
35.5	333.39	335.15	34.9	334.08	335.04	39	332.4										
37.2	332.75	335.15	36	333.11	335.04	41	332.3										
39	332.4	335.15	37.5	332.69	335.04	43	333.07										
40.5	332.14	335.15	39	332.45	335.04	44.6	333.94										
42.3	332.44	335.15	41	332.24	335.04	47	334.93										
44	333.66	335.15	43.5	333.43	335.04	55	335.45										
44.8	333.86	335.15	44.5	333.78	335.04	61	335.63										
44.9	334.02	335.15	44.9	334.06	335.04	63	336.11										
46	334.74	335.15	46.4	334.74	335.04	69.8	338.08										
47.5	335.21	335.15	49.2	335.11													
55	335.42		52	335.22													
60	335.61		56	335.36													
66	337.3		61	335.6													
69.8	338.06		65	336.99													
			69.8	338.1													

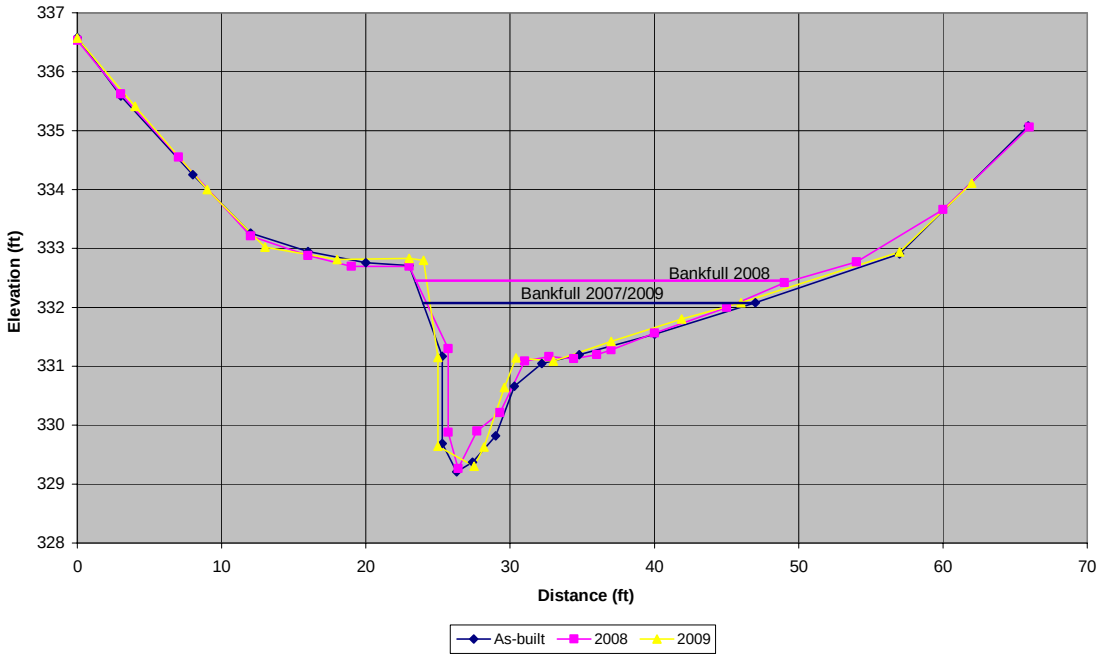


Facing downstream at Cross Section #10 (2009)

XSC #10 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	335.1		0	335.13		0	335.17										
6	335.25		5	335.1		9	335.14										
12	334.99		10	335.05		14	334.84										
16	334.67		17	334.5		17.4	334.55										
18	334.29	333.7	18.7	333.97		19	333.8										
20	333.3	333.7	20.6	333.11	333.77	21	332.82										
21	332.74	333.7	21.6	332.79	333.77	22.6	332.7										
22	332.58	333.7	22.2	332.62	333.77	23.1	332.38										
22.5	332.58	333.7	23	332.48	333.77	23.3	332.09										
23	332.54	333.7	23.5	332.08	333.77	23.7	331.99										
23.4	332.44	333.7	24.2	332.6	333.77	24.3	332.39										
24.2	332.13	333.7	25.5	332.75	333.77	25.2	332.72										
24.5	332.54	333.7	28	332.79	333.77	27	332.76										
27	332.67	333.7	31	333.08	333.77	28.6	332.98										
30	332.95	333.7	34	333.77	333.77	29.7	333										
33	333.7	333.7	38	334.01		30.9	333.11										
39	334.19		43	334.46		32	333.48										
47	334.88		50	335.15		34	333.72										
56.2	335.87					37	333.93										
						42	334.37										
						52	335.51										

XSC #11 - Ellington Branch Sta. 36+55.6
(pool)

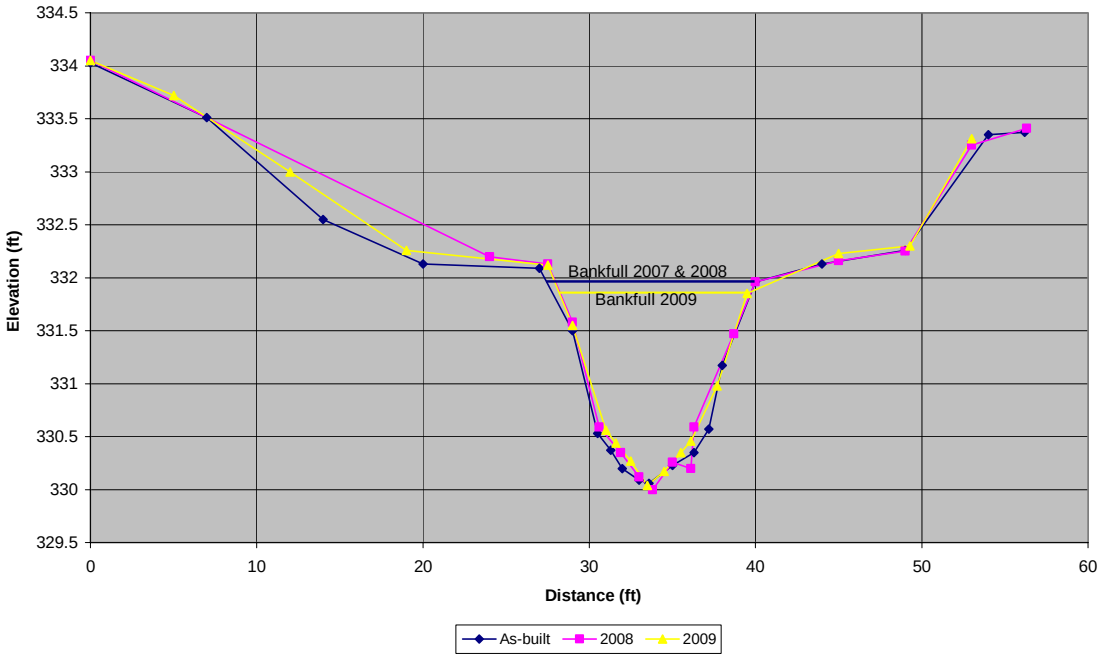


Facing downstream at Cross Section #11 (2009)

XSC #11 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	336.58		0	336.53		0	336.57										
3	335.59		3	335.62		4	335.41										
8	334.25		7	334.55		9	334										
12	333.26		12	333.21		13	333.02										
16	332.95		16	332.88		18	332.81										
20	332.76		19	332.7		23	332.83										
23	332.71	332.08	23	332.7		24	332.8	332.08									
25.3	331.17	332.08	25.7	331.3	332.42	25	331.15	332.08									
25.3	329.69	332.08	25.7	329.88	332.42	25	329.64	332.08									
26.3	329.21	332.08	26.4	329.26	332.42	27.5	329.3	332.08									
27.4	329.37	332.08	27.7	329.9	332.42	28.2	329.63	332.08									
29	329.82	332.08	29.3	330.21	332.42	29.6	330.64	332.08									
30.3	330.66	332.08	31	331.09	332.42	30.4	331.14	332.08									
32.2	331.05	332.08	32.7	331.16	332.42	33	331.09	332.08									
34.8	331.2	332.08	34.4	331.13	332.42	37	331.42	332.08									
40	331.54	332.08	36	331.2	332.42	41.9	331.8	332.08									
47	332.08	332.08	37	331.28	332.42	46	332.08	332.08									
57	332.91		40	331.56	332.42	57	332.94										
65.9	335.08		45	332	332.42	62	334.11										
			49	332.42	332.42												
			54	332.77													
			60	333.66													
			66	335.06													

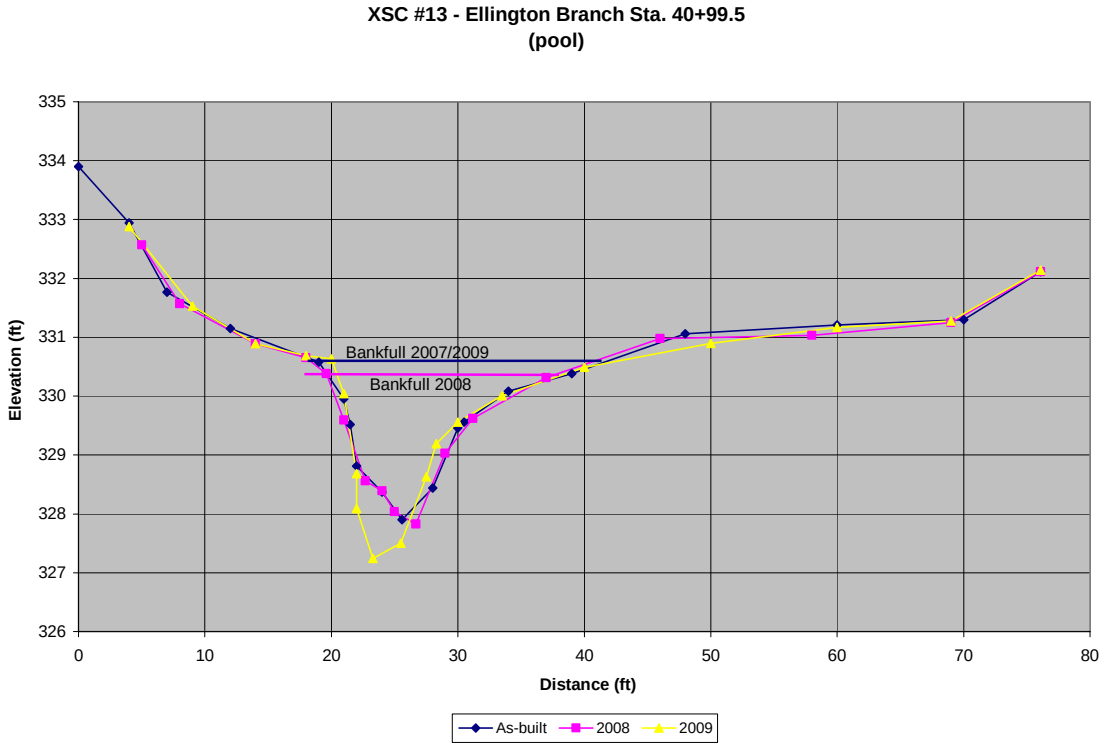
XSC #12 - Ellington Branch Sta. 38+49.7
(riffle)



Facing downstream at Cross Section #12 (2009)

XSC #12 - Riffle

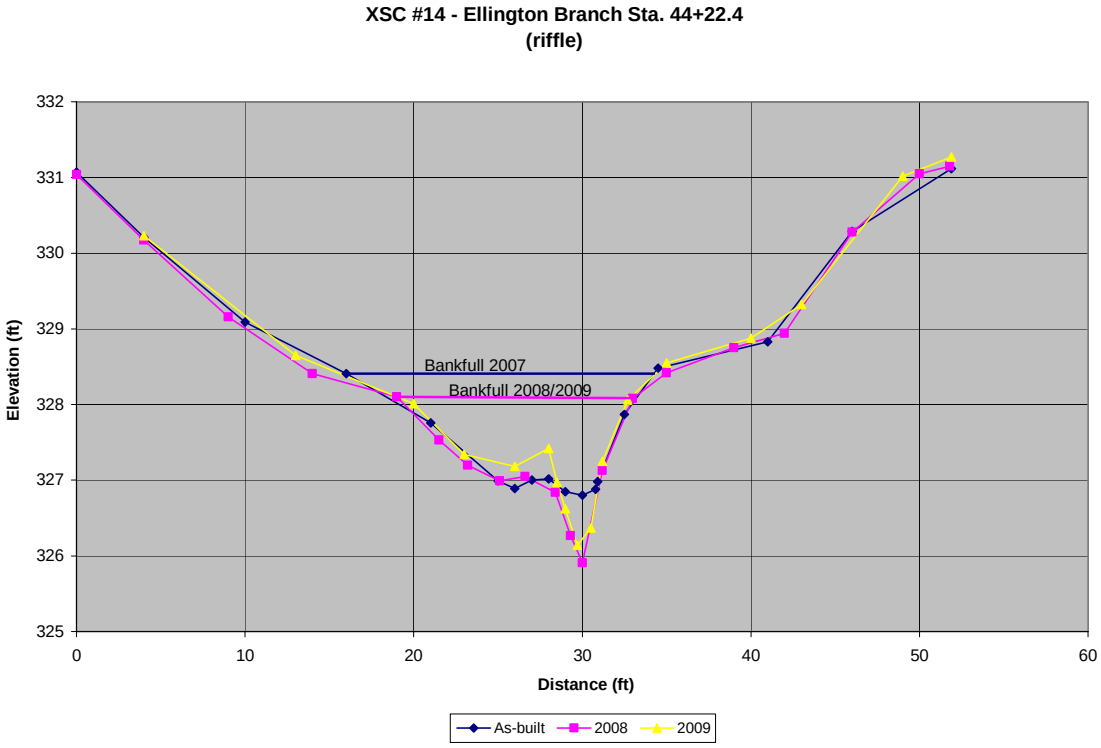
As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	334.03		0	334.05		0	334.05										
7	333.51		24	332.2		5	333.72										
14	332.55		27.5	332.13		12	333										
20	332.13		29	331.58	331.96	19	332.26										
27	332.09	331.96	30.6	330.59	331.96	27.5	332.12	332.12									
29	331.5	331.96	31.9	330.35	331.96	29	331.55	332.12									
30.5	330.53	331.96	33	330.12	331.96	31	330.56	332.12									
31.3	330.37	331.96	33.8	330	331.96	31.6	330.44	332.12									
32	330.2	331.96	35	330.26	331.96	32.5	330.27	332.12									
33	330.09	331.96	36.1	330.2	331.96	33.5	330.04	332.12									
33.6	330.06	331.96	36.3	330.59	331.96	34.5	330.17	332.12									
35	330.23	331.96	38.7	331.47	331.96	35.5	330.35	332.12									
36.3	330.35	331.96	40	331.96	331.96	36.1	330.46	332.12									
37.2	330.57	331.96	45	332.16		37.7	330.98	332.12									
38	331.17	331.96	49	332.25		39.5	331.85	332.12									
40	331.96	331.96	53	333.25		45	332.23	332.12									
44	332.13		56.3	333.41		49.3	332.3										
49	332.26					53	333.31										
54	333.35																
56.2	333.37																



Facing downstream at Cross Section #13 (2009)

XSC #13 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	333.9																
4	332.94		5	332.57		4	332.88										
7	331.77		8	331.57		9	331.53										
12	331.15		14	330.89		14	330.89										
19	330.58	330.58	18	330.65	330.65	18	330.69										
21	329.95	330.58	19.6	330.38	330.65	20	330.63	330.49									
21.5	329.52	330.58	21	329.59	330.65	21	330.04	330.49									
22	328.81	330.58	22.7	328.56	330.65	22	328.68	330.49									
24	328.37	330.58	24	328.39	330.65	22	328.09	330.49									
25.6	327.9	330.58	25	328.04	330.65	23.3	327.24	330.49									
28	328.44	330.58	26.7	327.83	330.65	25.5	327.5	330.49									
30	329.46	330.58	29	329.03	330.65	27.5	328.63	330.49									
30.5	329.56	330.58	31.2	329.62	330.65	28.3	329.19	330.49									
34	330.08	330.58	37	330.31	330.65	30	329.56	330.49									
39	330.38	330.58	46	330.98		33.5	330.01	330.49									
48	331.06	330.58	58	331.03		40	330.49	330.49									
60	331.21		69	331.25		50	330.9										
70	331.3		76.1	332.11		60	331.17										
76.1	332.11					69	331.28										
						76.1	332.14										

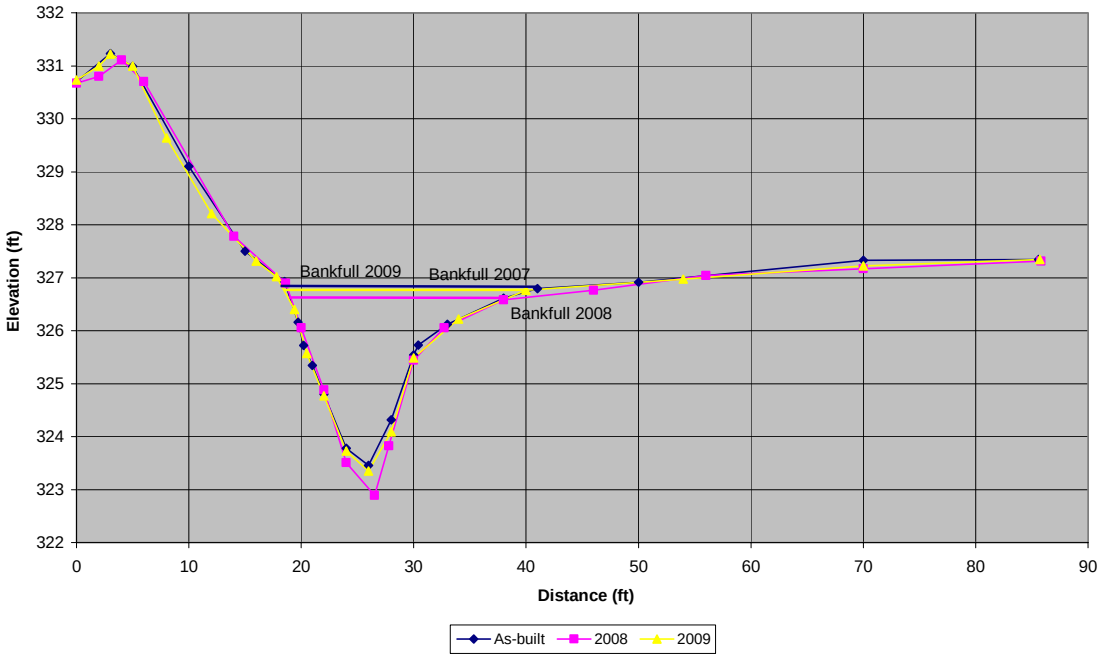


Facing downstream at Cross Section #14 (2009)

XSC #14 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	331.07		0	331.04													
4	330.21		4	330.17		4	330.23										
10	329.09		9	329.16		13	328.65	328.55									
16	328.41	328.41	14	328.41		20	328.01	328.55									
21	327.76	328.41	19	328.1	328.1	23	327.34	328.55									
25	326.99	328.41	21.5	327.53	328.1	26	327.18	328.55									
26	326.89	328.41	23.2	327.2	328.1	28	327.42	328.55									
27	327	328.41	25.1	326.99	328.1	28.5	326.97	328.55									
28	327.02	328.41	26.6	327.05	328.1	29	326.62	328.55									
29	326.85	328.41	28.4	326.84	328.1	29.7	326.14	328.55									
30	326.8	328.41	29.3	326.27	328.1	30.5	326.37	328.55									
30.8	326.88	328.41	30	325.91	328.1	31.2	327.25	328.55									
30.9	326.98	328.41	31.2	327.13	328.1	32.7	328.06	328.55									
32.5	327.87	328.41	33	328.08		35	328.55	328.55									
34.5	328.48	328.41	35	328.42		40	328.88										
41	328.83		39	328.75		43	329.32										
46	330.29		42	328.94		49	331.02										
51.9	331.12		46	330.28		51.9	331.27										
			50	331.05													
			51.8	331.15													

XSC #15 - Ellington Branch Sta. 46+79.1
(pool)

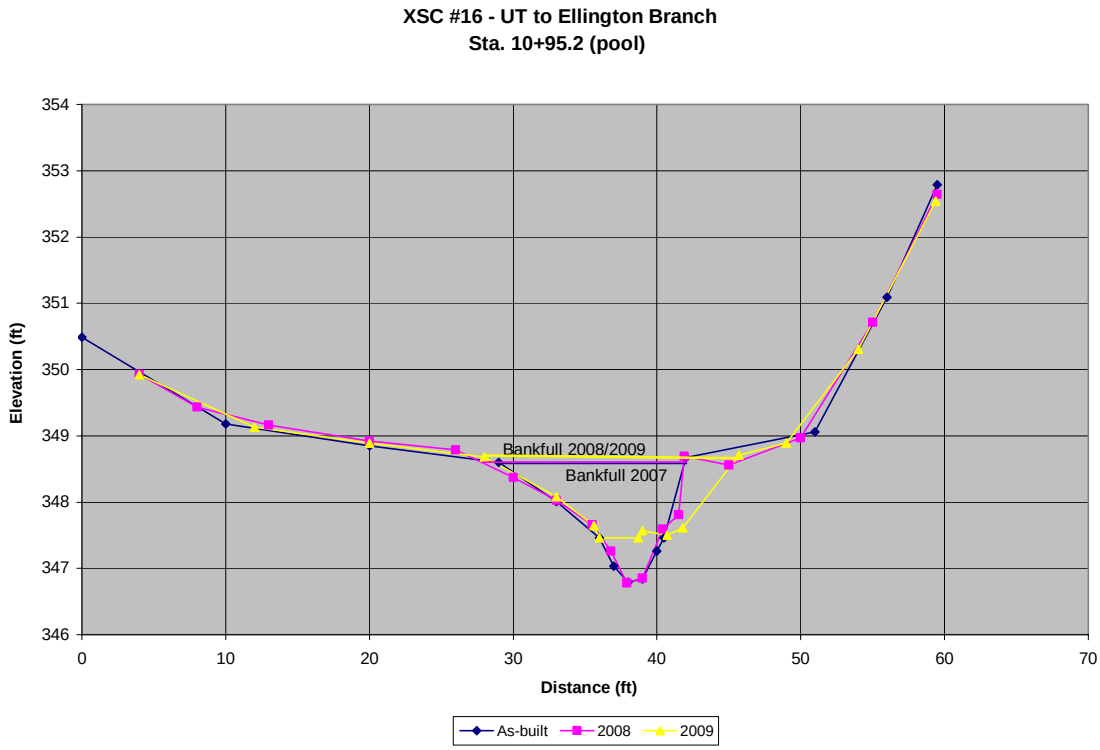


Facing downstream at Cross Section #15 (2009)

XSC #15 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	330.7		0	330.67		0	330.73										
3	331.23		2	330.8		2	331										
5	330.99		4	331.11		3	331.22										
10	329.1		6	330.7		5	331										
15	327.5		14	327.78		8	329.64										
18.5	326.93	326.79	18.6	326.9		12	328.21										
19.7	326.16	326.79	20	326.05	326.05	16	327.31										
20.2	325.72	326.79	22	324.88	326.05	17.8	327.02										
21	325.34	326.79	24	323.51	326.05	19.4	326.4										
22	324.8	326.79	26.5	322.89	326.05	20.5	325.57										
24	323.78	326.79	27.8	323.83	326.05	22	324.77										
26	323.46	326.79	30	325.44	326.05	24	323.73										
28	324.32	326.79	32.7	326.05	326.05	26	323.35										
30	325.54	326.79	38	326.58		28	324.09										
30.4	325.73	326.79	46	326.76		30	325.49										
33	326.12	326.79	56	327.04		34	326.22										
38	326.61	326.79	70	327.17		40	326.76										
41	326.79	326.79	85.8	327.31		54	326.97										
50	326.91					70	327.22										
70	327.33					85.7	327.34										
85.6	327.34																

APPENDIX C-3 Continued:
CROSS SECTION PLOTS AND RAW DATA TABLES – UT ELLINGTON BRANCH



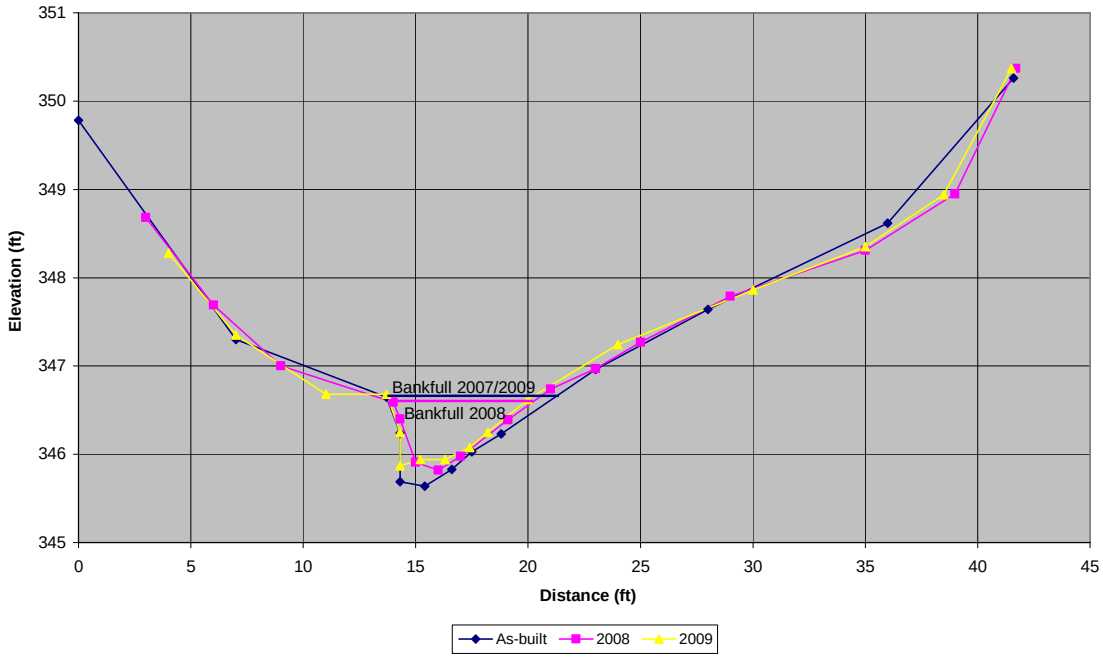
Facing downstream at Cross Section #16 (2009)

Note: Cross Section #16 increased in width due to the breakdown of the coir log that was installed along the outside of the meanderbend. This area is stable and current scour is not present.

XSC #16 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	350.49		4	349.93		4	349.92										
10	349.18		8	349.43		12	349.13										
20	348.85		13	349.16		20	348.89										
29	348.6	348.6	20	348.92		28	348.68										
33	348.01	348.6	26	348.79		33	348.08										
36	347.46	348.6	30	348.37	348.6	35.6	347.65										
37	347.03	348.6	33	348.03	348.6	36	347.46										
38	346.79	348.6	35.5	347.66	348.6	38.7	347.46										
39	346.84	348.6	36.8	347.26	348.6	39	347.57										
40	347.26	348.6	37.9	346.78	348.6	40.7	347.5										
40.5	347.46	348.6	39	346.85	348.6	41.8	347.61										
42	348.67	348.6	40.4	347.59	348.6	45.7	348.71										
51	349.06		41.5	347.81	348.6	49	348.89										
56	351.09		41.9	348.69		54	350.31										
59.5	352.79		45	348.56		59.4	352.54										
			50	348.97													
			55	350.71													
			59.5	352.64													

XSC #17 - UT to Ellington Branch
Sta. 12+35.1 (riffle)

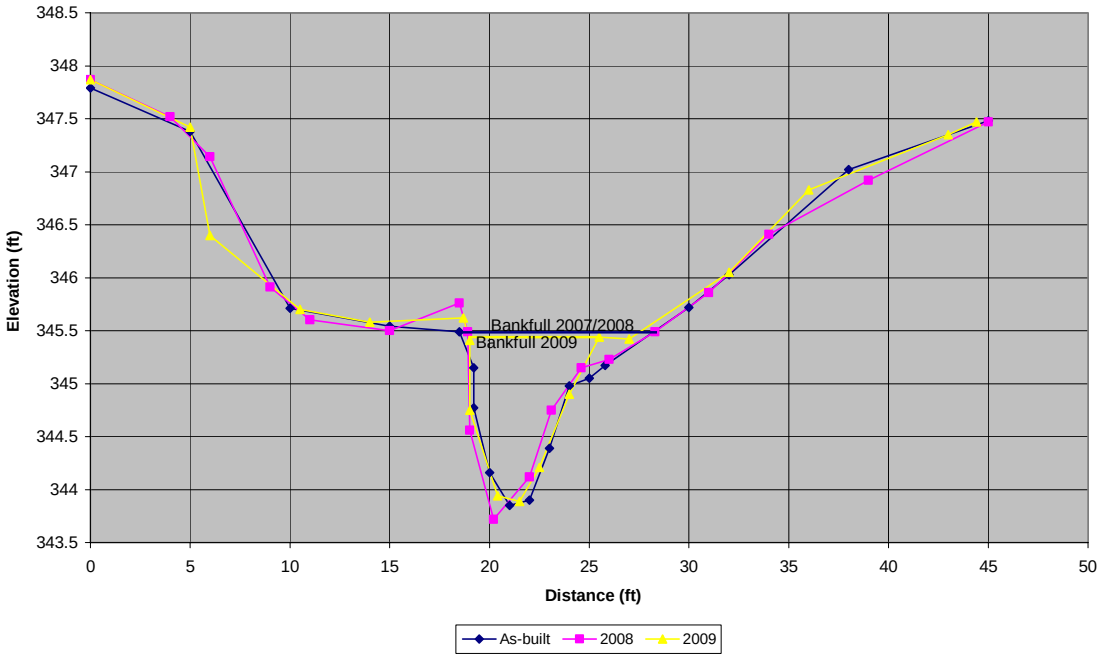


Facing downstream at Cross Section #17 (2009)

XSC #17 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	349.78		3	348.68		4	348.28										
7	347.3		6	347.69		7	347.35										
13.7	346.65	346.65	9	347		11	346.68										
14.3	346.24	346.65	14	346.59		13.7	346.68										
14.3	345.69	346.65	14.3	346.4	346.4	14.3	346.25										
15.4	345.64	346.65	15	345.91	346.4	14.3	345.87										
16.6	345.83	346.65	16	345.82	346.4	15.2	345.94										
17.5	346.03	346.65	17	345.98	346.4	16.3	345.94										
18.8	346.23	346.65	19.1	346.39	346.4	17.4	346.08										
23	346.96	346.65	21	346.74		18.2	346.25										
28	347.64		23	346.97		20	346.62										
36	348.62		25	347.27		24	347.24										
41.6	350.26		29	347.79		30	347.86										
			35	348.31		35	348.35										
			39	348.95		38.5	348.94										
			41.7	350.37		41.5	350.37										

XSC #18 - UT to Ellington Branch
Sta. 13+75.2 (pool)

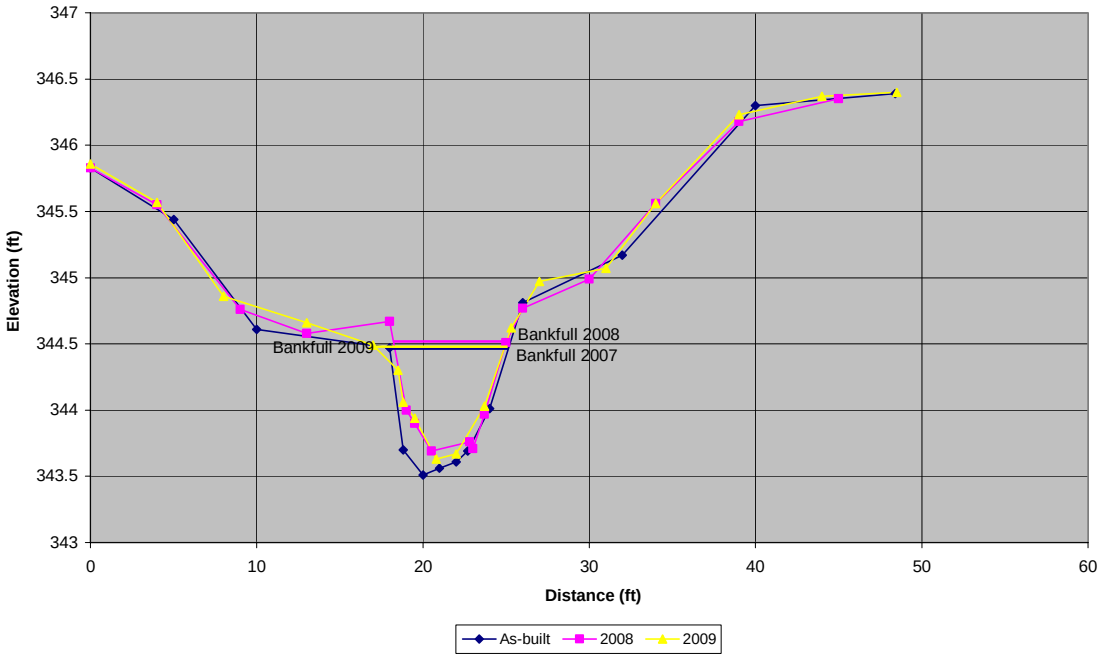


Facing downstream at Cross Section #18 (2009)

XSC #18 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	347.79		0	347.87		0	347.87										
5	347.38		4	347.52		5	347.42										
10	345.71		6	347.14		6	346.4										
15	345.54		9	345.91		10.5	345.7										
18.5	345.49	345.49	11	345.6		14	345.58										
19.2	345.15	345.49	15	345.5		18.7	345.62	345.62									
19.2	344.77	345.49	18.5	345.76		19	345.41	345.62									
20	344.16	345.49	18.9	345.49	345.49	19	344.75	345.62									
21	343.85	345.49	19	344.56	345.49	20.4	343.94	345.62									
22	343.9	345.49	20.2	343.72	345.49	21.5	343.89	345.62									
23	344.39	345.49	22	344.12	345.49	22.5	344.21	345.62									
24	344.98	345.49	23.1	344.75	345.49	24	344.9	345.62									
25	345.05	345.49	24.6	345.15	345.49	25.5	345.44	345.62									
25.8	345.17	345.49	26	345.23	345.49	27	345.42	345.62									
30	345.72	345.49	28.3	345.49	345.49	32	346.05	345.62									
32	346.03		31	345.86		36	346.83										
38	347.02		34	346.41		43	347.35										
45	347.48		39	346.92		44.4	347.47										
			45	347.47													

XSC #19 - UT to Ellington Branch
15+39.2 (riffle)

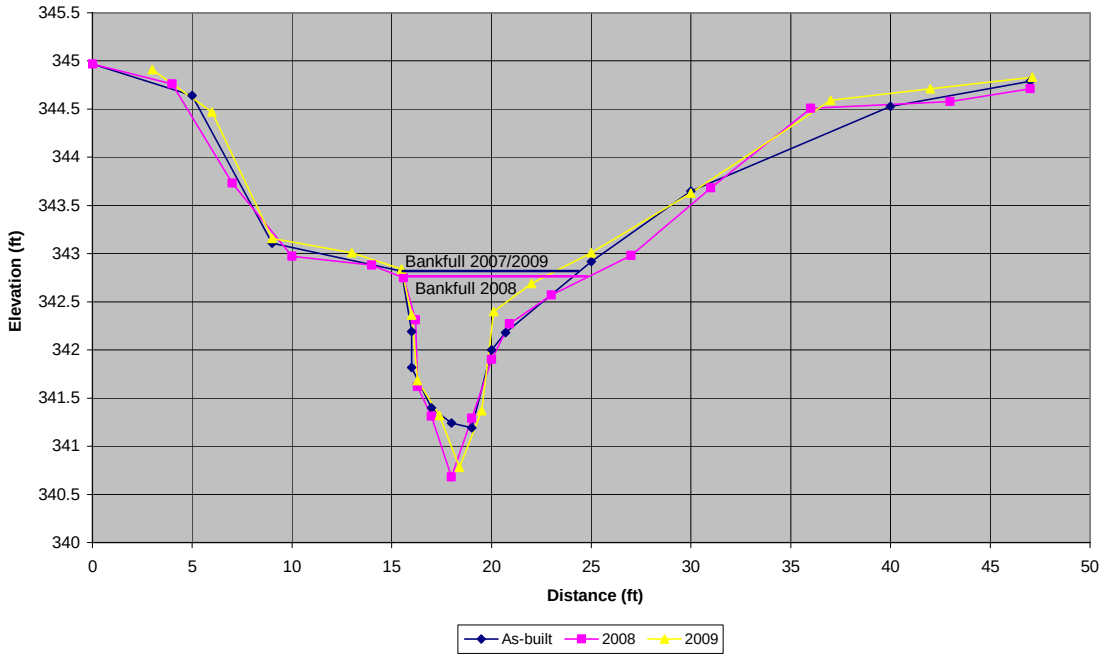


Facing downstream at Cross Section #19 (2009)

XSC #19 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	345.83		0	345.83		0	345.86										
5	345.44		4	345.55		4	345.57										
10	344.61		9	344.76		8	344.86										
18	344.47	344.47	13	344.58		13	344.66										
18.8	343.7	344.47	18	344.67		17	344.49	344.49									
20	343.51	344.47	19	344	344.51	18.5	344.3	344.49									
21	343.56	344.47	19.5	343.9	344.51	18.8	344.06	344.49									
22	343.61	344.47	20.5	343.69	344.51	19.5	343.94	344.49									
22.7	343.69	344.47	22.8	343.76	344.51	20.8	343.63	344.49									
24	344.01	344.47	23	343.71	344.51	22	343.67	344.49									
26	344.81	344.47	23.7	343.97	344.51	23.7	344.03	344.49									
32	345.17		25	344.51	344.51	25.3	344.62	344.49									
40	346.3		26	344.77		27	344.97										
48.4	346.39		30	344.99		31	345.07										
			34	345.56		34	345.56										
			39	346.18		39	346.23										
			45	346.35		44	346.37										
						48.5	346.4										

XSC #20 - UT to Ellington Branch
Sta. 16+82.0 (pool)

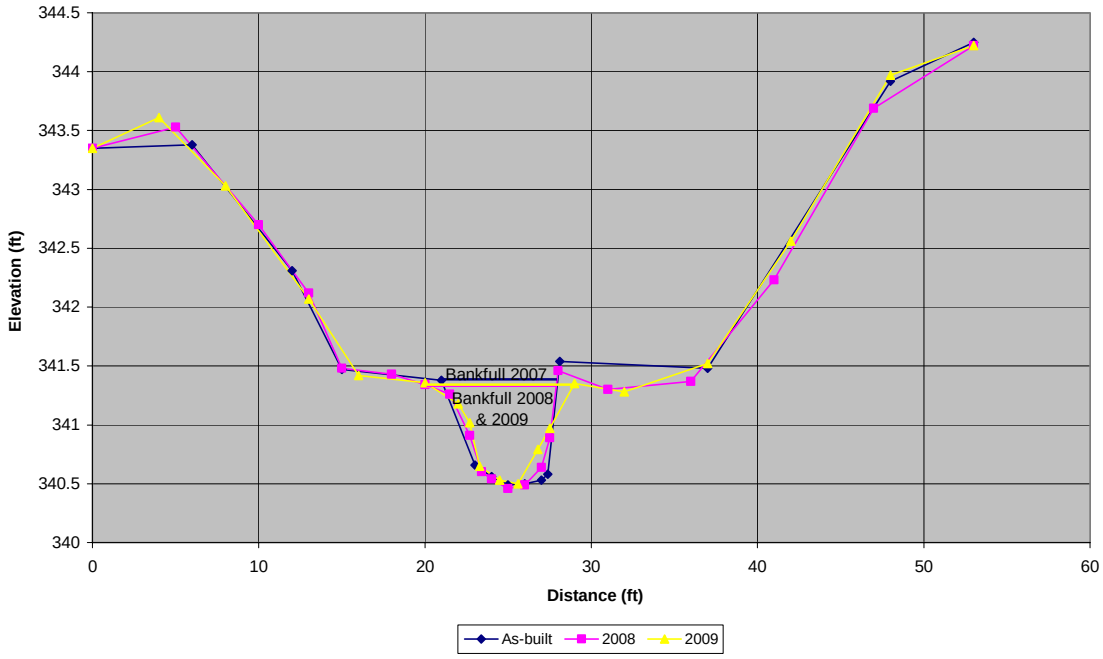


Facing downstream at Cross Section #20 (2009)

XSC #20 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	344.97		0	344.97		3	344.91										
5	344.64		4	344.76		6	344.47										
9	343.11		7	343.73		9	343.16										
15.5	342.82	342.82	10	342.97		13	343.01										
16	342.19	342.82	14	342.88		15.5	342.84	342.84									
16	341.82	342.82	15.6	342.75	342.75	16	342.36	342.84									
17	341.4	342.82	16.2	342.31	342.75	16.3	341.68	342.84									
18	341.24	342.82	16.3	341.62	342.75	17.4	341.32	342.84									
19	341.19	342.82	17	341.31	342.75	18.4	340.78	342.84									
20	342	342.82	18	340.68	342.75	19.5	341.37	342.84									
20.7	342.18	342.82	19	341.29	342.75	20.1	342.4	342.84									
25	342.92	342.82	20	341.9	342.75	22	342.69	342.84									
30	343.65		20.9	342.27	342.75	25	343.01	342.84									
40	344.53		23	342.57	342.75	30	343.63										
47	344.79		27	342.98		37	344.59										
			31	343.68		42	344.71										
			36	344.51		47.1	344.83										
			43	344.58													
			47	344.71													

XSC #21 - UT to Ellington Branch
Sta. 18+64.8 (riffle)

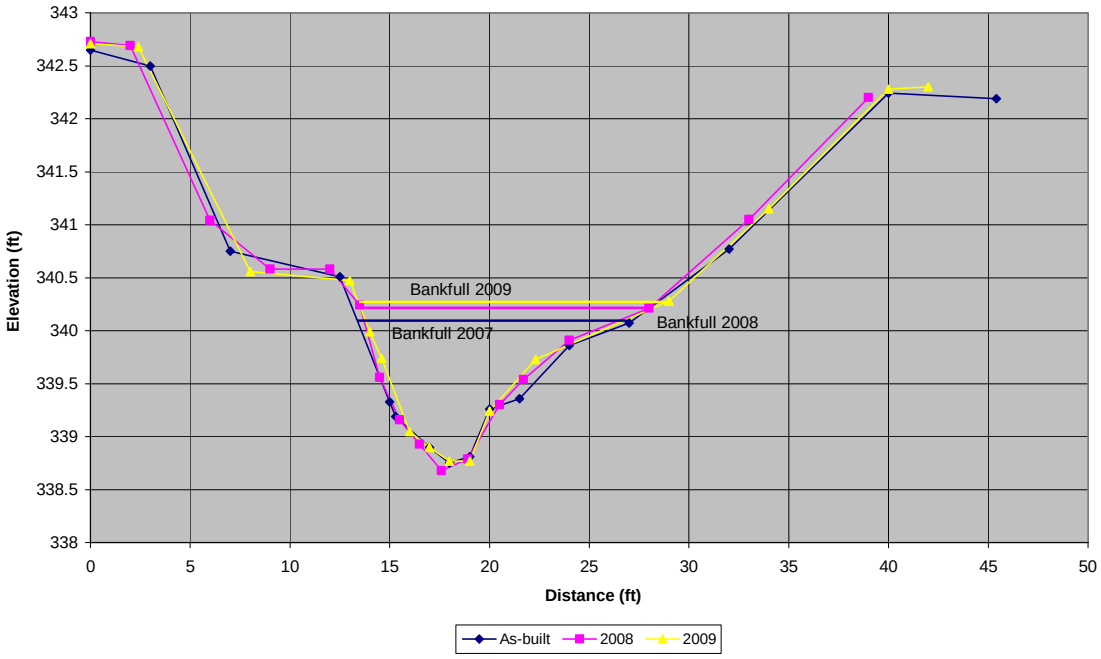


Facing downstream at Cross Section #21 (2009)

XSC #21 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	343.35		0	343.35		0	343.35										
6	343.38		5	343.53		4	343.61										
12	342.31		10	342.7		8	343.03										
15	341.47		13	342.12		13	342.07										
21	341.38	341.38	15	341.48		16	341.42										
23	340.66	341.38	18	341.43		20	341.36										
24	340.56	341.38	20	341.34	341.34	22	341.18										
25	340.49	341.38	21.5	341.26	341.34	22.7	341.02										
26	340.5	341.38	22.7	340.91	341.34	23.3	340.65										
27	340.53	341.38	23.4	340.6	341.34	24.5	340.53										
27.4	340.58	341.38	24	340.54	341.34	25.6	340.5										
28.1	341.54	341.38	25	340.46	341.34	26.8	340.79										
37	341.48		26	340.49	341.34	27.5	340.97										
48	343.92		27	340.64	341.34	29	341.35										
53	344.25		27.5	340.89	341.34	32	341.28										
			28	341.46		37	341.52										
			31	341.3		42	342.56										
			36	341.37		48	343.97										
			41	342.23		53	344.22										
			47	343.69													
			53	344.22													

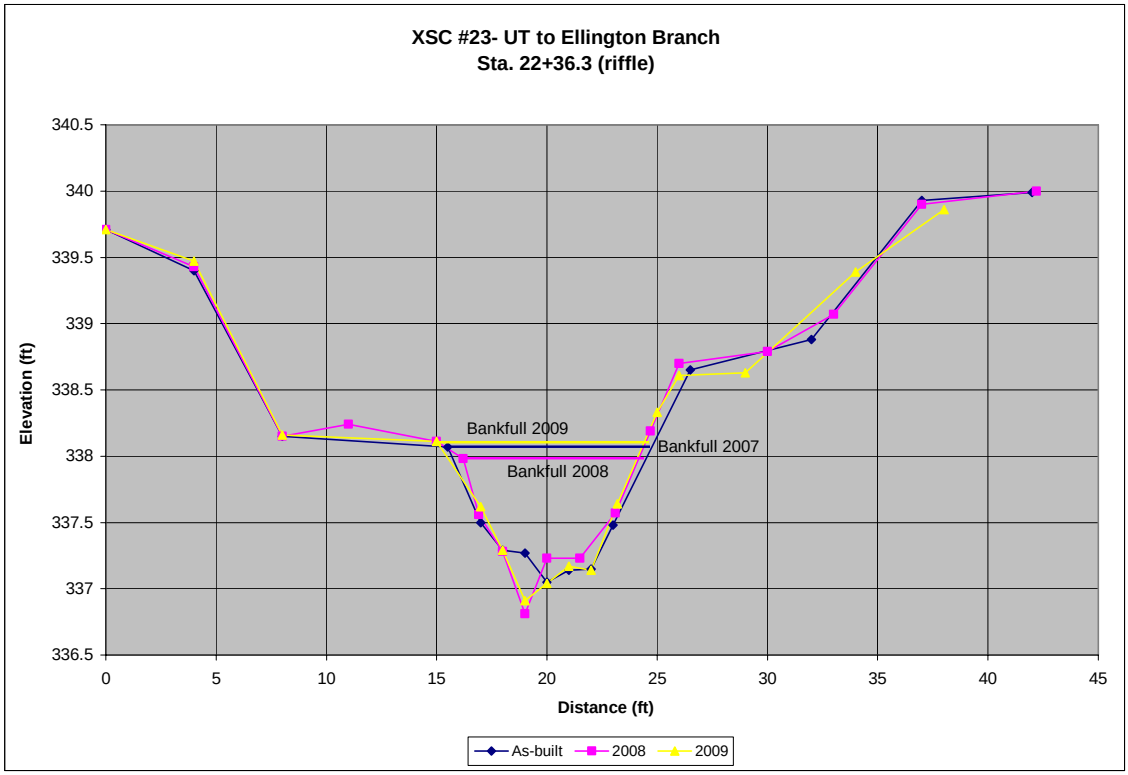
XSC #22 - UT to Ellington Branch
Sta. 19+73.0 (pool)



Facing downstream at Cross Section #22 (2009)

XSC #22 - Pool

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	342.65		0	342.73		0	342.71										
3	342.5		2	342.69		2.4	342.68										
7	340.75		6	341.04		8	340.56										
12.5	340.51	340.07	9	340.58		13	340.47	340.47									
15	339.33	340.07	12	340.58		14	339.99	340.47									
15.3	339.19	340.07	13.5	340.24		14.6	339.74	340.47									
17	338.9	340.07	14.5	339.56	340.21	16	339.05	340.47									
18	338.75	340.07	15.5	339.16	340.21	17	338.9	340.47									
19	338.81	340.07	16.5	338.93	340.21	18	338.77	340.47									
20	339.26	340.07	17.6	338.68	340.21	19	338.77	340.47									
21.5	339.36	340.07	18.9	338.79	340.21	20	339.24	340.47									
24	339.86	340.07	20.5	339.3	340.21	22.3	339.73	340.47									
27	340.07	340.07	21.7	339.54	340.21	29	340.28	340.47									
32	340.77		24	339.91	340.21	34	341.15	340.47									
40	342.24		28	340.21	340.21	40	342.28										
45.4	342.19		33	341.05		42	342.3										
			39	342.2													

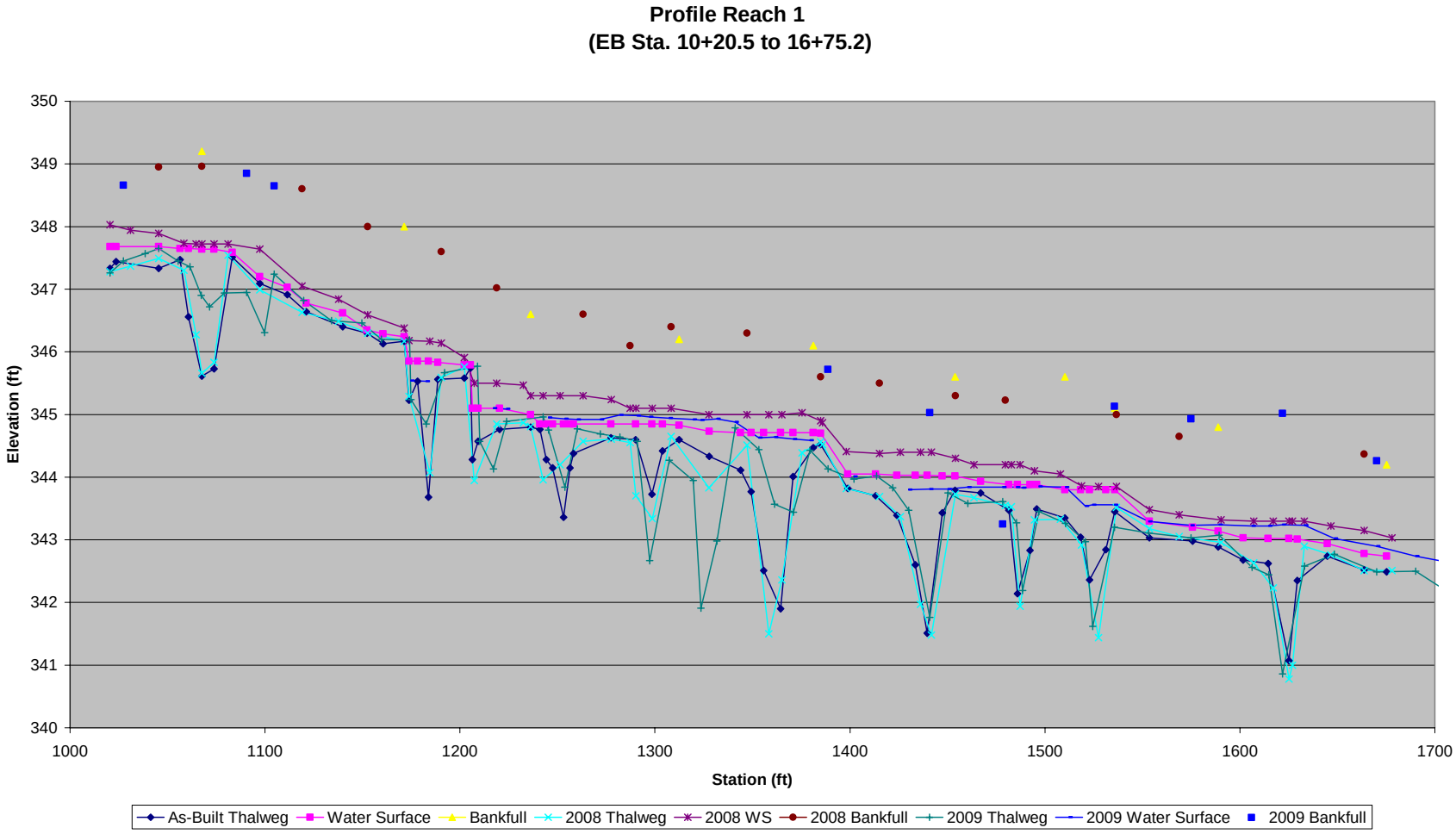


Facing downstream at Cross Section #23 (2009)

XSC #23 - Riffle

As-built			Year 1			Year 2			Year 3			Year 4			Year 5		
Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF	Station	Elevation	BKF
0	339.71		0	339.71		0	339.71										
4	339.4		4	339.43		4	339.47	338.61									
8	338.15		8	338.15		8	338.16	338.61									
15.5	338.07	338.07	11	338.24		15	338.11	338.61									
17	337.5	338.07	15	338.11		17	337.62	338.61									
18	337.29	338.07	16.2	337.98	337.98	18	337.29	338.61									
19	337.27	338.07	16.9	337.56	337.98	19	336.91	338.61									
20	337.05	338.07	18	337.28	337.98	20	337.04	338.61									
21	337.14	338.07	19	336.81	337.98	21	337.17	338.61									
22	337.15	338.07	20	337.23	337.98	22	337.14	338.61									
23	337.48	338.07	21.5	337.23	337.98	23.2	337.64	338.61									
26.5	338.65	338.07	23.1	337.57	337.98	25	338.33	338.61									
32	338.88		24.7	338.19		26	338.61	338.61									
37	339.93		26	338.7		29	338.63										
42	339.99		30	338.79		34	339.39										
			33	339.07		38	339.86										
			37	339.9													
			42.2	340													

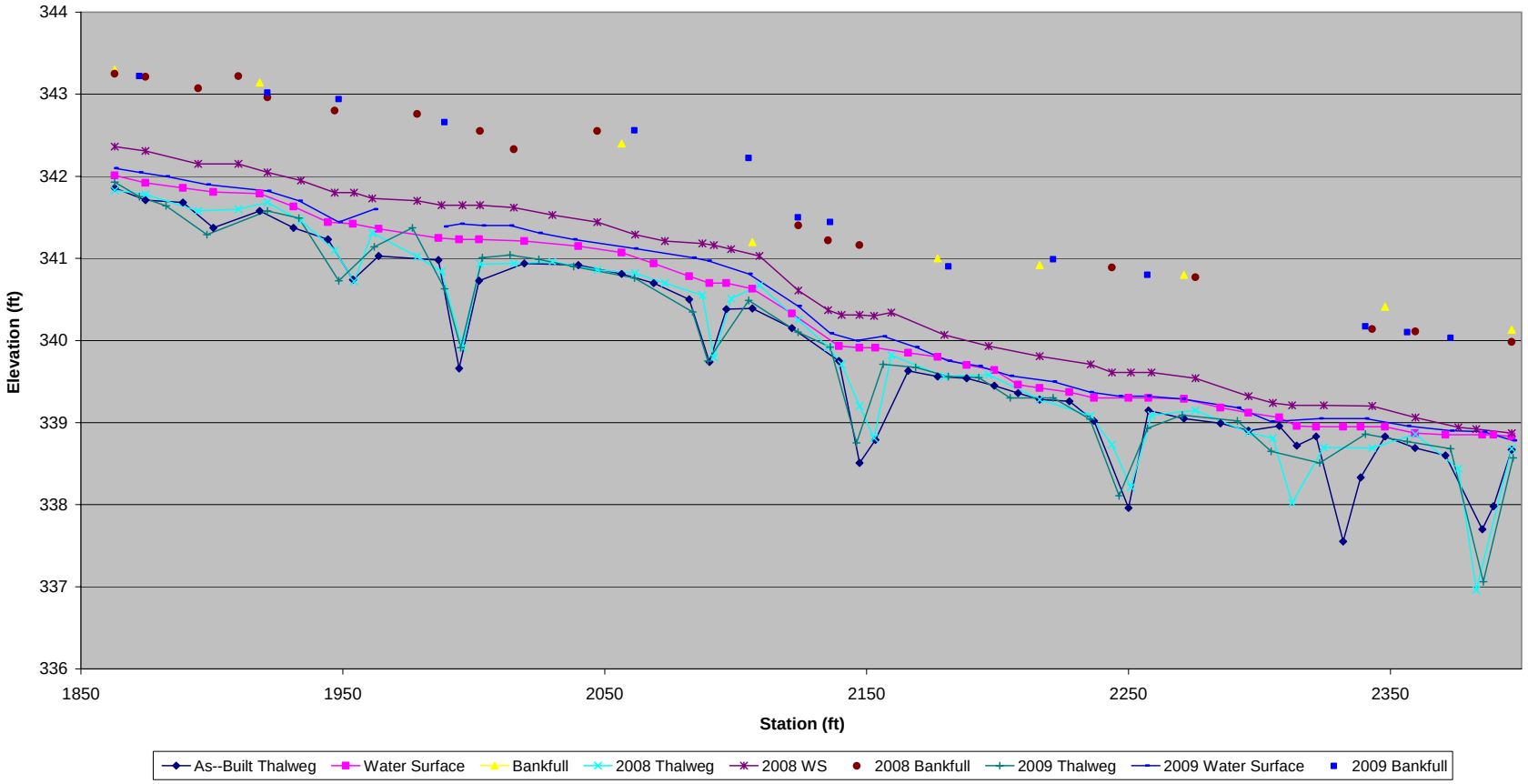
APPENDIX C-4:
LONGITUDINAL PLOTS AND RAW DATA TABLES



Profile Reach #1

As-Built					Year 1					Year 2				
Sta.	Elev	WS	Bankfull	Feature	Sta.	Elev	WS	Bankfull	Feature	Sta.	Elev	WS	Bankfull	Feature
1020.5	347.33	347.68			1020.5	347.28	348.03			1020.50	347.26			
1023.7	347.44	347.68			1030.96	347.37	347.94			1027.36	347.45		348.66	MaxD
1045.5	347.33	347.68			1045.43	347.49	347.89	348.95		1038.52	347.57			
1056.5	347.47	347.65		H Pool	1058.45	347.3	347.73			1045.40	347.65			Hriff
1060.7	346.56	347.65			1064.62	346.27	347.72			1055.50	347.45			
1067.7	345.61	347.64	349.2	Max D	1067.7	345.66	347.72	348.96		1061.62	347.36			Hpool
1073.9	345.73	347.64		H Glide	1073.84	345.83	347.72			1067.33	346.9			MaxD
1083.2	347.51	347.59		H Riffle	1081.07	347.54	347.72			1071.53	346.72			XS#1
1097.4	347.09	347.2			1097.37	346.99	347.64			1079.05	346.94			MaxD
1111.5	346.91	347.03			1119	346.63	347.05	348.6		1090.66	346.95		348.85	
1121.2	346.64	346.78			1137.76	346.49	346.84			1099.80	346.31			
1139.8	346.4	346.62			1152.64	346.3	346.59	348		1104.73	347.24		348.65	
1152.4	346.3	346.35			1171.4	346.17	346.38		X-Vane	1119.77	346.82			
1160.6	346.13	346.29		H Run	1173.8	345.29	346.18			1134.10	346.5			
1171.4	346.17	346.24	348	X-Vane	1184.51	344.07	346.17			1149.78	346.46			
1173.8	345.23	345.85		H Pool	1190.39	345.59	346.14	347.6		1159.79	346.2			
1178.3	345.53	345.85			1202.3	345.76	345.91		X-Vane	1174.20	346.19			X-Vane
1183.8	343.68	345.85		Max D	1207.35	343.95	345.5			1174.76	345.24	345.54		Hpool
1188.7	345.56	345.83		H Glide	1218.86	344.85	345.5	347.02		1182.75	344.85	345.53		MaxD
1202.3	345.58	345.79		X-Vane	1232.38	344.87	345.47			1192.15	345.67			
1205.3	345.74	345.79		H Pool	1236.3	344.81	345.3		X-Vane	1208.92	345.77			X-Vane
1206.3	344.28	345.1		Max D	1242.61	343.96	345.3			1210.10	344.57			Hpool
1209.3	344.57	345.1			1251.26	344.2	345.3			1217.12	344.13	345.1		MaxD
1220.3	344.76	345.1			1263.12	344.57	345.3	346.6		1223.92	344.89	345.09		
1236.3	344.8	345	346.6	X-Vane	1277.58	344.61	345.24			1242.69	344.96			X-Vane
1241	344.76	344.85		H Pool	1287.28	344.55	345.1	346.1		1245.42	344.75	344.95		
1244.2	344.28	344.85			1290.25	343.7	345.1			1253.86	343.84	344.93		MaxD
1247.6	344.15	344.85		Max D	1298.55	343.34	345.1			1260.24	344.77	344.92		
1253.2	343.36	344.85			1308.34	344.65	345.1	346.4		1272.07	344.69	344.92		
1256.4	344.15	344.85		H Glide	1327.7	343.83	345			1282.05	344.64	344.99		
1258.2	344.38	344.85			1347.26	344.51	345	346.3		1290.88	344.57	344.98		Hpool
1277.4	344.63	344.85			1358.41	341.5	345			1297.38	342.67	344.96		MaxD
1290	344.6	344.85		H Pool	1365.11	342.36	345			1307.38	344.27	344.94		
1298.5	343.73	344.85		Max D	1375.46	344.39	345.03			1319.60	343.95	344.92		
1303.8	344.42	344.85		H Glide	1385	344.56	344.9	345.6		1323.53	341.91	344.91		
1312.4	344.6	344.83	346.2	H Riffle	1385.9	344.52	344.87			1331.85	342.98	344.93		MaxD
1327.9	344.33	344.73		H Run	1398.16	343.82	344.41			1341.09	344.79	344.88		
1344	344.11	344.71		H Pool	1415.2	343.69	344.38	345.5		1353.32	344.44	344.63		
1349.4	343.77	344.71			1425.82	343.37	344.4			1361.25	343.57	344.64		
1355.8	342.51	344.71			1436.14	341.97	344.4			1370.95	343.44	344.61		
1364.4	341.9	344.71		Max D	1441.71	341.48	344.4			1379.52	344.43	344.59		
1370.9	344.01	344.71		H Glide	1454.01	343.73	344.3	345.3		1388.68	344.13		345.72	XS#2
1381.2	344.47	344.71	346.1	H Riff	1463.55	343.67	344.2			1401.98	343.97	344.01		
1385	344.52	344.7			1479.66	343.55	344.2	345.23		1413.72	344.02			
1398.9	343.82	344.05		H Run	1482.73	343.53	344.2			1421.84	343.83			
1413.2	343.7	344.05			1487.16	341.94	344.2			1430.09	343.47	343.8		Hpool
1424.1	343.39	344.03		H Pool	1494.69	343.32	344.1			1440.93	341.76	343.81	345.03	MaxD
1433.6	342.6	344.03			1507.85	343.33	344.05			1450.28	343.75	343.81		
1439.6	341.51	344.03		Max D	1518.68	342.92	343.86			1460.56	343.58	343.84		
1447.3	343.43	344.02		H Glide	1527.45	341.44	343.85			1478.39	343.61	343.84	343.25	
1453.9	343.79	344.02	345.6		1536.66	343.52	343.85	345		1485.38	343.27	343.84		HPool
1467.1	343.75	343.93			1553.56	343.18	343.48			1488.63	342.19	343.83		MaxD
1481.5	343.47	343.88			1568.83	343.05	343.4	344.65		1496.92	343.45	343.85		
1486	342.14	343.88			1590.37	342.96	343.32			1510.62	343.26	343.84		
1492.3	342.83	343.88			1607.13	342.63	343.3			1520.72	342.97	343.54		Hpool
1495.7	343.49	343.88			1617.09	342.23	343.3			1524.56	341.62	343.56		
1510.2	343.35	343.8	345.6		1625.2	340.78	343.3			1535.64	343.2	343.56	345.13	Hriff
1518.2	343.04	343.8			1626.96	341	343.3			1553.18	343.11	343.29		
1522.8	342.36	343.8			1633.08	342.9	343.3			1574.97	343.03	343.23	344.93	
1531.3	342.84	343.8			1646.72	342.76	343.22			1589.39	343.07	343.24		
1535.8	343.45	343.8	345.1		1663.65	342.51	343.15	344.37		1606.19	342.56	343.22		
1553.5	343.03	343.3			1678.03	342.51	343.03			1614.74	342.44	343.22		
1575.8	342.98	343.2								1621.90	340.86	343.24	345.02	XS #2
1588.9	342.89	343.14	344.8							1633.14	342.58	343.23		
1601.7	342.68	343.03								1648.38	342.77	343.02		
1614.4	342.62	343.02								1670.13	342.49	342.9	344.26	
1625.2	341.07	343.02								1690.08	342.5	342.74		
1629.4	342.35	343.01								1710.13	342.1	342.62		
1644.8	342.74	342.94								1713.93	341.35	342.64		
1663.7	342.52	342.78								1721.25	342.31	342.65		
1675.2	342.49	342.74	344.2							1733.15	342.31	342.55	344.12	

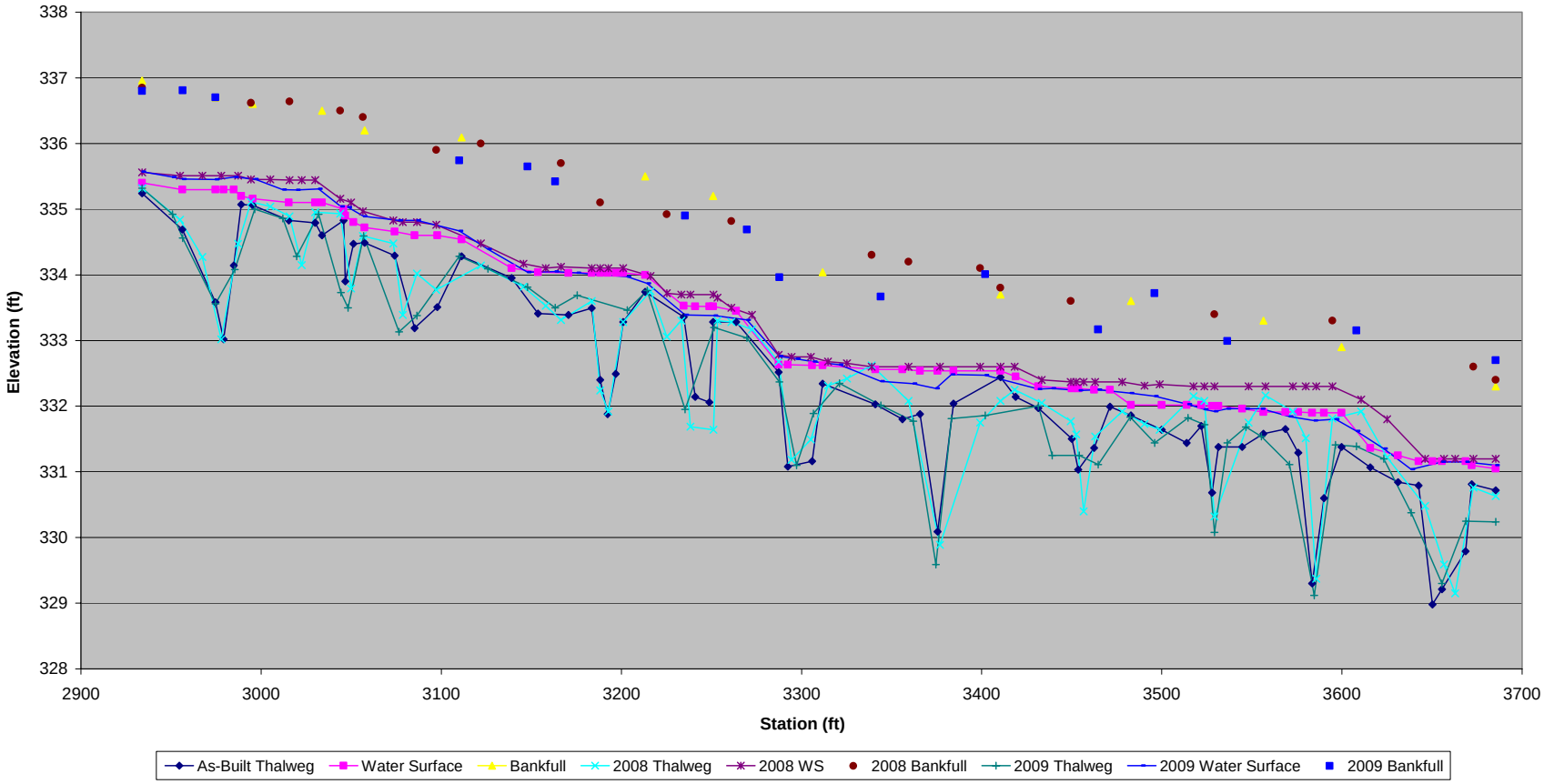
Profile Reach 2
(EB Sta. 18+62.9 to 23+96.3)



Profile Reach #2

As-Built					Year 1					Year 2				
Sta.	Elev	WS	Bankfull	Feature	Sta.	Elev	WS	Bankfull	Feature	Sta.	Elev	WS	Bankfull	Feature
1862.9	341.86	342.01	343.3		1862.9	341.83	342.36	343.25		1862.90	341.93	342.10		
1874.7	341.71	341.92			1874.7	341.78	342.31	343.21		1872.33	341.75	342.05	343.22	XS
1889	341.68	341.86			1894.72	341.58	342.15	343.07		1882.52	341.64	342.00		
1900.6	341.37	341.81			1910.13	341.6	342.15	343.22		1898.09	341.29	341.90		
1918.3	341.58	341.79	343.14		1921.18	341.68	342.05	342.96		1921.22	341.58	341.82	343.02	
1931.2	341.37	341.63			1933.97	341.46	341.95			1933.20	341.49	341.70		
1944.3	341.23	341.44			1946.92	341.1	341.8	342.8		1948.48	340.73	341.44	342.94	
1953.8	340.74	341.42			1954.2	340.72	341.8			1962.01	341.14	341.60		
1963.6	341.03	341.36			1961.19	341.31	341.73			1976.55	341.37			
1986.5	340.98	341.25			1978.43	341.02	341.7	342.76		1988.78	340.63	341.39	342.66	
1994.4	339.66	341.23			1987.66	340.84	341.65			1994.96	339.91	341.42		MaxD
2002	340.73	341.23			1995.68	339.91	341.65			2003.27	341.01	341.40		
2019.3	340.94	341.21			2002.42	340.93	341.65	342.55		2013.88	341.04	341.40		
2039.9	340.92	341.15			2015.33	340.94	341.62	342.33		2024.81	340.99	341.31		
2056.4	340.81	341.07	342.4		2029.96	340.96	341.53			2038.09	340.90	341.23		
2068.7	340.7	340.94			2047.18	340.86	341.44	342.55		2061.32	340.76	341.12	342.56	
2082.2	340.5	340.78			2061.58	340.82	341.29			2083.51	340.35	341.01		
2090	339.74	340.7			2072.97	340.7	341.21			2089.31	339.75	340.97		MaxD
2096.4	340.38	340.7			2087.29	340.55	341.18			2104.87	340.49	340.81	342.22	
2106.4	340.39	340.63	341.2		2091.66	339.79	341.16			2123.75	340.10	340.42	341.50	
2121.4	340.15	340.33			2098.26	340.51	341.11			2136.08	339.92	340.09	341.44	
2139.4	339.75	339.93			2109.05	340.67	341.03			2146.10	338.75	340.00		XS
2147.3	338.51	339.91			2123.93	340.25	340.61	341.4		2156.23	339.71	340.05		
2153.3	338.79	339.91			2135.23	339.92	340.37	341.22		2168.68	339.67	339.92		
2165.8	339.63	339.85			2140.37	339.71	340.31			2181.15	339.56	339.75	340.90	
2177.1	339.56	339.8	341		2147.3	339.2	340.31	341.16		2192.76	339.55	339.69		
2188.1	339.54	339.7			2152.82	338.81	340.3			2204.79	339.30	339.57		
2198.7	339.45	339.64			2159.33	339.82	340.34			2221.19	339.30	339.50	340.99	
2207.8	339.36	339.46			2179.62	339.56	340.07			2235.22	339.04	339.37		
2216	339.28	339.42	340.92		2196.52	339.58	339.93			2246.36	338.11	339.32		
2227.4	339.26	339.37			2215.97	339.28	339.81			2257.20	338.93	339.32	340.80	
2236.8	339.02	339.3			2235.48	339.08	339.71			2270.48	339.09	339.29		
2250	337.96	339.3			2243.62	338.73	339.61	340.89		2291.54	339.02	339.18		
2257.6	339.15	339.3			2250.89	338.21	339.61			2304.43	338.65	339.01		
2271.1	339.05	339.29	340.8		2258.79	339.09	339.61			2323.00	338.51	339.05		MaxD
2285	338.99	339.18			2275.49	339.15	339.54	340.77		2340.39	338.86	339.05	340.17	
2295.8	338.9	339.12			2295.8	338.88	339.32			2356.40	338.77	338.96	340.10	
2307.5	338.96	339.06			2305.09	338.81	339.24			2372.88	338.68	338.90	340.03	
2314.2	338.72	338.96			2312.4	338.02	339.21			2385.44	337.06	338.89		MaxD
2321.5	338.83	338.95			2324.56	338.7	339.21			2396.79	338.57	338.78		
2331.9	337.55	338.95			2343	338.69	339.2	340.14						
2338.6	338.33	338.95			2359.53	338.86	339.06	340.11						
2347.9	338.83	338.95	340.41		2375.9	338.44	338.94							
2359.3	338.69	338.87			2382.7	336.96	338.92							
2371	338.6	338.85			2396.3	338.68	338.87	339.98						
2385	337.7	338.85												
2389.3	337.98	338.85												
2396.3	338.67	338.83	340.13											

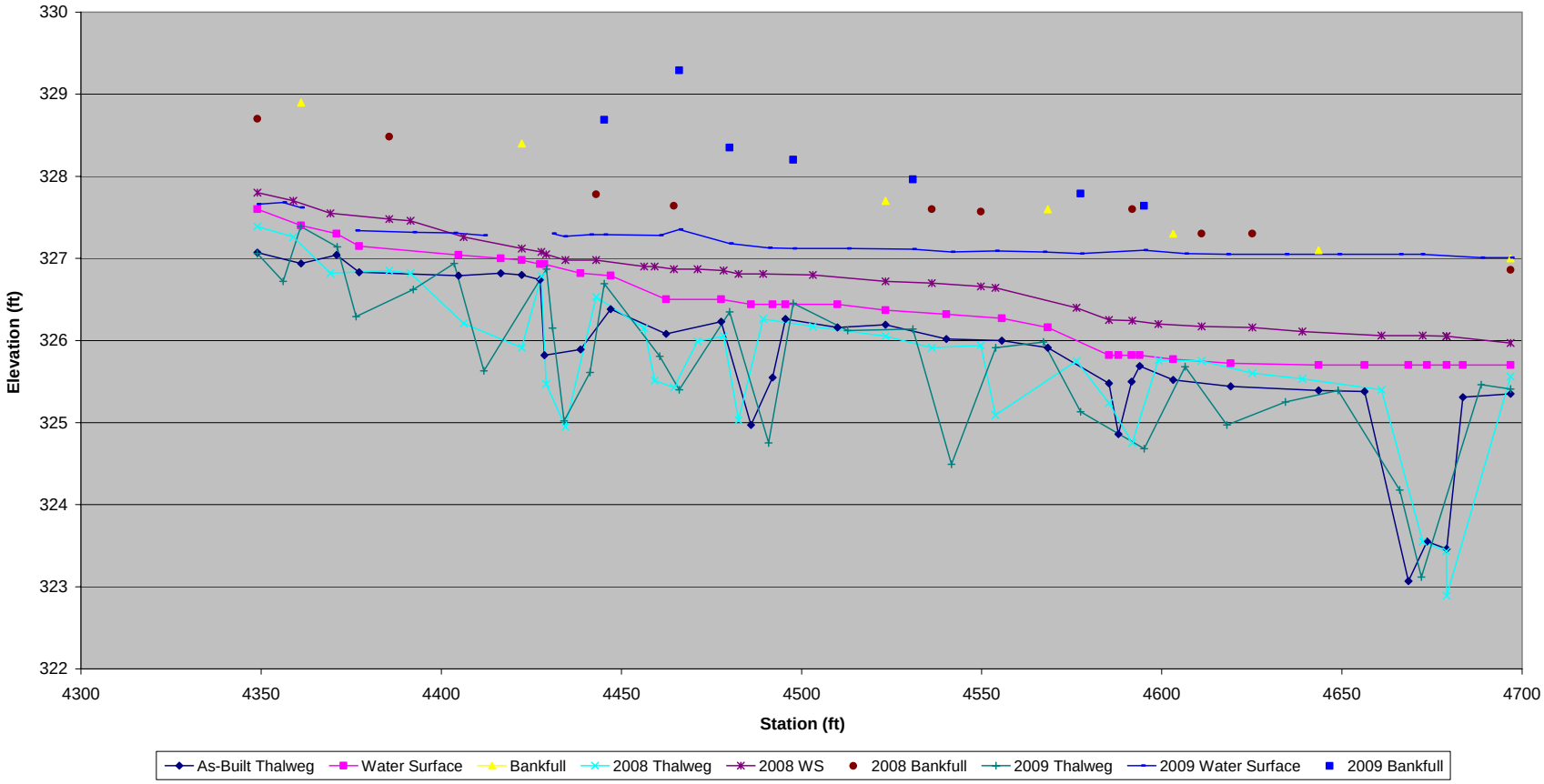
Profile Reach 3
(EB Sta. 29+33.9 to 36+85.3)



Profile Reach #3

As-Built					Year 1					Year 2				
Sta.	Elev	WS	Bankfull	Feature	Sta.	Elev	WS	Bankfull	Feature	Sta.	Elev	WS	Bankfull	Feature
2933.9	335.24	335.4	336.96		2933.9	335.32	335.56	336.85		2933.90	335.32	335.57	336.80	
2956.3	334.69	335.3			2954.95	334.84	335.51			2950.81	334.92	335.49		
2974.7	333.58	335.3	336.7		2967.36	334.27	335.51			2956.53	334.56	335.46	336.81	
2979.1	333.02	335.3			2977.87	333.02	335.51			2974.70	333.56	335.45	336.70	
2984.9	334.14	335.3			2987.24	334.47	335.51			2985.30	334.08	335.49		MaxD
2989	335.07	335.2			2994.35	335.11	335.45	336.62		2996.53	335.00	335.46		
2995.4	335.06	335.16	336.6		3005	335.04	335.45			3011.98	334.86	335.30		
3015.5	334.83	335.1			3015.81	334.89	335.44	336.64		3019.79	334.28	335.29		MaxD
3030	334.79	335.1			3022.49	334.15	335.44			3031.85	334.92	335.31		
3033.8	334.6	335.1	336.5		3029.98	334.95	335.44			3044.34	333.73	335.04		
3045.9	334.83	335			3043.93	334.93	335.16	336.5		3048.29	333.50	335.03		MaxD
3046.8	333.9	334.9			3049.94	333.79	335.1			3056.96	334.59	334.89		
3051.2	334.47	334.8			3056.42	334.59	334.97	336.4		3076.65	333.13	334.83		
3057.5	334.49	334.72	336.2		3073.33	334.48	334.83			3086.55	333.38	334.83		
3074.2	334.29	334.66			3078.65	333.39	334.8			3110.05	334.28	334.67	335.74	
3085.2	333.19	334.6			3086.45	334.02	334.8			3126.03	334.09	334.39		
3097.8	333.51	334.6			3097.14	333.77	334.76	335.9		3147.92	333.81	334.04	335.65	
3111.3	334.28	334.54	336.09		3122	334.14	334.48	336		3163.30	333.50	334.05	335.42	
3139	333.95	334.1			3145.57	333.82	334.17			3175.47	333.69	334.03		
3153.8	333.41	334.04			3158.04	333.53	334.1			3203.25	333.46	333.97		
3170.7	333.39	334.03			3166.57	333.31	334.12	335.7		3214.42	333.76	333.87		
3183.6	333.49	334.03			3183.54	333.6	334.1			3235.36	331.95	333.39	334.90	MaxD
3188.3	332.4	334.03			3188.34	332.24	334.1	335.1		3251.47	333.20	333.38		
3192.3	331.88	334.03			3192.72	331.92	334.1			3269.62	333.04	333.31	334.69	
3196.8	332.49	334.03			3201.04	333.28	334.1			3287.68	332.37	332.76	333.96	
3201	333.28	334.03			3216.14	333.75	333.98			3297.30	331.10	332.72		
3213.3	333.74	334	335.5		3225.27	333.06	333.72	334.92		3306.68	331.89	332.68		
3234.6	333.36	333.53			3233.29	333.3	333.7			3321.05	332.35	332.63		
3240.9	332.14	333.52			3238.3	331.69	333.7			3343.99	332.01	332.38	333.67	
3248.9	332.06	333.52			3251.07	331.64	333.7			3362.10	331.77	332.34		
3251	333.28	333.52	335.2		3253.37	333.3	333.65			3374.53	329.59	332.27		
3263.6	333.28	333.45			3261.08	333.28	333.5	334.82		3383.19	331.81	332.48		
3287.3	332.52	332.63			3272.53	333.17	333.39			3401.95	331.86	332.47	334.01	
3292.4	331.08	332.63			3287.34	332.68	332.78			3431.45	332.00	332.26		
3306	331.16	332.62			3294.51	331.18	332.75			3439.16	331.25	332.27		
3311.8	332.34	332.62	334.04		3305.1	331.49	332.75			3454.15	331.25	332.24		
3341	332.03	332.56			3314.65	332.31	332.68			3464.73	331.11	332.25	333.17	
3356	331.8	332.56			3325.25	332.42	332.65			3482.46	331.83	332.20		
3365.8	331.88	332.54			3338.9	332.62	332.6	334.3		3495.97	331.44	332.15	333.72	
3375.6	330.09	332.54			3359.34	332.08	332.6	334.2		3514.52	331.82	332.03		
3384.3	332.04	332.54			3376.85	329.89	332.6			3523.71	331.72	331.95		
3410.4	332.44	332.54	333.7		3399.14	331.75	332.6	334.1		3529.18	330.08	331.92		
3418.9	332.14	332.45			3410.36	332.08	332.6	333.8		3536.36	331.44	331.96	332.99	
3431.4	331.97	332.3			3418.24	332.25	332.6			3546.73	331.68	331.96		MaxD
3450	331.5	332.27			3433.37	332.05	332.4			3555.23	331.54	331.96		
3453.6	331.03	332.27			3449.44	331.77	332.37	333.6		3570.95	331.11	331.84		
3462.5	331.36	332.25			3452.44	331.57	332.37			3584.64	329.12	331.78		MaxD
3471.2	331.99	332.25			3456.6	330.4	332.37			3596.33	331.41	331.80		
3482.9	331.86	332.02	333.6		3462.91	331.54	332.37			3607.95	331.39	331.62	333.15	
3500	331.64	332.02			3478.02	331.92	332.37			3623.17	331.20	331.35		
3513.9	331.44	332.02			3490.37	331.73	332.31			3638.50	330.38	331.04		
3521.9	331.7	332.02			3498.75	331.64	332.33			3655.60	329.30	331.15		
3527.9	330.68	332			3517.57	332.15	332.3			3668.80	330.25	331.15		
3531.4	331.38	332			3523.57	332.08	332.3			3685.30	330.24	331.10	332.70	
3544.6	331.38	331.96			3529.31	330.32	332.3	333.4						
3556.5	331.58	331.91	333.3		3548.24	331.75	332.3							
3568.6	331.65	331.91			3557.54	332.16	332.3							
3575.8	331.29	331.91			3572.81	331.92	332.3							
3583.4	329.3	331.9			3579.9	331.51	332.3							
3590	330.6	331.9			3585.72	329.37	332.3							
3599.7	331.38	331.9	332.9		3594.77	331.81	332.3	333.3						
3615.8	331.07	331.36			3610.62	331.92	332.1							
3631.1	330.84	331.25			3625.12	331.22	331.8							
3642.5	330.79	331.16			3646.2	330.48	331.2							
3650.3	328.98	331.16			3656.67	329.59	331.2							
3655.6	329.21	331.16			3662.93	329.15	331.2							
3668.7	329.79	331.16			3672.98	330.76	331.2	332.6						
3672	330.81	331.1			3685.3	330.63	331.2	332.4						
3685.3	330.72	331.05	332.3											

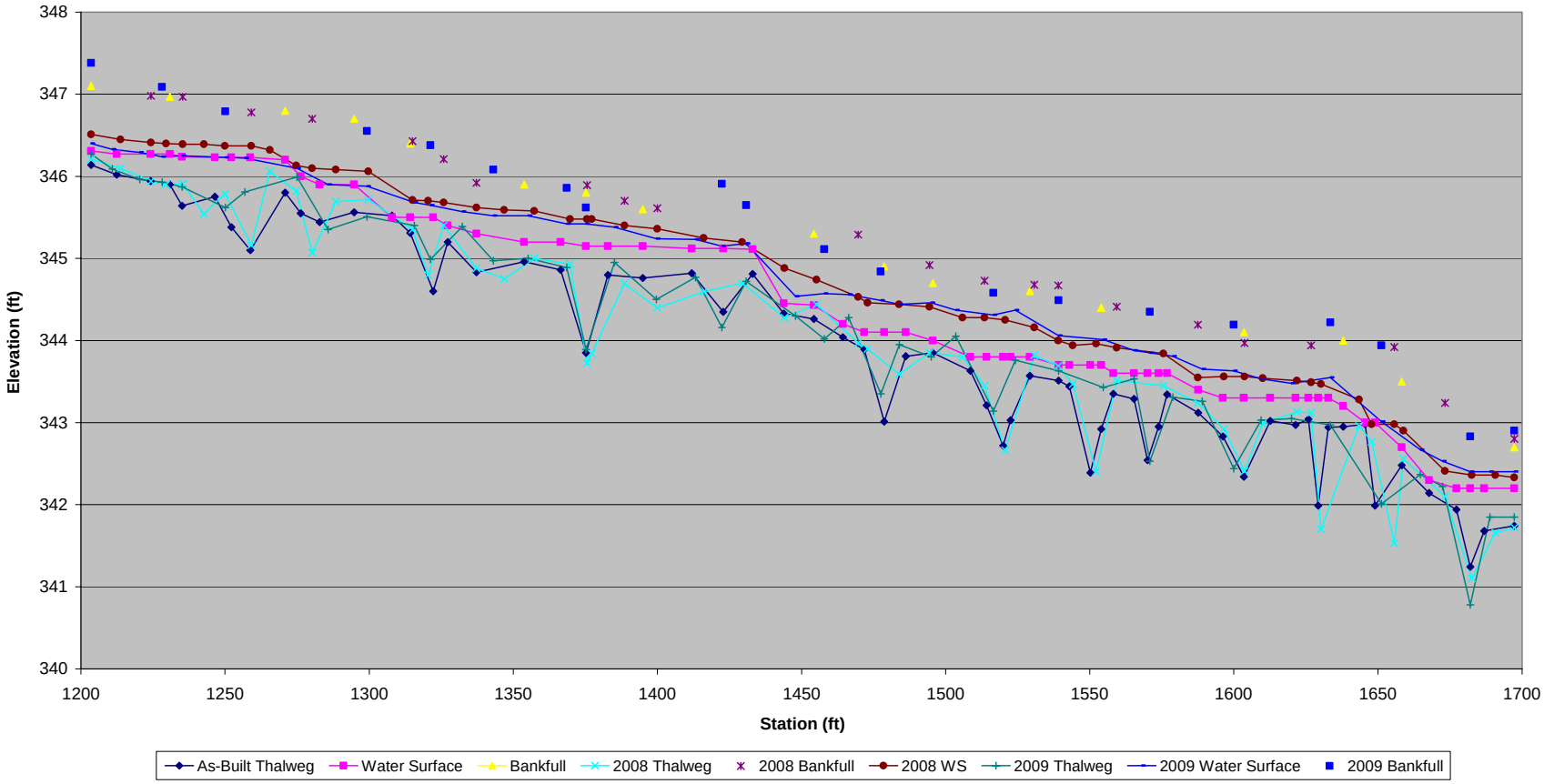
Profile Reach 4
(EB Sta. 43+49 to 46+96.8)



Profile Reach #4

As-Built					Year 1					Year 2				
Sta.	**Elev**	**WS**	**Bankfull**	**Feature**	**Sta.**	**Elev**	**WS**	**Bankfull**	**Feature**	**Sta.**	**Elev**	**WS**	**Bankfull**	**Feature**
4349	327.07	327.6			4349	327.39	327.8	328.7		4349.00	327.06	327.66		
4361.1	326.94	327.4	328.9		4358.94	327.26	327.7			4356.10	326.72	327.68		
4370.9	327.04	327.3			4369.29	326.82	327.55			4361.04	327.39	327.62		
4377.2	326.83	327.15			4385.61	326.85	327.48	328.48		4371.10	327.14			
4404.8	326.79	327.04			4391.51	326.82	327.46			4376.33	326.29	327.34		MaxD
4416.5	326.82	327			4406.2	326.21	327.26			4392.28	326.62	327.32		
4422.4	326.8	326.98	328.4		4422.4	325.91	327.12			4403.62	326.94	327.31		
4427.4	326.74	326.93			4427.81	326.78	327.08			4411.83	325.63	327.28		MaxD
4428.6	325.82	326.93			4429.07	325.47	327.05			4429.17	326.87			X-Vane
4438.7	325.89	326.82			4434.49	324.95	326.98			4430.85	326.15	327.30		Hpool
4447	326.38	326.79			4443.03	326.53	326.98	327.78		4434.07	325.02	327.27		
4462.4	326.08	326.5			4456.28	326.15	326.9			4441.33	325.61	327.29		MaxD
4477.7	326.23	326.5			4459.23	325.51	326.9			4445.26	326.69	327.29	328.69	
4486	324.97	326.44			4464.59	325.43	326.87	327.64		4460.67	325.81	327.28		
4492	325.55	326.44			4471.11	325.99	326.87			4466.11	325.40	327.35	329.29	
4495.5	326.26	326.44			4478.33	326.05	326.85			4480.05	326.35	327.18	328.35	
4510	326.16	326.44			4482.5	325.03	326.81			4490.82	324.75	327.13		MaxD
4523.3	326.19	326.37	327.7		4489.38	326.26	326.81			4497.72	326.45	327.12	328.20	
4540.2	326.02	326.32			4503.1	326.17	326.8			4512.79	326.12	327.12		
4555.6	326	326.27			4523.32	326.05	326.72			4530.92	326.14	327.11	327.96	
4568.4	325.91	326.16	327.6		4536.14	325.91	326.7	327.6		4541.61	324.49	327.08		MaxD
4585.3	325.48	325.82			4549.8	325.94	326.66	327.57		4553.89	325.91	327.09		
4588	324.86	325.82			4553.83	325.09	326.64			4567.16	325.98	327.08		
4591.6	325.5	325.82			4576.3	325.75	326.4			4577.49	325.13	327.06	327.79	MaxD
4593.9	325.69	325.82			4585.37	325.24	326.25			4595.09	324.68	327.10	327.64	MaxD
4603.2	325.52	325.77	327.3		4591.83	324.75	326.24	327.6		4606.46	325.68	327.06		
4619.1	325.44	325.72			4599.05	325.76	326.2			4618.10	324.97	327.05		MaxD
4643.5	325.39	325.7	327.1		4611.03	325.75	326.17	327.3		4634.33	325.25	327.05		
4656.3	325.38	325.7			4625.17	325.6	326.16	327.3		4648.97	325.39	327.05		
4668.5	323.07	325.7			4639.01	325.53	326.11			4666.01	324.18	327.05		MaxD
4673.6	323.55	325.7			4661	325.4	326.06			4671.99	323.12	327.05		MaxD
4679.1	323.46	325.7			4672.42	323.55	326.06			4688.65	325.46	327.01		
4683.6	325.31	325.7			4678.97	323.43	326.05			4696.80	325.41	327.01		
4696.8	325.35	325.7	327		4679.1	322.89	326.05							
					4696.8	325.56	325.97	326.86						

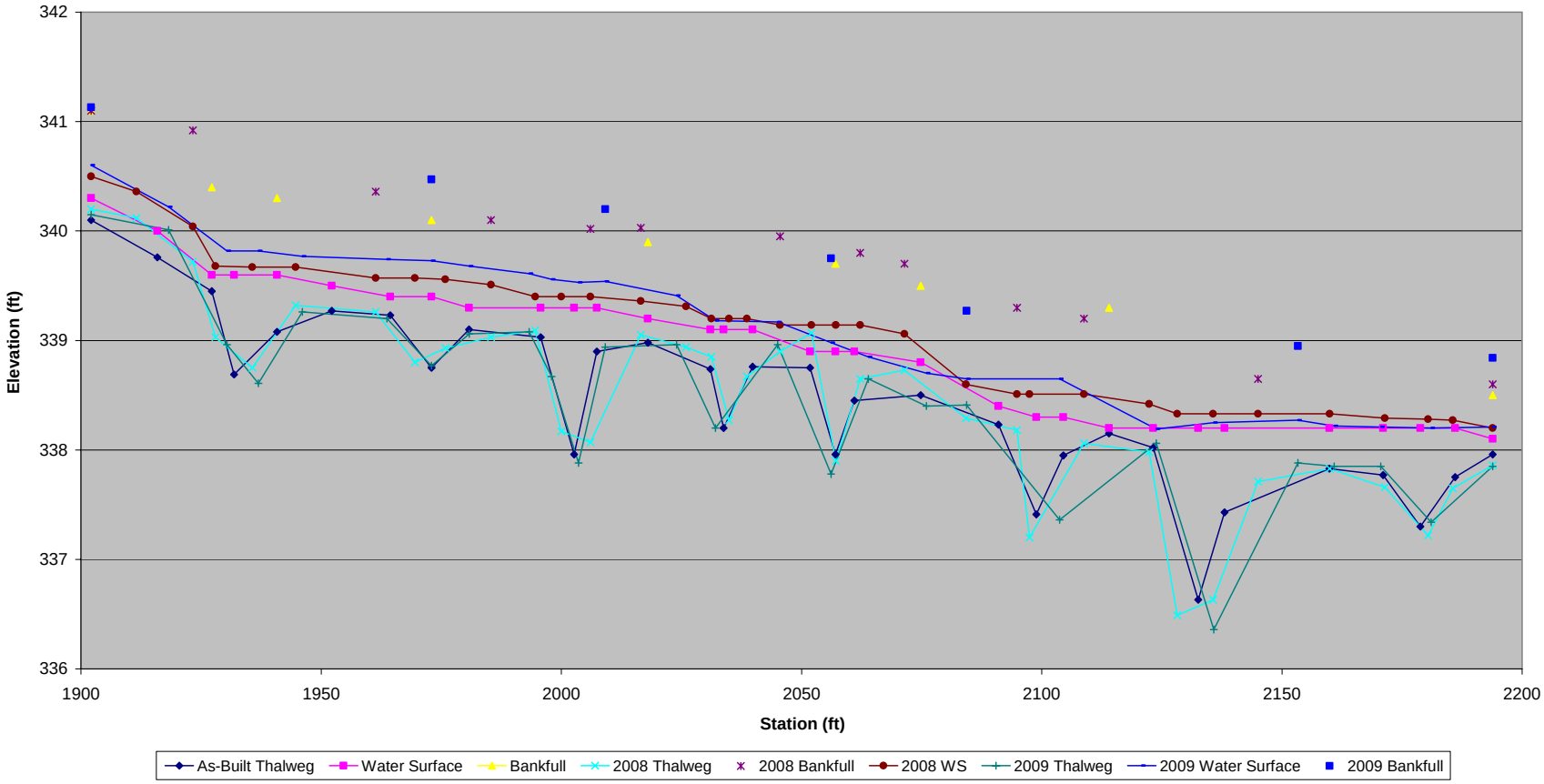
Profile Reach 5
(UT Sta. 12+03.5 to 16+97.3)



Profile Reach #5 (UT)

As-Built					Year 1					Year 2				
Sta.	Elev	Bankfull	WS	Feature	Sta.	Elev	Bankfull	WS	Feature	Sta.	Elev	WS	Bankfull	Feature
1203.5	346.14	347.1	346.31		1203.5	346.21		346.51		1203.50	346.27	346.40	347.38	
1212.4	346.02		346.27		1213.76	346.1		346.45		1210.93	346.09	346.33		
1224.2	345.94		346.27		1224.33	345.94	346.98	346.41		1220.46	345.96	346.29		
1230.8	345.9	346.97	346.27		1229.58	345.9		346.4		1228.10	345.93	346.24	347.09	
1235.1	345.64		346.24		1235.25	345.91	346.97	346.39		1235.10	345.87	346.25		XS
1246.4	345.75		346.23		1242.66	345.54		346.39		1250.09	345.62	346.23	346.79	
1252.2	345.38		346.23		1249.91	345.79		346.37		1256.84	345.81	346.22		
1258.8	345.1		346.23		1259.07	345.16	346.78	346.37		1275.00	345.99	346.10		
1270.8	345.8	346.8	346.2		1265.57	346.06		346.32		1285.68	345.35	345.90		
1276.2	345.55		346		1274.7	345.82		346.13		1299.18	345.51	345.88	346.55	
1282.8	345.44		345.9		1280.2	345.07	346.7	346.1		1315.70	345.40	345.68		
1294.8	345.56	346.7	345.9		1288.45	345.69		346.08		1321.30	344.99	345.65	346.38	MaxD
1307.9	345.52		345.5		1299.67	345.72		346.06		1332.27	345.39	345.57		
1314.2	345.31	346.4	345.5		1315.04	345.35	346.43	345.71		1343.09	344.97	345.52	346.08	
1322.2	344.6		345.5		1320.42	344.8		345.7		1355.18	345.00	345.52		
1327.2	345.2		345.4		1325.8	345.4	346.21	345.68		1368.55	344.89	345.42	345.86	
1337.2	344.83		345.3		1337.19	344.88	345.92	345.62		1375.20	343.89	345.42	345.62	XS
1353.8	344.96	345.9	345.2		1346.81	344.75		345.59		1385.05	344.95	345.38		
1366.4	344.86		345.2		1357.26	345		345.58		1399.60	344.50	345.24		
1375.2	343.85	345.8	345.15		1369.73	344.93		345.48		1413.22	344.77	345.23		
1382.8	344.8		345.15		1375.53	343.72	345.89	345.48		1422.41	344.16	345.15	345.91	MaxD
1394.9	344.76	345.6	345.15		1377.17	343.84		345.48		1430.81	344.72	345.18	345.65	
1411.9	344.82		345.12		1388.56	344.69	345.7	345.4		1447.91	344.30	344.54		
1422.8	344.35		345.12		1400	344.4	345.61	345.36		1457.91	344.02	344.57	345.11	
1433	344.81		345.11		1416.04	344.59		345.25		1466.41	344.28	344.56		
1443.9	344.33		344.45		1429.37	344.7		345.2		1477.51	343.35	344.49	344.84	MaxD
1454.3	344.26	345.3	344.43		1444.02	344.28		344.88		1484.01	343.95	344.44		
1464.4	344.04		344.2		1455.19	344.44		344.74		1494.99	343.80	344.46		
1471.8	343.89		344.1		1469.59	343.97	345.29	344.53		1503.59	344.05	344.37		
1478.7	343.01	344.9	344.1		1472.95	343.9		344.46		1516.54	343.14	344.31	344.58	
1486.2	343.81		344.1		1483.8	343.59		344.44		1524.14	343.76	344.37		
1495.6	343.85	344.7	344		1494.37	343.85	344.92	344.41		1539.20	343.63	344.06	344.49	XS
1508.6	343.63		343.8		1505.88	343.8		344.28		1554.70	343.43	344.01		
1514.2	343.21		343.8		1513.53	343.45	344.73	344.28		1565.35	343.53	343.88		
1520	342.72		343.8		1520.71	342.66		344.25		1570.85	342.53	343.85	344.35	MaxD
1522.5	343.03		343.8		1530.78	343.82	344.68	344.16		1578.80	343.31	343.81		
1529.2	343.57	344.6	343.8		1539.06	343.69	344.67	344		1589.10	343.26	343.65		
1539.2	343.51		343.7		1544.16	343.47		343.94		1599.90	342.44	343.63	344.19	
1543	343.44		343.7		1552.16	342.4		343.96		1609.40	343.03	343.53		
1550.2	342.39		343.7		1559.41	343.51	344.41	343.91		1620.00	343.05	343.48		
1554	342.92	344.4	343.7		1575.5	343.45		343.84		1633.50	342.97	343.55	344.22	
1558.2	343.35		343.6		1587.52	343.24	344.19	343.55		1651.20	342.01	343.01	343.94	MaxD
1565.4	343.29		343.6		1596.5	342.92		343.56		1664.70	342.37	342.67		
1570	342.54		343.6		1603.71	342.41	343.97	343.56		1672.40	342.22	342.53		
1573.9	342.95		343.6		1610	342.99		343.54		1682.00	340.78	342.40	342.83	XS
1576.8	343.34		343.6		1621.94	343.13		343.51		1688.88	341.85	342.40		
1587.6	343.12		343.4		1626.77	343.12	343.94	343.49		1697.30	341.85	342.40	342.90	
1596.2	342.83		343.3		1630.25	341.7		343.47						
1603.5	342.34	344.1	343.3		1643.42	342.96		343.28						
1612.6	343.02		343.3		1647.83	342.77		342.98						
1621.4	342.97		343.3		1655.68	341.53	343.92	342.98						
1625.9	343.04		343.3		1658.89	342.56		342.9						
1629.3	341.99		343.3		1673.22	342.1	343.24	342.41						
1632.8	342.94		343.3		1682.47	341.1		342.36						
1637.9	342.95	344	343.2		1690.77	341.66		342.36						
1645.6	342.98		343		1697.3	341.72	342.8	342.33						
1649	341.99		343											
1658.3	342.48	343.5	342.7											
1667.7	342.14		342.3											
1677.2	341.94		342.2											
1682	341.24		342.2											
1686.9	341.68		342.2											
1697.3	341.74	342.7	342.2											

Profile Reach 6
(UT Sta. 19+02.1 to 21+93.9)



Profile Reach #6 (UT)

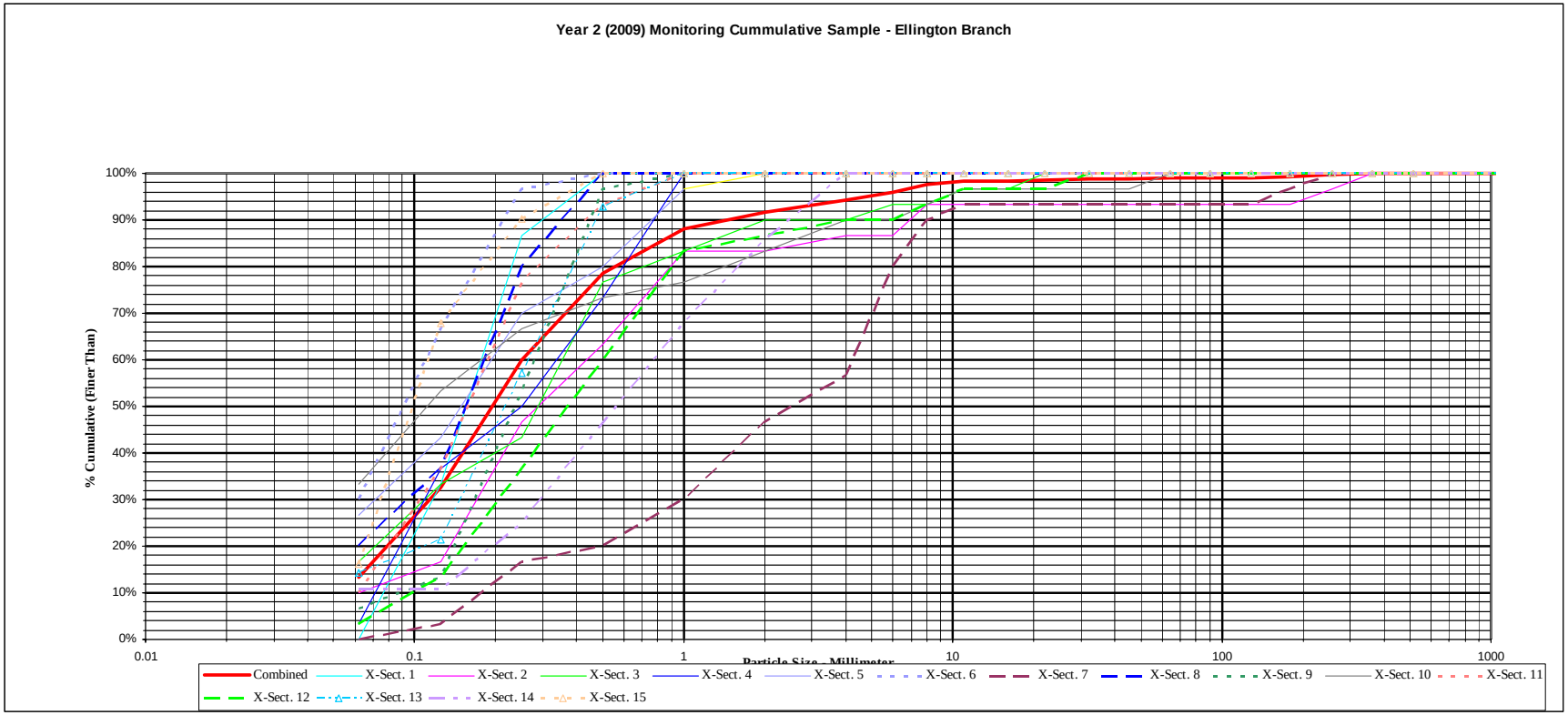
As-Built					Year 1					Year 2				
Sta.	**Elev**	**Bankfull**	**WS**	**Feature**	**Sta.**	**Elev**	**Bankfull**	**WS**	**Feature**	**Sta.**	**Elev**	**WS**	**Bankfull**	**Feature**
1902.1	340.1	341.1	340.3		1902.1	340.2	341.1	340.5		1902.10	340.15	340.60	341.13	
1915.9	339.76		340		1911.52	340.12		340.36		1918.22	340.01	340.22		
1927.2	339.45	340.4	339.6		1923.31	339.72	340.92	340.04		1930.42	338.96	339.82		
1931.9	338.69		339.6		1928.02	339.03		339.68		1936.92	338.61	339.82		
1940.8	339.08	340.3	339.6		1935.66	338.75		339.67		1946.12	339.26	339.77		
1952.2	339.27		339.5		1944.68	339.32		339.67		1963.72	339.20	339.74		
1964.4	339.23		339.4		1961.35	339.26	340.36	339.57		1973.00	338.77	339.73	340.47	XS
1973	338.75	340.1	339.4		1969.54	338.8		339.57		1980.89	339.06	339.68		
1980.8	339.1		339.3		1975.83	338.93		339.56		1993.30	339.08	339.61		
1995.7	339.03		339.3		1985.37	339.03	340.1	339.51		1997.98	338.67	339.56		
2002.7	337.96		339.3		1994.56	339.09		339.4		2003.62	337.88	339.53		MaxD
2007.4	338.9		339.3		2000	338.17		339.4		2009.17	338.94	339.54	340.20	
2018	338.98	339.9	339.2		2006.05	338.07	340.02	339.4		2023.98	338.96	339.41		
2031	338.74		339.1		2016.56	339.05	340.03	339.36		2032.06	338.20	339.18		MaxD
2033.8	338.2		339.1		2025.94	338.94		339.31		2045.06	338.96	339.17		
2039.8	338.76		339.1		2031.24	338.85		339.2		2056.16	337.78	338.98	339.75	
2051.8	338.75		338.9		2034.87	338.27		339.2		2063.91	338.65	338.85		
2057.1	337.96	339.7	338.9		2038.66	338.67		339.2		2076.01	338.40	338.70		
2061	338.45		338.9		2045.55	338.9	339.95	339.14		2084.41	338.41	338.65	339.27	
2074.8	338.5	339.5	338.8		2052.08	339.07		339.14		2103.75	337.36	338.65		
2091	338.23		338.4		2057.14	337.9		339.14		2123.85	338.06	338.19		
2098.9	337.41		338.3		2062.2	338.65	339.8	339.14		2135.85	336.36	338.25		
2104.5	337.95		338.3		2071.43	338.73	339.7	339.06		2153.35	337.88	338.27	338.95	
2114	338.15	339.3	338.2		2084.27	338.29		338.6		2160.85	337.85	338.22		
2123.2	338.02		338.2		2094.86	338.18	339.3	338.51		2170.55	337.85	338.21		
2132.6	336.63		338.2		2097.5	337.2		338.51		2181.05	337.34	338.20		MaxD
2138.1	337.43		338.2		2108.81	338.06	339.2	338.51		2193.90	337.85	338.21	338.84	
2159.9	337.83		338.2		2122.38	337.98		338.42						
2171.1	337.77		338.2		2128.2	336.49		338.33						
2178.8	337.3		338.2		2135.7	336.63		338.33						
2186.1	337.75		338.2		2145.07	337.71	338.65	338.33						
2193.9	337.96	338.5	338.1		2159.93	337.83		338.33						
					2171.41	337.66		338.29						
					2180.41	337.22		338.28						
					2185.55	337.65		338.27						
					2193.9	337.86	338.6	338.2						

APPENDIX C-5:
PEBBLE COUNT PLOTS AND RAW DATA TABLES – ELLINGTON BRANCH

PEBBLE COUNT DATA - CUMMULATIVE SAMPLE

Site:	Ellington Branch Stream Mitigation Site																	**Date:**	July-09	
Location:	Warren County - North Carolina																	**Party:**	GLS	
	PARTICLE COUNTS																			
Inches	**Particle**	**Millimeter**	**Group**	**EB XS1**	**EB XS2**	**EB XS3**	**EB XS4**	**EB XS5**	**EB XS 6**	**EB XS7**	**EB XS8**	**EB XS 9**	**EB XS10**	**EB XS11**	**EB XS12**	**EB XS13**	**EB XS14**	**EB XS 15**	**Total No.**	**Item %**	**% Cumulative**
	Silt/Clay	< 0.062	Silt/Clay			2					2		2						6	1.3%	1.3%
	Very Fine	.062 - .125	S	7	4	9	7	18	11		12	1	3	13	6	2	5	4	102	22.7%	24.1%
	Fine	.125 - .25	A	14	10	5	10	8	11	1	9	19	7	12	13	20	7	22	168	37.4%	61.5%
	Medium	.25 - .50	N	9	6	3	7	3	8	2	5	7	14	4	11	3	3	3	88	19.6%	81.1%
	Coarse	.50 - 1.0	D		8	3	4	1		2	2	3	3	1		5	13	1	46	10.2%	91.3%
.04 -.08	Very Coarse	1.0 - 2.0	S		2	2	2			4			1				2		13	2.9%	94.2%
.08 - .16	Very Fine	2.0 - 4.0				1				7									8	1.8%	96.0%
.16 - .22	Fine	4.0 - 5.7	G							7									7	1.6%	97.6%
.22 - .31	Fine	5.7 - 8.0	R							3									3	0.7%	98.2%
.31 - .44	Medium	8.0 - 11.3	A							3									3	0.7%	98.9%
.44 - .63	Medium	11.3 - 16.0	V			1													1	0.2%	99.1%
.63 - .89	Coarse	16.0 - 22.6	E			1													1	0.2%	99.3%
.89 - 1.26	Coarse	22.6 - 32.0	L			1				1									2	0.4%	99.8%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S			1													1	0.2%	100.0%
1.77 - 2.5	Very Coarse	45.0 - 64.0																	0	0.0%	100.0%
2.5 - 3.5	Small	64 - 90	C																0	0.0%	100.0%
3.5 - 5.0	Small	90 - 128	O																0	0.0%	100.0%
5.0 - 7.1	Large	128 - 180	B																0	0.0%	100.0%
7.1 - 10.1	Large	180 - 256	L																0	0.0%	100.0%
10.1 - 14.3	Small	256 - 362	B																0	0.0%	100.0%
14.3 - 20	Small	362 - 512	L																0	0.0%	100.0%
20 - 40	Medium	512 - 1024	D																0	0.0%	100.0%
40 - 80	Lrg- Very Lrg	1024 - 2048	R																0	0.0%	100.0%
	Bedrock		BDRK																0	0.0%	100.0%
			Totals	**30**	**30**	**29**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**449**	**100%**	**100%**
	Feature or Pebble Count Type			Pool	Riffle	Pool	Riffle	Pool	Riffle	Riffle	Pool	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool			

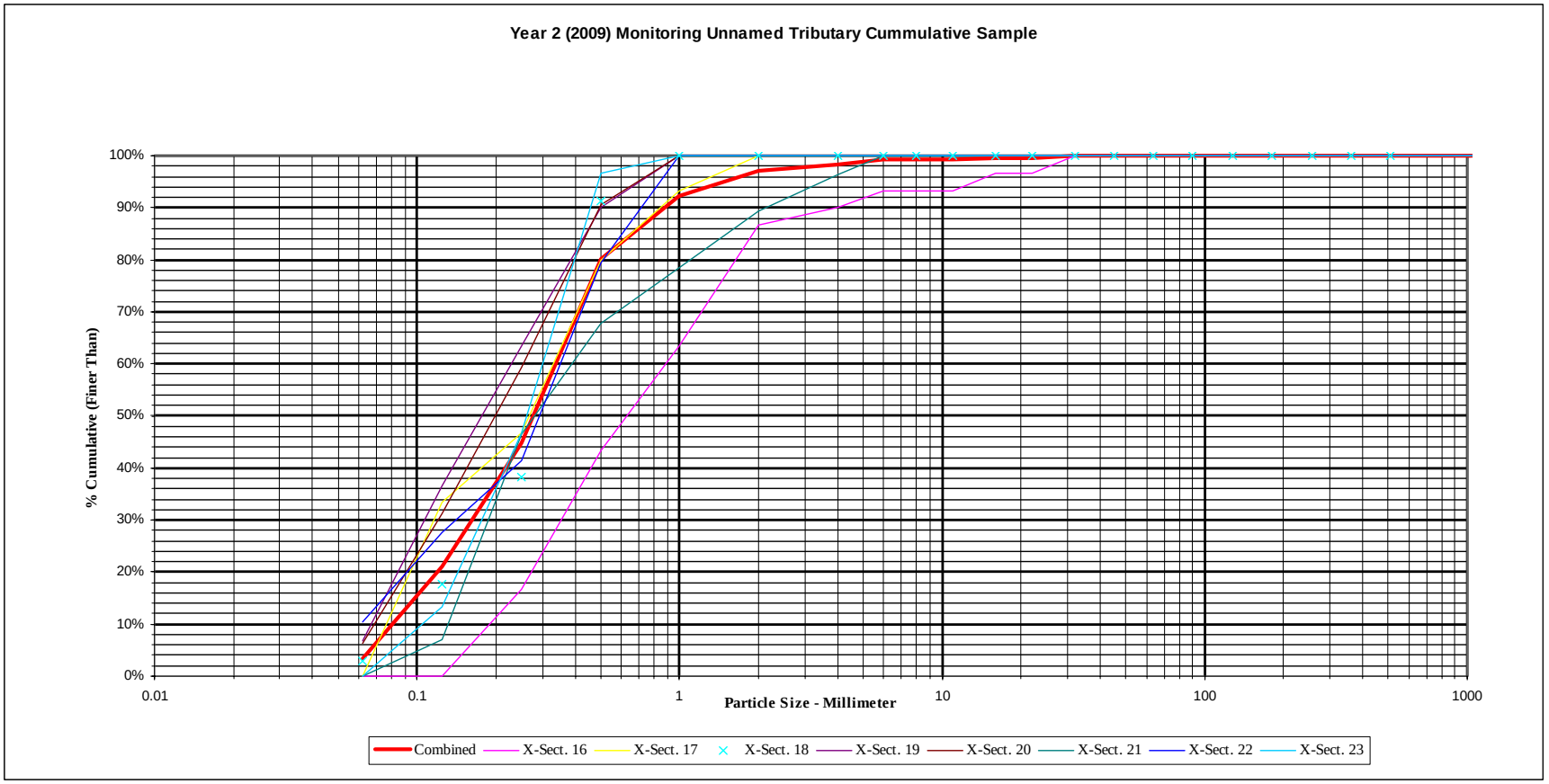
(i.e. Riffle, Pool, Pavement, Classification)


Year 2 (2009) Monitoring Cummulative Sample - Ellington Branch
% Cumulative (Finer Than)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
Particle Size - Millimeter
Combined
X-Sect. 1
X-Sect. 2
X-Sect. 3
X-Sect. 4
X-Sect. 5
X-Sect. 6
X-Sect. 7
X-Sect. 8
X-Sect. 9
X-Sect. 10
X-Sect. 11
X-Sect. 12
X-Sect. 13
X-Sect. 14
X-Sect. 15

APPENDIX C-5 Continued:
PEBBLE COUNT PLOTS AND RAW DATA TABLES – UT TO ELLINGTON BRANCH

PEBBLE COUNT DATA - UNNAMED TRIBUTARY TO ELLINGTON BRANCH

Site:	Ellington Branch Stream Mitigation Site - Unnamed Tributary													**Date:**	July-09		
Location:	Warren County North Carolina													**Party:**	GLS		
				PARTICLE COUNTS													
Inches	**Particle**	**Millimeter**	**Group**	**XS16**	**XS17**	**XS18**	**XS19**	**XS20**	**XS21**	**XS22**	**XS23**					**Total No.**	**Item %**	**% Cumulativ**
	Silt/Clay	< 0.062	Silt/Clay													0	0.0%	0.0%
	Very Fine	.062 - .125	S	7	5	11	3	3	5	14	7					55	23.0%	23.0%
	Fine	.125 - .25	A	7	14	14	21	18	11	13	12					110	46.0%	69.0%
	Medium	.25 - .50	N	4	11	5	5	8	13	3	10					59	24.7%	93.7%
	Coarse	.50 - 1.0	D	6			1		1		1					9	3.8%	97.5%
.04 -.08	Very Coarse	1.0 - 2.0	S	1												1	0.4%	97.9%
.08 - .16	Very Fine	2.0 - 4.0														0	0.0%	97.9%
.16 - .22	Fine	4.0 - 5.7	G													0	0.0%	97.9%
.22 - .31	Fine	5.7 - 8.0	R	1												1	0.4%	98.3%
.31 - .44	Medium	8.0 - 11.3	A	2												2	0.8%	99.2%
.44 - .63	Medium	11.3 - 16.0	V	1												1	0.4%	99.6%
.63 - .89	Coarse	16.0 - 22.6	E													0	0.0%	99.6%
.89 - 1.26	Coarse	22.6 - 32.0	L	1												1	0.4%	100.0%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S													0	0.0%	100.0%
1.77 - 2.5	Very Coarse	45.0 - 64.0														0	0.0%	100.0%
2.5 - 3.5	Small	64 - 90	C													0	0.0%	100.0%
3.5 - 5.0	Small	90 - 128	O													0	0.0%	100.0%
5.0 - 7.1	Large	128 - 180	B													0	0.0%	100.0%
7.1 - 10.1	Large	180 - 256	L													0	0.0%	100.0%
10.1 - 14.3	Small	256 - 362	B													0	0.0%	100.0%
14.3 - 20	Small	362 - 512	L													0	0.0%	100.0%
20 - 40	Medium	512 - 1024	D													0	0.0%	100.0%
40 - 80	Lrg- Very Lrg	1024 - 2048	R													0	0.0%	100.0%
	Bedrock		BDRK													0	0.0%	100.0%
			Totals	**30**	**30**	**30**	**30**	**29**	**30**	**30**	**30**	**0**	**0**	**0**	**0**	**239**	**100%**	**100%**
	Feature or Pebble Count Type (i.e. Riffle, Pool, Pavement, Classification)			Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle							


Year 2 (2009) Monitoring Unnamed Tributary Cummulative Sample
% Cumulative (Finer Than)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
Particle Size - Millimeter
Combined
X-Sect. 16
X-Sect. 17
X-Sect. 18
X-Sect. 19
X-Sect. 20
X-Sect. 21
X-Sect. 22
X-Sect. 23

WS-ER (2-08)

BMAP COOPERATIVE SERVICE AGREEMENT

Agreement No. X83-7237-349

#46799

Between
Charles Musser (COOPERATOR)
and the
UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE (APHIS)
WILDLIFE SERVICES (WS)

ARTICLE 1

The Cooperator has requested that WS reduce or eliminate property damage and/or threats to human health and safety caused by beaver and their activities. Techniques which may be used to address beaver damage include lethal removal of beaver using traps, snares, and shooting. Non-lethal techniques such as installation of exclusion devices to prevent beaver from gaining access to resources may also be used. To alleviate flooding, beaver dams may be removed using hand tools or explosives and/or water control devices such as the Clemson Beaver Pond Leveler maybe installed. The Cooperator acknowledges that he/she has been informed of and clearly understands the methods and manner in which the management materials and devices will be used and of the possible hazards associated with their use.

ARTICLE 2

APHIS WS has statutory authority under the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C.426-426b) as amended, and the Act of December 22, 1987 (101Stat. 1329-331, 7 U.S.C. 426c), to cooperate with States, local jurisdictions, individuals, public and private agencies, organizations, and institutions while conducting a program of wildlife services involving mammal and bird species that are reservoirs for zoonotic diseases, or animal species that are injurious and/or a nuisance to, among other things, agriculture, horticulture, forestry, animal husbandry, wildlife, and human health and safety.

ARTICLE 3

APHIS-WS and the Cooperator agree:

1. APHIS-WS will provide the requested wildlife damage management services.
2. The Cooperator will provide the USDA up to $ 150.00 to cover the following costs: $20 per site visit and $125 per beaver dam removed. Payment will be made by check **payable to "U.S. Department of Agriculture"** by a mutually agreed upon date.
3. The Cooperator ensures and certifies that it is not currently debarred or suspended and is free of delinquent Federal debt.
4. The monies received by APHIS-WS will be used for wildlife damage management activities and upon termination of the agreement any unexpended funds will be retained by APHIS-WS and used on similar program activities.
5. All activities will be conducted in accordance with all applicable Federal, State, and local laws and regulations.
6. Nothing in this agreement shall prevent APHIS-WS from entering into separate agreements with any other organization or individual for the purpose of providing wildlife damage management services exclusive of those provided for under this agreement..
7. The Cooperator certifies that APHIS WS has advised the Cooperator that there may be private sector service providers available to provide wildlife management services that the Cooperator is seeking from APHIS WS.
8. The performance of wildlife damage management actions by APHIS-WS under this agreement is contingent upon a determination by APHIS-WS that such actions are in compliance with the National Environmental Policy Act, Endangered Species Act, and any other applicable environmental statutes. APHIS-WS will not make a final decision to conduct requested wildlife damage management actions until it has made the determination of such compliance.

ARTICLE 4

Pursuant to Section 22, Title 41, United States Code, no member of or delegate to Congress shall be admitted to any share or part of this Agreement or to any benefit to arise therefrom.

ARTICLE 5

APHIS assumes no liability for any actions or activities conducted under this Cooperative Service Agreement except to the extent that recourse or remedies are provided by Congress under the Federal Tort Claims Act (FTCA), (28 U.S.C. 1346(b), 2401(b), and 2671-2680).

ARTICLE 6

The Agreement shall become effective 07/06/ 2009 and shall continue in effect until the completion or termination of the project. This Agreement may be amended or terminated at any time by mutual agreement of the parties in writing. Further, in the event the Cooperator does not provide necessary funds, APHIS-WS is relieved of the obligation to provide services under this agreement.

COOPERATOR Name: Charles Musser
Address: 915 Jones Franklin Rd
Raleigh, NC 27606
SSN or Tax ID Number (last 4 digits only): _____

Charles Musser 07/06/09
Cooperator's Signature Date

USDA-APHIS-Wildlife Services
6213-E Angus Drive, Raleigh, NC 27617

Anthony Steed Anthony Steed 07/06/09
WS Representative (Print Name and Sign) Date

_____
Jon F. Heisterberg, State Director Date

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

Agreement 4 6 7 9 9

AGREEMENT FOR CONTROL OF ANIMAL DAMAGE ON PRIVATE PROPERTY

Date 0 7 1 4 0 9 (MM DD YY)

TYPE OF AGREEMENT -" /" ALL THAT APPLY

- [ ] 1. Temporary Agreement
- [ ] 2. Urban Agreement
- [ ] 3. Continuation Form
- [ ] 4. Amendment of an Existing Agreement
- [ ] 5. Addendum to a Private Agreement
- [x] 6. Supplement is not Required
- [ ] 7. Special Considerations in Section 6

SECTION 1

Cooperator's Name: Musser (Last) Charles (First) (Middle Initial)

Cooperator's Address: 915 Jones Franklin Rd (Street) Raleigh (City) NC (State) 27606 (Zip)

Business/Farm/Ranch Name: Sungate Design Group

Owner's Name: (If different from Cooperator's)

Area Code: 9 1 9

Cooperator Telephone Number: 8 5 9 - 2 2 4 3

Owner's Address: (Street) (City) (State) (Zip)

SECTION 2

A. WS Employee Name, WS Code, State Code, and County Code

Steed (WS Employee Name)

WS Code: 4 6 6

State: 3 7

County: 0 6 9

B. List each Land Class with its Corresponding Acreage

	LAND CLASS	ACRES
1st	0 1	6 0 0 0 2
2nd		
3rd		
4th		
Total Acreage Protected		6 0 0 0 2

C. If this is an Adjoining Property Agreement, List the Properties Protected

D. List all Species to be Targeted During Damage Control Activities

SPECIES	CODE
Beaver	0 2 9

SECTION 3

In consideration of the benefits to be derived from the proper control of damage caused by those species listed in Section 2(D) of the agreement, I the undersigned cooperator, do hereby give my consent, and concurrence, to the Animal and Plant Health Inspection Service (APHIS), (to include its officials, employees, and agents) to use, upon lands owned, leased, or otherwise controlled by me, and identified by this agreement, the following methods and devices:

METHOD	CODE	METHOD	CODE	METHOD	CODE	METHOD	CODE
Leghold	0 0 1	Snare	0 0 3	Shooting	0 0 8	Explosives	0 1 8
Conibear	0 2 3	Dam Removal	2 3 1				

SECTION 4

I, the cooperator, have been informed of the methods and the manner in which the control materials and devices listed in Section 3 will be used, and of the possible hazards associated with their use. I understand that APHIS, again to include its officers, employees, and agents will: exercise reasonable precautions to safeguard all persons and to prevent injury to animal life other than those listed in Section 2(D) above; guard against the mishandling of control devices and materials; and exercise due caution and proper judgment in all control operations. I understand that WS will maintain restricted use pesticide application records on applications made under this agreement, and that WS will provide copies of the records or record information promptly upon the property owner's or cooperator's request.

SECTION 5

In consideration of these understandings and of the benefits to be derived, I, the cooperator, agree to: take reasonable precautions to prevent injury to livestock and other domestic animals; assume responsibility for injury to my property or to property under my control, when said injury is not the result of negligence on the part of APHIS; assist in maintaining such warning signs as APHIS may place out for the purpose of notifying persons entering onto such lands of the possible hazards associated with animal control measures in use thereon; and to give adequate warning to persons I authorize to enter onto such lands, of these possible hazards.

In recognition of the benefits to be derived from the use of the specified methods and devices authorized by this agreement, I, the cooperator, agree not to concurrently use or allow to be used upon lands covered by this agreement, any toxic material that might reasonably be expected to take a species listed in the above Section 2(D) unless such use of said toxicant is agreed to by APHIS in writing.

This agreement may be revoked by either party by a 30-day written notice.

SECTION 6

Special Considerations:

SIGNATURE AND TITLE (Landowner, Lessee, or Administrator)	ADDRESS	DATE
Charles Musser owner	915 JONES FRANKLIN ROAD RALEIGH, NC 27606	07/14/09
SIGNATURE AND TITLE (APHIS Representative)	**TELEPHONE**	**ADDRESS**	**DATE**
[illegible] Wildlife Specialist	252-359-9218	[illegible] NC 27557	07/14/09

WS FORM 12A (NOV 99)

*U.S. GPO: 2001-618-558/95793

PART 4 - COOPERATOR