Beaver Creek Stream Restoration
Annual Monitoring Report

Monitoring Year: 2004
Measurement Year: 1
As-built Date: 2002
NCEEP Project Number: 00005

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

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Raleigh, NC 27607

Submitted: June, 2005

Ecosystem Enhancement PROGRAM

NCDENR

NC STATE UNIVERSITY

BEAVER CREEK STREAM RESTORATION
2004 MONITORING REPORT

CONDUCTED FOR THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Table of Contents

TABLES

I. Executive Summary/Project Abstract

Overall the stream is not performing as designed. Repair work was completed in the fall of 2003. The following weekend an out of bank event occurred, heavily damaging the freshly graded and un-vegetated areas. This is the first report following the repair work; therefore the as-built was modified during the repairs. Additional repair work is scheduled for 2005.

Channel bed, banks and riparian vegetation are in poor condition. Many areas of channel instability occur along the project. Vegetation success is well below success rate goals. Problem areas are to numerous to detail in the abstract. Likely causes of the instability include inadequate vegetation establishment prior to significant storm events, poor soil conditions/type, uneven floodplain grading leading to floodplain constriction, and low pool to pool spacing (tight meander geometry)

Macroinvertebrate assessment shows similar trend to reference conditions but continued bank degradation could further impair the project site. Continued study is necessary to draw conclusions.

II. Project Background

The following project background information was extracted from the as-built monitoring report written by Earth Tech and dated February 2003.

> Beaver Creek project site consists of 4,670 linear feet of stream restoration. A tributary to the Fisher River, Beaver Creek (NCDWQ Stream Index Number – 12-63-12) is located on agricultural land southeast of the town of Dobson in Surry County, North Carolina. The watershed area for this project is 5.9 square miles. The project is fully contained within the property of five landowners.
>
> The Surry County Soil and Water Conservation District (SCSWCD) staff first identified Beaver Creek as a potential restoration site after landowners complained about active erosion and flooding adjacent to the stream. The stream was actively eroding along a tight meander located within property owned by Mr. Mike Jones. The meander eroded to the point where the radius was so tight that water was overtopping the bank and flooding the adjacent landowners (Mr. Wayne Draughn) field during storm events.
>
> Beyond the above stated problem area, Beaver Creek had other areas of significant active bank erosion throughout the proposed project limits. There is evidence of historic straightening and degradation resulting from this straightening. Thinning and removal of riparian vegetation had also accelerated the degradation process. The incised condition of the channel had accelerating the erosion process by forcing the channel to contain larger than bankfull storm events. One of the three tributaries, within the project limits, had also been straightened.
>
> The restoration site is located entirely within undeveloped land consisting of agricultural land predominantly being used for hay production, woodland, and sparse crop production. There are no utilities within the project limits. All of these characteristics combined to make Beaver Creek an excellent restoration site. The project had the following goals and objectives:
>
> 1. Restore 4,220 linear feet of Beaver Creek (as measured along the thalweg).

2. Provide a stable stream channel that neither aggrades nor degrades while maintaining its dimension, pattern, and profile with the capacity to transport its watershed's water and sediment load.
3. Improve water quality and reduce further property loss by stabilizing eroding stream banks.
4. Reconnect the stream to its floodplain or establish a new floodplain at a lower elevation.
5. Improve aquatic habitat with the use of natural material stabilization structures such as root wads, rock vanes, woody debris and a riparian buffer.
6. Provide aesthetic value, wildlife habitat and bank stability through the creation or enhancement of a riparian zone.

The Priority I restoration involved converting the impaired channel into a sinuous channel that meanders for a total of 4,220 ft as measured along the thalweg. Rock and log cross-vanes and rootwads were incorporated for aquatic habitat enhancement and bed and bank stability. A 50-foot riparian buffer on either side of the stream was planted with native vegetation.

Figure 1 shows a map with detailed directions to the project site. Table I and II list project structure and objectives. Activities and reporting history for the project are listed in Table III. Table IV lists contacts

Table I. Project Structure

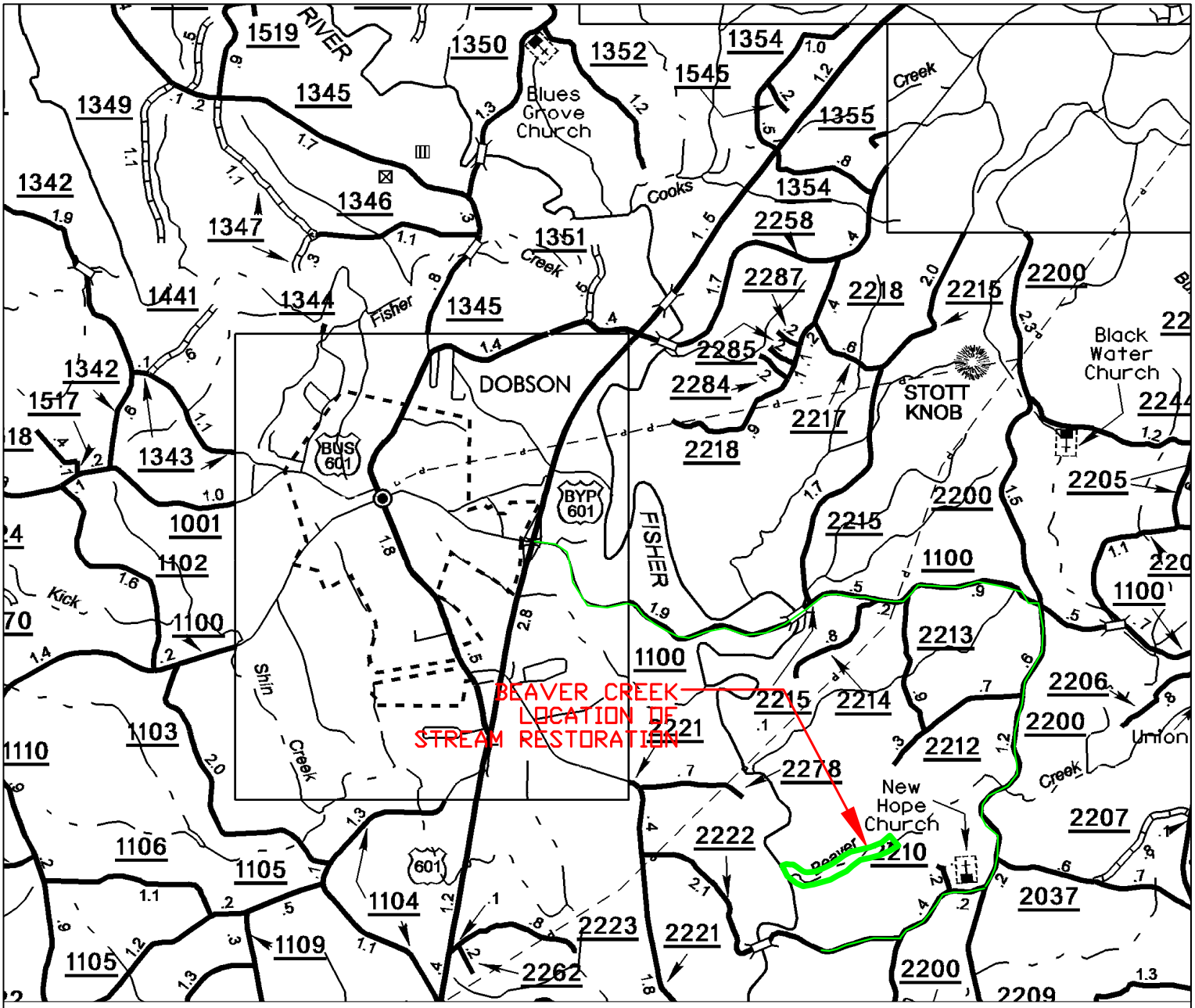
Project Number and Name: 00005 (Beaver Creek)

Segment/Reach ID	Linear Feet or Acreage
Beaver Creek	4220 linear feet

Table II. Project Objectives Table

Project Number and Name: 00005 (Beaver Creek)

Segment/Reach ID	Objectives	Linear Feet or Acreage	Comment
Beaver Creek	Full Restoration	4,220 linear feet	Priority 1 Approach
Beaver Creek	Buffer Restoration	9.4 Acres	Buffer Replanting



DIRECTIONS TO THE PROJECT SITE:
FROM WINSTON SALEM, FOLLOW HWY 421 WEST TO HWY 601. FOLLOW HYW 601 NORTH TO DOBSON. AT THE SECOND DOBSON EXIT, TURN RIGHT AT THE TOP OF THE RAMP ONTO TURKEY FORD ROAD (SR1100). FOLLOW TURKEY FORD ROAD FOR 3.7 MILES AND TURN RIGHT ONTO COPELAND SCHOOL ROAD (SR 2220). FOLLOW FOR 2.0 MILES AND TURN RIGHT ONTO SIMPSON MILL ROAD (SR2210). FOLLOW SIMPSON MILL ROAD FOR 0.7 MILES AND TURN RIGHT ONTO HAMLIN FORD ROAD (SR2222). THE ENTRANCE WILL BE A DRIVEWAY TO THE RIGHT AFTER THE TRAILER PARK (0.5 MILES). FOLLOW DRIVEWAY TO THE GATE. GO THROUGH THE GATE AND THE PORJECT IS LOCATED DOWN THE HILL.

PERMISSION MUST BE OBTAINED FROM EEP AND SURRY COUNTY SOIL AND WATER CONSERVATION DISTRICT PRIOR TO ENTERING THE PROJECT SITE.

SCALE 1" = 5000'

2500 0 2500 5000

DRAWING NO. | SHEET NO. Pg – | FILENAME BEAVERMS.DWG | PROJECT NO. | DATE 06/28/2005

BEAVER CREEK
STREAM RESTORATION
SURRY COUNTY, N.C.

FIGURE 1
PROJECT LOCATION MAP

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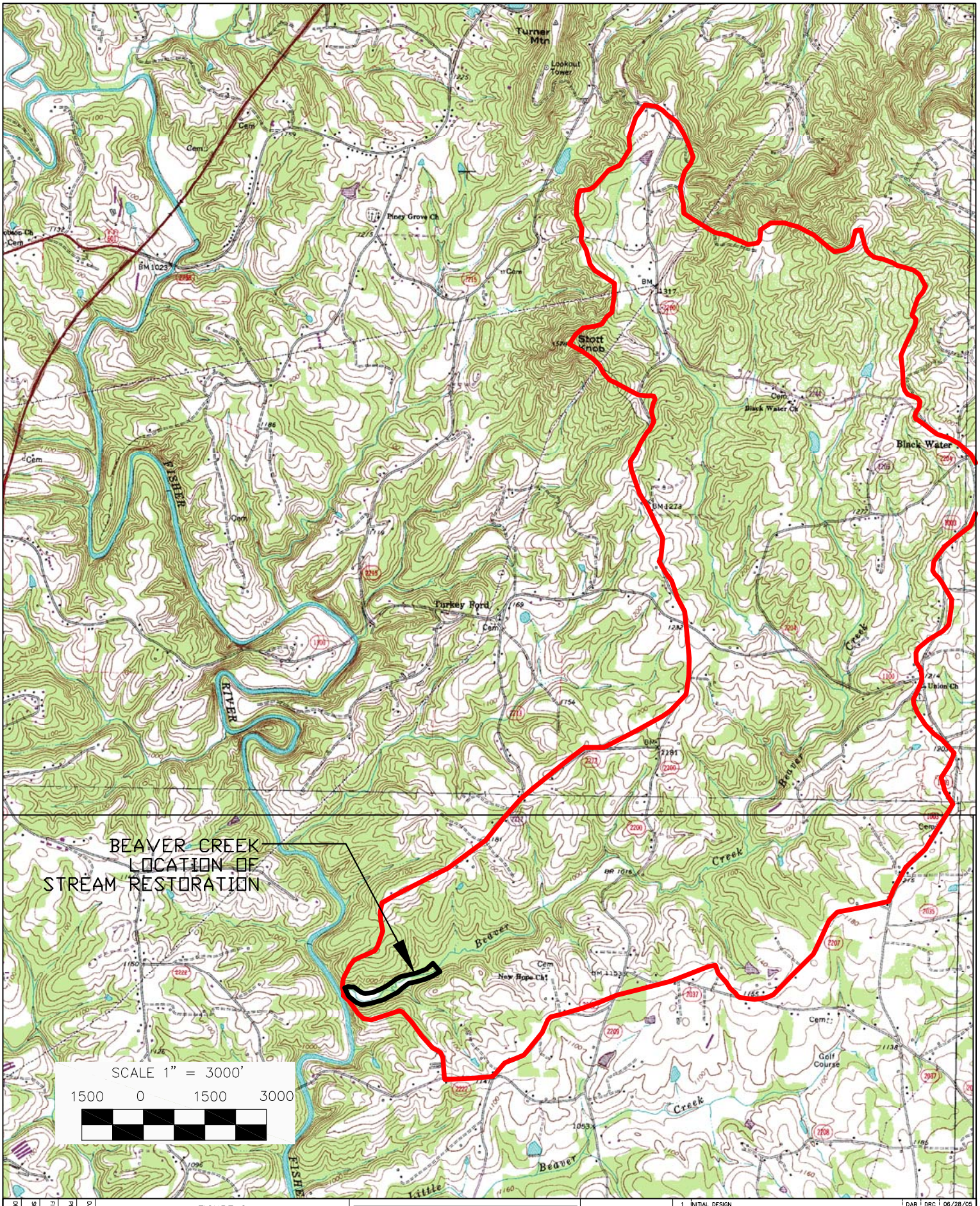
North Carolina State University
Raleigh, NC 27695

NO	REVISIONS	DRN	CHK	DATE
1	NITIAL DESIGN	DAB	DRC	06/28/05

Table III. Project Activity and Reporting History Project Number and Name: 00005 (Beaver Creek)		
Activity or Report	**Calendar Year of Completion or Planned Completion**	**Actual Completion Date**
Restoration Plan	2001	2001
Mitigation Plan	2001	2001
Construction	Fall 2002	Fall 2002
Temporary S&E mix applied to entire project area	Fall 2002	Fall 2002
As-Built report	Fall 2002	February-03
Permanent seed mix applied to reach	Fall 2002	Fall 2002
Containerized and B&B plantings for reach	N/A	N/A
Structural maintenance (bank and structure repairs)	Spring 2004	Spring 2004
Supplemental planting of bare root and containerized material	Spring 2004	Spring 2004
Initial – Year 1 monitoring	Fall 2003	Sep-04
Year 2 Monitoring	Aug-05	
Year 3 Monitoring	Aug-06	
Year 4 Monitoring	Aug-07	
Year 5 Monitoring	Aug-08	
Year 5+ Monitoring	Not Scheduled	

Table IV. Project Contact Table Project Number and Name: 00005 (Beaver Creek)	
Designer	Earth Tech of North Carolina 701 Corporate Center Drive, Suite 475 Raleigh, NC 27607
Primary project design POC	Mr. Bill Jenkins (919) 854-6200
Construction Contractor	West Contracting Post Office Box 310 Marble NC, 28905
Construction contractor POC	Maurice West Jr. (828) 837-2280
Planting Contractor	Carolina Environmental Post Office Box 1905 Mount Airy NC, 27030
Planting contractor POC	Joanne Cheatham (336) 320-3849
Seeding Contractor	Carolina Environmental Post Office Box 1905 Mount Airy NC, 27030
Planting contractor point of contact	Joanne Cheatham (336) 320-3849
Seed Mix Sources	N/A
Nursery Stock Suppliers	N/A
Monitoring Performers	Biological & Agricultural Engineering North Carolina State University Campus Box 7625 Raleigh, NC 27695
Stream Monitoring POC	Dan Clinton (919) 515-6771
Vegetation Monitoring POC	Dan Clinton (919) 515-6771

Table V. Project Background Table Project Number: 00005 (Beaver Creek)	
Project County	Surry County
Drainage Area	5.9 sq miles
Drainage impervious cover estimate (%)	Estimated at <5%
Stream Order	3rd order
Physiographic Region	Piedmont/Foothills
Ecoregion	Northern Inner Piedmont (45e)
Rosgen Classification of As-built	E-Stream Type
Cowardin Classification	N/A
Dominant soil types	N/A
Reference site ID	N/A
USGS HUC for Project and Reference	3040101
NCDWQ Sub-basin for Project and Reference	12-63-12
NCDWQ classification for Project and Reference	C
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	N/A
% of project easement fenced	0% - No cattle
Project County	Surry County



DRAWING NO.		
SHEET NO.	Pg –	
FILENAME	BEAFERWS.DWG	
PROJECT NO.		
DATE	06/28/2005	

FIGURE 2
BEAVER CREEK
SURRY COUNTY, N.C.

5.9 SQUARE MILES
WATERSHED WITH USGS QUAD

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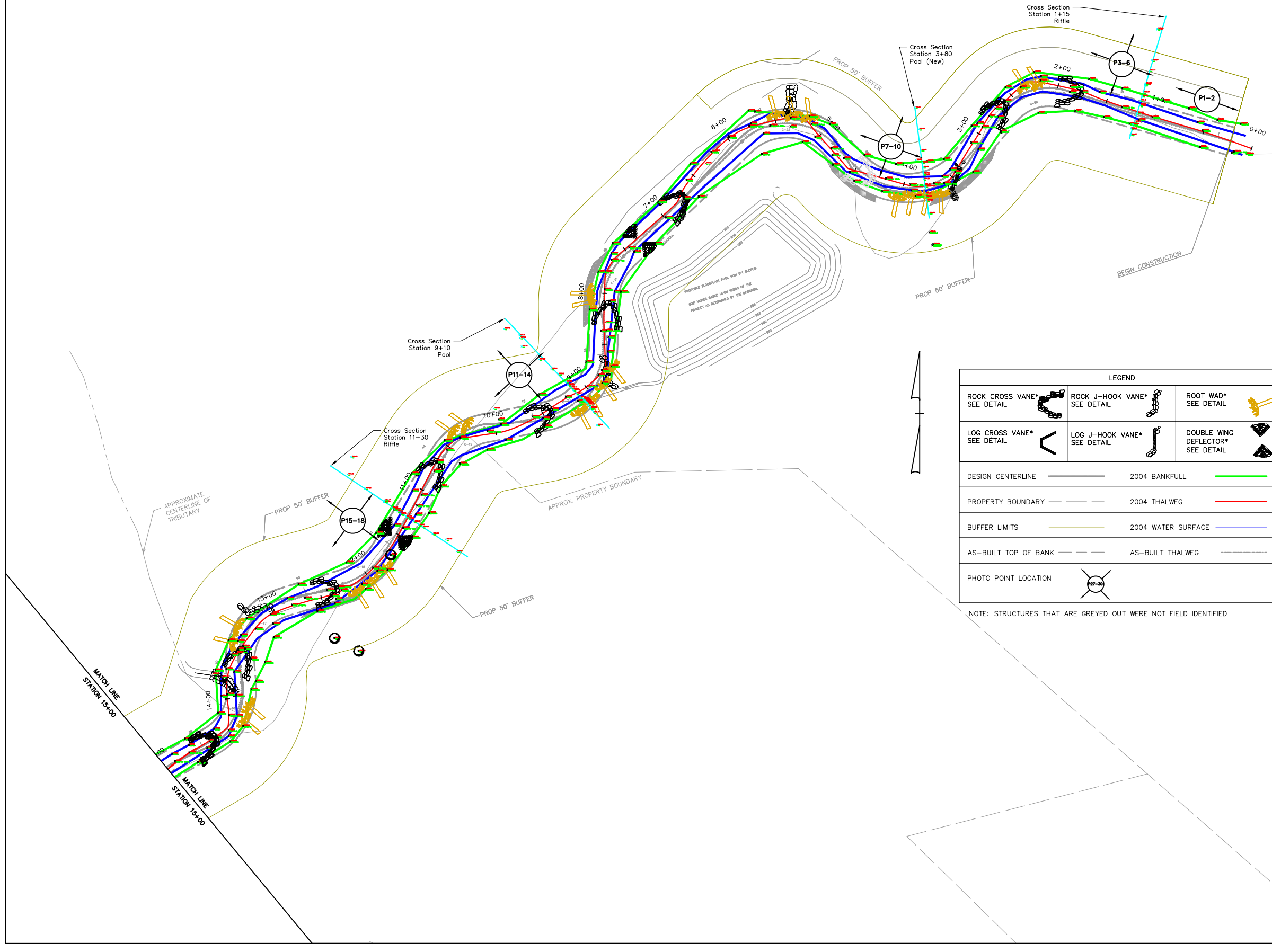

LEGEND		
ROCK CROSS VANE* SEE DETAIL	ROCK J-HOOK VANE* SEE DETAIL	ROOT WAD* SEE DETAIL
LOG CROSS VANE* SEE DETAIL	LOG J-HOOK VANE* SEE DETAIL	DOUBLE WING DEFLECTOR* SEE DETAIL
DESIGN CENTERLINE	2004 BANKFULL	
PROPERTY BOUNDARY	2004 THALWEG	
BUFFER LIMITS	2004 WATER SURFACE	
AS-BUILT TOP OF BANK	AS-BUILT THALWEG	
PHOTO POINT LOCATION (P27-36)		

NOTE: STRUCTURES THAT ARE GREYED OUT WERE NOT FIELD IDENTIFIED

SCALE 1" = 100'

100 0 50 100

NO	REVISIONS	DRN	CHK	DATE
1	INITIAL DESIGN	DRC	DAB	06/28/05

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Raleigh, NC 27695

FIGURE 3A
BEAVER CREEK
SURRY COUNTY, N.C.

STREAM RESTORATION
MONITORING PLAN VIEW

DATE 06/28/05
PROJECT NO.
FILENAME BEAVER CREEK.DWG
SHEET NO. PL – 1
DRAWING NO.

MATCH LINE STATION 15+00

MATCH LINE STATION 15+00

MATCH LINE STATION 33+00

MATCH LINE STATION 33+00

PROP 50' BUFFER

PROP 50' BUFFER

PROP 50' BUFFER

PROP 50' BUFFER

PROP 50' BUFFER

PROP 50' BUFFER

EXISTING BRIDGE

Cross Section Station 24+50 Pool

P19-22

PROPOSED FLOODPLAIN POOL WITH 3:1 SLOPES. SIZE RANGES BASED UPON NEEDS OF THE PROJECT AS DETERMINED BY THE DESIGNER.

16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00

LEGEND		
ROCK CROSS VANE* SEE DETAIL	ROCK J-HOOK VANE* SEE DETAIL	ROOT WAD* SEE DETAIL
LOG CROSS VANE* SEE DETAIL	LOG J-HOOK VANE* SEE DETAIL	DOUBLE WING DEFLECTOR* SEE DETAIL
DESIGN CENTERLINE	2004 BANKFULL	
PROPERTY BOUNDARY	2004 THALWEG	
BUFFER LIMITS	2004 WATER SURFACE	
AS-BUILT TOP OF BANK	AS-BUILT THALWEG	
PHOTO POINT LOCATION P27-30		

NOTE: STRUCTURES THAT ARE GREYED OUT WERE NOT FIELD IDENTIFIED

SCALE 1" = 100'

100 0 50 100

NO	REVISIONS	DRN	CHK	DATE
1	INITIAL DESIGN	DRC	DAB	06/28/05

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Raleigh, NC 27695

FIGURE 3B
BEAVER CREEK
SURRY COUNTY, N.C.

STREAM RESTORATION MONITORING PLAN VIEW

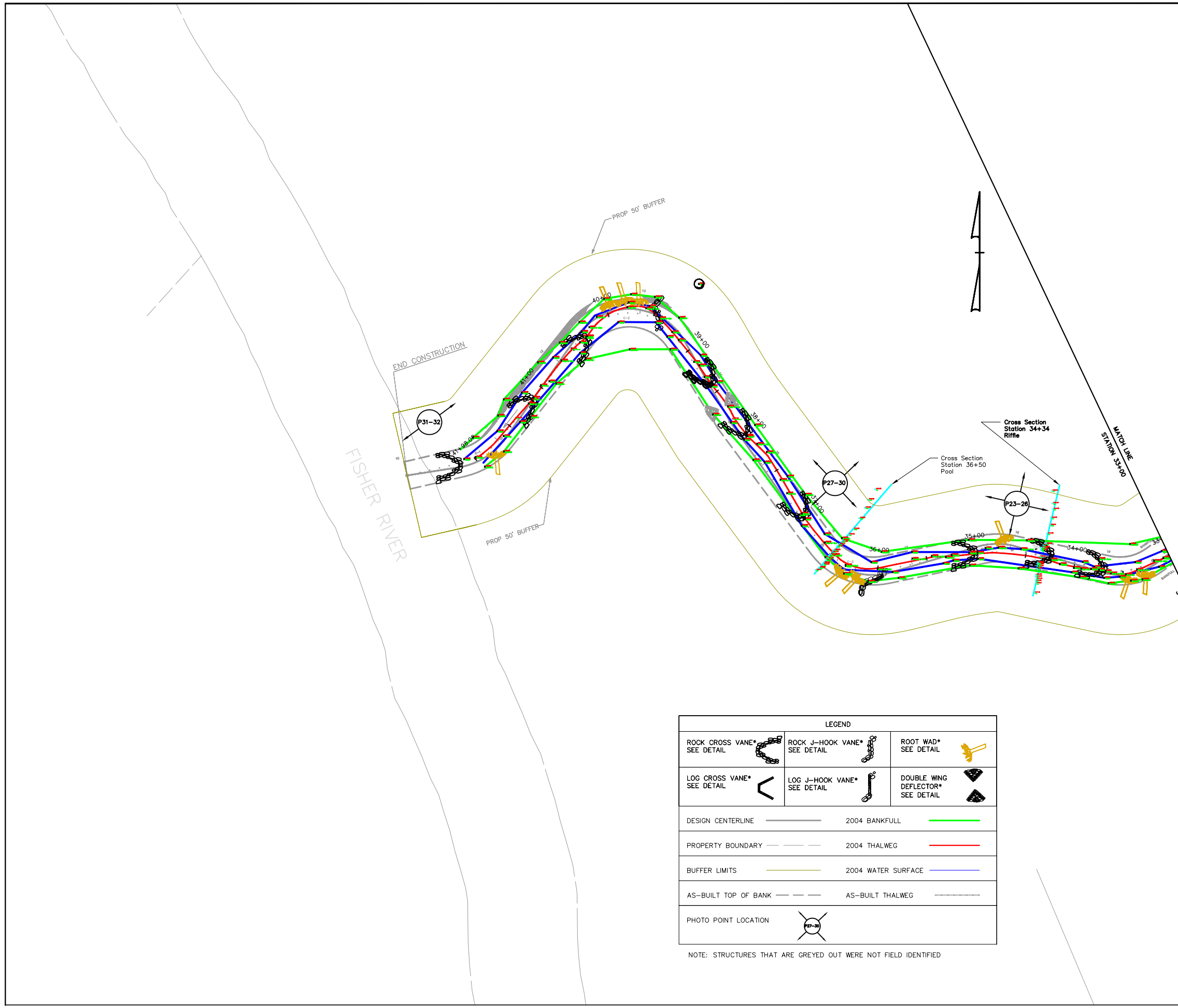
DATE 06/28/05

PROJECT NO.

FILENAME BEAVER CREEK.DWG

SHEET NO. PL - 2

DRAWING NO.



LEGEND		
ROCK CROSS VANE* SEE DETAIL	ROCK J-HOOK VANE* SEE DETAIL	ROOT WAD* SEE DETAIL
LOG CROSS VANE* SEE DETAIL	LOG J-HOOK VANE* SEE DETAIL	DOUBLE WING DEFLECTOR* SEE DETAIL
DESIGN CENTERLINE	2004 BANKFULL	
PROPERTY BOUNDARY	2004 THALWEG	
BUFFER LIMITS	2004 WATER SURFACE	
AS-BUILT TOP OF BANK	AS-BUILT THALWEG	
PHOTO POINT LOCATION P27-30		

NOTE: STRUCTURES THAT ARE GREYED OUT WERE NOT FIELD IDENTIFIED

SCALE 1" = 100'

100 0 50 100

NO	REVISIONS	DRN	CHK	DATE
1	INITIAL DESIGN	DRC	DAB	06/28/05

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FIGURE 3C
BEAVER CREEK
SURRY COUNTY, N.C.

STREAM RESTORATION MONITORING PLAN VIEW

DATE 06/28/2005
PROJECT NO.
FILENAME BEAVER CREEK.DWG
SHEET NO. PL - 3
DRAWING NO.

III. Project Condition and Monitoring Results

Monitoring results are shown below. 2004 Monitoring was conducted on September 10 and 11, 2004.

A. Vegetation Assessment

Using the Draft Vegetation Monitoring Plan for NCWRP Riparian Buffer and Wetland Restoration Projects, four vegetation monitoring plots randomly selected were surveyed for the 2004 monitoring season. No reference area was studied; therefore no comparisons could be made to reference conditions.

Vegetation within the riparian buffer of Beaver Creek varied in success. Much of the buffer is covered with new sediment from recent storms, but native herbaceous vegetation was dense in some areas. *Solidago* spp. (goldenrod) and *Juncus* spp. (rushes) are especially doing well throughout the area. Live stakes are marginally healthy in certain areas, although many have washed out during high flows and bank sloughing. Planted trees and shrubs are doing poorly throughout the entire buffer. In three of the four plots, no tree stems were counted. Although some stakes were found to be thriving, most stakes and trees had disappeared. Further, of the shrub and tree stems found alive throughout the site, most have been browsed. Overall, planted trees were found to be not successful.

Further, little to no natural regeneration was noted this year. Some very small (<15 cm) *Pinus virginiana* (Virginia pine) seedlings were noted, and appeared stressed. Overall, the area appeared to be subject to frequent disturbance keeping many areas in an early successional state.

Plot One contained 60% overall vegetation cover. Dominant plants included *Juncus* spp., *Carex* spp. (sedges), *Allium* spp. (wild onion), *Actaea* (baneberry), *Solanum* spp., *Microstegium vimineum* (Japanese stilt grass), and planted *Panicum clandestinum* (deer tongue) and *Panicum virgatum* (switch grass). Plot Two exhibited over 80% vegetation cover, including more invasives. Dominants included *Solidago* spp., *Rubus* spp. (blackberry), *Trifolium repens* (clover), *M. vimineum, Lonicera japonica* (Japanese honeysuckle), *Gnaphalium* spp. (rabbit tobacco), *Bidens* spp. (beggars ticks), and *Festuca* spp. (fescue). Plot Three had 80% vegetation cover also, with a bare area of sand and cobbles along the channel. Dominant plants included sedges, upland cress, *Solidago*, *Allium*, *P. virgatum*, and an unknown. Plot Four was typical of large areas of the buffer, conspicuous for recent overwash and sediment deposition. Plant cover was about 20%, primarily *Juncus* spp. Also present were *Panicum* spp., *Carex* spp., *Andropogon* spp., *Solidago* spp., and *L. japonica*. Dead stakes were present close to the channel.

Much deposition, overwash, and erosion have taken place since planting, and large areas originally impacted by construction have very little existing cover. However, the bank less impacted by construction has good cover of mature trees, providing bank stability and potential natural regeneration of trees.

Recommendations include replanting larger containerized trees to obtain mitigation requirements and staking in areas where erosion is problematic. Although invasive vegetation is not a major issue on this project site, exotic invasive species present include *M. vimineum, L. japonica*, and *Paulownia tomentosa* (princess tree). Control measures may be necessary if these species become dense. Finally, deer are an issue on this site. Measures should be taken to prevent deer browse of planted vegetation.

The following table summarizes vegetation and soils results for 2004 Monitoring. Preliminary soils data were not collected for this project. Please refer to the Beaver Creek Restoration Plan for soils information. Vegetation problem areas are summarized below in table VII. Raw vegetation data can be found in Appendix A. Data is summarized in Table VIII below. Photos were not taken of the vegetation plots but typical areas can be seen in the stream photo log.

Table VI. Preliminary Soil Data
00005 - Beaver Creek

Series	Max Depth (in.)	% Clay on Surface	K	T	OM %
No soils data was collected as part of the monitoring period/ Please refer to restoration plan for soils information.					

Table VII. Vegetative Problem Areas
Beaver Creek

Feature/Issue	Station # / Range	Probable Cause	Photo #
Bare Bank	Throughout problem areas	Bank erosion	Example see SP13
		Storm deposition	
Bare Flood Plain	Sporadic through the site	Storm deposition	Example see SP18
Invasive/Exotic Populations	Minimal locations not field identified	Existing or upland seed source	No photo taken
Dead and missing live stakes	Throughout project	Storm deposition	No photo taken
		Possible poor quality or installation	
		Deer browse	
Dead or missing trees	Sporadic through the site	Deer browse	No photo taken
		Storm deposition	
		Possible poor quality or installation	

Table VIII: Stem counts for each species arranged by plot.							
Species	**Plots**				**Initial Totals**	**Year 1 Totals**	**Survival %**
	1	2	3	4			
Shrubs							
Salix sericea	3	4	0	0	Unknown	7	-
Cornus amomum	1	1	0	0	Unknown	2	-
Trees							
Alnus spp.	0	4	0	0	Unknown	4	-
Pinus virginiana	0	6	0	0	Unknown	6	-
Betula nigra	0	3	0	0	Unknown	3	-

B. Stream Assessment

Overall the stream is not performing as designed. Repair work was completed in the fall of 2003. The following weekend an out of bank event occurred, heavily damaging the freshly graded and un-vegetated areas. This is the first report following the repair work; therefore the as-built was modified during the repairs. Additional repair work is scheduled for 2005.

Channel dimension has changed very significantly in four (#1, 5, 6, and 7) of the six monitoring cross-sections. Enlargement in sections 5, 6 and 7 were directly related to the repair work conducted in 2003. Cross section 1 reduced the as-built area but was larger then designed when built. Cross-section 2 was added at station 3+80 to monitor active bank erosion. Significant bank erosion is occurring on sections 2 and 3. Many other areas of significant channel enlargement and bank erosion is occurring along the project. A plan view and photos of problem areas can be found in Appendix B.

Channel substrate has become finer in two of the three riffle sections. All of the pools have coarsened. Sediment being generated from the active bank erosion throughout the project is the likely cause.

Although, channel pattern measurements remain similar to design conditions, the active bank erosion will likely have an effect on that if not repaired. A new meander is beginning to form at station 22+50.

Channel profile has changed throughout the project. The most significant problem is downcutting most evident from stations 10+50 to 12+34 and 20+00 to 28+00. This can be seen in cross section 4 at station 11+30 and cross section 5 at station 24+50. Some migration of bedform has occurred between station 18+00 and 23+00 and between 30+00 and 37+00. Riffle-pool complexes have disappeared between stations 11+80 and 17+00 as well as between stations 27+10 and 28+90. New riffle-pool complexes have formed between 37+50 and 39+00. Overall the bed profile is in poor condition.

Likely causes of the instability include inadequate vegetation establishment prior to significant storm events, poor soil conditions/type, uneven floodplain grading leading to floodplain constriction, and low pool to pool spacing (tight meander geometry).

Table IX. Stream Problem Areas				
Project Number and Name:				
Problem Number	**Feature Issue**	**Station numbers**	**Suspected Cause**	**Photo number**
PA 1	Erosion and scour around root wads	3+60 to 4+20	Short riffle section upstream Floodplain constriction	SP1
PA 2	Bank scour	8+10 to 8+30	Narrow vane configuration Floodplain constriction	SP2
PA 3	Erosion and scour around root wads	8+80 to 9+20	Short riffle section upstream Floodplain constriction	SP3-5
PA 4	Piping through cross vane	10+60	Poor soils	SP6
PA 5	Scour downstream of cross vane	11+10 to 11+30	Narrow bank graded below vane	SP7-8
PA 6	Blowout around rootwad and cross vane	12+00 to 12+60	Poor vegetation establishment Floodplain constriction	SP9-10
PA 7	Cutting around cross vane	13+50 to 13+80	Poor soils Floodplain constriction	SP11-14
PA 8	Cutting around cross vane	14+30 to14+60	Floodplain constriction	SP15
PA 9	Cutting around log cross vane	17+00 to 17+20	Floodplain constriction Poor vegetation establishment	SP16
PA 10	Bank Slumping Erosion around vane	18+10 to 18+30	Poor vegetation establishment Floodplain constriction	Similar to SP17
PA 11	Bank scour and erosion	20+10 to 20+40	Poor vegetation establishment Floodplain constriction	SP17
PA 12	Blowout around vane	22+20 to 22+80	Floodplain constriction Poor meander geometry	SP18-19
PA 13	Bank scour	23+80 to 24+00	Poor vegetation establishment Floodplain constriction	Similar to SP17
PA 14	Cutting around cross vane	24+10 to 24+30	Floodplain constriction Poor vegetation establishment	Similar to SP15
PA 15	Log vane moved Bank erosion	24+80 to 25+10	Floodplain constriction Tight meander geometry	SP20
PA 16	Bank scour	27+10 to 27+20	Tight meander geometry Poor vegetation establishment	SP21-22
PA 17	Cutting around single log vane	27+70 to 27+90	Floodplain constriction Improper backfilling behind vane	Similar to SP15
PA 18	Bank scour	28+20 to 28+30	Poor vegetation establishment Floodplain constriction	Similar to SP23
PA 19	Bank scour from debris jam	28+90 to 29+10	Debris jam directing flows into bank	SP23
PA 20	Scour in front or root wad	30+50 to 30+60	Inadequate number of root wads	SP24
PA 21	Bank erosion	30+80 to 31+00	Floodplain constriction	SP24
PA 22	Over wide	35+40 to 35+80	Poor construction	SP25
PA 23	Lower bank scour	37+20 to 37+40	Poor vegetation establishment	Similar to SP26
PA 24	Bare lower bank	39+20 to 39+40	Poor vegetation establishment	SP26
PA 25	Piping around vane	40+30 to 40+50	Poor soils Backwater from Fisher River	SP27-28
PA 26	Cutting around vane	40+90 to 41+10	Poor soils Backwater from Fisher River Poor vegetation establishment	SP29
PA 27	Bank scour Bank slumping	41+80 to 41+95	Poor soils Backwater from Fisher River Poor vegetation establishment	Similar to SP30
PA 28	Bank scour Bank slumping	42+00 to 42+30	Poor soils Backwater from Fisher River Poor vegetation establishment	SP30

Table X. Baseline Morphology and Hydraulic Summary
Project Number and Name:
Segment/Reach:

Parameter	USGS Gage Data			Regional Curve			Pre-Existing			Project Reference			Design			As-built		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)	USGS gage data is unavailable for this project						Please refer the the Beaver Creek Stream Mitigation Plan for Pre-Existing Conditions Data			Please refer the the Beaver Creek Stream Mitigation Plan for Project Reference Reach Data			Please refer the the Beaver Creek Stream Mitigation Plan and Construction Plan Sheets for Design Data			21.9	33.6	
Floodprone Width (ft)																		313
BF Cross Sectional Area (ft^2)																55.1	104.6	
BF Mean Depth (ft)																2.6	3.1	
BF Max Depth (ft)																4.3	5.2	
Width/Depth Ratio																9.8	10.8	
Entrenchment Ratio																9.4	12	
Wetted Perimeter(ft)																n/a	n/a	
Hydraulic radius (ft)																n/a	n/a	
Pattern																		
Channel Beltwidth (ft)																43	208	87
Radius of Curvature (ft)																45	76	65
Meander Wavelength (ft)																192	485	275
Meander Width ratio																		
Profile																		
Riffle length (ft)																n/a	n/a	n/a
Riffle slope (ft/ft)																n/a	n/a	n/a
Pool length (ft)																n/a	n/a	n/a
Pool spacing (ft)																n/a	n/a	n/a
Substrate																		
d50 (mm)																0.08	11.65	0.52
d84 (mm)																0.36	71.37	20.555
Additional Reach Parameters																		
Valley Length (ft)	3314																	
Channel Length (ft)	4220																	
Sinuosity	1.3																	
Water Surface Slope (ft/ft)	0.50%																	
BF slope (ft/ft)	n/a																	
Rosgen Classification	E5																	
Number of Bankfull Events	0																	
Extent of BF floodplain (acres)	n/a																	
*BEHI																		
*Habitat Index																		
*Macrobenthos																		

* Inclusion will be project specific and determined primarily by As-built monitoring plan/success criteria

Table XI. Morphology and Hydraulic Monitoring Summary

Project Number and Name:

Segment/Reach:

Parameter	Cross Section 1			Cross Section 2			Cross Section 3			Cross Section 4			Cross Section 5			Cross Section 6			Cross Section 7		
	Station 1+17 Riffle			Station 3+80 Pool			Station 9+11 Pool			Station 11+30 Riffle			Station 24+50 Pool			Station 34+34 Riffle			Station 36+50 Pool		
Dimension	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2
BF Width (ft)	33.6	29.1		N/A	29.1		27.4	24.6		33	32.9		21.9	48		25.7	34.6		22	38.2	
Floodprone Width (ft) (approx)	315	315								315	315					315	315				
BF Cross Sectional Area (ft^2)	104.6	86.8		N/A	110.6		75.2	78.2		103.8	108		55.1	125.8		67.4	93.6		66	95.2	
BF Mean Depth (ft)	3.1	2.7		N/A	3.8		2.7	3.2		3.1	3.3		2.5	2.6		2.6	2.7		3	2.5	
BF Max Depth (ft)	4.6	4.5		N/A	5.8		4.8	5.2		4.8	6.7		5	5.7		4.3	4.8		5.2	5.8	
Width/Depth Ratio	10.8	11.8								10.5	10					9.8	12.8				
Entrenchment Ratio	9.4	10.8								9.5	9.6					12.3	9.1				
Wetted Perimeter(ft)	n/a	n/a		n/a	n/a		n/a	n/a		n/a	n/a		n/a	n/a		n/a	n/a		n/a	n/a	
Hydraulic radius (ft)	n/a	n/a		n/a	n/a		n/a	n/a		n/a	n/a		n/a	n/a		n/a	n/a		n/a	n/a	
Substrate																					
d50 (mm)	3.93	1.13		N/A	0.36		0.14	0.44		11.65	0.55		0.94	5.25		0.11	0.36		0.08	0.36	
d84 (mm)	71.37	45.32		N/A	27.88		16.48	21.7		38.5	22.02		24.63	38.5		0.36	27.88		0.5	27.88	

Parameter	MY-00 (2002)			MY-01 (2004)			MY-02 (2005)			MY-03 (2006)			MY-04 (2007)			MY-05 (2008)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	43	208	87	39	192	80												
Radius of Curvature (ft)	45	76	65	42	170	90												
Meander Wavelength (ft)	192	485	275	182	481	267												
Meander Width ratio																		
Profile																		
Riffle length (ft)				12	408	69												
Riffle slope (ft/ft)				0.00	0.038	0.005												
Pool length (ft)				32	246	90.5												
Pool spacing (ft)				69.5	242.5	177.5												

Additional Reach Parameters																		
Valley Length (ft)	3314																	
Channel Length (ft)	4220			4198														
Sinuosity	1.3			1.3														
Water Surface Slope (ft/ft)	0.50%			0.55%														
BF slope (ft/ft)	n/a			0.54%														
Rosgen Classification	E5			E5														
Number of Bankfull Events	0			Aproximetly 3														
Extent of BF floodplain (area)	n/a			n/a														
BEHI*																		
Habitat Index*																		
Macrobenthos*																		

C. Benthic Macroinvertebrate Assessment

Two full scale samples were collected from Beaver Creek prior to and one year following restoration. Unfortunately samples were collected from very different seasonal time periods, which did account for significant differences in the fauna between investigations. An upstream site (reference) was located approximately 50 meters above the restoration reach and a downstream site (Station 1) was located near the end and within the restoration reach. Both stations had a well-developed riparian canopy (somewhat less so downstream) and fairly stable banks. There were some areas where the banks were eroding, but overall both stations looked relatively stable. The reference was in a more stable reach with large bedrock outcrops but had lots of fine sediments in the pools, which suggests that there are catchment-wide problems with erosion. The stability of this site was reflected in the higher abundance values of many EPT taxa (Epeorus, other Heptageniids, Isonychia) and Elimia relative to the downstream location. The collection location within in the restored reach is at transect 32+20 near an old wooden bridge. The EPT taxa richness and abundance values were very high at this location during the preconstruction survey. Interestingly the DIC metric only noted a 62% comparison between these two locations and that the downstream (restored) reach had 15 keystone species.

Table XII. Summary statistics from the stream restoration project at Beaver Creek (Surry County).

Metric/Site	**Reference Reach**		**Restored Reach**	
Year of Collection	April 2002	June 2004	April 2002	June 2004
Total Taxa Richness	98	58	111	60
EPT Taxa Richness	42	31	40	31
EPT Abundance	195	155	147	151
Dominant in Common Index (%)	-	-	62%	64%
# Keystone Species	16	14	15	11

The first post-construction survey was conducted during June 2004. Large differences in population structure within many groups were noted during this survey due to season variability. These groups include the caddisflies (13 and 14 taxa in 2002 and 8 and 9 taxa in 2004), stoneflies (12 and 8 taxa in 2002 and only 5 at both sites in 2004) and chironomidae (27 and 33 taxa in 2002 and 9 and 11 in 2004). These seasonal differences make direct comparison of the data difficult between surveys; however, post-construction data did note similar DIC percentages (64% vs 62% during the preconstruction survey) and the presence of 11 keystone taxa. These data suggest that fauna of downstream reach of Beaver Creek have recolonized rapidly following restoration. However many taxa were not collected, or reduced in abundance, at the downstream reach during the 2004 investigation (i.e. Epeorus, Rhyacophila and Elimia) and many more grazing taxa (especially Baetidae) were found within this reach. Additional information will be collected from this project in 2005.

IV. Methodology Section

Monitoring methods used are based on US Army Corps of Engineering and NC Division of Water Quality Guides as referenced below.

References:

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

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

APPENDIX A

Vegetation Raw Data

1. Vegetation Survey Data Tables

Beaver Creek Stream Restoration									
Surry County, NC									
		Quad 1							
Location of plot corner (at channel edge on upstream end of plot)									
N 36° 21.760'									
W 80° 40.186'									
Tree Stratum									
Species	**Height (cm)**	**Diameter (mm)**	**Radius (mm)**	**Σ X-sec. (mm²)**	**Rel. x-sec (%)**	**Density**	**Rel. Density (%)**	**Rank (Importance)**	**Average**
no trees present									
Total Trees per acre						0			
Planted trees per acre						0			
Natural regen. trees per acre						0			
Shrub Stratum									
Species	**Cover (%)**	**Rel. cover (%)**	**Density**	**Rel. Density (%)**	**Rank (Importance)**				
Cornus amomum	1	98%	3	75	1				
Salix sericea	0.02	2%	1	25	2				
Total	**1.02**	**100%**	**4**	**100**					
Herb Stratum									
Species	**Cover (%)**	**Rel. cover (%)**	**Rank (Importance)**						
Rubus spp.	5	12.5	4						
Solidago spp.	10	25.0	1						
Moss	3	7.5	5						
Winter annual unk. 1	10	25.0	2						
Winter annual unk. 1	10	25.0	3						
Aster spp.	2	5.0	6						
Total	**40**	**100.0**							

Beaver Creek Stream Restoration

Surry County, NC

Quad 2

Location of plot corner (at channel edge on upstream end of plot)

N 36° 21.779'

W 80° 40.134'

Tree Stratum

Species	Height (cm)	Diameter (mm)	Radius (mm)	Σ X-sec. (mm²)	Rel. x-sec (%)	Density	Rel. Density (%)	Rank (Importance)	Average
Alnus spp.						4	30.8%	2	
Pinus virginiana						6	46.2%	1	
Betula nigra						**3**	23.1%	3	
Overall Total						**13**			
Total Trees per acre						520			
Planted trees per acre						120			
Natural regen. trees per acre						400			

Shrub Stratum

Species	Cover (%)	Rel. cover (%)	Density	Rel. Density (%)	Rank (Importance)
Salix sericea	3	86%	4	80	1
Cornus amomum	0.5	14%	1	20	2
Total	**3.5**	**1.0**	**5**	**100**	

Herb Stratum

Species	Cover (%)	Rel. cover (%)	Rank (Importance)
Viola spp.	15	16.7	
Solidago spp.	60	66.7	
Lactuca spp.	15	16.7	
Total	**90**	**100.0**	

Beaver Creek Stream Restoration									
Surry County, NC									
		Quad 3							
Location of plot corner (at channel edge on upstream end of plot)									
N 36° 21.733'									
W 80° 40.291'									
Tree Stratum									
Species	**Height (cm)**	**Diameter (mm**	**Radius (mm)**	**Σ X-sec. (mm²)**	**Rel. x-sec (%)**	**Density**	**Rel. Density (%)**	**Rank (Importance)**	**Average**
no trees observed									
Overall Total									
Total Trees per acre						0			
Planted trees per acre						0			
Natural regen. trees per acre						0			
Shrub Stratum									
Species	**Cover (%)**	**Rel. cover (%)**	**Density**	**Rel. Density (%)**	**Rank (Importance)**				
no shrubs observed									
Herb Stratum									
Species	**Cover (%)**	**Rel. cover (%)**	**Rank (Importance)**						
Carex spp.	35	38.9	2						
Panicum spp.	55	61.1	1						
Total	90	100.0							

Beaver Creek Stream Restoration									
Surry County, NC									
		Quad 4							
Location of plot corner (at channel edge on upstream end of plot)									
N 36° 21.678'									
W 80° 40.445'									
Tree Stratum									
Species	**Height (cm)**	**Diameter (mm)**	**Radius (mm)**	**Σ X-sec. (mm²)**	**Rel. x-sec (%)**	**Density**	**Rel. Density (%)**	**Rank (Importance)**	**Average**
no trees observed									
Total Trees per acre						0			
Planted trees per acre						0			
Natural regen. trees per acre						0			
Shrub Stratum									
Species	**Cover (%)**	**Rel. cover (%)**	**Density**	**Rel. Density (%)**	**Rank (Importance)**				
no shrubs									
Herb Stratum									
Species	**Cover (%)**	**Rel. cover (%)**	**Rank (Importance)**						
Juncus spp.	20	100.0	1						
Total	20	100.0							

APPENDIX B

Morphology Raw Data

1. Problem Area Plan View
2. Representative Stream Problem Area Photos
3. Stream Photo-station Photos
4. Cross section Plots and Raw Data Tables
5. Longitudinal Plots and Raw Data Tables
6. Pebble Count Plots and Raw Data Tables

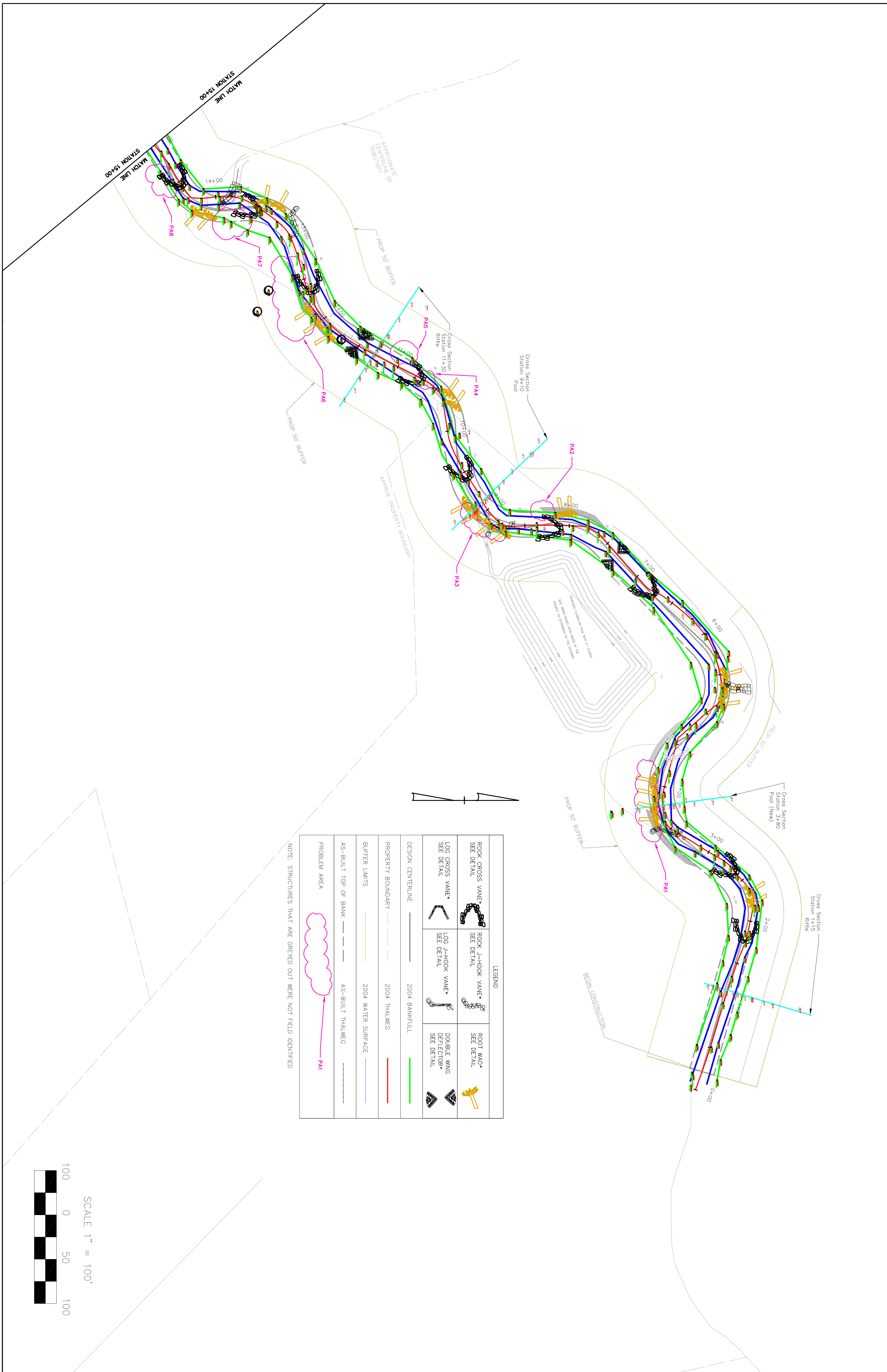


FIGURE B-1
BEAVER CREEK
SURRY COUNTY, N.C.

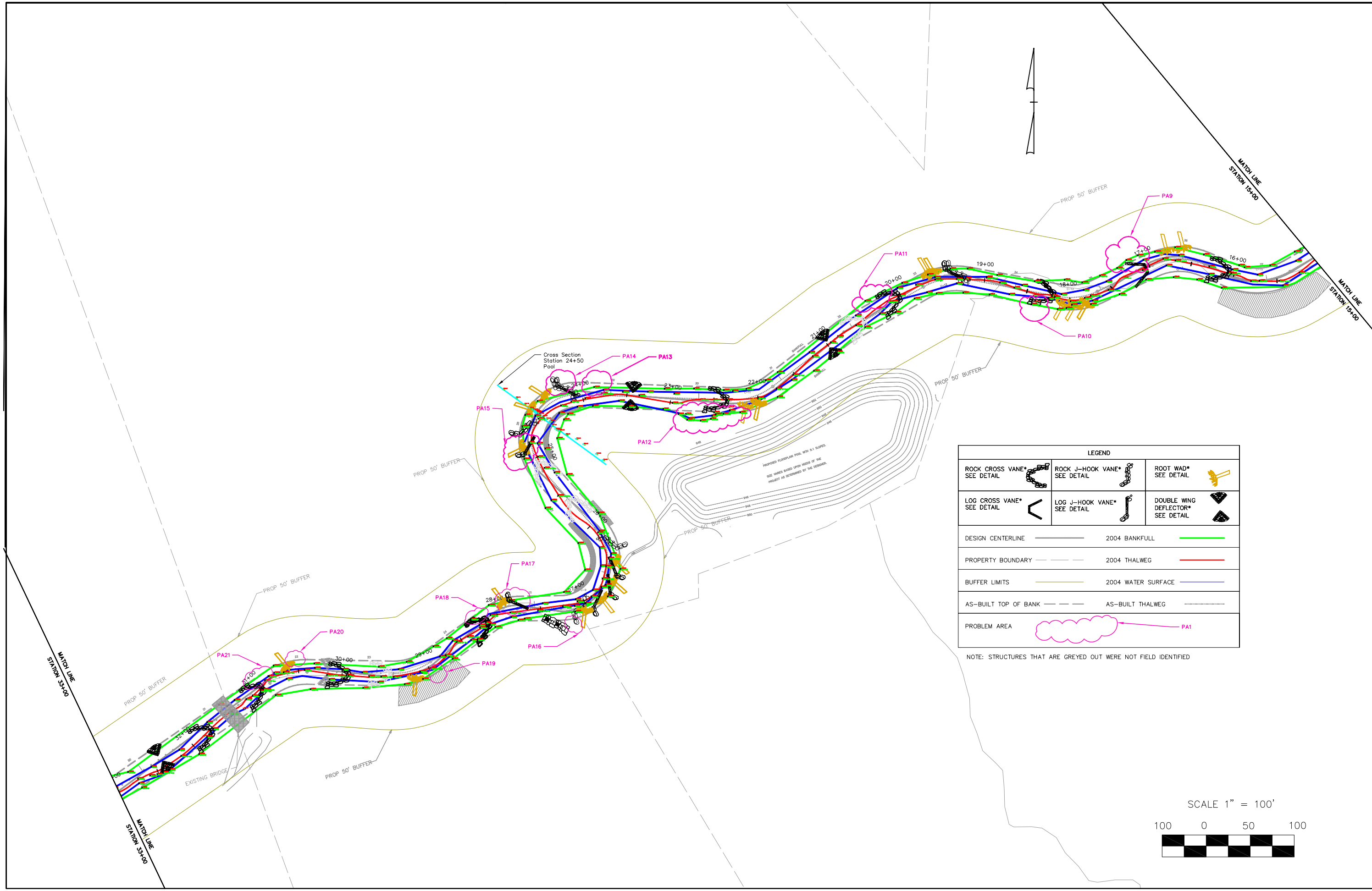
FIGURE B1–STREAM RESTORATION PROBLEM AREA PLAN VIEW

NC STATE UNIVERSITY

BIOLOGICAL & AGRICULTURAL ENGINEERING
Weaver Labs Campus Box 7625
North Carolina State University
Raleigh, NC 27695

NO	REVISIONS	DRN	CHK	DATE
1	INITIAL DESIGN	DRC	DAB	06/28/05

DATE 06/28/05
PROJECT NO.
FILENAME BEAVER CREEK.DWG
SHEET NO. PL - 1
DRAWING NO.



LEGEND		
ROCK CROSS VANE* SEE DETAIL	ROCK J-HOOK VANE* SEE DETAIL	ROOT WAD* SEE DETAIL
LOG CROSS VANE* SEE DETAIL	LOG J-HOOK VANE* SEE DETAIL	DOUBLE WING DEFLECTOR* SEE DETAIL
DESIGN CENTERLINE	2004 BANKFULL	
PROPERTY BOUNDARY	2004 THALWEG	
BUFFER LIMITS	2004 WATER SURFACE	
AS-BUILT TOP OF BANK	AS-BUILT THALWEG	
PROBLEM AREA PA1		

NOTE: STRUCTURES THAT ARE GREYED OUT WERE NOT FIELD IDENTIFIED

SCALE 1" = 100'

100 0 50 100

NO	REVISIONS	DRN	CHK	DATE
1	INITIAL DESIGN	DRC	DAB	06/28/05

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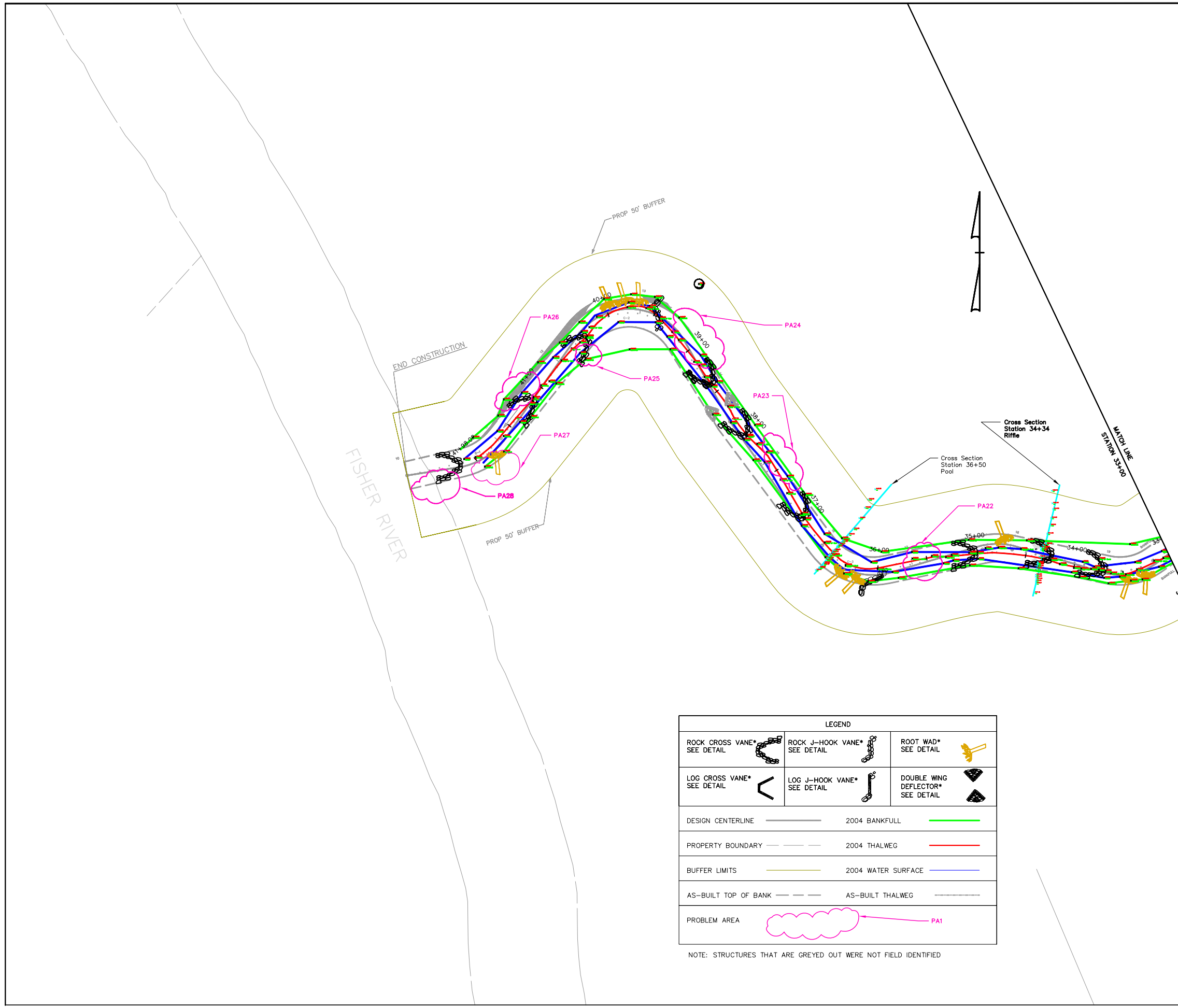
Weaver Labs, Campus Box 7625
North Carolina State University
Raleigh, NC 27695

FIGURE B-2
BEAVER CREEK
SURRY COUNTY, N.C.

STREAM RESTORATION MONITORING PLAN VIEW

DATE	06/28/05
PROJECT NO.	
FILENAME	BEAVER CREEK.DWG
SHEET NO.	PL - 2
DRAWING NO.	



LEGEND		
ROCK CROSS VANE* SEE DETAIL	ROCK J-HOOK VANE* SEE DETAIL	ROOT WAD* SEE DETAIL
LOG CROSS VANE* SEE DETAIL	LOG J-HOOK VANE* SEE DETAIL	DOUBLE WING DEFLECTOR* SEE DETAIL
DESIGN CENTERLINE	2004 BANKFULL	
PROPERTY BOUNDARY	2004 THALWEG	
BUFFER LIMITS	2004 WATER SURFACE	
AS-BUILT TOP OF BANK	AS-BUILT THALWEG	
PROBLEM AREA PA1		

NOTE: STRUCTURES THAT ARE GREYED OUT WERE NOT FIELD IDENTIFIED

SCALE 1" = 100'

100 0 50 100

NO	REVISIONS	DRN	CHK	DATE
1	INITIAL DESIGN	DRC	DAB	06/28/05

NC STATE UNIVERSITY

BIOLOGICAL & AGRICULTURAL ENGINEERING
Wilkinson Hall, Campus Box 7625
North Carolina State University
Raleigh, NC 27695

FIGURE B-3
BEAVER CREEK
SURRY COUNTY, N.C.

STREAM RESTORATION MONITORING PLAN VIEW

DATE 06/28/2005
PROJECT NO.
FILENAME BEAVER CREEK.DWG
SHEET NO. PL - 3
DRAWING NO.

2004 Problem Area Photos

Beaver Creek Stream Restoration
Surry County, North Carolina

SP1. Station 3+60 to 4+20
Erosion and scour around root wads

SP2. Station 8+10 to 8+30
Bank scour

SP3. Station 8+80 to 9+20
Erosion and scour around root wads

SP4. Station 8+80 to 9+20
Erosion and scour around root wads

SP5. Station 8+80 to 9+20
Erosion and scour around root wads

SP6. Station 10+60
Piping through cross vane

SP7. Station 11+10 to 11+30
Scour downstream of cross vane

SP8. Station 11+10 to 11+30
Scour downstream of cross vane

SP9. Station 12+00 to 12+60
Blowout around root wad and cross vane

SP10. Station 12+00 to 12+60
Blowout around root wad and cross vane

SP11. Station 13+50 to 13+80
Cutting around cross vane

SP12. 2002 Photo Station 13+50 to 13+80
Cutting around cross vane

SP13. 2002 Station 13+50 to 13+80
Cutting around cross vane

SP14. 2002 Station 13+50 to 13+80
Cutting around cross vane

SP15. Station 14+30 to 14+60
Cutting around cross vane

SP16. Station 17+00 to 17+20
Cutting around log cross vane

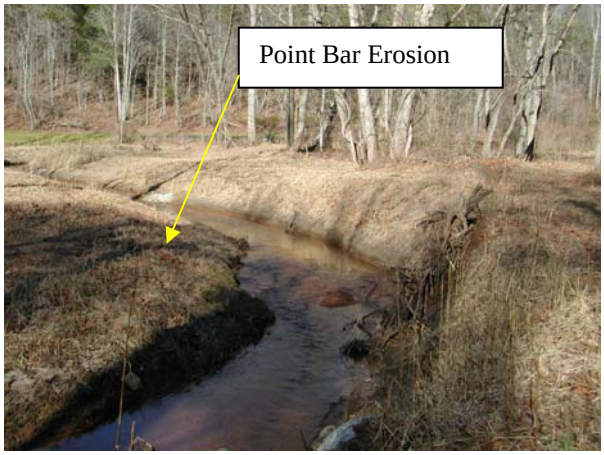
SP17. Station 20+10 to 20+40
Bank scour and erosion

SP18. Station 22+20 to 22+80
Blowout around vane

SP19. Station 22+20 to 22+80
Blowout around vane

SP20. Station 24+80 to 25+10
Log vane moved

SP21. Station 27+10 to 27+20
Bank scour



SP22. 2002 photo Station 27+10 to 27+20
Point bar scour

SP23. Station 28+90 to 29+10
Bank scour from debris jam

SP24. Station 30+50 to 31+00
Scour in front of root wad and bank erosion

SP25. Station 35+40 to 35+80
Over wide

SP26. Station 39+20 to 39+40
Bare lower bank

SP27. Station 40+30 to 40+50
Piping around vane

SP28. 2002 Problem Photo 40+50

SP29. Station 40+90 to 41+10
Cutting around vane

SP30. Station 42+00 to 42+30
Bank scour and bank slumping

2004 Photo Reference Points

Beaver Creek Stream Restoration
Surry County, North Carolina

2002-As-built 2004


Photo 1. Beginning of the project looking upstream


Photo 2. Beginning of the project looking downstream


Photo 3. Station 1+17 Cross section 1. Upstream


Photo 4. Station 1+17 Cross section 1. Downstream


Photo 5. Station 1+17 Cross section 1. Left Bank

As-built Photo Missing Right Bank

As-built Photo Missing Right Bank

Photo 6. Station 1+17 Cross section 1. Right Bank

New cross-section

Photo 7. Station 3+80 Cross section 2. Downstream

New cross-section

Photo 8. Station 3+80 Cross section 2. Upstream

New cross-section

Photo 9. Station 3+80 Cross section 2. Left Bank

New cross-section

Photo 10. Station 3+80 Cross section 2. Right Bank

Photo 11. Station 9+11 Cross section 3. Downstream


Photo 12. Station 9+11 Cross section 3. Upstream


Photo 13. Station 9+11 Cross section 3. Left Bank


Photo 14. Station 9+11 Cross section 3. Right Bank


Photo 15. Station 11+30 Cross section 4. Downstream


Photo 16. Station 11+30 Cross section 4. Upstream


Photo 17. Station 11+30 Cross section 4. Right Bank


Photo 18. Station 11+30 Cross section 4. Left Bank


Photo 19. Station 24+50 Cross section 5. Downstream


Photo 20. Station 24+50 Cross section 5. Upstream


Photo 21. Station 24+50 Cross section 5. Left Bank


Photo 22. Station 24+50 Cross section 5. Right Bank


Photo 23. Station 34+34 Cross section 6. Downstream

Photo 24. Station 34+34 Cross section 6. Upstream

Photo 25. Station 34+34 Cross section 6. Left Bank

Photo 26. Station 34+34 Cross section 6. Right Bank

Photo 27. Station 36+50 Cross section 7. Downstream

Photo 28. Station 36+50 Cross section 7. Upstream

Photo 29. Station 36+50 Cross section 7. Left Bank


Photo 30. Station 36+50 Cross section 7. Right Bank

No as built photo

Photo 31. End of the project looking downstream

No as built photo

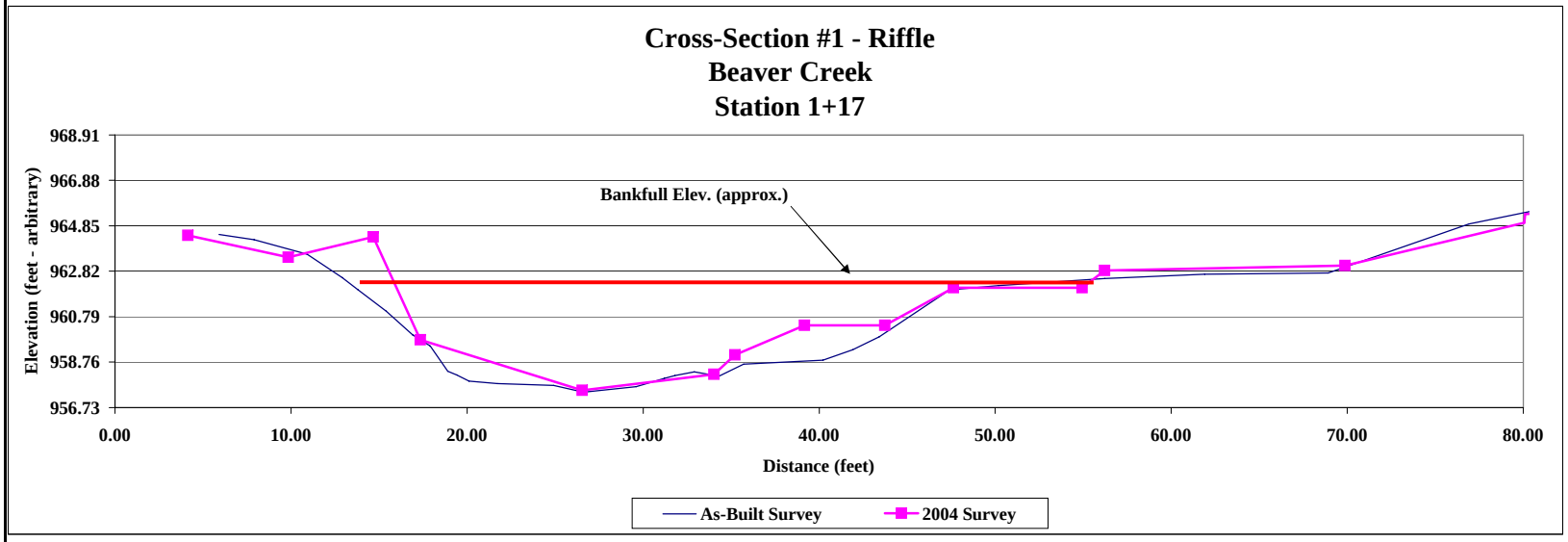
Photo 32. End of the project looking upstream

Project Name	Beaver Creek
Cross Section	X1 - Station 1+17 Old Station 51+10
Feature	Riffle
Date	10/20/2004
Crew	Dan Clinton, David Bidelspach

2002 As-Built Survey				2004 2004 Survey			
Station	**Adj Sta**	**Elev**	**Notes**	**Station**	**Elev**	**Adj Elev**	**Notes**
0+02	5.91	964.47	Ex. Bank	0+04	104.42	964.42	xsp
0+04	7.91	964.23	Ex. Bank	0+10	103.45	963.45	xs
0+07	10.91	963.59	LTOB/Ex. Bank	0+15	104.36	964.36	xs
0+09	12.91	962.54	Ex. Bank	0+17	99.75	959.75	xs
0+10	13.81	961.99	LBKF-Calc/ Ex. Bank	0+27	97.50	957.5	xs
0+12	15.41	961.04	Ex. Bank	0+34	98.21	958.21	xs
0+13	16.91	959.97	Ex. Bank	0+35	99.08	959.08	xs
0+14	17.91	959.48		0+39	100.41	960.41	xs
0+15	18.91	958.35		0+44	100.40	960.4	xs
0+16	19.41	958.18	LEW/WS	0+48	102.09	962.09	xs
0+16	20.11	957.91		0+55	102.08	962.08	xs
0+18	21.71	957.80		0+56	102.85	962.85	xsp
0+21	24.91	957.72		0+70	103.07	963.07	xs
0+23	26.61	957.42	TW	0+80	104.99	964.99	xs
0+26	29.61	957.66		0+80	105.37	965.37	xs
0+27	31.21	958.04		1+11	107.27	967.27	xs
0+28	31.81	958.16	REW/WS	1+12	107.12	967.12	xs
0+29	32.91	958.33					
0+30	34.31	958.13					
0+32	35.71	958.67					
0+36	40.21	958.85		0+57	104.57	964.57	xsp
0+38	41.91	959.31					
0+40	43.41	959.89					
0+44	47.41	961.99	RBKF				
0+46	50.21	962.18					
0+52	56.21	962.50	RPIN Grd				
0+58	61.91	962.69					
0+65	68.91	962.75	Toe Slope				
0+73	76.91	964.93	Top Terrace				
0+80	83.91	966.06					
0+52	56.21	962.69	Top RPIN				

Cross-Section #1 - Looking Downstream

Bankfull Area	As-Built	2004
Area	104.6	86.8
Width	33.6	32.0
Mean Depth	3.1	2.7
Max Depth	4.6	4.5
w/d ratio	10.8	11.8

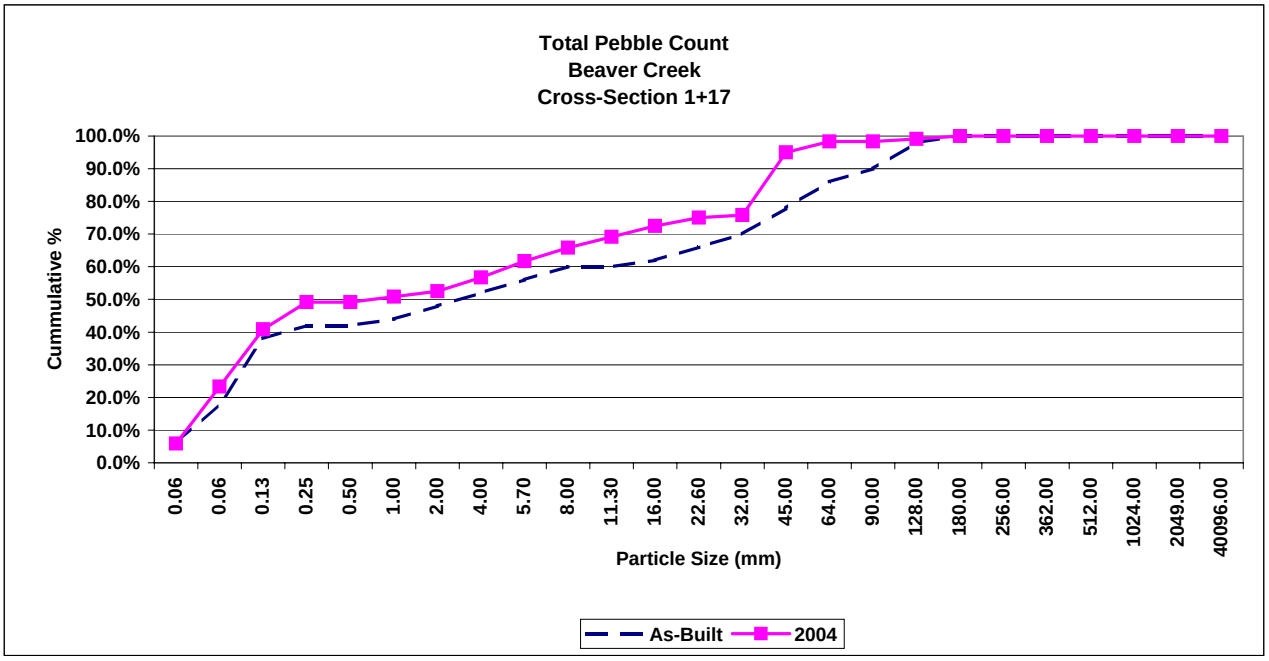


Project Name	Beaver Creek
Cross Section	X1 - Station 1+17
Feature	Riffle
Date	10/20/04
Crew	Shaffer, Bidelspach

Cross Section #1
Brush Creek

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	6	6.0%	6.0%	0	7	5.8%	5.8%
Sand	very fine sand	0.062	12	12.0%	18.0%	3	18	17.5%	23.3%
	fine sand	0.125	20	20.0%	38.0%	5	16	17.5%	40.8%
	medium sand	0.25	4	4.0%	42.0%	1	9	8.3%	49.2%
	course sand	0.50	0	0.0%	42.0%	0	0	0.0%	49.2%
	very course sand	1.0	2	2.0%	44.0%	2	0	1.7%	50.8%
G r a v e l	very fine gravel	2.0	4	4.0%	48.0%	2	0	1.7%	52.5%
	fine gravel	4.0	4	4.0%	52.0%	5	0	4.2%	56.7%
	fine gravel	5.7	4	4.0%	56.0%	6	0	5.0%	61.7%
	medium gravel	8.0	4	4.0%	60.0%	5	0	4.2%	65.8%
	medium gravel	11.3	0	0.0%	60.0%	4	0	3.3%	69.2%
	course gravel	16.0	2	2.0%	62.0%	4	0	3.3%	72.5%
	course gravel	22.6	4	4.0%	66.0%	3	0	2.5%	75.0%
	very course gravel	32	4	4.0%	70.0%	1	0	0.8%	75.8%
	very course gravel	45	8	8.0%	78.0%	23	0	19.2%	95.0%
Cobble	small cobble	64	8	8.0%	86.0%	4	0	3.3%	98.3%
	medium cobble	90	4	4.0%	90.0%	0	0	0.0%	98.3%
	large cobble	128	8	8.0%	98.0%	1	0	0.8%	99.2%
	very large cobble	180	2	2.0%	100.0%	1	0	0.8%	100.0%
Boulder	small boulder	256	0	0.0%	100.0%	0	0	0.0%	100.0%
	small boulder	362	0	0.0%	100.0%	0	0	0.0%	100.0%
	medium boulder	512	0	0.0%	100.0%	0	0	0.0%	100.0%
	large boulder	1024	0	0.0%	100.0%	0	0	0.0%	100.0%
	very large boulder	2049	0	0.0%	100.0%	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	0.0%	100.0%	0	0	0.0%	100.0%
TOTAL / %of whole count			100	100.0%		70	50	100.0%	

	d16	**d35**	**d50**	**d84**	**d95**
As-Built	0.09	0.17	3.93	71.37	137.13
2004	0.08	0.16	1.13	45.32	54.50



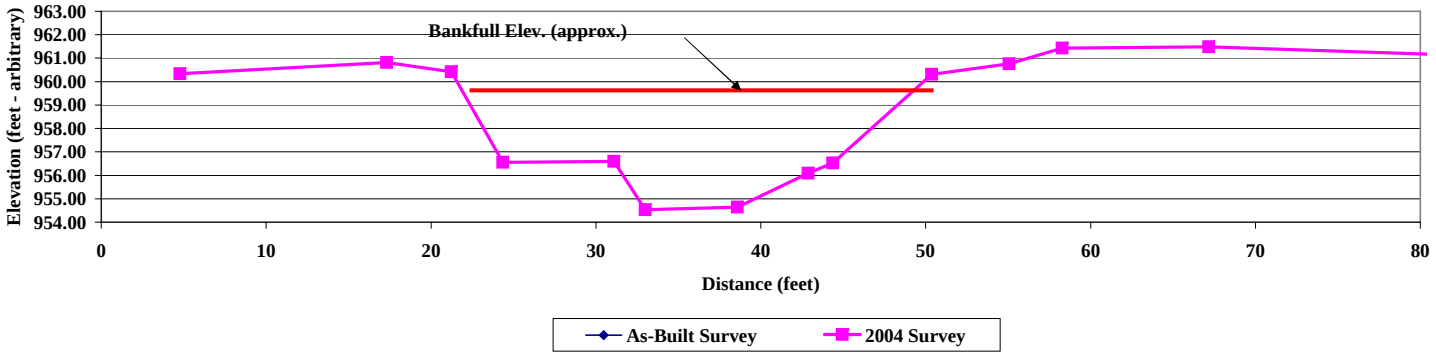
Project Name	Beaver Creek
Cross Section	X2 - Station 3+80 New Station
Feature	Riffle
Date	10/20/2004
Crew	Dan Clinton, David Bidelspach

2002 As-Built Survey			2004 2004 Survey		
Station	**Elev**	**Notes**	**Station**	**Elev**	**Notes**
			00+04.78	960.34	xsp
			00+17.31	960.82	xs
			00+21.23	960.42	xs
			00+24.36	956.55	xs
			00+31.10	956.6	xs
			00+33.00	954.53	xs
			00+38.58	954.64	xs
			00+42.88	956.09	xs
			00+44.37	956.53	xs
			00+50.36	960.31	xs
			00+55.06	960.76	xs
			00+58.29	961.43	xs
			00+67.18	961.48	xsp
			00+88.02	960.99	xs
			01+09.58	962.07	xs

Cross-Section #2 - Looking Upstream

Bankfull Area	As-Built	2004
Area	N/A	110.6
Width	N/A	29.1
Mean Depth	N/A	3.8
Max Depth	N/A	5.8

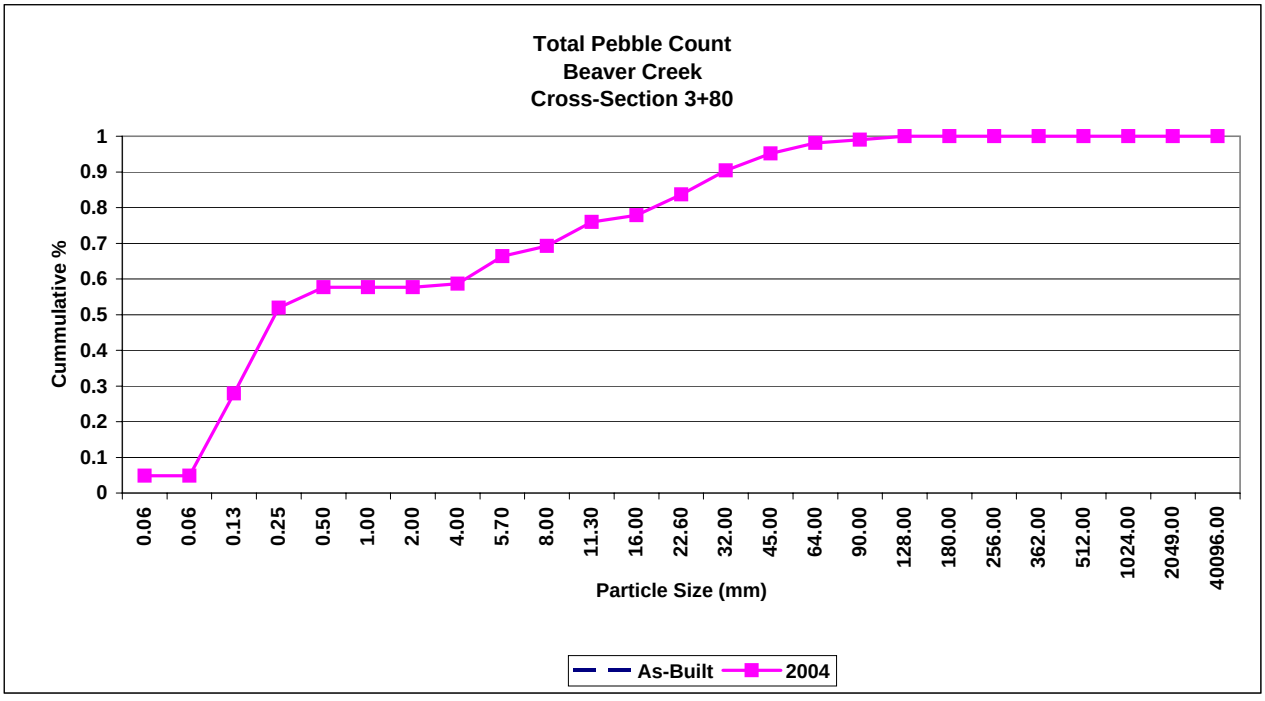
Cross-Section #2 - Pool
Beaver Creek
Station 3+80



Project Name	Beaver Creek
Cross Section	X2 - Station 3+80
Feature	Pool
Date	10/20/04
Crew	Shaffer, Bidelspach

		As-Built				2004			
Description	**Material**	**Size (mm)**	**Pool**	**%**	**Cum %**	**Pool - Bed**	**Pool - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061				0	5	4.8%	4.8%
Sand	very fine sand	0.062				0	0	0.0%	4.8%
	fine sand	0.125				4	20	23.1%	27.9%
	medium sand	0.25				5	20	24.0%	51.9%
	course sand	0.50				6	0	5.8%	57.7%
	very course sand	1.0				0	0	0.0%	57.7%
G r a v e l	very fine gravel	2.0				0	0	0.0%	57.7%
	fine gravel	4.0				1	0	1.0%	58.7%
	fine gravel	5.7				8	0	7.7%	66.3%
	medium gravel	8.0				3	0	2.9%	69.2%
	medium gravel	11.3				7	0	6.7%	76.0%
	course gravel	16.0				2	0	1.9%	77.9%
	course gravel	22.6	Not Sampled - New Cross-section			6	0	5.8%	83.7%
	very course gravel	32				7	0	6.7%	90.4%
	very course gravel	45				5	0	4.8%	95.2%
Cobble	small cobble	64				3	0	2.9%	98.1%
	medium cobble	90				1	0	1.0%	99.0%
	large cobble	128				1	0	1.0%	100.0%
	very large cobble	180				0	0	0.0%	100.0%
Boulder	small boulder	256				0	0	0.0%	100.0%
	small boulder	362				0	0	0.0%	100.0%
	medium boulder	512				0	0	0.0%	100.0%
	large boulder	1024				0	0	0.0%	100.0%
	very large boulder	2049				0	0	0.0%	100.0%
Bedrock	bedrock	40096				0	0	0.0%	100.0%
TOTAL / %of whole count			0	100.0%		59	45	100.0%	

	d16	**d35**	**d50**	**d84**	**d95**
As-Built	0.00	0.00	0.00	0.00	0.00
2004	0.14	0.24	0.36	27.88	53.86

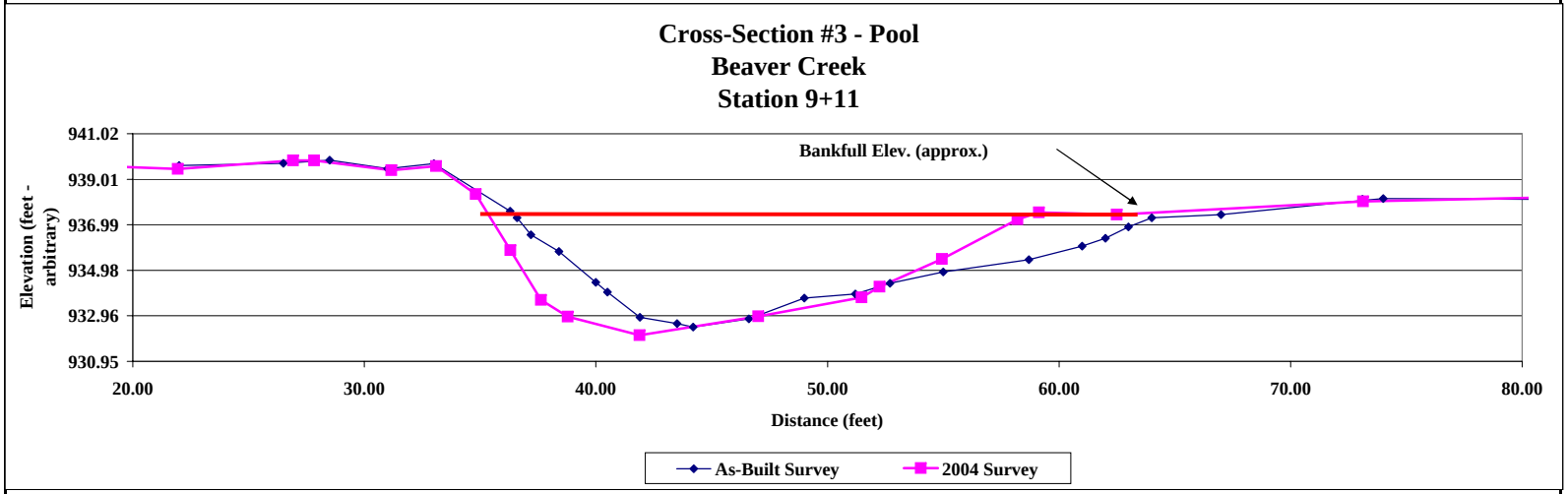


Project Name	Beaver Creek
Cross Section	X3 - Station 9+11 Old Station 47+12
Feature	Pool
Date	10/20/2004
Crew	Dan Clinton, David Bidelspach

2002 As-Built Survey					2004 2004 Survey		
Station	**Adj Sta**	**Elev**	**Adj Elev**	**Notes**	**Station**	**Elev**	**Notes**
0+00.0	22.00	959.30	939.61		0+10.4	939.91	xs
0+04.5	26.50	959.40	939.71	Wood Stake Grd	0+22.0	939.46	xs
0+06.5	28.50	959.54	939.85		0+26.9	939.84	xsp
0+09.0	31.00	959.17	939.48		0+27.8	939.83	xs
0+11.0	33.00	959.39	939.70		0+31.2	939.4	xs
0+14.3	36.30	957.28	937.59		0+33.1	939.58	xs
0+14.6	36.60	956.99	937.30	LBKF-calc	0+34.8	938.35	xs
0+15.2	37.20	956.24	936.55		0+36.3	935.87	xs
0+16.4	38.40	955.50	935.81		0+37.6	933.67	xs
0+18.0	40.00	954.13	934.44	LEW/WS	0+38.8	932.92	xs
0+18.5	40.50	953.70	934.01		0+41.9	932.1	xs
0+19.9	41.90	952.58	932.89		0+47.0	932.94	xs
0+21.5	43.50	952.31	932.62		0+51.5	933.78	xs
0+22.2	44.20	952.15	932.46	TW	0+52.3	934.25	xs
0+24.6	46.60	952.51	932.82		0+55.0	935.47	xs
0+27.0	49.00	953.43	933.74		0+58.2	937.23	xs
0+29.2	51.20	953.62	933.93		0+59.1	937.54	xs
0+30.7	52.70	954.09	934.40	REW/WS	0+62.5	937.44	xs
0+33.0	55.00	954.59	934.90		0+73.1	938.02	xsp
0+36.7	58.70	955.14	935.45		0+81.4	938.21	xs
0+39.0	61.00	955.74	936.05		0+96.5	937.88	xs
0+40.0	62.00	956.08	936.39		1+17.6	937.71	xs
0+41.0	63.00	956.59	936.90		1+24.9	937.32	xs
0+42.0	64.00	956.99	937.30	RBKF	1+27.0	939.1	xs
0+45.0	67.00	957.13	937.44		1+42.2	939.43	xs
0+51.1	73.10	957.76	938.07	RPIN Grd			
0+52.0	74.00	957.84	938.15				
0+63.0	85.00	957.79	938.10				
0+88.0	110.00	957.52	937.83				
0+98.0	120.00	957.72	938.03				
	22.00						
0+51.1	73.10	957.81	938.12	Top RPIN			

Cross-Section #3 - Looking Downstream

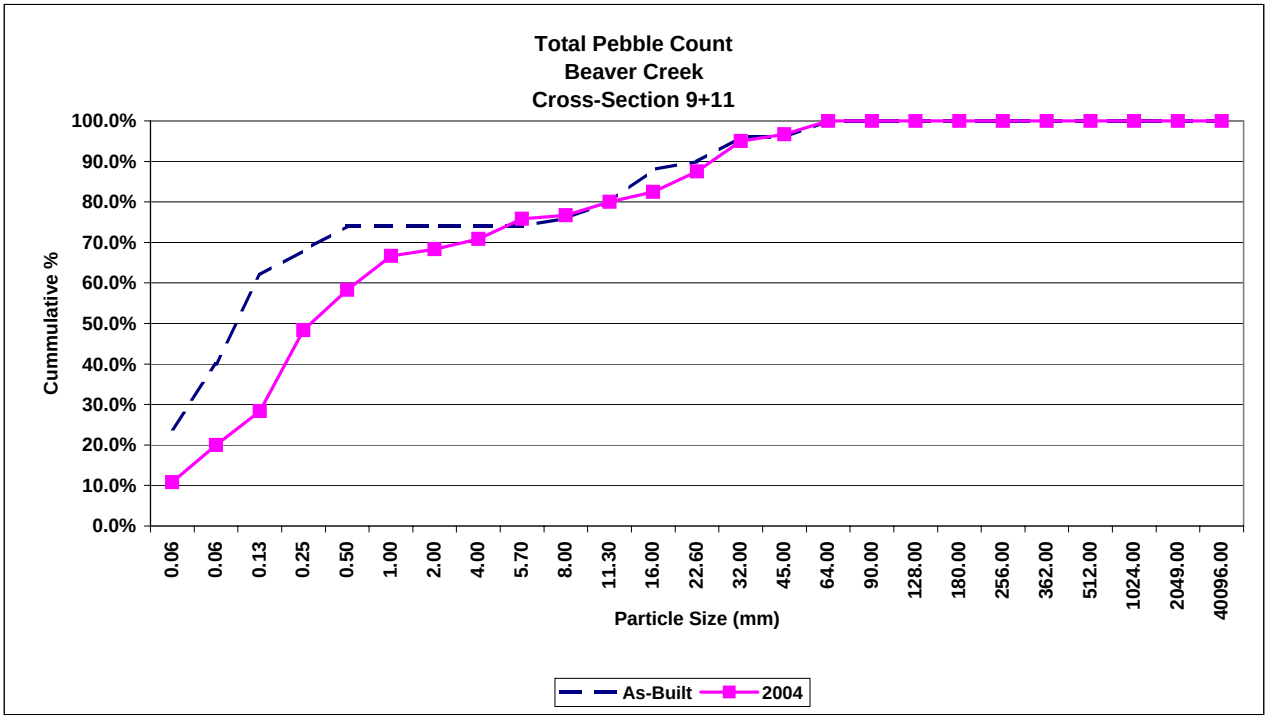
	Bankfull Area	
	As-Built	**2004**
Area	75.2	78.2
Width	27.4	24.6
Mean Depth	2.7	3.2
Max Depth	4.8	5.2



Project Name	Beaver Creek
Cross Section	X3 - Station 9+11
Feature	Pool
Date	10/20/04
Crew	Shaffer, Bidelspach

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Pool**	**%**	**Cum %**	**Pool - Bed**	**Pool Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	24	24.0%	24.0%	0	13	10.8%	10.8%
Sand	very fine sand	0.062	16	16.0%	40.0%	3	8	9.2%	20.0%
	fine sand	0.125	22	22.0%	62.0%	7	3	8.3%	28.3%
	medium sand	0.25	6	6.0%	68.0%	8	16	20.0%	48.3%
	course sand	0.50	6	6.0%	74.0%	12	0	10.0%	58.3%
	very course sand	1.0	0	0.0%	74.0%	10	0	8.3%	66.7%
G r a v e l	very fine gravel	2.0	0	0.0%	74.0%	2	0	1.7%	68.3%
	fine gravel	4.0	0	0.0%	74.0%	3	0	2.5%	70.8%
	fine gravel	5.7	0	0.0%	74.0%	6	0	5.0%	75.8%
	medium gravel	8.0	2	2.0%	76.0%	1	0	0.8%	76.7%
	medium gravel	11.3	4	4.0%	80.0%	4	0	3.3%	80.0%
	course gravel	16.0	8	8.0%	88.0%	3	0	2.5%	82.5%
	course gravel	22.6	2	2.0%	90.0%	6	0	5.0%	87.5%
	very course gravel	32	6	6.0%	96.0%	9	0	7.5%	95.0%
	very course gravel	45	0	0.0%	96.0%	2	0	1.7%	96.7%
Cobble	small cobble	64	4	4.0%	100.0%	4	0	3.3%	100.0%
	medium cobble	90	0	0.0%	100.0%	0	0	0.0%	100.0%
	large cobble	128	0	0.0%	100.0%	0	0	0.0%	100.0%
	very large cobble	180	0	0.0%	100.0%	0	0	0.0%	100.0%
Boulder	small boulder	256	0	0.0%	100.0%	0	0	0.0%	100.0%
	small boulder	362	0	0.0%	100.0%	0	0	0.0%	100.0%
	medium boulder	512	0	0.0%	100.0%	0	0	0.0%	100.0%
	large boulder	1024	0	0.0%	100.0%	0	0	0.0%	100.0%
	very large boulder	2049	0	0.0%	100.0%	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	0.0%	100.0%	0	0	0.0%	100.0%
TOTAL / %of whole count			100	100.0%		80	40	100.0%	

	d16	**d35**	**d50**	**d84**	**d95**
As-Built	0.00	0.08	0.14	16.48	36.63
2004	0.08	0.25	0.44	21.70	38.50

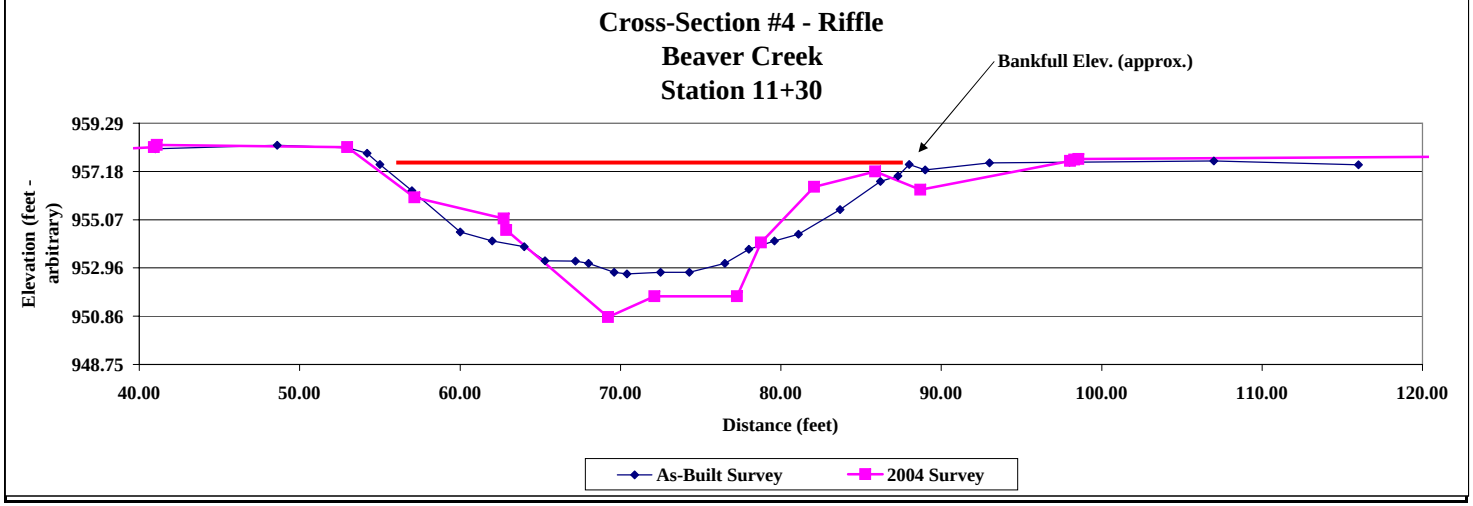


Project Name	Beaver Creek	
Cross Section	X4 - Station 11+30	Old Station 41+10
Feature	Riffle	
Date	10/20/2004	
Crew	Dan Clinton, David Bidelspach	

2002 As-Built Survey				2004 2004 Survey		
Station	**Adj Sta**	**Elev**	**Notes**	**Station**	**Elev**	**Notes**
0+00.0	41.00	958.17		0+11.7	958.33	xs
0+07.6	48.60	958.33	Wooden Stake	0+27.1	957.75	xs
0+12.0	53.00	958.21		0+40.9	958.24	xs
0+13.2	54.20	957.98	LBKF	0+41.1	958.34	xsp
0+14.0	55.00	957.49	LBKF-Calc	0+53.0	958.24	bkf
0+16.0	57.00	956.34		0+57.2	956.05	xs
0+19.0	60.00	954.54		0+62.7	955.12	xs
0+21.0	62.00	954.15		0+62.9	954.62	xs
0+23.0	64.00	953.89		0+69.2	950.82	xs
0+24.3	65.30	953.27		0+72.1	951.73	xs
0+26.2	67.20	953.26		0+77.3	951.73	xs
0+27.0	68.00	953.16	LEW/WS	0+78.8	954.07	xs
0+28.6	69.60	952.77		0+82.1	956.51	xs
0+29.4	70.40	952.71	TW	0+85.9	957.18	bkf
0+31.5	72.50	952.77		0+88.7	956.38	xs
0+33.3	74.30	952.78		0+98.0	957.64	xs
0+35.5	76.50	953.17	REW/WS	0+98.3	957.7	xsp
0+37.0	78.00	953.78		0+98.6	957.72	xsp
0+38.6	79.60	954.15		1+21.0	957.82	xs
0+40.1	81.10	954.43		1+43.0	957.82	xs
0+42.7	83.70	955.51		1+49.3	958.5	xs
0+45.2	86.20	956.75				
0+46.3	87.30	956.98				
0+47.0	88.00	957.49	RBKF			
0+48.0	89.00	957.25				
0+52.0	93.00	957.55				
0+57.0	98.00	957.58	RPIN Grd			
0+66.0	107.00	957.64				
0+75.0	116.00	957.47				
0+57.0	98.00	957.64	Top RPIN			

Cross-Section #4- Looking Upstream

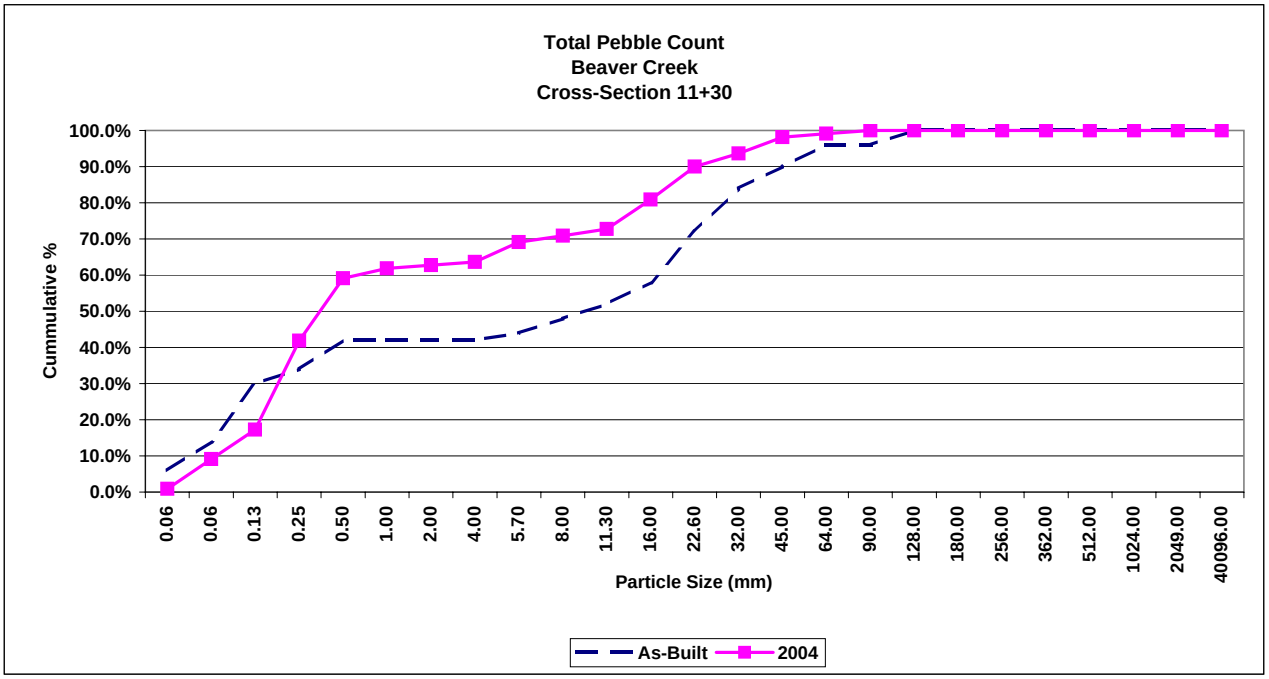
Bankfull Area	As-Built	2004
Area	103.8	107.9
Width	33.0	32.9
Mean Depth	3.1	3.3
Max Depth	4.8	6.7
w/d ratio	10.5	10.0



Project Name	Beaver Creek
Cross Section	X4 - Station 11+30
Feature	Riffle
Date	10/20/04
Crew	Shaffer, Bidelspach

			As-Built			2003			
Description	**Material**	**Size (mm)**	**Riffle**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	6	6.0%	6.0%	0	1	0.9%	0.9%
Sand	very fine sand	0.062	8	8.0%	14.0%	1	8	8.2%	9.1%
	fine sand	0.125	16	16.0%	30.0%	3	6	8.2%	17.3%
	medium sand	0.25	4	4.0%	34.0%	7	20	24.5%	41.8%
	course sand	0.50	8	8.0%	42.0%	4	15	17.3%	59.1%
	very course sand	1.0	0	0.0%	42.0%	3	0	2.7%	61.8%
Gravel	very fine gravel	2.0	0	0.0%	42.0%	1	0	0.9%	62.7%
	fine gravel	4.0	0	0.0%	42.0%	1	0	0.9%	63.6%
	fine gravel	5.7	2	2.0%	44.0%	6	0	5.5%	69.1%
	medium gravel	8.0	4	4.0%	48.0%	2	0	1.8%	70.9%
	medium gravel	11.3	4	4.0%	52.0%	2	0	1.8%	72.7%
	course gravel	16.0	6	6.0%	58.0%	9	0	8.2%	80.9%
	course gravel	22.6	14	14.0%	72.0%	10	0	9.1%	90.0%
	very course gravel	32	12	12.0%	84.0%	4	0	3.6%	93.6%
	very course gravel	45	6	6.0%	90.0%	5	0	4.5%	98.2%
Cobble	small cobble	64	6	6.0%	96.0%	1	0	0.9%	99.1%
	medium cobble	90	0	0.0%	96.0%	1	0	0.9%	100.0%
	large cobble	128	4	4.0%	100.0%	0	0	0.0%	100.0%
	very large cobble	180	0	0.0%	100.0%	0	0	0.0%	100.0%
Boulder	small boulder	256	0	0.0%	100.0%	0	0	0.0%	100.0%
	small boulder	362	0	0.0%	100.0%	0	0	0.0%	100.0%
	medium boulder	512	0	0.0%	100.0%	0	0	0.0%	100.0%
	large boulder	1024	0	0.0%	100.0%	0	0	0.0%	100.0%
	very large boulder	2049	0	0.0%	100.0%	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	0.0%	100.0%	0	0	0.0%	100.0%
TOTAL / %of whole count			100	100.0%		60	50	100.0%	

	d16	**d35**	**d50**	**d84**	**d95**
As-Built	0.11	0.42	11.65	38.50	73.25
2003	0.17	0.32	0.55	22.02	43.30



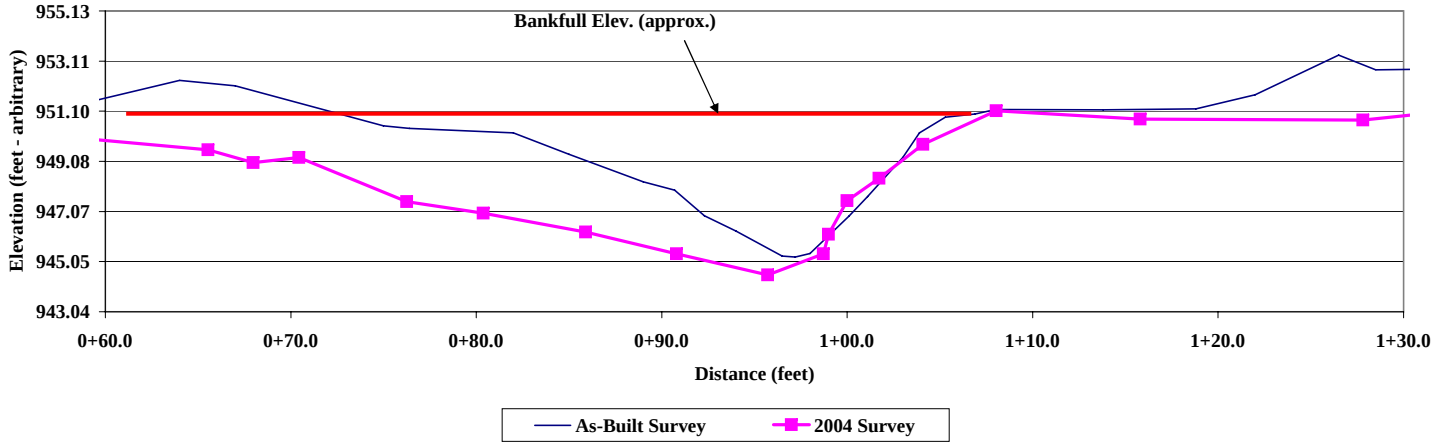
Project Name	Beaver Creek
Cross Section	X5 - Station 24+50 Old Station 28+50
Feature	Pool
Date	10/20/2004
Crew	Dan Clinton, David Bidelspach

2002 As-Built Survey				2004 2004 Survey		
Station	**Adj Sta**	**Elev**	**Notes**	**Station**	**Elev**	**Notes**
0+00.0	0+58.0	951.27		0+06.2	950.85	xs
0+06.0	0+64.0	952.33		0+16.5	949.82	xs
0+09.0	0+67.0	952.11		0+34.6	950.03	xs
0+17.0	0+75.0	950.51		0+45.0	950.03	xs
0+18.4	0+76.4	950.41	Left Stake-No Iron Pin	0+57.6	950.08	bkf/pin
0+24.0	0+82.0	950.22	LBKF	0+65.5	949.55	xs
0+27.0	0+85.0	949.36		0+68.0	949.03	xs
0+31.0	0+89.0	948.26		0+70.4	949.24	xs
0+32.7	0+90.7	947.92		0+76.3	947.46	xs
0+34.3	0+92.3	946.90	LEW/WS	0+80.4	947	xs
0+36.0	0+94.0	946.28		0+85.9	946.24	xs
0+38.5	0+96.5	945.28		0+90.8	945.36	xs
0+39.2	0+97.2	945.24	TW	0+95.7	944.52	xs
0+40.0	0+98.0	945.38		0+98.7	945.37	xs
0+42.1	1+00.1	946.88	REW/WS	0+99.0	946.15	xs
0+43.1	1+01.1	947.67		1+00.0	947.5	xs
0+45.0	1+03.0	949.23		1+01.7	948.4	xs
0+45.9	1+03.9	950.22	RBKF-calc	1+04.1	949.76	xs
0+47.3	1+05.3	950.85	RBKF	1+08.0	951.11	bkf/pin
0+48.9	1+06.9	950.98	Grd @ RPIN	1+15.8	950.78	xs
0+50.0	1+08.0	951.16		1+27.8	950.74	xs
0+55.8	1+13.8	951.15	Wooden Stake Grd	1+45.3	952.1	xs
0+60.8	1+18.8	951.19				
0+64.0	1+22.0	951.75				
0+68.5	1+26.5	953.35				
0+70.5	1+28.5	952.76				
0+80.0	1+38.0	952.85				
0+48.9	1+06.9	951.87	Top RPIN			

Cross-Section #5 - Looking Downstream

Bankfull Area	As-Built	2004
Area	55.1	125.8
Width	21.9	48.0
Mean Depth	2.5	2.6
Max Depth	5.0	5.7

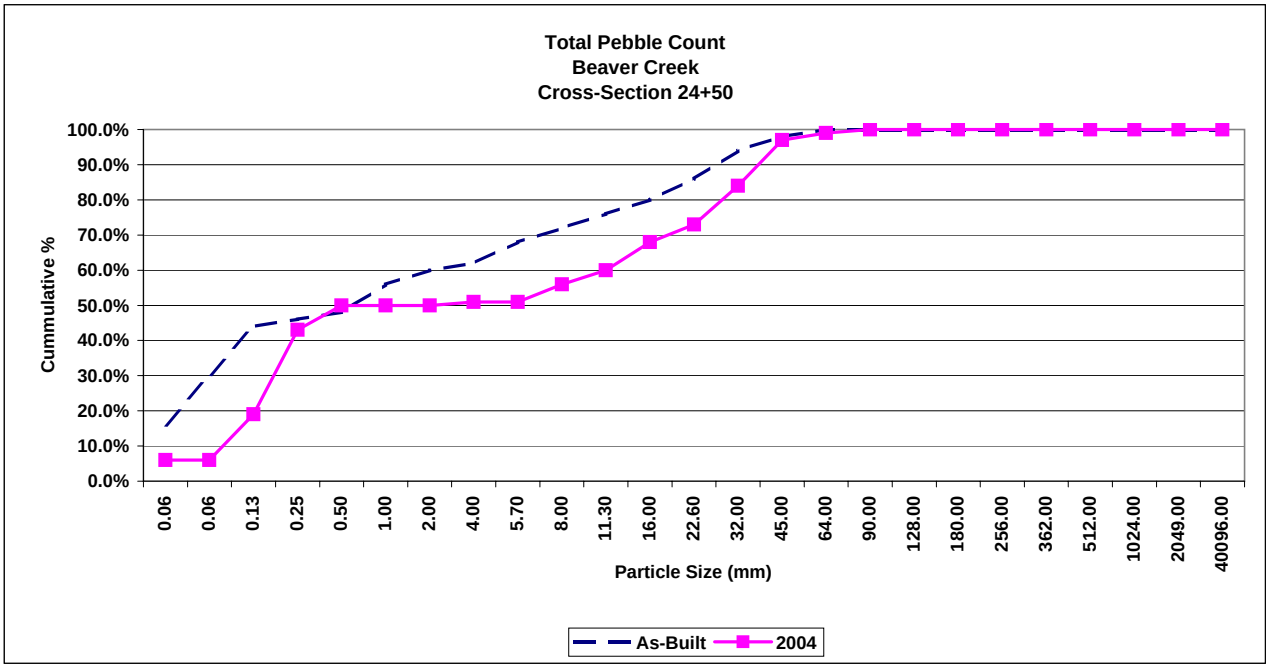
Cross-Section #5 - Pool
Beaver Creek
Station 24+50



Project Name	Beaver Creek
Cross Section	X5 - Station 24+50
Feature	Pool
Date	10/20/04
Crew	Shaffer, Bidelspach

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Pool**	**%**	**Cum %**	**Pool - Bed**	**Pool - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	16	16.0%	16.0%	0	6	6.0%	6.0%
Sand	very fine sand	0.062	14	14.0%	30.0%	0	0	0.0%	6.0%
	fine sand	0.125	14	14.0%	44.0%	0	13	13.0%	19.0%
	medium sand	0.25	2	2.0%	46.0%	0	24	24.0%	43.0%
	course sand	0.50	2	2.0%	48.0%	6	1	7.0%	50.0%
	very course sand	1.0	8	8.0%	56.0%	0	0	0.0%	50.0%
Gravel	very fine gravel	2.0	4	4.0%	60.0%	0	0	0.0%	50.0%
	fine gravel	4.0	2	2.0%	62.0%	0	1	1.0%	51.0%
	fine gravel	5.7	6	6.0%	68.0%	0	0	0.0%	51.0%
	medium gravel	8.0	4	4.0%	72.0%	2	3	5.0%	56.0%
	medium gravel	11.3	4	4.0%	76.0%	3	1	4.0%	60.0%
	course gravel	16.0	4	4.0%	80.0%	4	4	8.0%	68.0%
	course gravel	22.6	6	6.0%	86.0%	0	5	5.0%	73.0%
	very course gravel	32	8	8.0%	94.0%	5	6	11.0%	84.0%
	very course gravel	45	4	4.0%	98.0%	8	5	13.0%	97.0%
Cobble	small cobble	64	2	2.0%	100.0%	1	1	2.0%	99.0%
	medium cobble	90	0	0.0%	100.0%	1	0	1.0%	100.0%
	large cobble	128	0	0.0%	100.0%	0	0	0.0%	100.0%
	very large cobble	180	0	0.0%	100.0%	0	0	0.0%	100.0%
Boulder	small boulder	256	0	0.0%	100.0%	0	0	0.0%	100.0%
	small boulder	362	0	0.0%	100.0%	0	0	0.0%	100.0%
	medium boulder	512	0	0.0%	100.0%	0	0	0.0%	100.0%
	large boulder	1024	0	0.0%	100.0%	0	0	0.0%	100.0%
	very large boulder	2049	0	0.0%	100.0%	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	0.0%	100.0%	0	0	0.0%	100.0%
TOTAL / %of whole count			100	100.0%		30	70	100.0%	

	d16	**d35**	**d50**	**d84**	**d95**
As-Built	0.06	0.13	0.94	24.63	42.50
2004	0.17	0.31	5.25	38.50	52.04

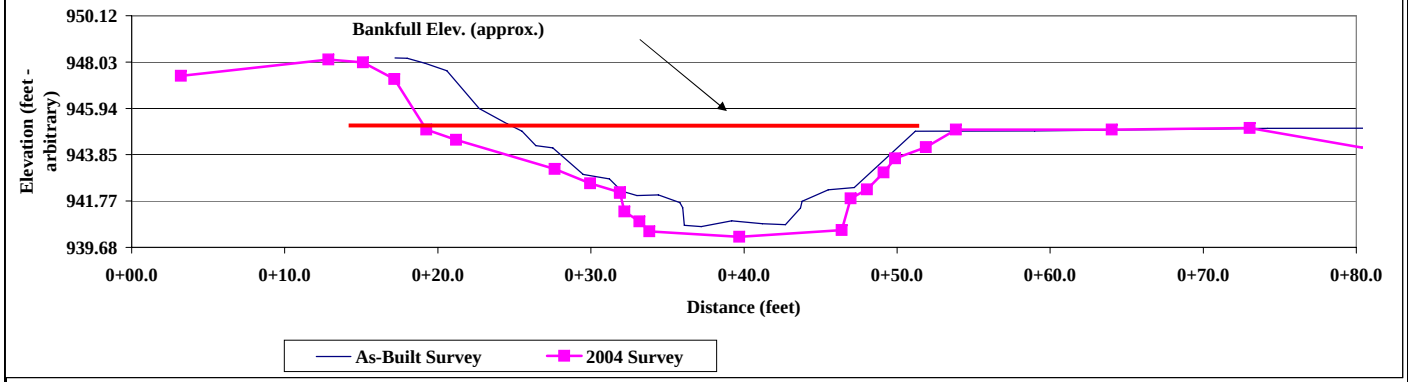


Project Name	Beaver Creek
Cross Section	X6 - Station 34+34 Old Station 18+50
Feature	Riffle
Date	10/20/2004
Crew	Dan Clinton, David Bidelspach

2002 As-Built Survey				2004 2004 Survey		
Station	**Adj Sta**	**Elev**	**Notes**	**Station**	**Elev**	**Notes**
0+00.0	0+17.2	948.21		0+03.2	947.41	xs
0+00.8	0+18.0	948.20	Wooden Stake Grd	0+12.9	948.14	xs
0+02.0	0+19.2	947.97		0+15.1	948.01	xs
0+03.4	0+20.6	947.64	LTOB	0+17.2	947.26	xs
0+05.5	0+22.7	945.94		0+19.3	944.99	BKF
0+07.3	0+24.5	945.26	LBKF	0+21.2	944.52	xs
0+08.3	0+25.5	944.91	LBKF-Calc	0+27.6	943.21	xs
0+09.2	0+26.4	944.26		0+30.0	942.56	xs
0+10.3	0+27.5	944.16		0+31.9	942.16	xs
0+12.3	0+29.5	942.96		0+31.9	942.13	xs
0+14.0	0+31.2	942.76		0+32.2	941.29	xs
0+14.8	0+32.0	942.22		0+33.2	940.85	xs
0+15.8	0+33.0	942.02		0+33.8	940.4	xs
0+17.2	0+34.4	942.04		0+39.7	940.16	xs
0+18.6	0+35.8	941.70		0+46.4	940.46	xs
0+18.8	0+36.0	941.47	LEW/WS	0+47.0	941.89	xs
0+18.9	0+36.1	940.68		0+48.0	942.29	xs
0+20.0	0+37.2	940.61	TW	0+49.1	943.06	xs
0+22.0	0+39.2	940.87		0+49.9	943.69	xs
0+24.0	0+41.2	940.74		0+51.9	944.19	xs
0+25.5	0+42.7	940.70		0+53.8	944.98	BKF
0+26.5	0+43.7	941.45	REW/WS	0+64.0	944.98	xs
0+26.6	0+43.8	941.76		0+73.0	945.06	xsp
0+28.3	0+45.5	942.27		0+80.4	944.18	xs
0+30.0	0+47.2	942.38		0+89.5	944.56	xs
0+34.0	0+51.2	944.91	RBKF	0+95.0	945.49	xs
0+41.8	0+59.0	944.93	Wooden Stake Grd	1+07.0	945.7	xs
0+57.0	0+74.2	945.04				
0+71.0	0+88.2	945.06				
0+74.0	0+91.2	945.35				
0+79.00	0+96.2	946.30				
0+85.0	1+02.2	946.51				
41.8	0+59.0	945	Top RPIN			

Cross-Section #6 - Looking Upstream

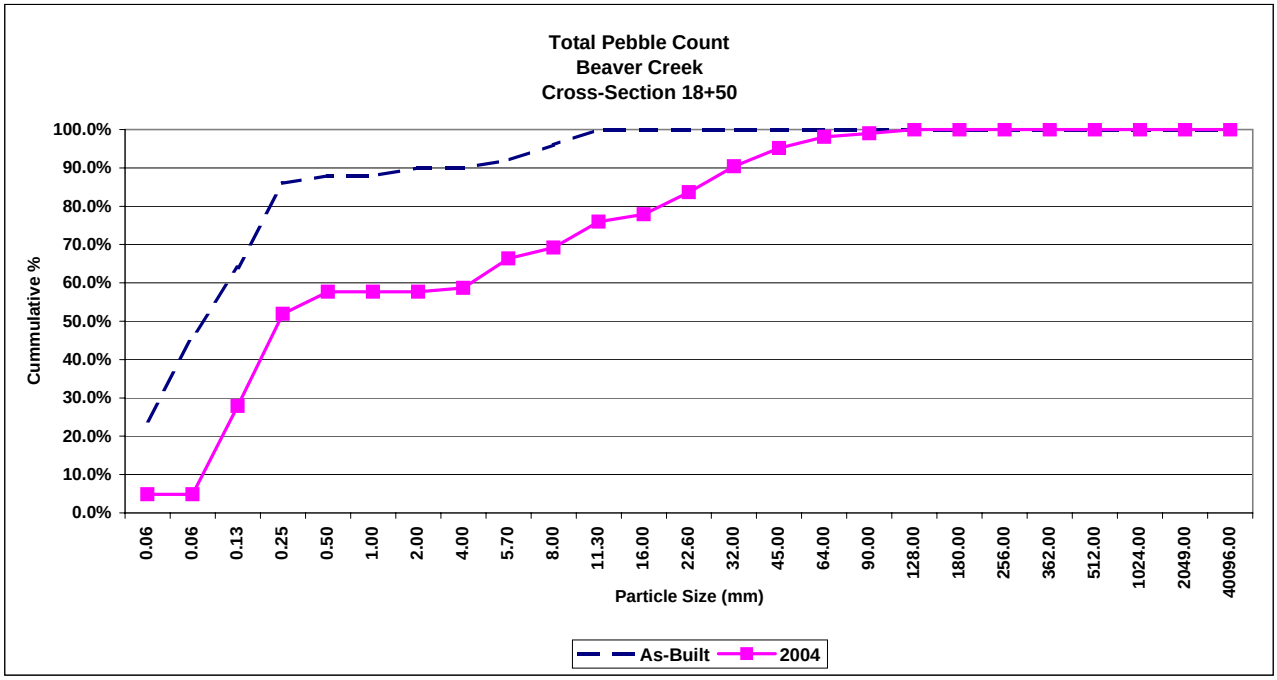
	Bankfull Area	
	As-Built	**2004**
Area	67.4	93.6
Width	25.7	34.6
Mean Depth	2.6	2.7
Max Depth	4.3	4.8
w/d ratio	9.8	12.8



Project Name	Beaver Creek
Cross Section	X6 - Station 34+34
Feature	Riffle
Date	10/20/04
Crew	Shaffer, Bidelspach

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	24	24.0%	24.0%	0	5	4.8%	4.8%
Sand	very fine sand	0.062	22	22.0%	46.0%	0	0	0.0%	4.8%
	fine sand	0.125	18	18.0%	64.0%	4	20	23.1%	27.9%
	medium sand	0.25	22	22.0%	86.0%	5	20	24.0%	51.9%
	course sand	0.50	2	2.0%	88.0%	6	0	5.8%	57.7%
	very course sand	1.0	0	0.0%	88.0%	0	0	0.0%	57.7%
Gravel	very fine gravel	2.0	2	2.0%	90.0%	0	0	0.0%	57.7%
	fine gravel	4.0	0	0.0%	90.0%	1	0	1.0%	58.7%
	fine gravel	5.7	2	2.0%	92.0%	8	0	7.7%	66.3%
	medium gravel	8.0	4	4.0%	96.0%	3	0	2.9%	69.2%
	medium gravel	11.3	4	4.0%	100.0%	7	0	6.7%	76.0%
	course gravel	16.0	0	0.0%	100.0%	2	0	1.9%	77.9%
	course gravel	22.6	0	0.0%	100.0%	6	0	5.8%	83.7%
	very course gravel	32	0	0.0%	100.0%	7	0	6.7%	90.4%
	very course gravel	45	0	0.0%	100.0%	5	0	4.8%	95.2%
Cobble	small cobble	64	0	0.0%	100.0%	3	0	2.9%	98.1%
	medium cobble	90	0	0.0%	100.0%	1	0	1.0%	99.0%
	large cobble	128	0	0.0%	100.0%	1	0	1.0%	100.0%
	very large cobble	180	0	0.0%	100.0%	0	0	0.0%	100.0%
Boulder	small boulder	256	0	0.0%	100.0%	0	0	0.0%	100.0%
	small boulder	362	0	0.0%	100.0%	0	0	0.0%	100.0%
	medium boulder	512	0	0.0%	100.0%	0	0	0.0%	100.0%
	large boulder	1024	0	0.0%	100.0%	0	0	0.0%	100.0%
	very large boulder	2049	0	0.0%	100.0%	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	0.0%	100.0%	0	0	0.0%	100.0%
TOTAL / %of whole count			100	100.0%		59	45	100.0%	

	d16	**d35**	**d50**	**d84**	**d95**
As-Built	0.00	0.08	0.11	0.36	8.95
2004	0.14	0.24	0.36	27.88	53.86

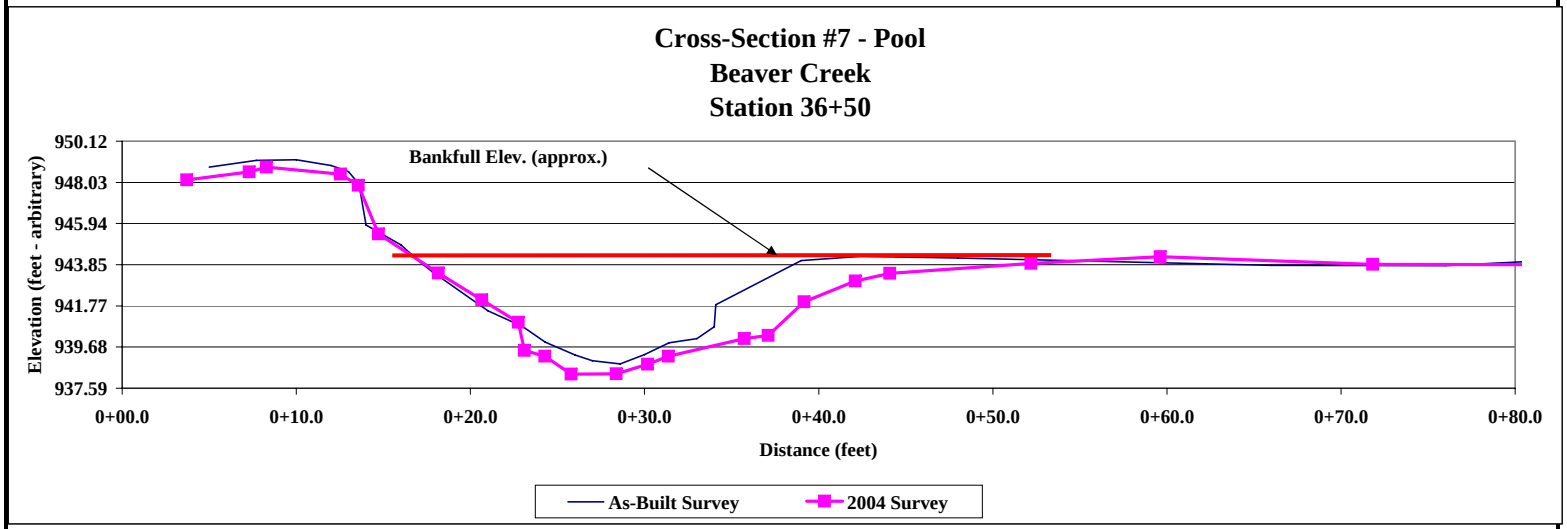


Project Name	Beaver Creek
Cross Section	X7 - Station 36+50 Old Station 16+10
Feature	Pool
Date	10/20/2004
Crew	Dan Clinton, David Bidelspach

2002 As-Built Survey				2004 2004 Survey		
Station	**Adj Sta**	**Elev**	**Notes**	**Station**	**Elev**	**Notes**
0+00.0	0+05.0	948.81		0+03.7	948.15	xs
0+02.7	0+07.7	949.15	Wood Stake Grd	0+07.3	948.56	xs
0+05.0	0+10.0	949.17		0+08.3	948.8	xsp
0+07.0	0+12.0	948.89		0+12.5	948.45	xs
0+08.0	0+13.0	948.58		0+13.6	947.88	xs
0+08.6	0+13.6	947.95		0+14.7	945.41	BKF
0+09.0	0+14.0	945.87		0+18.2	943.43	xs
0+11.0	0+16.0	944.86	LBKF	0+20.7	942.07	xs
0+12.0	0+17.0	944.07	LBKF-calc	0+22.8	940.94	xs
0+12.8	0+17.8	943.49		0+23.1	939.51	xs
0+16.0	0+21.0	941.52		0+24.3	939.22	xs
0+18.0	0+23.0	940.72	LEW/WS	0+25.8	938.3	xs
0+19.3	0+24.3	939.93		0+28.4	938.32	xs
0+21.0	0+26.0	939.27		0+30.2	938.81	xs
0+22.0	0+27.0	938.99		0+31.4	939.21	xs
0+23.6	0+28.6	938.83	TW	0+35.7	940.1	xs
0+25.0	0+30.0	939.30		0+37.1	940.27	xs
0+26.4	0+31.4	939.90		0+39.2	941.98	xs
0+28.0	0+33.0	940.10		0+42.1	943.03	xs
0+29.0	0+34.0	940.70	REW/WS	0+44.1	943.41	xs
0+29.1	0+34.1	941.82		0+52.2	943.92	BKF
0+34.0	0+39.0	944.07	RBKF	0+59.6	944.26	xsp
0+37.4	0+42.4	944.27	RPIN Grd	0+71.8	943.87	xsp
0+43.0	0+48.0	944.19	Ponded Water	0+83.3	943.85	xsp
0+61.0	0+66.0	943.83	Ponded Water	0+91.8	945.33	xsp
0+71.0	0+76.0	943.80	Ponded Water	1+04.2	945.55	xs
0+79.0	0+84.0	944.16	Ponded Water			
0+83.0	0+88.0	944.63	Toe Terrace			
0+90.0	0+95.0	946.11	Top Terrace			
1+00.0	1+05.0	945.94				
0+37.4	0+42.4	945.10	Top RPIN			

Cross-Section #7- Looking Upstream

Bankfull Area	As-Built	2004
Area	66.0	95.2
Width	22.0	38.2
Mean Depth	3.0	2.5
Max Depth	5.2	5.8

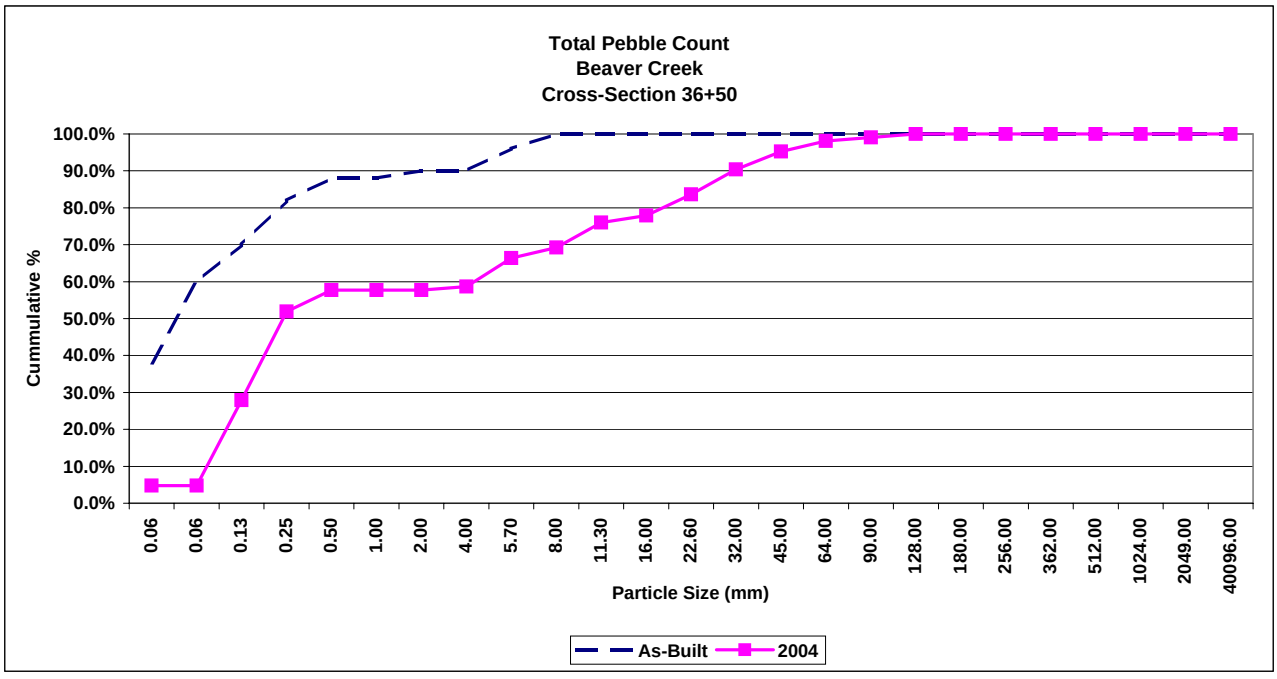


Project Name	Beaver Creek
Cross Section	X7 - Station 36+50
Feature	Pool
Date	10/20/04
Crew	Shaffer, Bidelspach

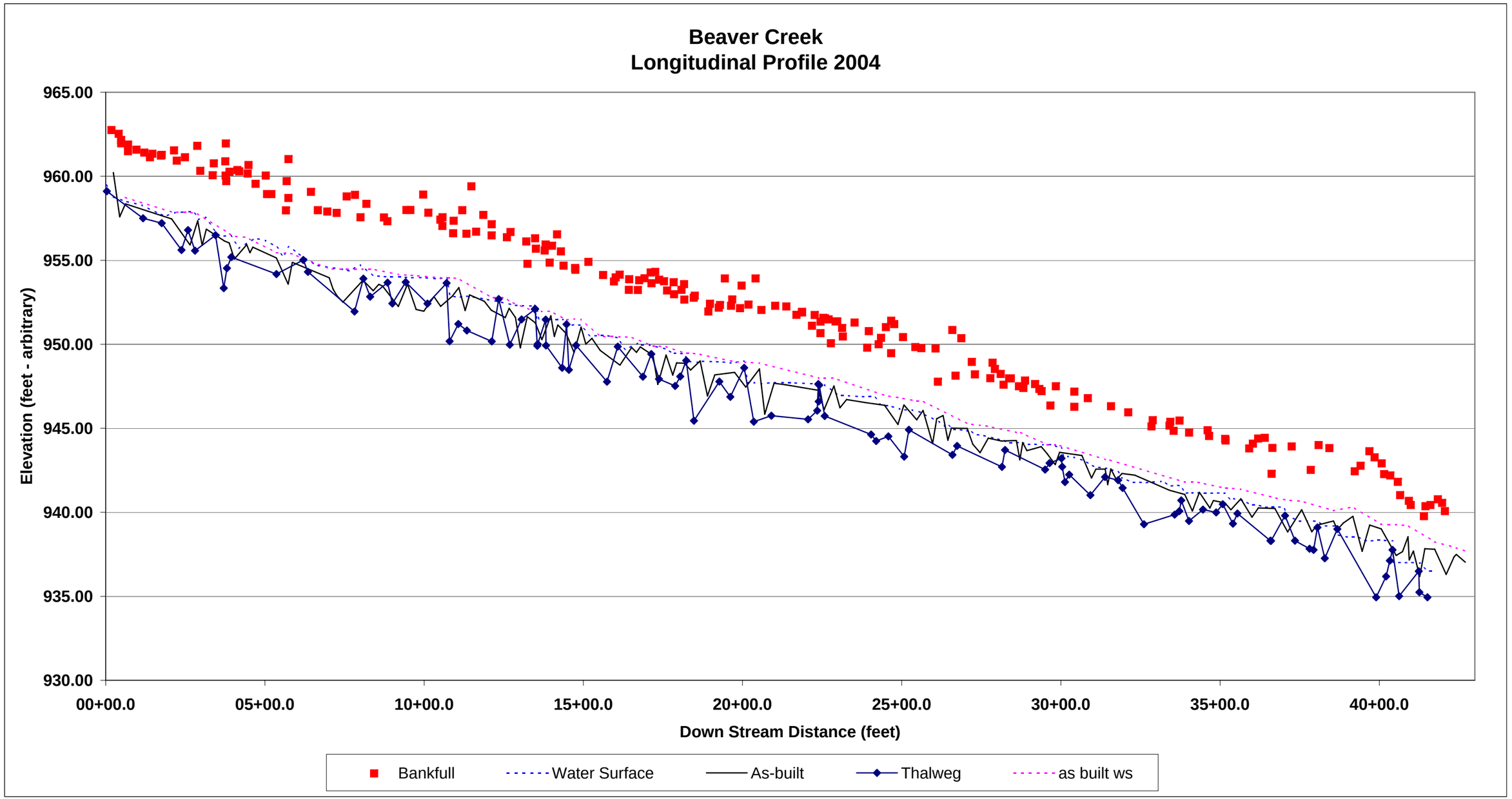
Cross Section #1
Brush Creek

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Pool**	**%**	**Cum %**	**Pool - Bed**	**Pool - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	38	38.0%	38.0%	0	5	4.8%	4.8%
Sand	very fine sand	0.062	22	22.0%	60.0%	0	0	0.0%	4.8%
	fine sand	0.125	10	10.0%	70.0%	4	20	23.1%	27.9%
	medium sand	0.25	12	12.0%	82.0%	5	20	24.0%	51.9%
	course sand	0.50	6	6.0%	88.0%	6	0	5.8%	57.7%
	very course sand	1.0	0	0.0%	88.0%	0	0	0.0%	57.7%
Gravel	very fine gravel	2.0	2	2.0%	90.0%	0	0	0.0%	57.7%
	fine gravel	4.0	0	0.0%	90.0%	1	0	1.0%	58.7%
	fine gravel	5.7	6	6.0%	96.0%	8	0	7.7%	66.3%
	medium gravel	8.0	4	4.0%	100.0%	3	0	2.9%	69.2%
	medium gravel	11.3	0	0.0%	100.0%	7	0	6.7%	76.0%
	course gravel	16.0	0	0.0%	100.0%	2	0	1.9%	77.9%
	course gravel	22.6	0	0.0%	100.0%	6	0	5.8%	83.7%
	very course gravel	32	0	0.0%	100.0%	7	0	6.7%	90.4%
	very course gravel	45	0	0.0%	100.0%	5	0	4.8%	95.2%
Cobble	small cobble	64	0	0.0%	100.0%	3	0	2.9%	98.1%
	medium cobble	90	0	0.0%	100.0%	1	0	1.0%	99.0%
	large cobble	128	0	0.0%	100.0%	1	0	1.0%	100.0%
	very large cobble	180	0	0.0%	100.0%	0	0	0.0%	100.0%
Boulder	small boulder	256	0	0.0%	100.0%	0	0	0.0%	100.0%
	small boulder	362	0	0.0%	100.0%	0	0	0.0%	100.0%
	medium boulder	512	0	0.0%	100.0%	0	0	0.0%	100.0%
	large boulder	1024	0	0.0%	100.0%	0	0	0.0%	100.0%
	very large boulder	2049	0	0.0%	100.0%	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	0.0%	100.0%	0	0	0.0%	100.0%
TOTAL / %of whole count			100	100.0%		59	45	100.0%	

	d16	**d35**	**d50**	**d84**	**d95**
As-Built	0.00	0.00	0.08	0.50	6.52
2004	0.14	0.24	0.36	27.88	53.86



Beaver Creek
Longitudinal Profile 2004



Project Name Beaver Creek
Task Longitudinal Profile
Section
Date 10/7/03
Crew Dan Clinton, Jan Patterson

Symbol Key

T	Thalweg	bro	bedrock outcropping
TR	Head of Riffle	xs	Cross section
TP	Head of Pool	xvane	Cross vane
TU	Head of Run		
TM	Max Pool		

2004 Survey* * 2004 elev adjusted up by 1.0 ft

TW Station	TW Elev	WS Station	WS Elev	BKF Station	BKF Elev	Feature
00+03.5	959.11	00+02.2	959.48			
01+17.5	957.5	00+16.8	958.82	00+18.1	962.75	xs
01+75.8	957.21	00+58.0	958.53	00+40.6	962.53	xvane
02+38.0	955.61	01+14.0	958.28	00+48.3	962.16	Max Pool
02+58.5	956.8	01+59.2	957.84	00+48.5	961.96	xvane
02+80.6	955.57	01+87.3	957.62	00+70.1	961.49	Max Pool
03+44.8	956.49	02+17.8	957.84	00+70.4	961.89	xvane
03+70.7	953.34	02+75.5	957.91	00+96.5	961.58	Max Pool
03+80.7	954.53	02+92.1	957.44	01+21.3	961.41	xs
03+94.5	955.19	03+13.6	957.55	01+39.1	961.13	Head of Glide
05+36.2	954.18	03+45.1	956.72	01+46.9	961.34	Max Pool
06+20.5	955.02	03+60.6	956.43	01+73.4	961.23	bro
06+35.1	954.31	03+92.7	956.47	01+76.0	961.27	bro
07+81.5	951.95	04+19.3	955.72	02+14.5	961.54	Max Pool
08+09.4	953.91	04+68.4	956.32	02+23.3	960.93	xvane
08+30.6	952.83	05+02.4	956.17	02+49.0	961.13	scourpool
08+85.2	953.67	05+37.5	955.8	02+87.7	961.81	xvane
09+00.5	952.43	05+57.8	955.21	02+97.2	960.32	scourpool
09+42.2	953.7	05+75.5	955.81	03+35.9	960.06	xvane
10+10.5	952.42	05+99.8	955.48	03+39.5	960.77	Head of Glide
10+70.7	953.64	06+59.5	954.71	03+75.7	960.89	xvane
10+80.2	950.18	07+46.6	954.45	03+76.6	960.04	scourpool
11+07.5	951.21	07+64.2	954.37	03+77.4	961.95	Head of Glide
11+34.4	950.82	08+00.2	954.73	03+78.7	959.71	xs
12+12.5	950.17	08+39.0	954.09	03+89.0	960.27	Max Pool
12+34.3	952.69	08+59.7	954.05	04+13.8	960.37	xvane
12+69.1	949.97	08+88.1	954.01	04+19.5	960.29	Head of Glide
13+06.2	951.48	09+24.7	954.01	04+46.0	960.16	xvane
13+48.1	952.08	09+54.6	953.96	04+48.6	960.67	xvane
13+48.7	952.11	09+94.6	953.97	04+70.7	959.55	xvane
13+55.6	949.91	10+38.4	953.9	05+02.8	960.04	scourpool
13+56.8	950.01	10+71.6	953.96	05+06.8	958.94	s
13+82.0	951.47	10+81.1	952.89	05+20.4	958.94	Trib
13+83.0	949.93	11+07.9	952.79	05+66.2	957.97	Trib
14+33.6	948.6	11+27.0	952.87	05+68.5	959.71	Max Pool
14+47.4	951.19	11+46.3	952.84	05+73.8	958.71	xvane
14+54.6	948.48	11+93.2	952.68	05+74.0	961.02	scourpool
14+77.3	949.94	12+42.8	952.51	06+44.5	959.07	Head of Glide
15+74.4	947.77	12+85.3	952.32	06+66.4	957.98	Max Pool
16+08.1	949.86	13+09.2	952.3	06+96.0	957.9	xvane
16+87.1	948.07	13+40.2	952.28	07+25.4	957.82	Max Pool
17+13.5	949.42	13+46.7	952.34	07+57.0	958.80	xvane
17+37.6	947.93	13+53.0	951.51	07+83.1	958.89	scourpool
17+88.3	947.52	13+53.6	952.23	08+00.3	957.56	Max Pool
18+04.7	948.08	13+61.0	951.47	08+18.7	958.36	Head of Glide
18+23.2	949.03	13+75.2	951.54	08+74.1	957.55	xvane
18+47.6	945.45	14+01.0	951.46	08+84.7	957.32	scourpool
19+27.2	947.78	14+20.8	951.46	09+44.6	957.99	Lv
19+61.9	946.87	14+36.6	951.48	09+57.0	957.99	Max Pool
20+05.4	948.6	14+44.3	951.46	09+97.2	958.91	xvane
20+35.4	945.39	14+60.1	951.13	10+13.3	957.83	scourpool
20+90.7	945.75	14+74.1	951.17	10+51.2	957.42	dw
22+06.0	945.53	14+91.7	951.13	10+57.7	957.04	Max Pool
22+34.6	946.05	15+21.9	950.49	10+57.9	957.56	
22+37.9	947.63	15+48.8	950.52	10+91.5	956.61	scourpool
22+39.2	946.6	15+76.9	950.51	10+92.8	957.35	t
22+41.1	947.57	16+07.5	950.39	11+20.0	957.98	v
22+58.3	945.73	16+32.3	949.69	11+33.1	956.58	scourpool
24+03.8	944.63	16+70.2	950.06	11+48.7	959.4	v
24+19.9	944.24	16+82.5	949.95	11+63.4	956.7	Max Pool
24+58.0	944.52	17+07.8	949.95	11+85.9	957.70	xs
25+07.8	943.31	17+58.5	949.72	12+12.1	956.48	Max Pool
25+22.5	944.91	17+80.8	949.47	12+12.3	957.14	Head of Glide
26+59.4	943.42	17+86.2	949.47	12+60.2	956.37	Max Pool
26+73.9	943.95	18+03.2	949.46	12+71.3	956.68	Head of Glide
28+14.9	942.7	18+16.4	949.44	13+20.9	956.12	Max Pool
28+24.6	943.71	18+29.8	948.98	13+24.7	954.79	Rv
29+50.3	942.54	18+62.9	948.92	13+48.5	956.31	Max Pool
29+64.5	942.93	18+73.5	948.99	13+51.2	955.69	Head of Glide
30+01.7	943.21	19+03.1	948.97	13+78.8	955.58	Rv
30+04.1	942.71	19+36.9	948.95	13+81.6	955.94	Rv
30+12.8	941.8	19+61.5	948.89	13+94.4	954.86	scourpool
30+26.1	942.24	19+76.0	948.91	14+01.8	955.86	Head of Glide
30+92.6	941.02	20+04.4	949	14+17.6	956.54	Max Pool

2004 Survey Continued*

TW Station	TW Elev	WS Station	WS Elev	BKF Station	BKF Elev	Feature
30+26.1	942.24	1975.98	948.91	1401.81	955.86	Head of Glide
30+92.6	941.02	2004.43	949	1417.55	956.54	Max Pool
31+38.5	942.1	2016.56	947.72	1429.67	955.53	t
31+79.7	941.91	2036.79	947.71	1438.13	954.68	xvane
31+93.7	941.45	2059.91	947.65	1474.15	954.54	t
32+60.8	939.29	2090.49	947.72	1475.3	954.43	Max Pool
33+57.1	939.86	2126.96	947.71	1516.02	954.9	Max Pool
33+72.1	940.07	2162.61	947.7	1562.24	954.12	Head of Glide
33+78.0	940.71	2238.07	947.64	1596.49	953.74	xvane
34+02.3	939.48	2258.02	947.58	1601.68	953.98	Max Pool
34+46.2	940.16	2290.48	947.14	1614.29	954.14	xs
34+87.6	939.99	2303.18	946.95	1643.23	953.24	Max Pool
35+08.4	940.48	2333.28	946.94	1644.14	953.87	xvane
35+40.3	939.32	2365.94	946.89	1671.59	953.23	Max Pool
35+54.3	939.93	2381.79	946.88	1675.78	953.81	Head of Glide
36+58.0	938.31	2414.45	946.88	1692.23	953.93	Max Pool
36+60.1	938.3	2437.76	946.34	1711.67	954.27	xs
37+03.9	939.8	2461.61	946.33	1714.24	953.63	xvane
37+35.3	938.31	2492.62	946.16	1725.98	954.31	Max Pool
37+80.8	937.83	2501.9	946.1	1738.06	953.84	Max Pool
37+93.5	937.76	2532.88	946.09	1753.33	953.75	Head of Glide
38+05.8	939.1	2557.87	945.96	1763.07	953.2	xvane
38+28.6	937.26	2619	945.36	1783.93	953.69	scourpool
38+68.1	939	2635.61	945.11	1785.16	952.98	xvane
39+90.2	934.94	2645.86	945.2	1808.37	953.24	Max Pool
40+21.2	936.18	2659.89	944.93	1816.63	953.58	Max Pool
40+33.0	937.12	2679.4	944.92	1817.22	952.66	Head of Glide
40+41.5	937.76	2692.39	944.89	1846.94	952.77	xvane
40+62.2	935.01	2708.02	944.85	1849.99	952.89	scourpool
41+23.7	936.49	2717.12	944.86	1892.72	951.95	Rv
41+25.9	935.24	2730.03	944.63	1897.79	952.41	scourpool
41+51.2	934.94	2755.57	944.58	1925.43	952.18	Tp
		2793.02	944.39	1929.22	952.34	
		2822.08	944.28	1944.61	953.92	
		2831.84	944.14	1964.12	952.29	
		2849.35	944.14	1967.66	952.67	
		2866.7	944.15	1992.24	952.15	
		2882.89	944.03	1997.23	953.49	
		2890.21	944.04	2018.84	952.36	
		2918.02	944.05	2041.05	953.92	
		2943.86	944.02	2059.59	952.04	
		2968.07	944.03	2102.57	952.29	
		2986.53	943.91	2137.77	952.25	
		3001.64	943.84	2169.42	951.75	
		3008.7	943.3	2186.49	951.93	
		3022.47	943.31	2186.98	951.89	
		3040.89	943.28	2218.28	951.1	
		3074.07	943.06	2226.83	951.74	
		3093.1	942.84	2244.84	950.66	
		3105.65	942.7	2245.25	951.35	
		3140.84	942.63	2253.88	951.57	
		3150.74	942.59	2259.31	951.54	
		3179.55	942.41	2270.78	951.48	
		3191.45	942.06	2277.54	950.06	
		3191.55	942.05	2292.1	951.36	
		3224.95	941.78	2297.47	951.36	
		3246.98	941.79	2312.86	950.97	
		3264.52	941.76	2315.12	950.46	
		3284.91	941.8	2352.12	951.29	
		3314.42	941.83	2391.7	949.8	
		3323.77	941.82	2396.7	950.78	
		3343.72	941.55	2427.59	950	
		3363.15	941.62	2435.01	950.38	
		3377.6	941.56	2450.36	951.02	
		3389.76	941.13	2466.85	949.47	
		3402.03	941.16	2467.05	951.4	
		3411.34	941.15	2476.57	951.2	
		3423.88	941.2	2504.28	950.43	
		3433.91	941.13	2542.65	949.83	
		3464.59	941.13	2561.65	949.77	
		3486.71	941.15	2606.37	949.75	
		3508.22	941.14	2613.51	947.77	
		3514.4	941.13	2659.17	950.85	
		3533.25	940.75	2669.03	948.13	

2004 Survey Continued*

WS Station	WS Elev	BKF Station	BKF Elev
3533.25	940.75	2669.03	948.13
3542.95	940.81	2687.36	950.36
3573.06	940.7	2720.18	948.95
3596.21	940.44	2729.95	948.21
3616.02	940.44	2778.2	947.98
3641.98	940.3	2785.56	948.9
3657.36	940.31	2792.5	948.53
3679.7	940.32	2811.04	948.23
3700.27	940.29	2820.05	947.59
3710.55	939.77	2837.46	947.97
3749.82	939.48	2842.74	947.97
3773.76	939.48	2868.16	947.5
3805.59	939.47	2882.06	947.4
3826.46	939.19	2887.44	947.84
3868.17	939.18	2918.88	947.63
3871.73	938.65	2932.48	947.34
3899.33	938.52	2939.42	947.21
3934.81	938.53	2967.04	946.35
3953.73	938.33	2984.01	947.5
3969.01	938.28	3042.19	946.28
3988.19	938.34	3042.24	947.18
4004.68	938.34	3084.55	946.79
4041.78	938.3	3157.61	946.31
4044.61	937.01	3211.34	945.95
4058.15	937.01	3284.69	945.11
4080.28	937	3288.37	945.48
4101.22	937.01	3341.07	945.16
4127.76	936.97	3343.69	945.38
4151.29	936.51	3354.01	944.85
4173.05	936.5	3372.56	945.46
		3402.7	944.74
		3460.71	944.88
		3465.41	944.54
		3515.96	944.37
		3517.22	944.27
		3591.47	943.8
		3602.95	944.08
		3619.58	944.39
		3640.35	944.43
		3661.79	942.29
		3664.28	943.83
		3725.03	943.92
		3784.81	942.52
		3809.4	944
		3843.23	943.82
		3922.92	942.44
		3941.21	942.77
		3968.84	943.63
		3985.31	943.27
		4007.36	942.91
		4015.15	942.27
		4034.34	942.19
		4058.22	941.81
		4065.55	941.02
		4092.75	940.68
		4098.82	940.43
		4140.17	939.77
		4145.06	940.36
		4160.53	940.43
		4184	940.77
		4197.2	940.56
		4206.17	940.07
		4197.2	940.56
		4206.17	940.07

As-built

TW Station	Adjusted TW Sta	TW Elev	WS Elev	BKF Elev	Feature
10+24.0	00+24.0	960.22			Top Bedrock
10+44.0	00+44.0	957.59			pool below
10+62.0	00+62.0	958.36	958.74	963.31	Top Riffle
12+07.0	02+07.0	957.46	957.87	962.09	XVANE-Top Pool
12+65.0	02+65.0	955.91	957.85	961.81	Max Pool
12+89.0	02+89.0	957.35	957.77	961.82	XVANE-Top Riffle
13+03.0	03+03.0	955.89			XVANE-Scour Pool
13+16.0	03+16.0	956.85			End Scour Pool
13+73.0	03+73.0	956.15			Log Vane
13+88.0	03+88.0	956.03	956.59	961.16	Top Pool
14+04.0	04+04.0	955.07	956.43	961.23	Max Pool
14+43.0	04+43.0	955.93	956.36	960.76	XVANE-Top Riffle
14+53.0	04+53.0	955.45			XVANE-Scour Pool
14+62.0	04+62.0	955.78			End Scour Pool
15+36.0	05+36.0	955.14	955.45	959.71	Top Pool
15+73.0	05+73.0	953.58	955.41	960.03	Max Pool
15+86.0	05+86.0	954.88	955.38	959.22	Top Riffle
17+02.0	07+02.0	953.96	954.49	958.67	Log XVANE
17+14.0	07+14.0	953.29			XVANE-Scour Pool
17+26.0	07+26.0	952.9			End Scour Pool
17+45.0	07+45.0	952.51	954.47	957.83	Top Pool
18+08.0	08+08.0	953.81	954.47	957.64	Max Pool
18+40.0	08+40.0	953.19	954.47	958.14	XVANE-Top Riffle
18+58.0	08+58.0	953.57			XVANE-Scour Pool
18+70.0	08+70.0	953.46			End Scour Pool
19+19.0	09+19.0	952.25	954.15	957.52	J-Hook/Top Pool/XSEC
19+48.0	09+48.0	953.58	954.11	957.05	Max Pool
19+75.0	09+75.0	952.07	954.09	957.45	XVANE-Top Riffle
19+99.0	09+99.0	951.97			XVANE-Scour Pool
20+31.0	10+31.0	952.83			Intermediate Point
20+52.0	10+52.0	952.26	953.95	956.75	Top Pool
20+88.0	10+88.0	952.85	953.95	957.24	Max Pool
21+09.0	11+09.0	953.37	953.91	957.30	XVANE-Top Riffle
21+29.0	11+29.0	952.01			XVANE-Scour Pool
21+43.0	11+43.0	952.94			End Scour Pool
21+89.0	11+89.0	952.56			DBL Wing Deflector
22+11.0	12+11.0	952.03	952.79	957.43	Top Pool
22+55.0	12+55.0	951.59	952.77	956.80	Max Pool
22+67.0	12+67.0	952.14	952.57	955.62	XVANE-Top Riffle
22+87.0	12+87.0	951.59			Intermediate Point
23+02.0	13+02.0	949.79			Problem
23+24.0	13+24.0	951.64			End Scour Pool/J-hook
23+49.0	13+49.0	951.28	951.93	956.17	Top Pool
23+70.0	13+70.0	950.28	951.96	955.59	Max Pool
23+98.0	13+98.0	951.7	951.97	955.82	XVANE-Problem
24+09.0	14+09.0	950.47			XVANE-Scour Pool
24+20.0	14+20.0	951.15			End Scour Pool
24+46.0	14+46.0	950.64	951.45	955.75	Top Pool/Tributray
24+71.0	14+71.0	949.51	951.51	955.43	Max Pool
24+93.0	14+93.0	951.02	951.48	956.01	XVANE-Top Riffle
25+08.0	15+08.0	950.01			XVANE-Scour Pool
25+27.0	15+27.0	950.35			End Scour Pool
25+53.0	15+53.0	949.64	950.46	954.97	Top Pool
26+15.0	16+15.0	948.76	950.45	954.22	Max Pool
26+52.0	16+52.0	949.81	950.42	954.29	XVANE-Top Riffle
26+67.0	16+67.0	949.52			XVANE-Scour Pool
26+79.0	16+79.0	949.84			End Scour Pool
27+19.0	17+19.0	949.34	949.89	953.81	Top Pool
27+34.0	17+34.0	947.61	949.89	953.84	Max Pool
27+60.0	17+60.0	949.36	949.86	953.68	Log XVANE-Top Riffle
27+81.0	17+81.0	948.17			XVANE-Scour Pool
27+93.0	17+93.0	948.89			End Scour Pool
28+17.0	18+17.0	948.87	949.48	953.2	Top Pool
28+37.0	18+37.0	948.47	949.48	953.4	Max Pool
28+67.0	18+67.0	949.01	949.4	952.88	XVANE-Top Riffle
28+90.0	18+90.0	946.93			XVANE-Scour Pool
29+13.0	19+13.0	948.18			End Scour Pool
29+75.0	19+75.0	948.33	948.96	951.82	Log vane-Top Pool
30+10.0	20+10.0	947.45	948.93	952.19	Max Pool
30+53.0	20+53.0	948.53	948.88	952.05	XVANE-Top Riffle
30+70.0	20+70.0	945.84			XVANE-Scour Pool
30+99.0	20+99.0	947.68			End Scour Pool
31+35.0	21+35.0	947.59			DBL Wing Deflector
32+39.0	22+39.0	947.26	948	951.7	Top Pool

As-built Continued

TW Station	TW Elev	WS Elev	BKF Elev	Feature
3239	947.26	948	951.70	Top Pool
3256	946.1	948	951.74	Max Pool
3287	947.52	947.99	951.62	XVANE-Top Riffle
3306	946.22			XVANE-Scour Pool
3327	946.71			End Scour Pool
3389	946.52			DBL Wing Deflector
3446	946.37	946.95	950.66	Log vane-Top Pool
3488	945.23	946.83	950.17	Max Pool/XSEC
3507	946.39			Rock Vane
3547	945.51	946.62	950.67	Max Pool
3567	946.06	946.62	950.63	XVANE-Top Riffle
3597	944.09			XVANE-Scour Pool
3610	945.57			End Scour Pool
3630	945.76			XVANE
3645	944.29			XVANE-Scour Pool
3656	945.01			End Scour Pool
3706	944.99	945.27	948.19	Top Pool
3723	944.06			Log Vane
3746	943.55	945.18	948.36	Max Pool
3772	944.41	945.12	948.37	Top Riffle
3813	944.24			Tributary
3860	944.27	944.75	948.27	Top Pool
3871	943.12	944.76	948.15	Max Pool
3880	944.15	944.69	948.31	XVANE
3893	943.67			XVANE-Scour Pool
3913	943.77			End Scour Pool
3938	943.91			Intermediate Point
3957	943.48	944.03	947.61	Top Pool
3982	942.84	944.03	946.89	Max Pool
3996	943.57	943.98	946.72	Top Riffle
4066	943.38			XVANE
4096	942.04			XVANE-Scour Pool
4110	942.57			End Scour Pool
4139	942.57	943.14	947.38	Top Pool
4147	941.65	943.15	947.30	Max Pool
4157	942.58			XVANE-Top Riffle
4174	941.94			XVANE-Scour Pool
4192	942.31			End Scour Pool
4232	942.21			XVANE
4341	941.31			DBL Wing Deflector
4389	941.06	941.79	945.61	Top Pool
4413	940.08	941.79	945.55	Max Pool
4435	941.19	941.77	945.07	XVANE-Top Riffle
4468	940.26			XVANE-Scour Pool
4479	940.7			End Scour Pool
4515	940.56	941.43	944.5	Top Pool
4534	940.15	941.43	944.64	Max Pool
4565	940.8	941.37	944.81	XVANE-Top Riffle
4600	939.71			XVANE-Scour Pool
4620	940.26			End Scour Pool
4672	940.23	940.86	944.06	Log vane-Top Pool
4712	938.83	940.72	944.05	Max Pool-XSEC
4756	940.15	940.66	944.12	XVANE-Top Riffle
4788	938.84			XVANE-Scour Pool
4804	939.23			End Scour Pool
4856	939.48	940.1	944.01	XVANE
4868	938.97			XVANE-Scour Pool
4887	939.36			End Scour Pool
4917	939.76	940.32	943.55	XVANE
4946	937.68			XVANE-Scour Pool
4970	939.24			End Scour Pool
5006	939.01	939.28	942.63	Rock Vane-Top Pool
5053	937.43	939.26	942.83	Max Pool
5073	937.66			Intermediate Point
5090	938.54	939.21	942.68	XVANE
5094	937.16			XVANE-Scour Pool
5107	937.69			End Scour Pool
5127	936.18			Intermediate Point
5143	937.83			Intermediate Point
5174	937.8	938.24	943.49	XVANE
5210	936.3			XVANE-Scour Pool
5235	937.36			End Scour Pool
5242	937.49	937.88	943.89	XVANE-Scour Pool
5270	937.03	937.69		End Scour Pool

SLOPE AND LENGTH CALCULATIONS
BEAVER CREEK 2004

	Riffle Station	Riffle Elev	Riffle Length	Riffle Slope		Pool Station	Pool Length	Pool Spacing
	2	959.48				187		
	187	957.62	185	1.01%		313	126	
	313	957.55				360		
	360	956.43	47	2.38%		468	108	164
	468	956.32				537		
	537	955.8	69	0.75%		575	38	142
	575	955.81				659		
	659	954.71	84	1.31%		800	141	173.5
	800	954.73				839		
	839	954.09	39	1.64%		1071	232	225.5
	1193	952.68				1081		
	1340	952.28	147	0.27%		1193	112	182
	1607	950.39				1361		
	1780	949.47	173	0.53%		1607	246	347
	1817	949.44				1780		
	1829	948.98	12	3.83%		1817	37	314.5
	2237	947.64				1829		
	2303	946.95	66	1.05%		2004	175	118
	2437	946.34				2016		
	2656	944.93	219	0.64%		2237	221	210
	2717	944.86				2303		
	2890	944.04	173	0.47%		2414	111	232
	2968	944.03				2656		
	3001	943.84	33	0.58%		2717	61	328
	3040	943.28				2890		
	3225	941.78	185	0.81%		2968	78	242.5
	3323	941.82				3008		
	3377	941.56	54	0.48%		3040	32	95
	3533	940.75				3225		
	3642	940.3	109	0.41%		3323	98	250
	3710	939.77				3389		
	3749	939.48	39	0.74%		3514	125	177.5
	3805	939.47				3642		
	3826	939.19	21	1.33%		3700	58	219.5
	3871	938.65				3749		
	3899	938.52	28	0.46%		3805	56	106
	3934	938.53				3826		
	3969	938.28	35	0.71%		3868	42	70
	4127	936.97				3899		
	4151	936.51	24	1.92%		3934	35	69.5
						3969		
						4041	72	88.5
						4044		
Avg Wate Slope		**0.55%**				4127	83	80.5
		Min	**12**	**0.27%**		**Min**	**32**	**70**
		Max	**219**	**3.83%**		**Max**	**246**	**347**
		Median	**60**	**0.75%**		**Median**	**91**	**178**

Pattern Measurement
BEAVER CREEK 2004

	Design Wavelength	2004 Wavelength	Design Beltwidth	2004 Beltwidth	Design Rad. Of Curv	2004 Rad. Of Curv.
	242	240	208	101	55	68
	375	375	123	162	72	81
	213	239	48	80	63	75
	278	300	93	60	65	90
	280	267	78	56	72	170
	192	182	78	67	60	145
	272	273	43	99	75	90
	269	222	137	54	60	158
	213	265	204	55	60	123
	389	389	87	84	76	126
	485	481	92	81	72	122
	262	221	61	192	72	80
	230	227	61	138	75	122
	249	234	104	46	75	112
	257	253	76	61	52	46
	395	411	64	77	54	42
	381	357	71	82	45	93
	436	279	87	39	72	93
	286	450	157	116	72	79
	386		108		59	79
					72	66
					64	66
					60	
					70	
Median	275.0	267.0	87.0	80.0	65.0	90.0
Min	192.0	182.0	43.0	39.0	45.0	42.0
Max	485.0	481.0	208.0	192.0	76.0	170.0