Little Beaver Creek
Stream Restoration
Wake County, North Carolina
Year 1 Monitoring Report

Ecosystem Enhancement PROGRAM

Monitoring Year: 2007
Measurement Year 1
As-Built Date *2005*
NCEEP Project Number 221

February 2008

LITTLE BEAVER CREEK STREAM RESTORATION
YEAR 1 MONITORING REPORT

CONDUCTED FOR THE NORTH CAROLINA DEPARTMENT
OF
ENVIRONMENT AND NATURAL RESOURCES

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I. EXECUTIVE SUMMARY/PROJECT ABSTRACT

The Little Beaver Creek project consists of 3,712 linear feet of stream restoration, 1,913 linear feet of stream preservation, and 2.4 acres of wetland restoration located southwest of the town of Apex, North Carolina. The site was constructed between July 2005 and November 2005. The following report provides the stream and wetland restoration information.

The project consists of a portion of Little Beaver Creek, a tributary to the Cape Fear River. It is located on private lands southwest of Apex and drains into B. Everett Jordan Lake in Chatham County, North Carolina. The watershed area for this project is 1.1 square miles.

The property is located at the end of Olive Farm Road (SR 1178) south of Humie Olive Road (SR 1142) approximately 0.7 miles east of the intersection with NC 751.

The North Carolina Wetlands Restoration Program (NCWRP; now the North Carolina Ecosystem Enhancement Program, NCEEP) identified Little Beaver Creek as a potential stream and wetland restoration site. Prior to restoration Little Beaver Creek was an incised channel with moderate habitat and an unstable pattern that was actively migrating. Stream banks were steep with areas of active erosion, particularly along outside meander bends. Sand bars were made of easily erodible material that migrated frequently during small storm events. Long straight sections of the channel had central bars indicating a channel that was too wide. The central bars were deflecting the stream flow toward the banks and accelerated bank erosion.

The stream was divided into three separate reaches for the purposes of the design. Reach 1 and 2 consisted of Priority 2 restoration that involved adjusting the stream dimension, pattern, and profile to allow the stream to more fully transport its water and sediment load. A combination of bedform transformations, channel dimension adjustments, pattern alterations, and structure installations were used to accomplish this. The natural meander patterns were restored and rock grade control vanes and rootwads were incorporated for aquatic habitat enhancement and bed and bank stability. Tributaries were restored using Priority 1 restoration. Reach 3 was initially proposed for restoration but that plan was revised due to bedrock constraints, an only a portion (Reach 3A) underwent restoration. The remaining portion of Reach 3 (termed 3B) underwent buffer enhancement with plantings and will be protected with a permanent easement.

Construction of the restored channel was completed in November 2005. Planting material that was available at the time of construction was not suitable for the site, so planting was delayed until the 2006/2007 dormant season when suitable material was available. Tropical Storm Alberto passed over the area on June 14, 2006 and produced heavy precipitation and flooding which eroded a number of areas and caused some bank failures along the project. The channel was also constructed slightly overwide which caused the thalweg to move causing scour in unpredicted locations.

The restoration plan called for raising the elevation of the creek to allow it to access the abandoned floodplain. During construction it was determined that this was not possible. Additionally, because of bedrock constraints no stream work was performed along the majority of Reach 3. Because of the above design changes wetland restoration potential is less then initially anticipated. Currently two gauges are displaying jurisdictional hydrology (> 12.5% of growing season), three are saturated within 12 inches of the surface between 5 and 12.5% of the growing season, and 2 are less than 5% of the growing season. Finally, the piedmont of North Carolina has been in an extended period of drought that began during the summer of 2007.

A monitoring baseline was established in the Year 0 monitoring effort, and was stationed from 10+00 to the end of the constructed portion of the project at the culvert. It should be noted that this stationing differs from the stationing of the design alignment in the construction documents, which begins the stationing of each reach at a multiple of one thousand (1000). Thus, in the construction document, Reach 1 begins at station 10+00 and ends at station 19+91, Reach 2 begins at station 20+00 and ends at station 33+09, and Reach 3a begins at station 40+00 and ends at station 47+32. This was done purely for design purposes, and not because any physical feature demarcates or otherwise separates each of the reaches, such as a road or culvert. Rather, the restored portion of Little Beaver Creek flows continuously and uninterrupted from the first to the last station. Therefore, in order to facilitate efficient monitoring and to avoid confusion amongst different monitoring groups in future monitoring efforts, a baseline was established that stations the restored portion of Little Beaver Creek continuously from 10+00 to 40+32. All of the stations presented in this report are based on this monitoring baseline. Tributaries 1-3 and Reach3b stationing is the same in the monitoring as the design shown in the construction document.

II. PROJECT BACKGROUND

A. Location and Setting

The Little Beaver Creek project site is located approximately 3.5 miles southwest of the town of Apex in southwestern Wake County, North Carolina (Figure 1). The headwaters of the project originate approximately 0.75 miles to the east of the restoration site. From the headwaters, Little Beaver Creek flows for approximately 4.5 miles before emptying into B. Everett Jordan Lake. Several tributaries enter Little Beaver Creek along its project extent.

The watershed is approximately 1.11 square miles (711 acres) and is oriented east to west in the shape of a teardrop. The project is located within a conservation easement that occurs on private land. Little Beaver Creek originates slightly west of the intersection of Humie Olive Road. and Old US 1. From here it flows west southwest to Jordan Lake. The project is located upstream and downstream of the intersection of Little Beaver Creek and Olive Farm Road. (a gravel road).

Directions to the site: From Raleigh take US 64 west through Apex. Turn left onto Kelly Road and take Kelly Road until it dead-ends at Old US 1. Turn right onto Old US 1 slightly more than a mile and turn right onto Humie Olive Road. Take Humie Olive Road

approximately 2 miles and then turn left onto Olive Farm Road. Take Olive Farm Road to the end and the site is perpendicular to the gravel road over Little Beaver Creek.

B. Mitigation Structures and Objectives

The Priority 2 restoration involved adjusting the stream dimension, pattern, and profile along Reach 1, 2, and 3A to allow the stream to more fully transport its water and sediment load. A combination of bedform transformations, channel dimension adjustments, pattern alterations, and structure installations were used to restore the stream. The natural meander patterns were restored and rock grade control vanes and rootwads were incorporated for aquatic habitat enhancement and bed and bank stability. Tributaries were restored using Priority 1 restoration. The Priority 2 restoration involved converting the impaired channel into a sinuous channel that meanders for a total of 3,032 linear feet of stream as measured along the centerline. A riparian buffer was planted on January 15 - February 9, 2007 and is protected by a Conservation Easement.

Table I. Project Mitigation Structure and Objectives Table
Little Beaver Creek Stream Mitigation Site/Project No. 221

Project Segment/Reach ID	Mitigation Type	Approach	Linear Footage	Stationing*	Comment
Little Beaver Creek/Reach 1 and 2	Restoration	N/A	2.4 acres	N/A	Wetland restoration
Little Beaver Creek/Reach 1 and 2	Restoration	Priority 2	2,300	10+00 to 19+91 19+91 to 33+00	Instream structures and vegetated buffers
Little Beaver Creek/Reach 3A	Restoration	Priority 2	732	33+00 to 40+32	Instream structures and vegetated buffers
Little Beaver Creek/Reach 3B	Preservation	N/A	1,913	48+00 to 63+13	Preservation and enhancement of vegetated buffers by plantings and permanent easement
Tributary 1	Restoration	Priority 1	381	10+00 to 13+81	Instream structures and vegetated buffers
Tributary 2	Restoration	Priority 1	206	10+00 to 12+06	Instream structures and vegetated buffers
Tributary 3	Restoration	Priority 1 and 2	93	10+00 to 10+92	Instream structures and vegetated buffers

*Stationing is based on monitoring baseline established in Year 0 Monitoring.

The project had the goal of accomplishing the following objectives:

1. Restore 3,032 linear feet of Little Beaver Creek and 680 linear feet of unnamed tributaries to Little Beaver Creek and enhance 1,913 linear feet of Little Beaver Creek. *Additional linear feet of restoration proposed between design alignment stations 48+00 and 63+13.29 (the end of the project) was revised to Preservation due to bedrock constraints encountered during construction.*
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 erosion by stabilizing the stream banks.
4. Reconnect the stream to its floodplain.
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.
7. Restore characteristic hydrologic regime to disturbed wetlands.
8. Restore characteristic plant communities and animal habitat to disturbed wetlands.
9. Increase the capacity of disturbed wetlands to perform characteristic functions such as flood storage, biogeochemical cycling, runoff attenuation, and maintenance of plant and animal habitat and species diversity.

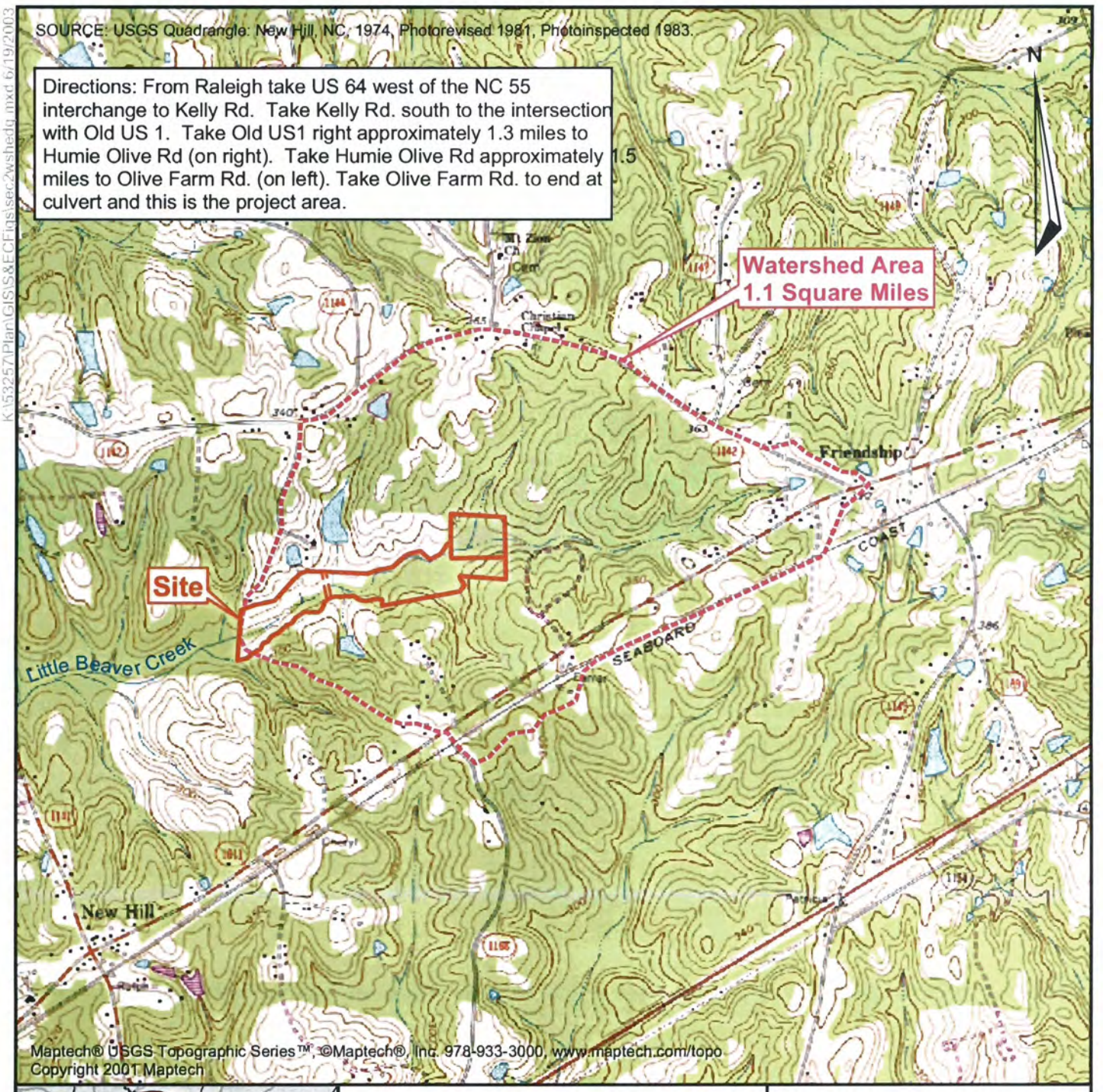
C. Project History and Background

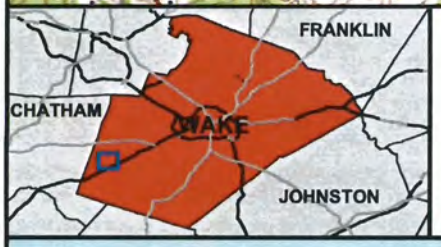
The North Carolina Wetlands Restoration Program (NCWRP; now the North Carolina Ecosystem Enhancement Program, NCEEP) identified Little Beaver Creek as a potential stream and wetland restoration site. Prior to restoration Little Beaver Creek consisted of an incised channel with moderate habitat and an unstable pattern that was actively migrating. Stream banks were steep with areas of active erosion, particularly along outside meander bends. Sand bars consisted of easily erodible material that migrated frequently during small storm events. Long straight sections of the channel had central bars indicating a channel that was too wide. Instead of focusing the flow along the thalweg, the central bars deflected the stream flow toward the banks and accelerated bank erosion.

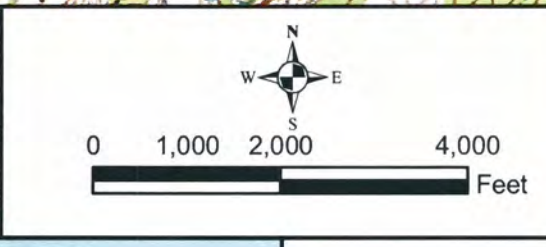
Little Beaver Creek enters the site as second-order stream before joining B. Everett Jordan Lake as a third-order stream. It is located within the Piedmont Physiographic Province of the Cape Fear River Basin (USGS Cataloging Unit 03030002). The watershed is located to the southwest of Apex, in Wake County, North Carolina. The watershed has an average width of 4,500 feet from the headwaters to its outlet. The topography is gently sloping with relatively flat floodplains occurring along Little Beaver Creek. Land surface elevations range from approximately 270 to 390 feet above mean sea level. Areas of hydric soils are common along the flat, narrow drainageways of this watershed. Few intact wetland

communities are present, however, as a result of alterations to accommodate agricultural and residential land uses.

Little Beaver Creek (NCDWQ Stream Index Number 16-41-11-(1)) has a WS-IV, NSW classification, The WS-IV classification indicates waters used as sources of potable water where a WS-I, II or III classification is not feasible. These waters are also protected for Class C uses. WS-IV waters are generally in moderately to highly developed watersheds or Protected Areas, and involve no categorical restrictions on discharges. Class C designation indicates waters protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, agriculture and other uses suitable for Class C. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner. There are no restrictions on watershed development or types of discharges. The NSW supplemental classification indicates waters needing additional nutrient management due to their being subject to excessive growth of microscopic or macroscopic vegetation.







Ecosystem Enhancement Program

FIGURE 1
Site Location Map

Little Beaver Creek
Wake County, North Carolina

February 2007

Table II. Project Activity and Reporting History Little Beaver Creek Stream Mitigation Site/Project No. 221			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion Date**
Restoration Plan	2003	2003	March 2003
Final Design - 90%	2005	2005	2005
Construction	2005	2005	November 2005
Temporary S&E mix applied to entire project area	2005	2005	2005
Permanent seed mix applied to entire project area	2005	2005	2005
Containerized, B&B, and livestake plantings	January 2006	February 2007	February 2007
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	July 2006	Morphology - Mar 2006 Vegetation – Feb - 2007	February 2007
Year 1 Monitoring	Fall 2006	Morphology – Feb 2006 Hydrology – Jan 2007 Vegetation – Nov 2007	November 2007
Year 2 Monitoring	Fall 2007	NA	NA
Year 3 Monitoring	Fall 2008	NA	NA
Year 4 Monitoring	Fall 2009	NA	NA
Year 5 Monitoring	Fall 2010	NA	NA

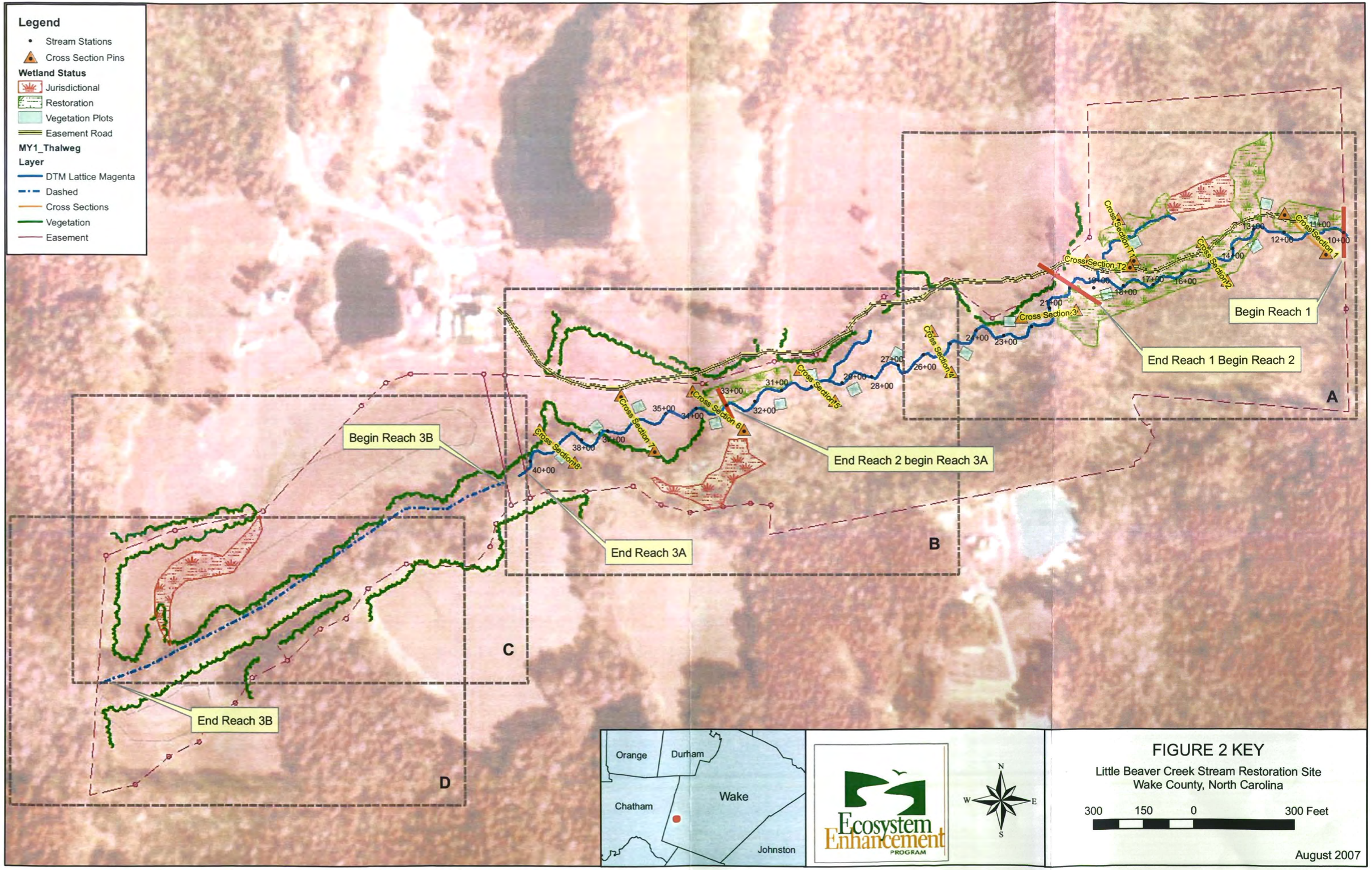

Legend
Stream Stations
Cross Section Pins
Wetland Status
Jurisdictional
Restoration
Vegetation Plots
Easement Road
MY1_Thalweg
Layer
DTM Lattice Magenta
Dashed
Cross Sections
Vegetation
Easement
Begin Reach 1
End Reach 1 Begin Reach 2
End Reach 2 begin Reach 3A
End Reach 3A
Begin Reach 3B
End Reach 3B
A
B
C
D
Cross Section 1
Cross Section T1
Cross Section T2
Cross Section 2
Cross Section 3
Cross Section 4
Cross Section 5
Cross Section 6
Cross Section 7
Cross Section 8
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
21+00
23+00
24+00
26+00
27+00
28+00
29+00
31+00
32+00
33+00
34+00
35+00
37+00
38+00
40+00
Orange
Durham
Chatham
Wake
Johnston
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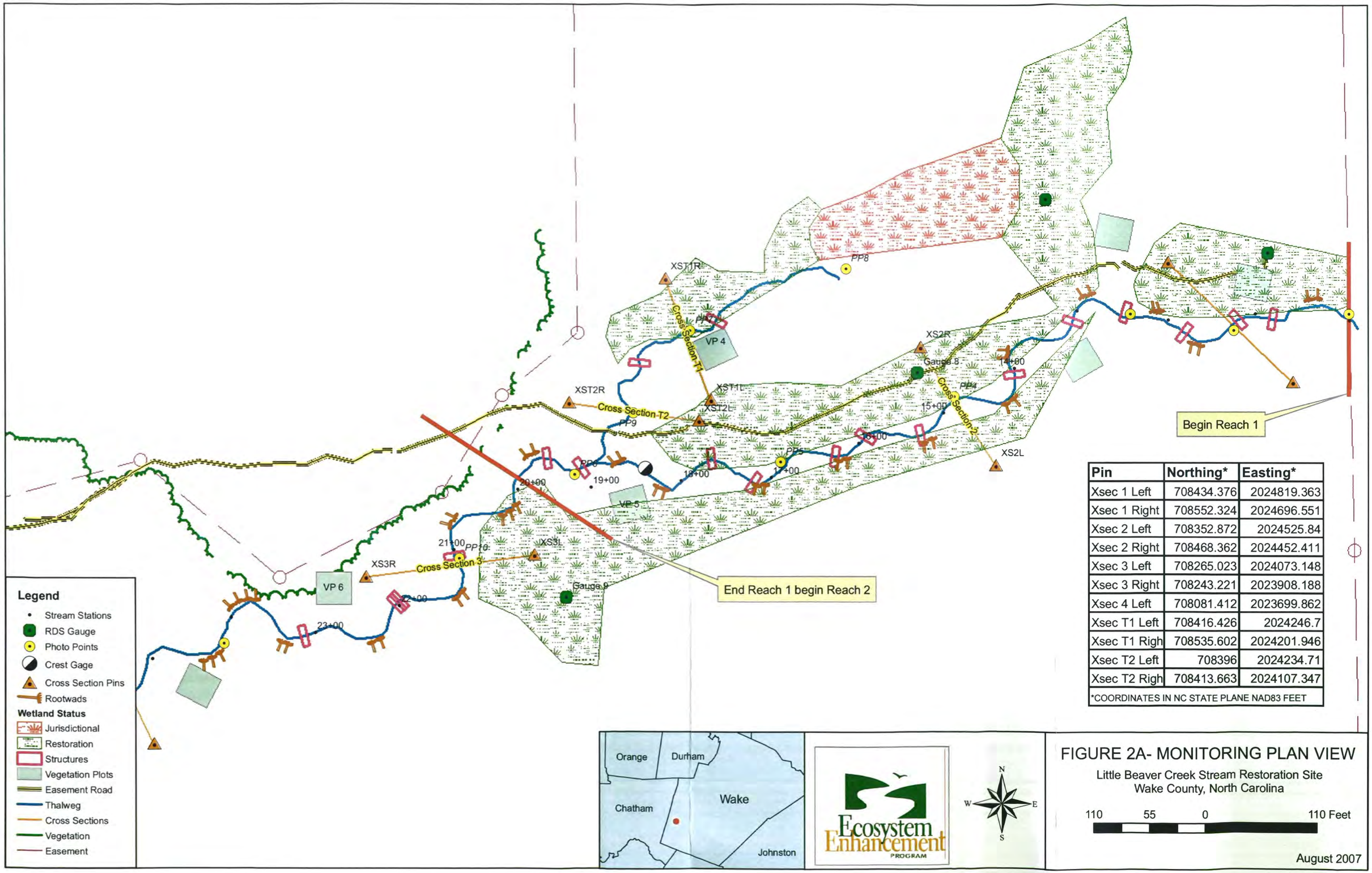
FIGURE 2 KEY
Little Beaver Creek Stream Restoration Site
Wake County, North Carolina
300 150 0 300 Feet
August 2007



Pin	Northing*	Easting*
Xsec 1 Left	708434.376	2024819.363
Xsec 1 Right	708552.324	2024696.551
Xsec 2 Left	708352.872	2024525.84
Xsec 2 Right	708468.362	2024452.411
Xsec 3 Left	708265.023	2024073.148
Xsec 3 Right	708243.221	2023908.188
Xsec 4 Left	708081.412	2023699.862
Xsec T1 Left	708416.426	2024246.7
Xsec T1 Righ	708535.602	2024201.946
Xsec T2 Left	708396	2024234.71
Xsec T2 Righ	708413.663	2024107.347

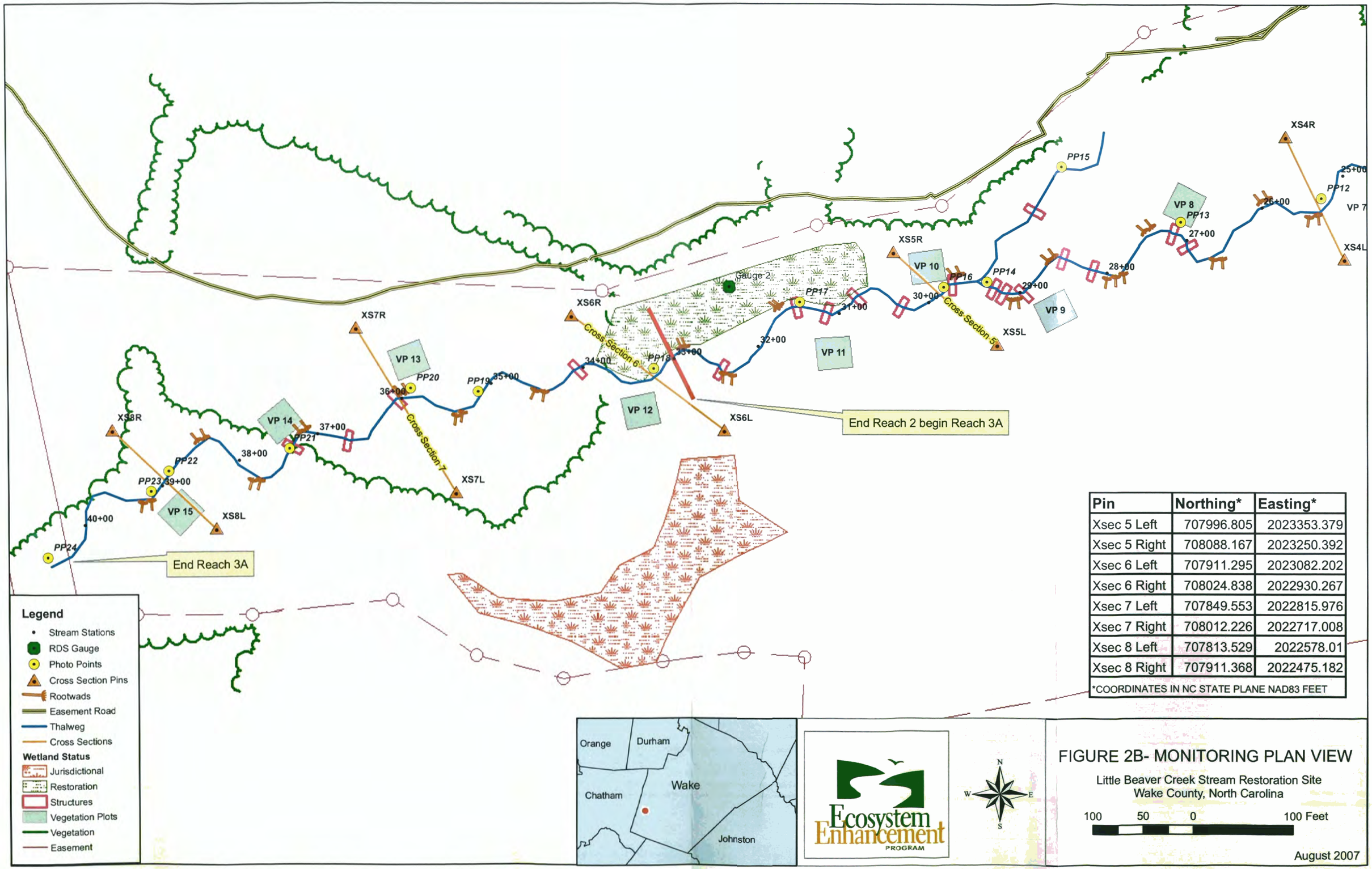
*COORDINATES IN NC STATE PLANE NAD83 FEET

FIGURE 2A- MONITORING PLAN VIEW

Little Beaver Creek Stream Restoration Site
Wake County, North Carolina

110 55 0 110 Feet

August 2007



Pin	Northing*	Easting*
Xsec 5 Left	707996.805	2023353.379
Xsec 5 Right	708088.167	2023250.392
Xsec 6 Left	707911.295	2023082.202
Xsec 6 Right	708024.838	2022930.267
Xsec 7 Left	707849.553	2022815.976
Xsec 7 Right	708012.226	2022717.008
Xsec 8 Left	707813.529	2022578.01
Xsec 8 Right	707911.368	2022475.182
*COORDINATES IN NC STATE PLANE NAD83 FEET		

FIGURE 2B- MONITORING PLAN VIEW

Little Beaver Creek Stream Restoration Site
Wake County, North Carolina

100 50 0 100 Feet

August 2007

Gauge 3

Begin Reach 3B

PP24

Area Proposed for Restoration
in 2003 Restoration Plan

Gauge 4

Legend

- Stream Stations
- RDS Gauge
- Photo Points
- Cross Section Pins
- Thalweg
- Easement Road
- Cross Sections

Wetland Status

- Jurisdictional
- Structures
- Vegetation Plots
- Vegetation
- Easement

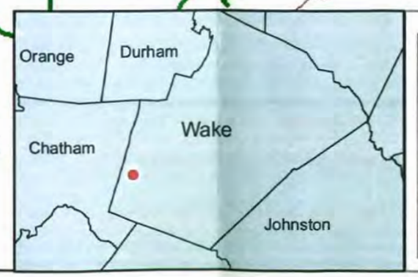


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FIGURE 2C- MONITORING PLAN VIEW

Little Beaver Creek Stream Restoration Site
Wake County, North Carolina

100 50 0 100 Feet

August 2007

Gauge 4

End Reach 3B

Gauge 5

Area Proposed for Enhancement in 2003 Restoration Plan

Legend

- Stream Stations
- RDS Gauge
- Photo Points
- Cross Section Pins
- Thalweg
- Rootwads
- Easement Road
- Cross Sections

Wetland Status

- Jurisdictional
- Structures
- Vegetation Plots
- Vegetation
- Easement

Ecosystem Enhancement PROGRAM

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FIGURE 2D- MONITORING PLAN VIEW

Little Beaver Creek Stream Restoration Site
Wake County, North Carolina

100 50 0 100 Feet

August 2007

Table III. Project Contact Table Little Beaver Creek Stream Restoration Site/Project No. 221	
Designer POC	*Earth Tech* 701 Corporate Center Drive Suite 475 Raleigh, NC 27607 Bill Jenkins PE (919) 854-6200
Construction Contractor POC	*Envirocon, Inc.* 651 Corporate Circle Suite 114 Golden, CO 80401 Verne Musser (303) 215-0187
Planting Contractor POC	*Seal Brothers* 131 West Cleve St. Mt. Airy, NC 27030 Brian Seal (336) 786-2263
Seeding Contractor POC	*Seal Brothers.* 131 West Cleve St. Mt. Airy, NC 27030 Brian Seal (336) 786-2263
Seed Mix Sources	*Evergreen Seeding* 4792 Rawls Church Rd. Fuquay-Varina, NC 27526 (919) 567-1333
Nursery Stock Suppliers	*Mellow Marsh Farm* 1312 Woody Store Rd. Siler City, NC 27344 (919) 742-1200
Monitoring Performers	Earth Tech 701 Corporation Center Drive, Suite 475 Raleigh, NC 27607 Ron Johnson (919) 854-6210
Stream Monitoring	Ron Johnson
Vegetation Monitoring	Ron Johnson
Wetland Monitoring	Ron Johnson

Table IV. Project Background Table Little Beaver Creek Stream Mitigation Site/Project No. 221	
Project County	Wake
Drainage Area	
Little Beaver Creek	1.1 sq mi
Drainage impervious cover estimate (%)	<5%
Stream Order	
Little Beaver Creek	2nd
Physiographic Region	Piedmont
Ecoregion	Triassic Basins
Rosgen Classification of As-Built	C
Cowardin Classification	Riverine
Dominant Soil Types	Augusta fine sandy loam
	Wehadkee silt loam
	Worsham sandy loam
Reference site ID	Richland Creek and Little Beaver Creek
USGS HUC for Project	03030002
USGS HUC for Reference	Richland Creek (03030003), Little Beaver Creek (03030002)
NCDWQ Sub-basin for Project	030605
NCDWQ Sub-basin for Reference	Richland Creek (030610), Little Beaver Creek (030605)
NCDWQ Classification for Project	Little Beaver Creek (WS-IV, NSW)
NCDWQ Classification for Reference	Richland Creek (B), Little Beaver Creek (WS-IV, NSW)
Any portion of any project segment 303D listed?	No
Any portion of any project segment upstream of a 303D listed segment?	Yes
Reasons for 303D listing or stressor	Chlorophyll a
% of project easement fenced	0%

III. PROJECT CONDITION AND MONITORING RESULTS

A. Vegetation Assessment

The final vegetative success criteria will be the survival of 260 5-year old planted trees per acre at the end of year 5 of the monitoring period. An interim measure of vegetation planting success will be the survival of at least 320 3-year old planted trees per acre at the end of year 3 of the monitoring period. Vegetation monitoring protocol was the 2004 EEP Stem Counting Protocol.

1. *Soil Data*

Table V. Preliminary Soil Data Little Beaver Creek Stream Mitigation Site/Project No. 221					
Series	**Max Depth (in.)**	**% Clay in Surface Horizon**	**K**	**T**	**OM % (Surface)**
Augusta fine sandy loam	70	3-25	NA	NA	0.5 - 2
Wehadkee silt loam	50	5-40	NA	NA	2 - 5
Worsham sandy loam	70	10-25	NA	NA	1 - 3

2. *Vegetative Problem Areas*

Table VI. Vegetative Problem Areas Little Beaver Creek Stream Mitigation Site/Project No. 221			
Feature/Issue	**Station#/Range**	**Probable Cause**	**Photo#**
Bare Bank	10+00	Unvegetated coir matting, both banks	VPA 1
	10+50	Eroded banks	VPA 2
	12+00	Bare coir matting, both banks	
	14+50	Bare coir matting/ eroded bank, left bank	VPA 6
	15+80	Bare coir matting, both banks	
	16+10	Bare coir matting/ eroded banks, both banks	
	17+40	Bare coir matting, both banks	
	18+80	Eroded bank, right bank	
	21+80	Bare coir matting/eroded bank, right bank	VPA 11
	24+00	Bare coir matting/ eroded bank, both banks	VPA 12
	26+00	Bare coir matting/ eroded bank, both banks SEVERE	VPA 13
	27+00	Eroded bank, left bank	
	28+50	Bare coir matting, eroded bank, both banks	
	30+00	Bare coir matting/ eroded bank, both banks	
	31+00	Bare coir matting/ eroded bank, both banks	
	32+30	Bare coir matting/ eroded bank, both banks	
	33+10	Bare coir matting, both banks	
	34+60	Bare coir matting/ eroded bank, both banks	VPA 20
	35+50	Bare coir matting/ eroded bank, both banks	
	37+00	Bare coir matting/ eroded bank, both banks	
	38+10	Bare coir matting/ eroded bank, both banks	VPA 23
	39+60	Bare coir matting/ eroded bank, both banks	
Disturbance	Near 10+90	Excessive mulch	VPA 3
	Near 13+80	Excessive mulch on dirt road in floodplain	VPA 5

3. *Stem Counts*

Baseline vegetation plots were established on February 19, 2007 after vegetative planting was completed February 9, 2007. Year 1 vegetation monitoring was performed on November 8, 2007. Fifteen (15) vegetation survival plots were staked out in the floodplain and terrace along Little Beaver Creek and its tributaries in the project area. Each plot measured 10m X 10m and had an area of $100m^2$. Survival of the planted trees and shrubs was evaluated using

the fifteen plots and will continue for at least 5 years to determine survival. Stems were flagged and counted to establish baseline and yearly stem counts.

Year 1 monitoring revealed an average of 297 trees per acre. This average is slightly below the Corps of Engineers mitigation requirement of 320 planted trees per acre at Year 3. When shrubs are included in the assessment, there are 340 woody stems per acre, which is slightly more than the Corps of Engineers requirements. Table VII shows the baseline and Year 1 stem count. Some misidentification during the baseline assessment was possible due to the difficulty of identifying some species of small trees and shrubs without the presence of leaves. The counts per species in each plot changed slightly from the previous year's counts due to the greater accuracy in identification of many individuals due to the presence of leaves. Overall, 67% survival of planted trees is good considering the timing of their planting preceded a record drought in 2007 that was still underway at the time of vegetation monitoring. Additional plantings may be required if there is another significant drop in survival at the end of Year 2.

4. *Vegetation Plot Photos*

Photos of the vegetation plots are located in Appendix A.

Table VII. Stem Counts for Each Species by Plot
Little Beaver Creek/Project No. 221

Species		Plots															Initial Totals	Year 1 Totals	Survival %
Scientific Name	Common Name	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15			
Shrubs																			
Euonymus americana	Strawberry bush								1								*1*	*0*	*0%*
Lindera benzoin	Spice bush																*0*	*1*	*NA*
Viburnum nudum	Possum-haw																*32*	*0*	*0%*
Ilex verticillata	Winterberry																*0*	*0*	*NA*
Cephalanthus occidentalis	Buttonbush				1												*3*	*1*	*33%*
Cornus amomum	Silky dogwood			2	1		1					2					*2*	*6*	*300%*
Alnus serrulata	Tag alder			1											1		*4*	*2*	*50%*
Aronia arbutifolia	Red chokeberry			1					1								*15*	*2*	*13%*
Myrica cerifera	Wax myrtle							4									*9*	*4*	*44%*
	Total Shrubs	***0***	***0***	***4***	***2***	***0***	***1***	***4***	***2***	***0***	***0***	***2***	***0***	***0***	***1***	***0***	***66***	***16***	***24%***
Trees																			
Fraxinus pennsylvanica	Green ash		1	7		19	5	6		1	1	7	2	3	1		*54*	*53*	*98%*
Hamamelis virginiana	Witch hazel			1	1		4	4			1				1		*11*	*12*	*109%*
Juglans nigra	Black walnut			1													*3*	*1*	*33%*
Nyssa sylvatica	Black gum	1	1	1										1	2		*7*	*6*	*86%*
Quercus nigra	Water oak																*8*	*0*	*0%*
Quercus phellos	Willow oak	1			2		2	2				1					*4*	*8*	*200%*
Quercus rubra	Northern red oak																*5*	*0*	*0%*
Carpinus caroliniana	Ironwood	1		1		4			2				1			2	*2*	*11*	*550%*
Asimina triloba	Paw Paw			2													*17*	*2*	*12%*
Carya glabra	Pignut hickory	1		2													*25*	*3*	*12%*
Cornus florida	Flowering dogwood		1						1		1						*10*	*3*	*30%*
Quercus lyrata	Overcup oak		1		1	3	2	2				1					*0*	*10*	*NA*
Quercus michauxii	Swamp chestnut oak																*4*	*0*	*0%*
Diospyros virginiana	Persimmon									1							*5*	*1*	*20%*
Amelanchier arborea	Downy serviceberry																*8*	*0*	*0%*
	Total Trees	***4***	***4***	***15***	***4***	***26***	***13***	***14***	***3***	***2***	***3***	***9***	***3***	***4***	***4***	***2***	***163***	***110***	***67%***
TABLE SUMMARY	**Total Stems of planted woody vegetation**	**4**	**4**	**19**	**6**	**26**	**14**	**18**	**5**	**2**	**3**	**11**	**3**	**4**	**5**	**2**	***229***	***126***	***55%***
	% Shrubs	0%	0%	21%	33%	0%	7%	22%	40%	0%	0%	18%	0%	0%	20%	0%	***29%***	***13%***	
	% Trees	100%	100%	79%	67%	100%	93%	78%	60%	100%	100%	82%	100%	100%	80%	100%	***71%***	***87%***	
	Current Density																		
	Shrubs per acre	0	0	162	81	0	40	162	81	0	0	81	0	0	40	0	178	43	
	Trees per acre	162	162	607	162	1052	526	567	121	81	121	364	121	162	162	81	440	297	
	Total stems per acre	***162***	***162***	***769***	***243***	***1052***	***567***	***728***	***202***	***81***	***121***	***445***	***121***	***162***	***202***	***81***	***618***	***340***	

B. Stream Assessment

The stream suffered damage as a result of heavy rainfall associated with Tropical Storm Alberto on June 14, 2006. The combination of heavy rainfall and lack of permanent vegetation led to erosion of banks, meanders, and structures.

1. Morphometric Criteria

Considering the 5 year timeframe of standard mitigation monitoring, restored streams should demonstrate morphologic stability in order to be considered successful. Stability does not equate to an absence of change, but rather to sustainable rates of change or stable patterns of variation. Restored streams often demonstrate some level of initial adjustment in the several months that follow construction and some change/variation subsequent to that is to also be expected. However, the observed change should not indicate a high rate or be unidirectional over time such that a robust trend is evident. If some trend is evident, it should be very modest or indicate migration to another stable form. Examples of the latter include depositional processes resulting in the development of constructive features on the banks and floodplain, such as an inner berm, slight channel narrowing, modest natural levees, and general floodplain deposition. Annual variation is to be expected, but over time this should demonstrate maintenance around some acceptable central tendency while also demonstrating consistency or a reduction in the amplitude of variation. Lastly, all of this must be evaluated in the context of hydrologic events to which the system is exposed over the monitoring period.

For channel dimension, cross-sectional overlays and key parameters such as cross-sectional area and the channel's width to depth ratio should demonstrate modest overall change and patterns of variation that are in keeping with above. For the channels' profile, the reach under assessment should not demonstrate any consistent trends in thalweg aggradation or degradation over any significant continuous portion of its length. Over the monitoring period, the profile should also demonstrate the maintenance or development of bedform (facets) more in keeping with reference level diversity and distributions for the stream type in question. It should also provide a meaningful contrast in terms of bedform diversity against the pre-existing condition. Bedform distributions, riffle/pool lengths and slopes will vary, but should do so with maintenance around design/As-built distributions. This requires that the majority of pools are maintained at greater depths with lower water surface slopes and riffles are shallow with greater water surface slopes. Substrate measurements should indicate the progression towards, or the maintenance of, the known distributions from the design phase.

Cross-section and longitudinal surveys were completed on January 25, 2007. Ten cross-sections and approximately 3,030 linear feet of Little Beaver Creek and 511 linear feet of two unnamed tributaries were surveyed. A bed material analysis was performed on January 30, 2007 and photographs were taken at all permanent photo points.

A monitoring baseline was established in the Year 0 monitoring effort, and was stationed from 10+00 to the end of the constructed portion of the project at the culvert, in order to facilitate future monitoring efforts by different monitoring groups. The stationing of this baseline is used to identify locations along the restored portion of Little Beaver Creek throughout this report. It should be noted that this stationing differs from the stationing of the design alignment shown on the construction documents, which begins the stationing of each reach at a multiple of one thousand (1000). Tributaries 1-3 and Reach3b stationing is the same in the monitoring as the construction documents.

The assessment included the survey of ten cross-sections, as well as the longitudinal profile. Cross-sections were marked with wooden stakes and rebar. Cross sections are located at the following locations.

Cross-Section #1. Little Beaver Creek, Station 11+30, riffle
Cross-Section #2. Little Beaver Creek, Station 14+98, pool
Cross-Section #3. Little Beaver Creek, Station 21+40, riffle
Cross-Section #4. Little Beaver Creek, Station 25+42, pool
Cross-Section #5. Little Beaver Creek, Station 30+00, riffle
Cross-Section #6. Little Beaver Creek, Station 33+27, riffle
Cross-Section #7. Little Beaver Creek, Station 36+3, pool
Cross-Section #8. Little Beaver Creek, Station 38+94, riffle
Cross-Section #9. UT 1 Little Beaver Creek 11+63, pool
Cross-Section #10. UT 1 Little Beaver Creek 12+85, pool

Survey data collected during future monitoring periods may vary depending on actual rod placement and alignment; however, from this point forward this information should remain similar in overall appearance.

2. Hydrologic Criteria

Monitoring requirements state that at least two bankfull events must be documented through the five-year monitoring period. No surface water gauges exist on Little Beaver Creek or its tributaries. A review of known U.S. Geological Survey (USGS) surface water gauges identified three surface water gauges within 20 miles of the mitigation site: one on Buckhorn Creek near Corinth (76.3 square miles), one on White Oak Creek near Green Level (11.9 square miles), and one on B. Everett Jordan Lake at the dam near Moncure (1,689.00 square miles). None of the three streams has a drainage area that is comparable to Little Beaver Creek (1.1 square miles). In order to accurately document future bankfull events it is recommended that a crest gauge be installed since comparison to nearby gauges may not reflect what is occurring on site given the large difference in watershed size between the existing stream gauges and the project stream.

One documented bankfull event occurred on June 14, 2006 as a result of heavy rainfall associated with Tropical Storm Alberto.

Table VIII. Verification of Bankfull Events Little Beaver Creek/ Project No. 221			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo # (if applicable)**
2006	6-14-06	Visual	N/A

Table IX BEHI estimates are not applicable to the Year 1 Monitoring Report.

Table X. Stream Problem Areas Little Beaver Creek Stream Mitigation Site/Project No. 221			
Feature/Issue	**Station#/Range**	**Probable Cause**	**Photo #**
Bank Scour	10+05	Bank scour	
	11+87	Scour of left and right bank	SPA 2
	15+70	Left bank scour	
	16+14	Left bank scour	
	18+63	Rock in stream/downstream scour	
	21+91	Coir matting dislodged	SPA 11
	24+11	Right bank scour/ chute cutoff	
	25+66	Left bank scour	
	26+00	Point bar chute cutoff (C33)	SPA 15
	26+33	Channel overwide, left and right bank scour	
	28+38	Left bank scour	
	31+65	Point bar scoured	
	35+37	Bankfull bench collapse	SPA 21
	36+14	Right and left bank scour around structure	SPA 22
	39+39	Overland flow over point bar	SPA 26
	40+53	Center of bridge	
Aggradation/Bar Formation	12+02	Channel deposition	
	12+35	Mid channel bar	
	13+30 - 14+00	Left bank deposition	
	15+27	Deposition in mid point of curve	SPA 6
	18+80	Mid channel bar	
	25+20	Left bank deposition	
	26+78	Aggradation in pool	SPA 17
	36+45	Riprap transverse bar formation	SPA 23
	37+08	Transverse bar formation	
	37+78	Constructed riffle riprap filling in pool	
Engineered Structures	28+53	Outside meander is scouring around rootwads	

Table XI. Categorical Stream Feature Visual Stability Assessment Little Beaver Creek Stream Mitigation Site/Project No. 221					
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**
A. Riffles	100%	65%			
B. Pools	100%	65%			
C. Thalweg	100%	88%			
D. Meanders	100%	72%			
E. Bed General	100%	98%			
F. Vanes/J Hooks etc.	100%	68%			
G. Wads and Boulders	100%	83%			

C. Wetland Assessment

Wetland restoration and enhancement were initially proposed for this project in addition to the stream restoration. The March 2003 Restoration Plan proposed 4.4 acres of wetland restoration and 0.7 acres of wetland enhancement for the site. However, stream restoration did not occur along Reach 3, and thus, there will be no increase in groundwater levels that would potentially restore historical wetland hydrology along the reach back to jurisdictional status. Therefore, no wetlands along Reach 3 are considered for either restoration or enhancement in this report. Additionally, the stream bed along Reach 1 and 2 was not raised to the elevation initially anticipated in the Restoration Plan. Therefore, it is unclear whether or not it will be possible to attain wetland hydrology in the proposed wetland restoration areas along these reaches. Currently there are 2.4 acres of potential wetland restoration along Reach 1 and 2. No areas are proposed for enhancement.

The wetland design was modeled on the reference community as well as published descriptions of Piedmont bottomland systems and general observations of characteristic wetland structure and function. Areas considered suitable for restoration are those on which hydrophytic vegetation can be planted and excessive drainage can be reversed so that groundwater levels remain within 12 inches of the surface for at least 12.5% of the growing season. Areas that were considered for enhancement are those on which soils are hydric and wetland hydrology is present, but hydrophytic vegetation is absent and can be planted.

Eight Remote Data Systems (RDS) groundwater monitoring gauges were placed in the project area on March 22, 2006 near the locations of the original gauges used to determine the jurisdictional status of hydric soil patches within the project area prior to restoration. These gauges record groundwater levels on a daily basis and this data is collected every month during site monitoring visits. Gauges were installed according to the specifications of Technical Note HY-1A-3.1 (USACE 1993).

Hydrologic restoration will be considered successful if groundwater levels are within 12 inches of the surface for at least 12.5% of the growing season or for a hydroperiod comparable to that of the reference wetland. If the period of saturation is between 5 and 12.5% of the growing season, the presence of hydrophytic vegetation and hydric soils will be taken into consideration. In Wake County, the growing season is 228 days, from March 26 to

November 11. Five to 12.5% of 228 days is 12 to 29 days. Rainfall normal ranges will be considered when judging hydrologic success.

Table XII. Wetland Criteria Attainment
Little Beaver Creek Stream Mitigation Site/Project No. 221

Tract	Gauge ID	Hydrology Threshold Met?	Tract Mean	Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	2	N	22%	VP 11	Yes	340
	3	N		N/A	N/A	
	4	N*		N/A	N/A	
	5	N*		N/A	N/A	
	6	N*		VP 1	No	
	7	Y		VP 2	No	
	8	Y		VP 3	Yes	
	9	N		VP 5	Yes	

* Meets hydrology threshold for 5% or greater of growing season

Currently two gauges (7 and 8) within wetland restoration areas are showing jurisdictional hydrology by being saturated within 12.0 inches of the surface for more than 12.5 % of the growing season. Hydrology at one site (Gauge 6) is only slightly below the minimum criteria of what the USACE requires as jurisdictional wetland hydrology (12.2%). If the criteria for jurisdictional hydrology threshold is saturation for 5% of the growing season, then Gauges 4 (7.4% saturation) and 5 (8.3% saturation) meet jurisdictional wetland hydrology. Gauges 2, 3, and 9 do not meet the minimum jurisdictional wetland hydrology criteria. Rainfall totals for the months March through November reflect a slightly higher than average amount of precipitation in Apex for these months when compared to averages for Apex. 38.48 inches of precipitation fell in 2006 compared to an average for the same period of 32.52.

This outcome is not unexpected in that Reach 3 was not restored due to bedrock constraints. Therefore, because the stream elevation was not raised, no subsequent increase in groundwater elevation is expected. Gauges 3, 4, and 5 are all located along Reach 3 and did not meet jurisdictional hydrology criteria. It should be noted that Gauge 5 (which did not attain threshold hydrology) is in an enhancement area that was considered to be a jurisdictional wetland prior to restoration efforts. The stream on Reach 1 and 2 was raised approximately 1 foot but will likely not flow onto the original floodplain as often as originally anticipated. Therefore, the resulting hydrology regime is not as "wet" as originally designed. Though rainfall was higher than normal for the period covering the growing season there was a period between late summer where rainfall was below normal for three months. This may have contributed to lower groundwater levels during that period.

Due to the necessary change in the extent of stream restoration it is recommended that Gauges 2, 3, 4, and 5 be removed from their current locations and placed in areas of the project site that visually exhibit wetland conditions. This will help to determine the extent of restored wetlands on the project.

VII. Methodology

The survey of the cross-sections and longitudinal profile were performed using total station survey equipment and methodology. A monitoring baseline was established in the Year 0 monitoring effort, and was stationed from 10+00 to the end of the constructed portion of the project at the culvert, in order to facilitate future monitoring efforts by different monitoring groups. The stationing of this baseline is used to identify locations along the restored portion of Little Beaver Creek throughout this report. This stationing differs from the stationing of the design alignment, which began the stationing of each reach at a multiple of one thousand (1000), and was done entirely for design purposes. Tributaries 1-3 and Reach 3b stationing is the same in the monitoring as the design.

Data was then entered into the stream morphology applications program, Rivermorph, to obtain the dimensions of the cross sections and parameters applicable to the longitudinal profile. Reports were then generated by Rivermorph that are used in this report to display and summarize stream survey data.

Table XIII. Baseline Morphology and Hydraulic Summary Little Beaver Creek Stream Mitigation Site/Project No. 221 Reach 1 (991 feet)																		
Parameter	**USGS Data**			**Regional Curve Interval**			**Pre-Existing Condition**			**Project Reference Stream**			**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)				7.1	28.0	16.0			11.2	14.0	16.7	14.4			14.5	17.5	29.7	23.6
BF Cross Sectional Area (ft^2)				11.0	43.0	21.0			8.0	12.2	15.5	13.7			15	24.9	34.2	29.55
BF Mean Depth (ft)				0.9	2.5	1.7			0.7	0.8	0.9	0.9			1.04	1.2	1.4	1.3
BF Max Depth (ft)									1.2	1.4	2.0	1.8			2.3	2.33	2.65	2.49
Width/Depth Ratio									15.6	16.0	18.0	17.6			14	25.8	36.2	31.0
Entrenchment Ratio									2.0	3.0	13.6	6.1			>8	3.4	4.3	3.8
Wetted Perimeter (ft)																18.1	32.2	25.2
Hydraulic radius (ft)																0.83	1.13	0.98
Bank height ratio (ft/ft)															1.0	1.0	1.0	1.0
Pattern																		
Channel Beltwidth (ft)							12	16		5	40		36	65		37.9	58.2	48.1
Radius of Curvature (ft)							6.0	12		11	90		29	44		10.9	26.2	18.59
Meander Wavelength									38	14	67		46	83		68.7	98.5	80.1
Meander Width ratio							1.1	1.4					2.5	4.5		1.61	2.47	2.04
Profile																		
Riffle length (ft)										4	18					17	68	32
Riffle slope (ft/ft)							0.009	0.067		0.00083	0.1125		0.007	0.02		.001	.02	.008
Pool length (ft)										6	41.5					.0013	.0035	.0027
Pool spacing (ft)							4.0	78		14	95.8		36.5	58		31	43	
Substrate																		
d50 (mm)										0.5-1.0	45							
d84 (mm)										8.0-11.3	125							
Additional Reach Parameters																		
Valley Length (ft)															3997			834
Channel Length (ft)																		991
Sinuosity									1.0	1.2	1.5				1.3			1.81
Water Surface Slope (ft/ft)									0.011	.0025	.0133				0.0066			.0076
BF slope (ft/ft)																		.0072
Rosgen Classification								E4				C4,C5			C4/5			C4/C5
Habitat Index																		

Table XIII. Baseline Morphology and Hydraulic Summary
Little Beaver Creek Stream Mitigation Site/Project No. 221
Reach 2 (1,309 feet)

Parameter	USGS Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			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)				7.1	16.0	28.0	10.5	15.1		14.0	16.7	14.4			16.1	15.4	21.1	17.8
BF Cross Sectional Area (ft^2)				11.0	21.0	43.0	14.3	14.8		12.2	15.5	13.7			18.5	17.9	22.8	20.4
BF Mean Depth (ft)				0.9	1.7	2.5	0.9	1.4		0.8	0.9	0.9			1.15	0.8	1.3	1.13
BF Max Depth (ft)							1.9	2.5		1.4	2.0	1.8			2.5	1.88	2.54	2.29
Width/Depth Ratio							7.4	16		16.0	18.0	17.6			14	11.69	17.24	16.4
Entrenchment Ratio									1.4	3.0	13.6	6.1			>11	2.27	8.07	5.8
Wetted Perimeter (ft)																11.6	24.8	16.4
Hydraulic radius (ft)																0.83	1.27	1.11
Bank Height Ratio (ft/ft)															1.0	1.0	1.0	1.0
Pattern																		
Channel Beltwidth (ft)							10	37		5	40		40	72		32.2	61	45
Radius of Curvature (ft)							6	35		11	90		32	48		18.3	31.8	24.4
Meander Wavelength							40	95		14	67		51	91		76.9		113.3
Meander Width ratio							1.0	1.9					2.5	4.5		1.81	3.43	2.53
Profile																		
Riffle length (ft)										4	18					17	68	32
Riffle slope (ft/ft)							0.009	0.045		0.00083	0.1125		0.005	0.015		.001	.02	.008
Pool length (ft)										6	41.5					.0013	.0035	.0027
Pool spacing (ft)							30	86		14	95.8		36.5	80.5		31	43	
Substrate																		
d50 (mm)										0.5-1.0	45							
d84 (mm)										8.0-11.3	125							
Additional Reach Parameters																		
Valley Length (ft)															3997			828
Channel Length (ft)																		1309
Sinuosity									1.1	1.2	1.5				1.3			1.58
Water Surface Slope (ft/ft)									0.0055	.0025	.0133				0.0047			.0047
BF slope (ft/ft)																		.0045
Rosgen Classification									F4-G4			C4,C5			C4/5			C4/C5
Habitat Index																		

Table XIII. Baseline Morphology and Hydraulic Summary
Little Beaver Creek Stream Mitigation Site/Project No. 221
Reach 3A (732 feet)

Parameter	USGS Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			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)				7.1	16.0	28.0	9.5	15.5		14.0	16.7	14.4			17.1	16.9	18.8	18.1
BF Cross Sectional Area (ft^2)				11.0	21.0	43.0	19.2	21.9		12.2	15.5	13.7			21	20.1	33.6	25.5
BF Mean Depth (ft)				0.9	1.7	2.5	1.4	2.0		0.8	0.9	0.9			1.22	1.1	1.8	1.4
BF Max Depth (ft)							2.1	2.6		1.4	2.0	1.8			2.7	1.75	3.23	2.41
Width/Depth Ratio							6.8	7.8		16.0	18.0	17.6			14	10.48	17.24	13.41
Entrenchment Ratio									1.6	3.0	13.6	6.1			3.0	4.06	4.42	10.17
Wetted Perimeter (ft)																17.95	20.79	19.04
Hydraulic radius (ft)																1.06	1.62	1.32
Bank Height Ratio (ft/ft)															1.0	1.0	1.0	1.0
Pattern																		
Channel Beltwidth (ft)							9	79		5	40		43	77		19.4	43.2	32.4
Radius of Curvature (ft)							4	33		11	90		34	51		15.29	23.3	19.58
Meander Wavelength							19	135		14	67		54	97		78.8	123.3	
Meander Width ratio							1.0	6.2					2.5	4.5		1.07	2.38	1.79
Profile																		
Riffle length (ft)										4	18					17	68	32
Riffle slope (ft/ft)							0.01	0.07		0.00083	0.1125		.005	.015		.001	.02	.008
Pool length (ft)										6	41.5					.0013	.0035	.0027
Pool spacing (ft)							18	122		14	95.8		33	84		31	43	
Substrate																		
d50 (mm)									5.7	0.5-1.0	45							
d84 (mm)									16	8.0-11.3	125							
Additional Reach Parameters																		
Valley Length (ft)															2855			625
Channel Length (ft)																		732
Sinuosity									1.1	1.2	1.5				1.3			1.17
Water Surface Slope (ft/ft)									0.0067	.0025	.0133				.0057			.0067
BF slope (ft/ft)																		.0062
Rosgen Classification									G4			C4,C5			C4/5			C4/C5
Habitat Index																		

Table XIV. Morphology and Hydraulic Monitoring Summary
Little Beaver Creek Stream Mitigation Site/Project No. 221
Reach 1 (991 feet)

Parameter	Cross Section 1			Cross Section 2			Cross Section T1			Cross Section T2					
	Riffle			Pool			Pool			Pool					
Dimension	MY0	MY1*	MY2	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2			
BF Width (ft)	17.5	13.8		29.7	17.35		9.4	12.48		11.8	9.46				
Floodprone Width (ft) (approx)	104	154		128	87		32	42		57	53				
BF Cross-Sectional Area (ft^2)	24.9	25.1		34.2	17.23		6	10.66		9	5.96				
BF Mean Depth (ft)	1.4	1.8		1.2	0.99		0.6	0.85		0.8	0.63				
BF Max Depth (ft)	2.65	3.4		2.33	2.21		1.12	2.04		1.54	1.31				
Width/Depth Ratio	12.4	7.6		25.8	17.53		14.69	14.68		15.57	15.02				
Entrenchment Ratio	3.36	11.2		4.31	5.04		3.48	3.38		4.88	5.61				
Wetted Perimeter (ft)	18.19	16.9		34.24	18.16		9.73	14.51		12.51	10.0				
Hydraulic radius (ft)	0.83	1.5		1.13	0.95		0.61	0.73		0.72	0.6				
Bank Height Ratio (ft/ft)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0				
Substrate															
d50 (mm)		0.81			0.57			0.59			0.18				
d84 (mm)		1.6			7.42			7.11			0.91				

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	28.98	78.09	43.03															
Radius of Curvature (ft)	6.84	32.56	17.48															
Meander Wavelength (ft)	62.09	126.31	88.45															
Meander Width Ratio	1.56	4.20	2.31															
Profile																		
Riffle Length (ft)	3.77	109.38	18.61															
Riffle Slope (ft/ft)	0.006	1.7	0.04															
Pool length (ft)	9.86	93.65	40.88															
Pool spacing (ft)	3.77	97.59	18.05															

Additional Reach Parameters						
Valley Length (ft)	834					
Channel Length (ft)	991					
Sinuosity	1.19					
Water Surface Slope (ft/ft)	.0069					
BF Slope (ft/ft)	.0085					
Rosgen Classification	C4/C5					
Habitat Index						

*The location of Cross Section 1 was reset in the 1st year of monitoring to obtain more representative measurements.

Table XIV. Morphology and Hydraulic Monitoring Summary
Little Beaver Creek Stream Mitigation Site/Project No. 221
Reach 2 (1,309 feet)

Parameter	Cross Section 3			Cross Section 4			Cross Section 5								
	Riffle			Pool			Riffle								
Dimension	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2						
BF Width (ft)	21.1	16.43		15.4	19.42		17.1	28.18							
Floodprone Width (ft) (approx)	48	53		124	97		123	126							
BF Cross Sectional Area (ft^2)	17.9	19.1		20.4	23.93		22.8	43.98							
BF Mean Depth (ft)	0.8	1.16		1.3	1.23		1.3	1.56							
BF Max Depth (ft)	1.88	2.32		2.54	2.71		2.46	3.93							
Width/Depth Ratio	24.87	14.16		11.69	15.79		12.87	18.06							
Entrenchment Ratio	2.27	3.25		8.07	4.98		7.2	4.47							
Wetted Perimeter (ft)	30.3	17.53		21.6	20.61		16.57	30.28							
Hydraulic radius (ft)	0.83	1.09		1.23	1.16		1.27	1.45							
Bank Height Ratio (ft/ft)	1.0	1.0		1.0	1.0		1.0	1.0							
Substrate															
d50 (mm)		1.31			0.43			7.08							
d84 (mm)		1.85			1.55			14.24							

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	28.98	78.09	43.03															
Radius of Curvature (ft)	6.84	32.56	17.48															
Meander Wavelength (ft)	62.09	126.31	88.45															
Meander Width Ratio	1.56	4.20	2.31															
Profile																		
Riffle Length (ft)	3.77	109.38	18.61															
Riffle Slope (ft/ft)	0.006	1.7	0.04															
Pool length (ft)	9.86	93.65	40.88															
Pool spacing (ft)	3.77	97.59	18.05															
Additional Reach Parameters																		
Valley Length (ft)	828 feet																	
Channel Length (ft)	1,309 feet																	
Sinuosity	1.58																	
Water Surface Slope (ft/ft)	.0048																	
BF Slope (ft/ft)	.0039																	
Rosgen Classification	C4/C5																	
Habitat Index																		

Table XIV. Morphology and Hydraulic Monitoring Summary
Little Beaver Creek Stream Mitigation Site/Project No. 221
Reach 3A (732 feet)

Parameter	Cross Section 6			Cross Section 7			Cross Section 8								
	Riffle			Pool			Riffle								
Dimension	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2						
BF Width (ft)	18.6	21.65		18.8	19.87		16.9	19.46							
Floodprone Width (ft) (approx)	82	95		191	156		69	75							
BF Cross Sectional Area (ft^2)	20.1	25.54		33.6	38.05		22.9	23.62							
BF Mean Depth (ft)	1.1	1.18		1.8	1.91		1.4	1.21							
BF Max Depth (ft)	1.75	2.34		3.23	4.29		2.27	2.68							
Width/Depth Ratio	17.24	18.35		10.48	10.4		12.53	16.08							
Entrenchment Ratio	4.42	4.4		10.17	7.86		4.06	3.84							
Wetted Perimeter (ft)	17.95	22.38		19.04	22.96		20.79	20.6							
Hydraulic radius (ft)	1.06	1.14		1.62	1.66		1.29	1.15							
Bank Height Ratio (ft/ft)	1.0	1.0		1.0	1.0		1.0	1.0							
Substrate															
d50 (mm)		3.4			0.2			0.21							
d84 (mm)		17.98			0.82			bedrock							

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	28.98	78.09	43.03															
Radius of Curvature (ft)	6.84	32.56	17.48															
Meander Wavelength (ft)	62.09	126.31	88.45															
Meander Width Ratio	1.56	4.20	2.31															
Profile																		
Riffle Length (ft)	3.77	109.38	18.61															
Riffle Slope (ft/ft)	0.006	1.7	0.04															
Pool length (ft)	9.86	93.65	40.88															
Pool spacing (ft)	3.77	97.59	18.05															
Additional Reach Parameters																		
Valley Length (ft)	625																	
Channel Length (ft)	732																	
Sinuosity	1.17																	
Water Surface Slope (ft/ft)	.0069																	
BF Slope (ft/ft)	.0058																	
Rosgen Classification	C4/C5																	
Habitat Index																		

APPENDIX A

A-1 Vegetation Raw Data Table

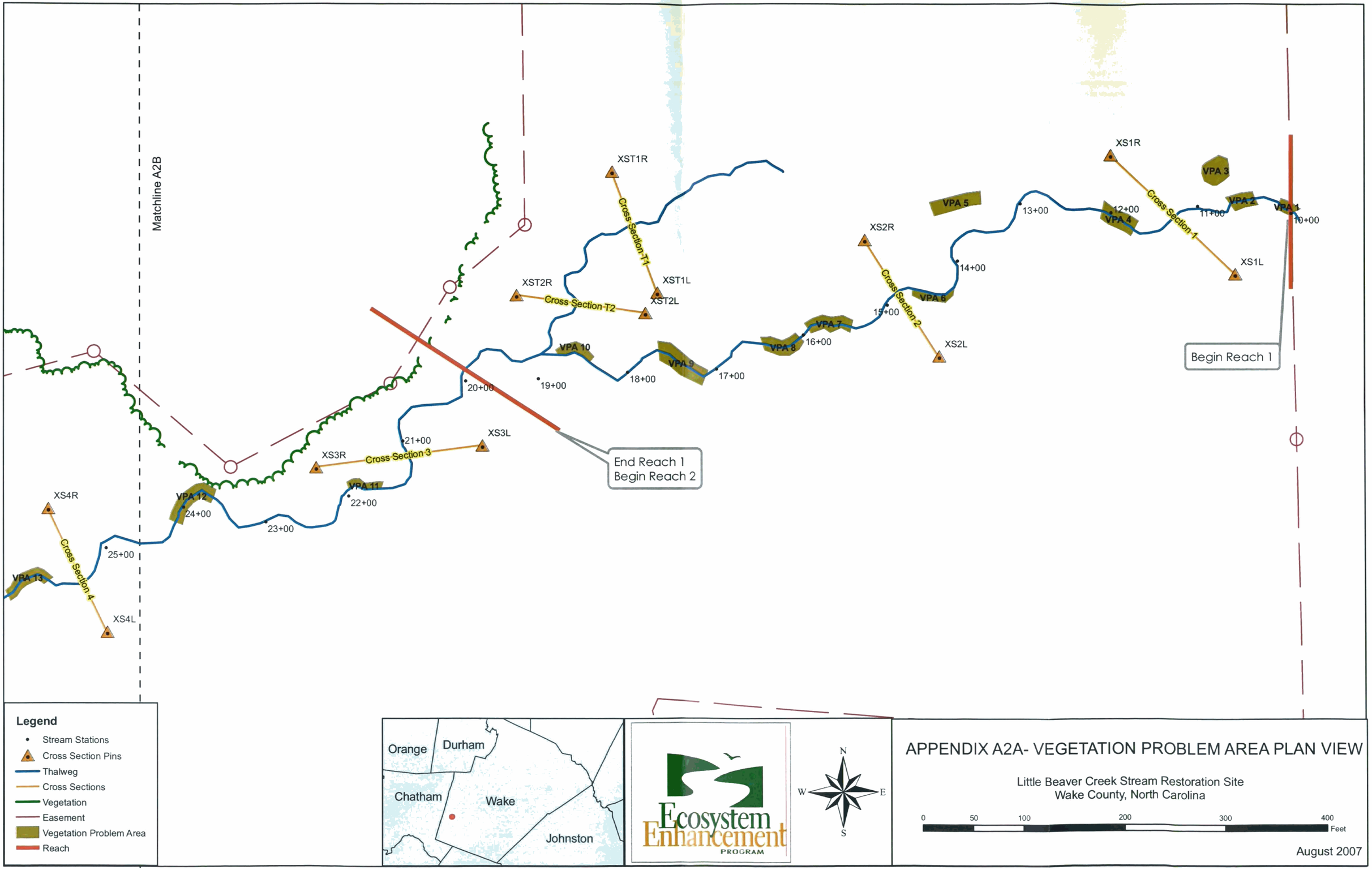
A-2 Vegetation Problem Area Plan View

A-3 Vegetation Problem Area Photos

A-4 Vegetation Monitoring Plot Photos

Little Beaver Creek Stream Restoration Site
Year 1 Monitoring Report
Appendix A-1
Vegetation Survey Data Table

Stem Counts for each species arranged by plot																	
Species		**Plots***															**Initial Totals**
Scientific Name	**Common Name**	**VP-01**	**VP-02**	**VP-03**	**VP-04**	**VP-05**	**VP-06**	**VP-07**	**VP-08**	**VP-09**	**VP-10**	**VP-11**	**VP-12**	**VP-13**	**VP-14**	**VP-15**	**total shrubs**
Shrubs																	
Euonymus americana	Strawberry bush																*0*
Lindera benzoin	Spice bush																*0*
Viburnum nudum	Possum-haw																*0*
Ilex verticillata	Winterberry																*0*
Cephalanthus occidentalis	Buttonbush																*0*
Cornus amomum	Silky dogwood																*0*
Alnus serrulata	Tag alder																*0*
Aronia arbutifolia	Red chokeberry																*0*
Myrica cerifera	Wax myrtle																*0*
	Total Shrubs	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Trees																	
Scientific Name	**Common Name**	**VP-01**	**VP-02**	**VP-03**	**VP-04**	**VP-05**	**VP-06**	**VP-07**	**VP-08**	**VP-09**	**VP-10**	**VP-11**	**VP-12**	**VP-13**	**VP-14**	**VP-15**	**total trees**
Fraxinus pennsylvanica	Green ash																*0*
Hamamelis virginiana	Witch hazel																*0*
Juglans nigra	Black walnut																*0*
Nyssa sylvatica	Black gum																*0*
Quercus nigra	Water oak																*0*
Quercus phellos	Willow oak															unk	*0*
Quercus rubra	Northern red oak																*0*
Carpinus caroliniana	Ironwood																*0*
Asimina triloba	Paw Paw																*0*
Carya glabra	Pignut hickory																*0*
Cornus florida	Flowering dogwood																*0*
Quercus lyrata	Overcup oak																*0*
Quercus michauxii	Swamp chestnut oak																*0*
Diospyros virginiana	Persimmon																*0*
Amelanchier arborea	Downy serviceberry																*0*
	Total Trees	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
TABLE SUMMARY	*Total Stems of planted woody vegetation*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*0*
	% Shrubs	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	***#DIV/0!***
	% Trees	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	***#DIV/0!***
	Current Density																
	Shrubs per acre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Shrubs per hectare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Trees per acre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Trees per hectare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total stems per acre	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	Total stems per hectare	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***


Matchline A2B
XST1R
Cross Section T1
XST1L
XST2R
Cross Section T2
XST2L
VPA 10
VPA 9
VPA 8
VPA 7
VPA 6
VPA 5
VPA 4
VPA 3
VPA 2
VPA 1
XS2R
Cross Section 2
XS2L
XS1R
Cross Section 1
XS1L
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
XS3L
XS3R
Cross Section 3
VPA 11
22+00
23+00
VPA 12
24+00
25+00
XS4R
Cross Section 4
XS4L
VPA 13
Begin Reach 1
End Reach 1
Begin Reach 2
Legend
Stream Stations
Cross Section Pins
Thalweg
Cross Sections
Vegetation
Easement
Vegetation Problem Area
Reach
Orange
Durham
Chatham
Wake
Johnston
Ecosystem Enhancement PROGRAM
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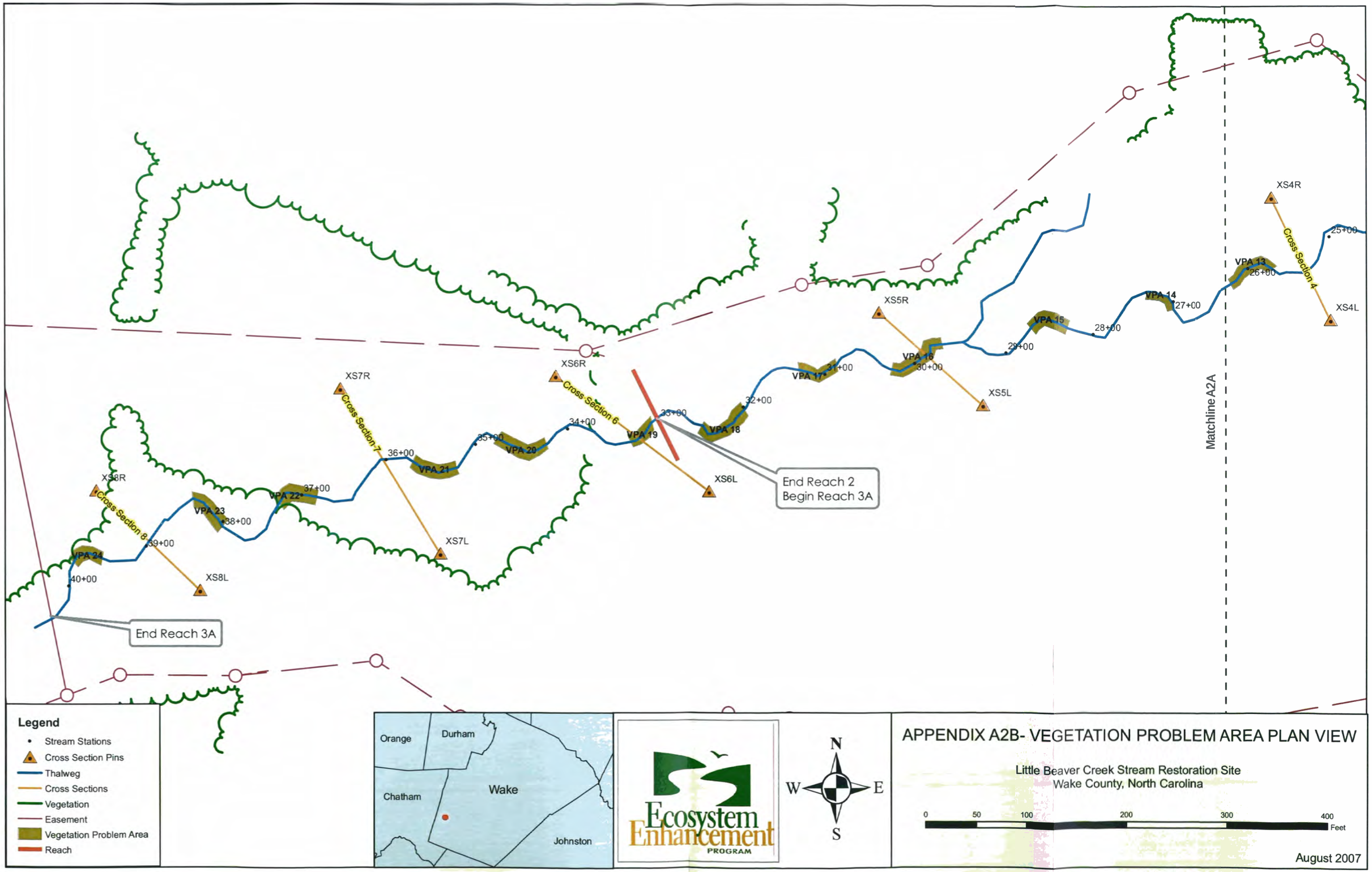
APPENDIX A2A- VEGETATION PROBLEM AREA PLAN VIEW
Little Beaver Creek Stream Restoration Site
Wake County, North Carolina
0
50
100
200
300
400
Feet
August 2007


XS4R
Cross Section 4
25+00
VPA 13
26+00
XS4L
XS5R
VPA 14
27+00
VPA 15
28+00
29+00
VPA 16
30+00
XS5L
XS6R
Cross Section 6
VPA 17
31+00
32+00
33+00
VPA 18
VPA 19
34+00
35+00
VPA 20
XS7R
Cross Section 7
36+00
VPA 21
XS6L
End Reach 2
Begin Reach 3A
XS8R
Cross Section 8
37+00
VPA 22
VPA 23
38+00
39+00
XS7L
VPA 24
40+00
XS8L
End Reach 3A
Matchline A2A
Legend
Stream Stations
Cross Section Pins
Thalweg
Cross Sections
Vegetation
Easement
Vegetation Problem Area
Reach
Orange
Durham
Chatham
Wake
Johnston
Ecosystem Enhancement PROGRAM
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APPENDIX A2B- VEGETATION PROBLEM AREA PLAN VIEW
Little Beaver Creek Stream Restoration Site
Wake County, North Carolina
0
50
100
200
300
400
Feet
August 2007

Little Beaver Creek Stream Restoration Site
Year 1 Monitoring Report
Appendix **A-3**
Vegetation Problem Area Photos

This photolog displays a representation of the types of vegetative problem areas that are present along the restored reaches of Little Beaver Creek. Not all vegetative problem areas are depicted.

VPA 1. Unvegetated coir matting on both banks.

VPA 2. Eroded banks from lack of vegetation.

VPA 3. Exceedingly thick area of mulch preventing vegetation growth.

VPA 5. Dirt road through overly mulched area.

VPA 6. Live stakes not establishing allowing for eroded bank on left bank.

VPA 12. Vegetation not establishing through coir matting.

VPA 20. Vegetation not establishing through coir matting on both banks.

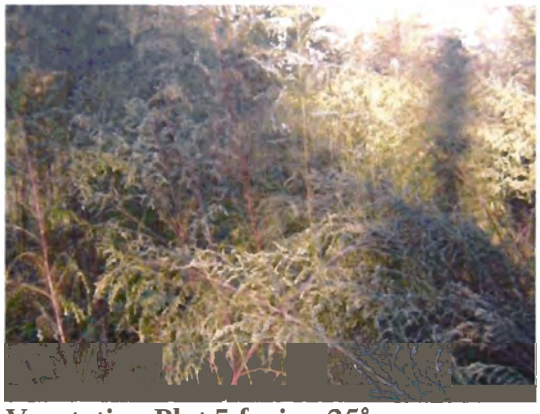
VPA 23. Vegetation not establishing through coir matting.

Vegetation Plot 1 facing 144°.

Vegetation Plot 2 facing 146°.

Vegetation Plot 3 facing 10°.

Vegetation Plot 4 facing 31°.



Vegetation Plot 5 facing 25°.

Vegetation Plot 6 facing 140".

Vegetation Plot 7 facing 64°.

Vegetation Plot 8 facing 168°.

Vegetation Plot 9 facing 42".

Vegetation Plot 10 facing 140°.

Vegetation Plot 11 facing 40".

Vegetation Plot 12 facing 40°.

Vegetation Plot 13 facing 132°.

Vegetation Plot 14 facing 100°.

Vegetation Plot 15 facing 15°.

APPENDIX B

Matchline B1B

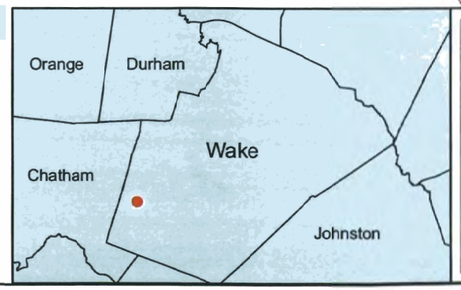
XST1R
XST2R
XST1L
XST2L
XS1R
XS2R
XS1L
XS2L
XS3L
XS3R
XS4R
XS4L
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00

End Reach 1
Begin Reach 2

Begin Reach 1

Legend

- Stream Stations
- Cross Section Pins
- Reach Boundary
- Stream Problem Areas
- Rootwads
- Thalweg
- Cross Sections
- Road
- Vegetation
- Structure
- Easemen



Ecosystem Enhancement PROGRAM

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APPENDIX B1A- STREAM PROBLEM AREA PLAN VIEW

Little Beaver Creek Stream Restoration Site
Wake County, North Carolina

0 50 100 200 300 400 Feet

August 2007

XS4R
XS4L
XS5R
XS5L
XS6R
XS6L
XS7R
XS7L
XS8R
XS8L
25+00
26+00
27+00
28+00
29+00
30+00
31+00
32+00
33+00
34+00
35+00
36+00
37+00
38+00
39+00
40+00
End Reach 2
Begin Reach 3A
End Reach 3A
Matchline B1A

Legend

- Stream Stations
- Cross Section Pins
- Reach Boundary
- Stream Problem Areas
- Rootwads
- Thalweg
- Cross Sections
- Road
- Vegetation
- Structures
- Easement

Ecosystem Enhancement Program

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S

APPENDIX B1B- STREAM PROBLEM AREA PLAN VIEW

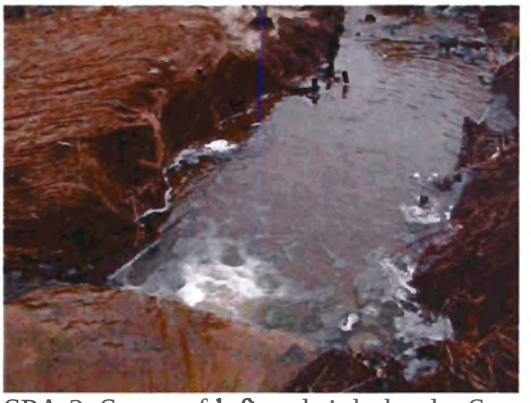
Little Beaver Creek Stream Restoration Site
Wake County, North Carolina

0 50 100 200 300 400 Feet

August 2007

Little Beaver Creek Stream Restoration Site
Mitigation Report
Appendix B-2
Representative Stream Problem Area Photos

The photographs contained in this section are intended only to illustrate the variety of major issues present at Little Beaver Creek and are not extensive in scope.



SPA 2. Scour of left and right bank. Sta. 11+87.

SPA 6. Deposition in mid point of curve. Sta. 15+27.

SPA 11. Coir matting dislodged. Sta. 21+91.

SPA 15. Point bar chute cutoff (C33). Sta. 26+00.

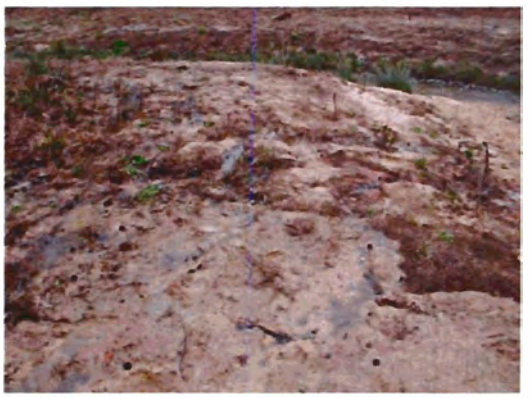
SPA 17. Aggradation in pool. Sta. 26+78.

SPA 21. Bankfull bench collapse. Sta. 35+37.

Little Beaver Creek Stream Restoration Site
Mitigation Report
Appendix B-2
Representative Stream Problem Area Photos

SPA. 22. Right bank scour around structure. Sta. 36+14.

SPA 23. Riprap transverse bar formation. Sta. 36+45.



SPA 26. Overland flow over point bar. Sta. 39+39.

Little Beaver Creek Stream Restoration Site
Mitigation Report
Appendix B-3
Stream Photo-Station Photos

Photo Point 1. Downstream From Start of Project.

Photo Point 2. Upstream From Cross Section #1.

Photo Point 2. Downstream From Cross Section #1.

Photo Point 3. Facing Upstream.

Photo Point 3. Facing Downstream.

Photo Point 4. Upstream from Cross Section #2.

Photo Point 4. Downstream from Cross Section #2.

Photo Point *5*. Facing Upstream.

Photo Point 5. Facing Downstream.

Photo Point 6. Facing Upstream at tributary confluence.

Photo Point 6. Facing Downstream at Tributary Confluence.

Photo Point 6. Facing Upstream on Tributary.

Photo Point 7. Facing Upstream at Cross Section Tributary #1.

Photo Point 7. Facing Downstream at Cross Section Tributary #1.

Photo Point 8. Facing Downstream on Tributary.

Photo Point 9. Facing Upstream from Cross Section 2 Tributary 1.

Photo Point 9. Facing Downstream on Cross Section 2 Tributary 1.

Photo Point 10. Facing Upstream from Cross Section #3.

Photo Point 10. Facing downstream from Cross Section #3.

Photo Point 11. Facing Upstream.

Photo Point 11. Facing Downstream.

Photo Point 12. Facing upstream from Cross Section #4.

Photo Point 12. Facing downstream from Cross Section #4.

Photo Point 13. Facing upstream from sill.

Photo Point 13. Facing downstream from sill.

Photo Point 14. Facing upstream at confluence.

Photo Point 14. Facing downstream at confluence.

Photo Point 14. Facing upstream on tributary at confluence.

Photo Point 15. Facing upstream on tributary.

Photo Point 15. Pacing downstream on tributary.

Photo Point 16. F'acmg upstream on Cross Section #5.

Photo Point 16. Facing downstream on Cross Section #5.

Photo Point 17. Facing upstream.

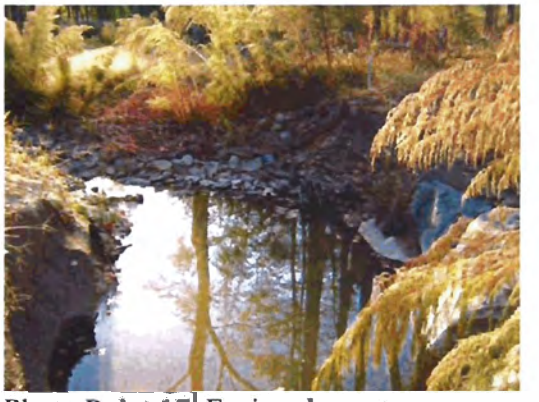


Photo Point 17. Facing downstream.

Photo Point 18. Facing upstream at Cross Section #6.

Photo Point 18. Facing downstream at Cross Section #6.

Photo Point 19. Facing upstream.

Photo Point 19. Facing downstream.

Photo Point 20. Facing upstream at Cross Section #7.

Photo Point 20. Facing downstream at Cross Section #7.

Photo Point 21. Facing upstream at confluence.

Photo Point 21. Facing downstream at confluence.

Photo Point 21. Facing upstream on tributary at confluence.

Photo Point 22. Facing upstream at Cross Section #8.

Photo Point 22. Facing downstream at Cross Section #8.

Photo Point 23 Facing upstream at confluence.

Photo Point 23. Facing upstream on tributary at confluence.

Photo Point 23. Facing downstream at confluence.

Photo Point 24. Facing upstream from culvert at end of project.

Little Beaver Creek Stream Restoration Site
Year 1 Monitoring Report
Appendix B-4
Visual Morphological Stability Assessment

Table B-4. Visual Morphological Stability Assessment
Little Beaver Creek Stream Restoration/Project 221

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	% Performing Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	55	84	NA	65	
	2. Armor stable (e.g. no displacement)?	55	84	NA	65	
	3. Facet grade appears stable?	55	84	NA	65	
	4. Minimal evidence of embedding/fining?	55	84	NA	65	
	5. Length appropriate?	55	84	NA	65	65%
B. Pools	1. Present? (e.g not subject to severe aggradation or migration.?)	53	82	NA	65	
	2. Sufficiently deep (Max Pool D:Mean Bkf >1.6?)	53	82	NA	65	
	3. Length appropriate?	53	82	NA	65	65%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	80	84	NA	95	
	2. Downstream of meander (glide/inflection) centering?	67	84	NA	80	88%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	53	82	NA	65	
	2. Of those eroding, # w/concomitant point bar formation?	17	29	NA	59	
	3. Apparent Rc within spec?	82	82	NA	100	
	4. Sufficient floodplain access and relief?	53	82	NA	65	72%
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	2/85	98	
	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	NA	NA	21/785	75	98%
G. Vanes *	1. Free of back or arm scour?	38	49	NA	78	
	2. Height appropriate?	40	49	NA	82	
	3. Angle and geometry appear appropriate?	39	49	NA	80	
	4. Free of piping or other structural failures?	42	49	NA	86	82%
H. Wads/ Boulders	1. Free of scour?	32	42	NA	76	
	2. Footing stable?	38	42	NA	90	83%

Cross Section Summary
Little Beaver Creek Cross Section 1
River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-1

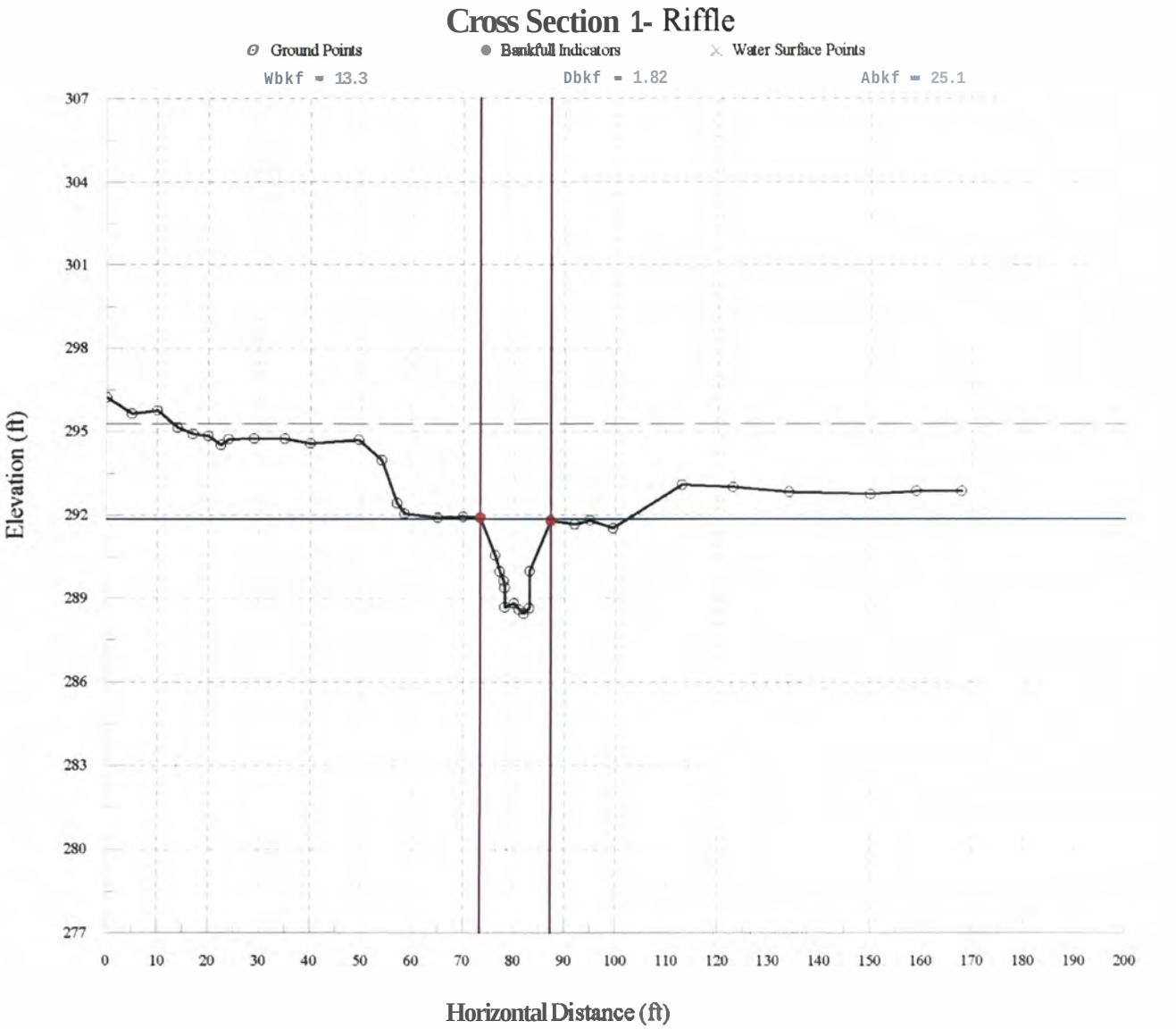
TAPE	FS	ELEV	NOTE
0	4.12	296.22	
5	4.71	295.63	
10	4.59	295.75	
14	5.21	295.13	
17	5.43	294.91	
20	5.51	294.83	
22.5	5.83	294.51	
24	5.63	294.71	
29	5.6	294.74	
35	5.61	294.73	
40	5.78	294.56	
49.5	5.65	294.69	
54	6.38	293.96	
57	7.92	292.42	
58.5	8.3	292.04	
65	8.44	291.9	
70	8.41	291.93	
73.3	8.44	291.9	BKF
76.3	9.79	290.55	
77.2	10.38	289.96	
78	10.72	289.62	
78.2	10.96	289.38	lew
78.2	11.67	288.67	
80	11.53	288.81	
81	11.75	288.59	
81.9	11.9	288.44	TW
83	11.7	288.64	
83.1	10.37	289.97	
87.2	8.55	291.79	BKF
92	8.68	291.66	
95	8.54	291.8	
99.5	8.82	291.52	
113	7.26	293.08	
123	7.34	293	
134	7.52	292.82	
150	7.6	292.74	
159	7.49	292.85	
167.9	7.49	292.85	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	295.26	295.26	295.26
Bankfull Elevation (ft)	291.85	291.85	291.85
Floodprone Width (ft)	154.74	-----	-----
Bankfull Width (ft)	13.79	6.9	6.89
Entrenchment Ratio	11.22	-----	-----

Mean Depth (ft)	1.82	1.74	1.9
Maximum Depth (ft)	3.41	3.18	3.41
Width/Depth Ratio	7.58	3.97	3.63
Bankfull Area (sq ft)	25.05	11.98	13.07
Wetted Perimeter (ft)	16.88	11.37	11.72
Hydraulic Radius (ft)	1.48	1.05	1.11
Begin BKF Station	73.41	73.41	80.31
End BKF Station	87.2	80.31	87.2

Cross Section 1 Year 1 (black)*



*The location of Cross Section 1 was reset in Year 1 monitoring to give a more accurate representation of the stream, therefore no comparison with Year 0 is provided.

Cross Section Summary

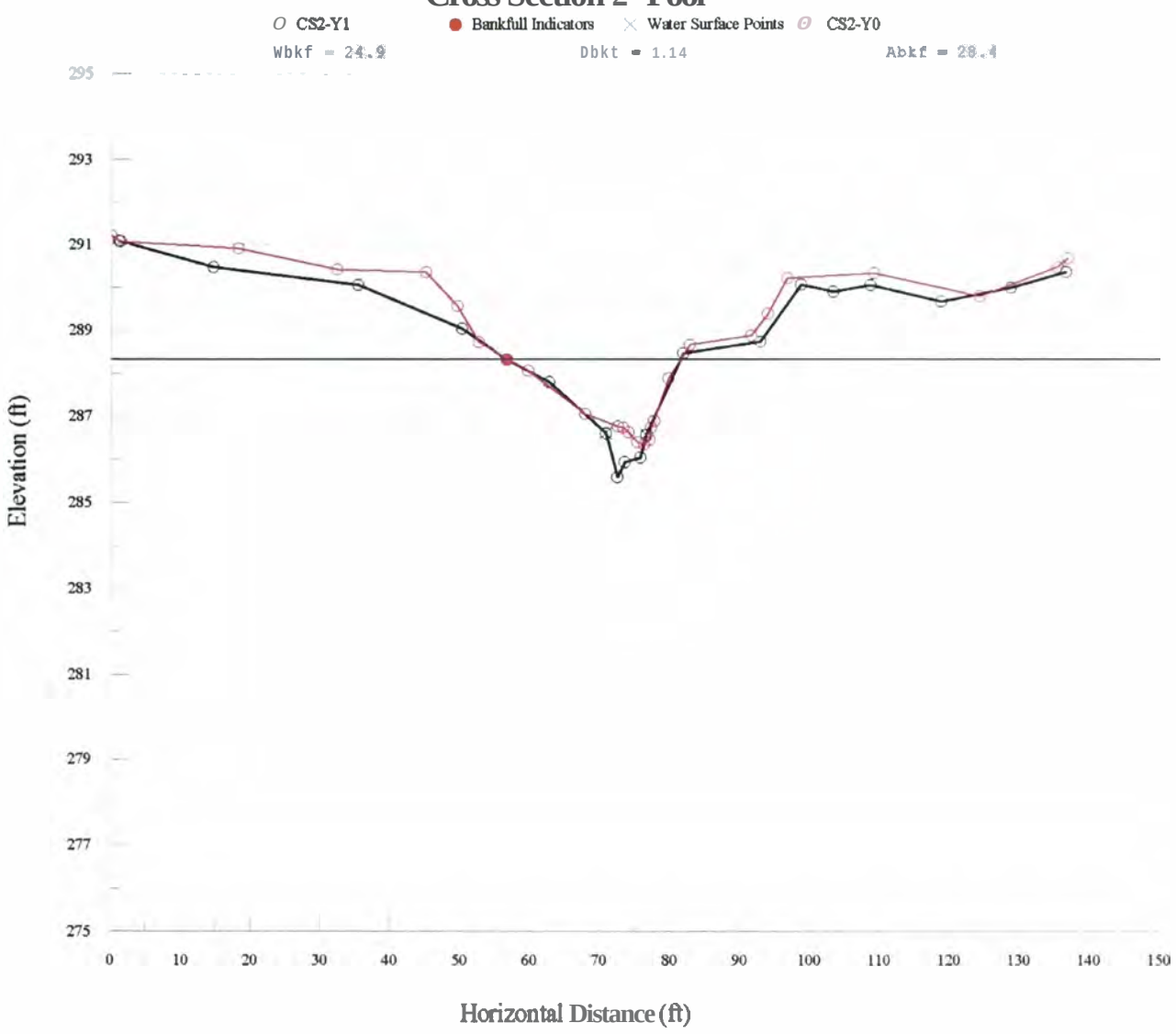
Little Beaver Creek Cross Section 2
River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-2
Survey Date: 03/06/06

TAPE	FS	ELEV	NOTE
1.088	0	291.083	
14.6	0	290.474	
35.299	0	290.055	
50.125	0	289.036	
56.522	0	288.323	
62.625	0	287.794	BKF
70.82	0	286.597	LEW
72.483	0	285.579	
73.532	0	285.931	
75.785	0	286.036	
76.618	0	286.564	REW
81.881	0	288.468	
92.898	0	288.735	
98.697	0	290.068	
103.321	0	289.902	
108.642	0	290.052	
118.767	0	289.669	
128.755	0	289.992	
136.617	0	290.359	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	290	290	290
Bankfull Elevation (ft)	287.79	287.79	287.79
Floodprone Width (ft)	87.55	-----	-----
Bankfull Width (ft)	17.35	6.05	11.31
Entrenchment Ratio	5.04	-----	-----
Mean Depth (ft)	0.99	0.44	1.29
Maximum Depth (ft)	2.21	0.88	2.21
Width/Depth Ratio	17.53	13.75	8.77
Bankfull Area (sq ft)	17.23	2.67	14.55
Wetted Perimeter (ft)	18.16	7	12.93
Hydraulic Radius (ft)	0.95	0.38	1.13
Begin BKF Station	62.65	62.65	68.7
End BKF Station	80.01	68.7	80.01

Cross Section 2 Year 0 (magenta)
Cross Section 2 Year 1 (black)



Cross Section Summary
Little Beaver Creek Cross Section 3
River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-3
Survey Date: 03/06/06

Cross Section Data Entry

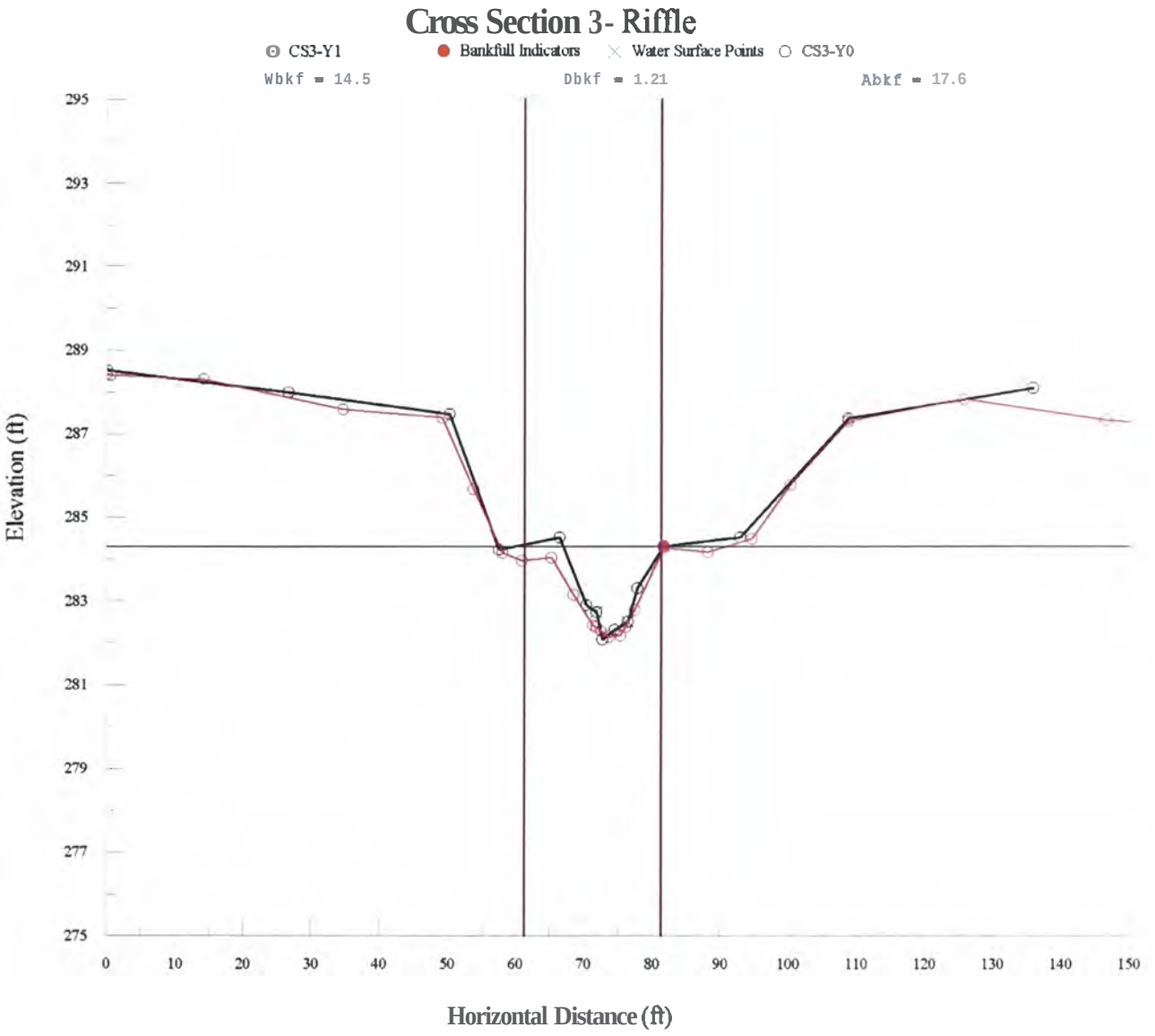
BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0.043	0	288.513	
26.603	0	287.985	
50.259	0	287.464	
57.458	0	284.223	
66.395	0	284.509	
70.363	0	282.898	
71.88	0	282.729	LEW
72.745	0	282.083	
74.544	0	282.316	
76.507	0	282.51	REW
77.864	0	283.302	
81.703	0	284.297	BKF
92.955	0	284.51	BKF
108.805	0	287.357	
135.877	0	288.084	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	286.72	286.72	286.72
Bankfull Elevation (ft)	284.4	284.4	284.4
Floodprone Width (ft)	53.32	-----	-----
Bankfull Width (ft)	16.43	8.21	11.89
Entrenchment Ratio	3.25	-----	-----
Mean Depth (ft)	1.16	0.37	1.46
Maximum Depth (ft)	2.32	1.16	2.32
Width/Depth Ratio	14.16	22.19	8.14
Bankfull Area (sq ft)	19.1	1.69	17.41
Wetted Perimeter (ft)	17.53	5.97	13.87
Hydraulic Radius (ft)	1.09	0.28	1.26
Begin BKF Station	61.3	61.3	69.51
End BKF Station	81.4	69.51	81.4

Cross Section 3 Year 0 (magenta)
Cross Section 3 Year 1 (black)



Cross Section Summary
Little Beaver Creek Cross Section 4
River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-4
Survey Date: 08/23/06

Cross Section Data Entry

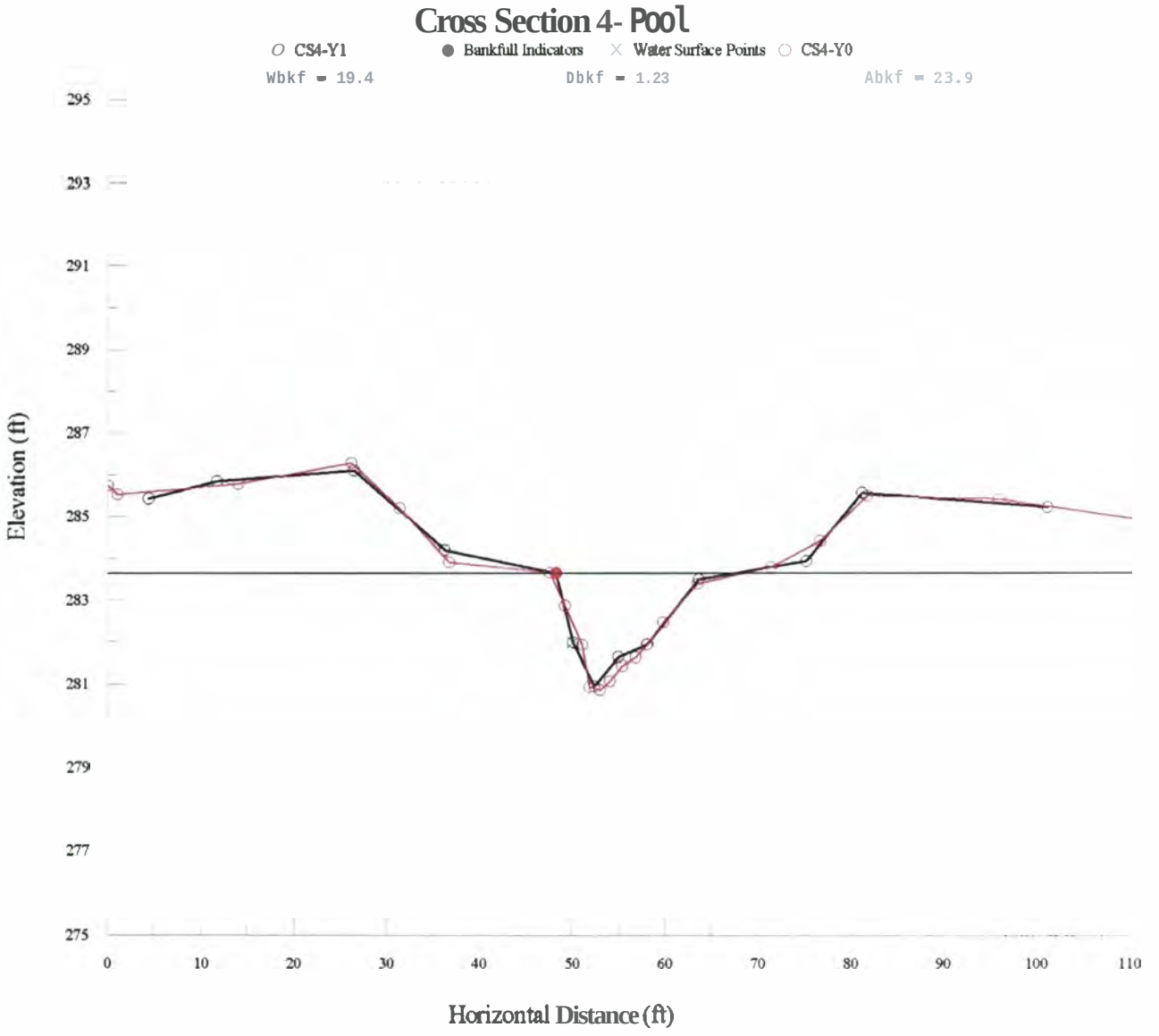
BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
4.378	0	285.429	
11.69	0	285.847	
26.393	0	286.103	
36.189	0	284.196	
48.166	0	283.648	BKF
50.03	0	281.984	LEW
52.311	0	280.942	
54.913	0	281.641	
57.971	0	281.926	
63.563	0	283.499	
75.146	0	283.938	
81.117	0	285.568	
101.114	0	285.22	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	286.36	286.36	286.36
Bankfull Elevation (ft)	283.65	283.65	283.65
Floodprone Width (ft)	96.74	-----	-----
Bankfull Width (ft)	19.42	9.71	9.72
Entrenchment Ratio	4.98	-----	-----
Mean Depth (ft)	1.23	1.87	0.6
Maximum Depth (ft)	2.71	2.71	1.74
Width/Depth Ratio	15.79	5.19	16.2
Bankfull Area (sq ft)	23.93	18.14	5.79
Wetted Perimeter (ft)	20.61	12.41	11.67
Hydraulic Radius (ft)	1.16	1.46	0.5
Begin BKF Station	48.12	48.12	57.83
End BKF Station	67.55	57.83	67.55

Cross Section 4 Year 0 (magenta)
Cross Section 4 Year 1 (black)



Cross Section Summary
Little Beaver Creek Cross Section 5
River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-5
Survey Date: 08/23/06

Cross Section Data Entry

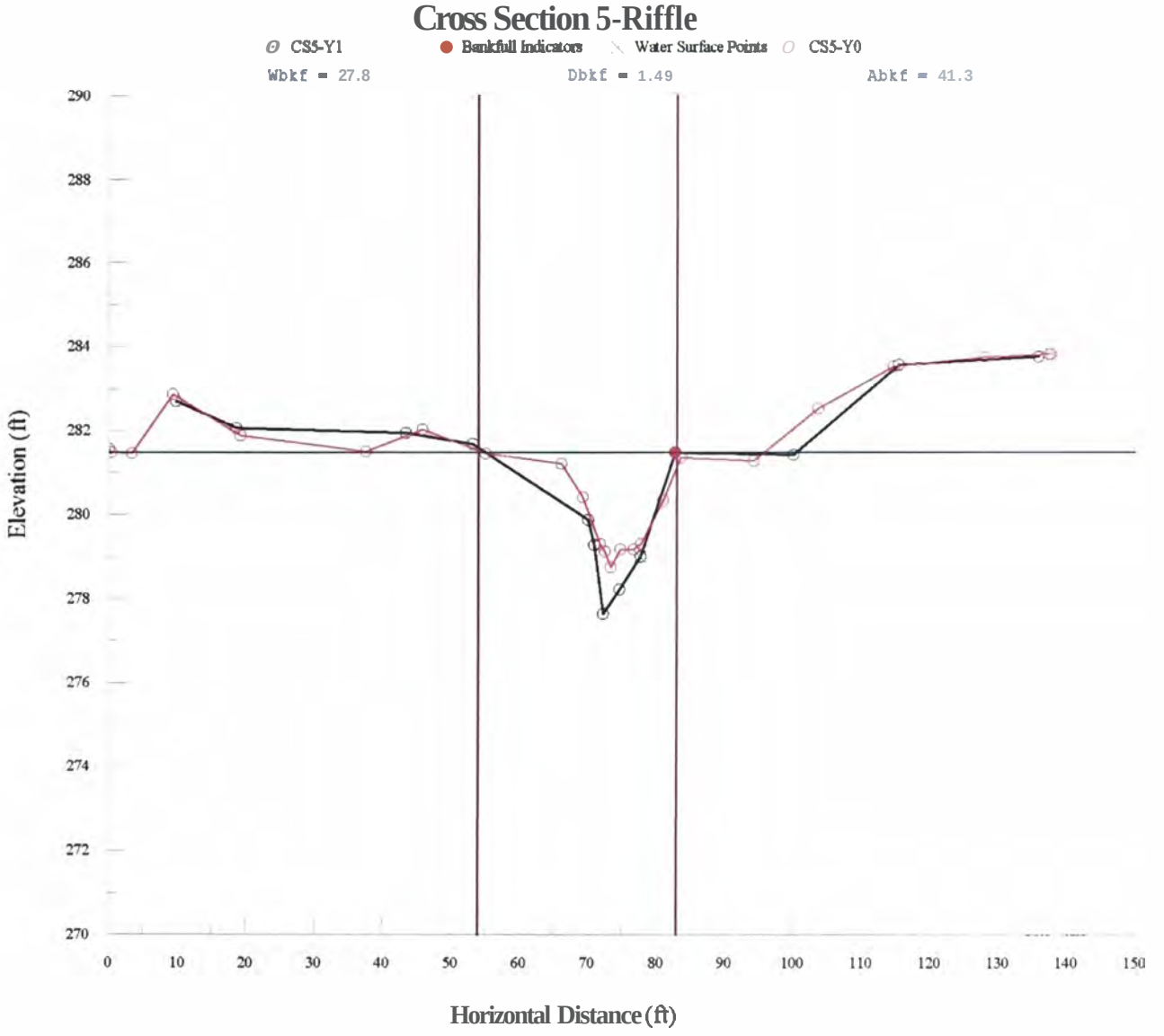
BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
9.759	0	282.698	
18.551	0	282.059	
43.367	0	281.937	
53.092	0	281.674	BKF
70.014	0	279.871	
70.928	0	279.271	
72.217	0	277.638	
74.647	0	278.22	
77.751	0	279.004	REW
82.766	0	281.471	BKF
100.074	0	281.419	
115.409	0	283.557	
135.854	0	283.753	

Cross Sectional Geometry

	Channel	Left	Right	
Floodprone Elevation (ft)	285.5	285.5	285.5	
Bankfull Elevation (ft)	281.57	281.57	281.57	
Floodprone Width (ft)	126.1	-----	-----	
Bankfull Width (ft)	28.18	14.09	14.09	
Entrenchment Ratio	4.47	-----	-----	
Mean Depth (ft)	1.56	0.75	2.37	
Maximum Depth (ft)	3.93	1.5	3.93	
Width/Depth Ratio	18.06	18.79	5.95	
Bankfull Area (sq ft)	43.98	10.58	33.4	
Wetted Perimeter (ft)	30.28	15.67	17.61	
Hydraulic Radius (ft)	1.45	0.67	1.9	
Begin BKF Station	54.07	54.07	68.16	
End BKF Station	82.25	68.16	82.25	

Cross Section 5 Year 0 (magenta)
Cross Section 5 Year 1 (black)



Cross Section Summary
Little Beaver Creek Cross Section 6
River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-6
Survey Date: 08/23/06

Cross Section Data Entry

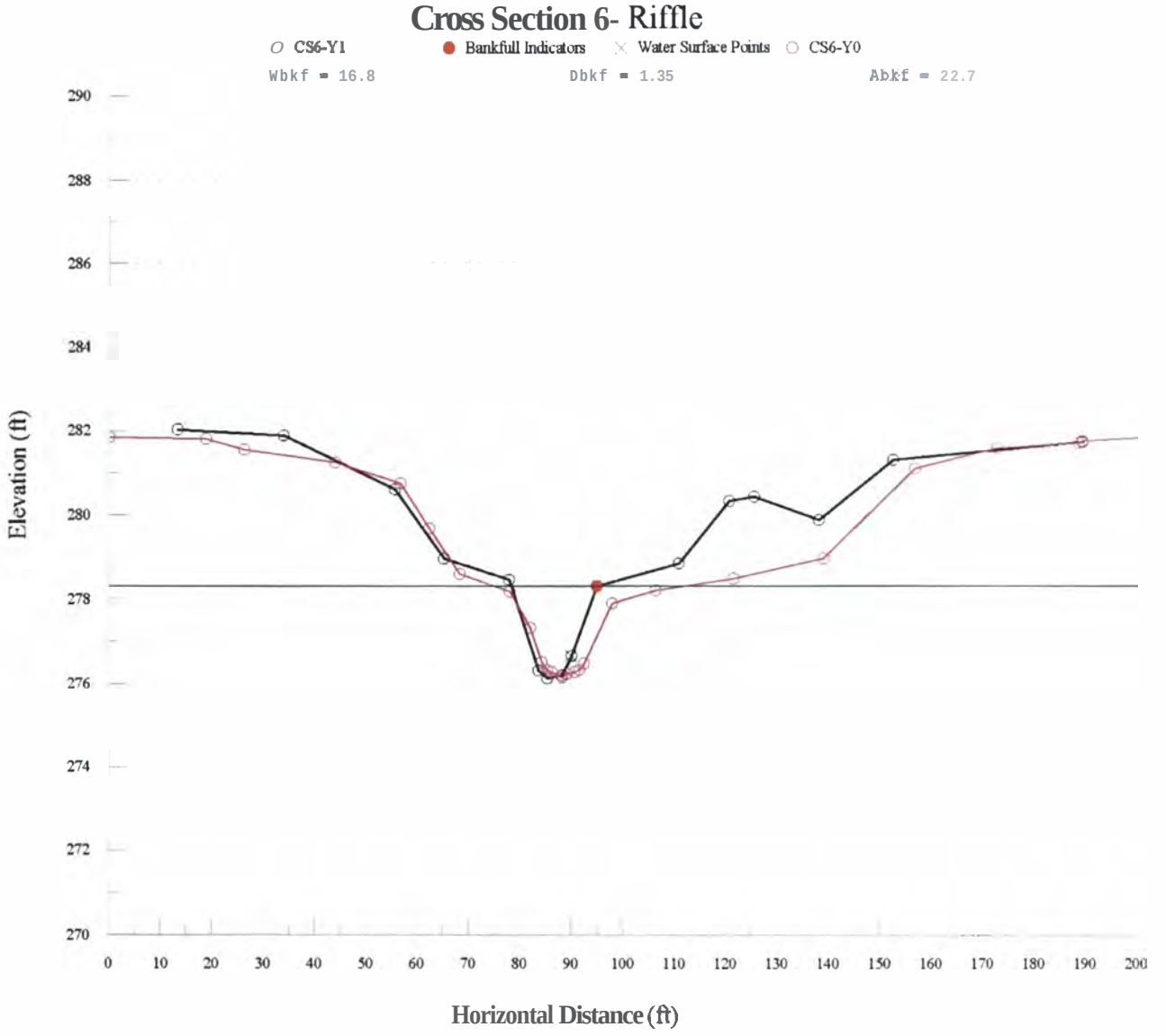
BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
13.282	0	282.021	
33.812	0	281.877	
55.538	0	280.599	
65.114	0	278.96	
77.748	0	278.462	BKF
83.532	0	276.312	
85.261	0	276.122	
88.145	0	276.199	
89.949	0	276.653	REW
94.858	0	278.308	
110.838	0	278.842	
120.705	0	280.324	
125.496	0	280.422	
138.128	0	279.874	
152.535	0	281.293	
189.328	0	281.717	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	280.8	280.8	280.8
Bankfull Elevation (ft)	278.46	278.46	278.46
Floodprone Width (ft)	95.35	-----	-----
Bankfull Width (ft)	21.65	10.62	11.04
Entrenchment Ratio	4.4	-----	-----
Mean Depth (ft)	1.18	1.62	0.75
Maximum Depth (ft)	2.34	2.34	2.2
Width/Depth Ratio	18.35	6.56	14.72
Bankfull Area (sq ft)	25.54	17.22	8.32
Wetted Perimeter (ft)	22.38	13.23	13.56
Hydraulic Radius (ft)	1.14	1.3	0.61
Begin BKF Station	77.75	77.75	88.37
End BKF Station	99.41	88.37	99.41

Cross Section 6 Year 0 (magenta)
Cross Section 6 Year 1 (black)



Cross Section Summary
Little Beaver Creek Cross Section 7
River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-7
Survey Date: 08/23/06

Cross Section Data Entry

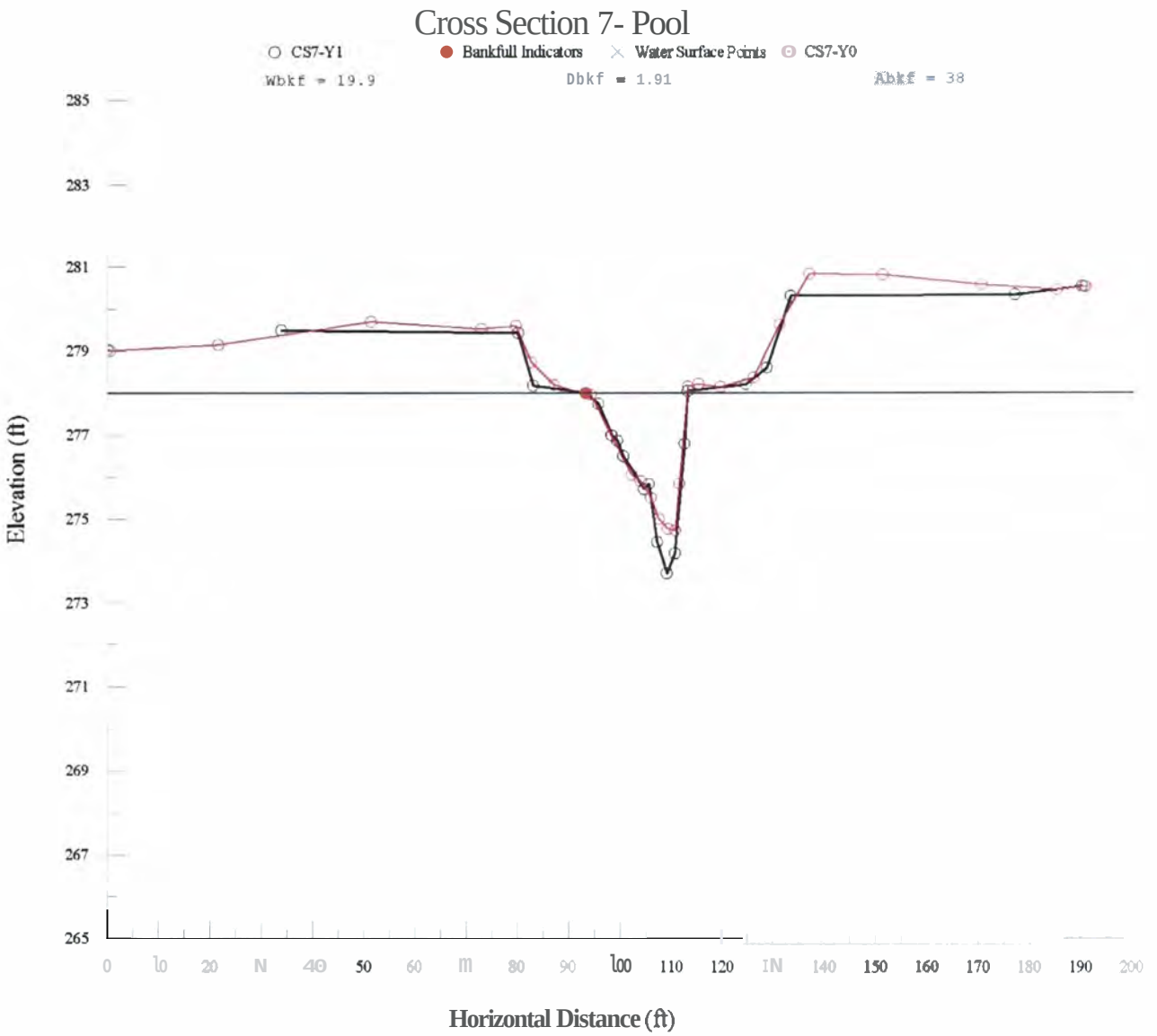
BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
33.871	0	279.486	
80.043	0	279.431	
82.978	0	278.174	
93.22	0	278.001	BKF
95.724	0	277.739	
98.349	0	276.99	
99.368	0	276.863	
100.513	0	276.5	
104.615	0	275.711	
105.514	0	275.836	
107.136	0	274.455	
109.075	0	273.707	
110.653	0	274.181	
112.523	0	276.792	
113.122	0	278.052	
124.51	0	278.205	
128.632	0	278.601	
133.265	0	280.31	
176.974	0	280.341	
190.038	0	280.536	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	282.29	282.29	282.29
Bankfull Elevation (ft)	278	278	278
Floodprone Width (ft)	156.17	-----	-----
Bankfull Width (ft)	19.87	9.93	9.94
Entrenchment Ratio	7.86	-----	-----
Mean Depth (ft)	1.91	0.93	2.9
Maximum Depth (ft)	4.29	2.01	4.29
Width/Depth Ratio	10.4	10.68	3.43
Bankfull Area (sq ft)	38.05	9.24	28.8
Wetted Perimeter (ft)	22.96	12.17	14.8
Hydraulic Radius (ft)	1.66	0.76	1.95
Begin BKF Station	93.23	93.23	103.16
End BKF Station	113.1	103.16	113.1

Cross Section 7 Year 0 (magenta)
Cross Section 7 Year 1 (black)



Cross Section Summary
Little Beaver Creek Cross Section 8
River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-8
Survey Date: 08/23/06

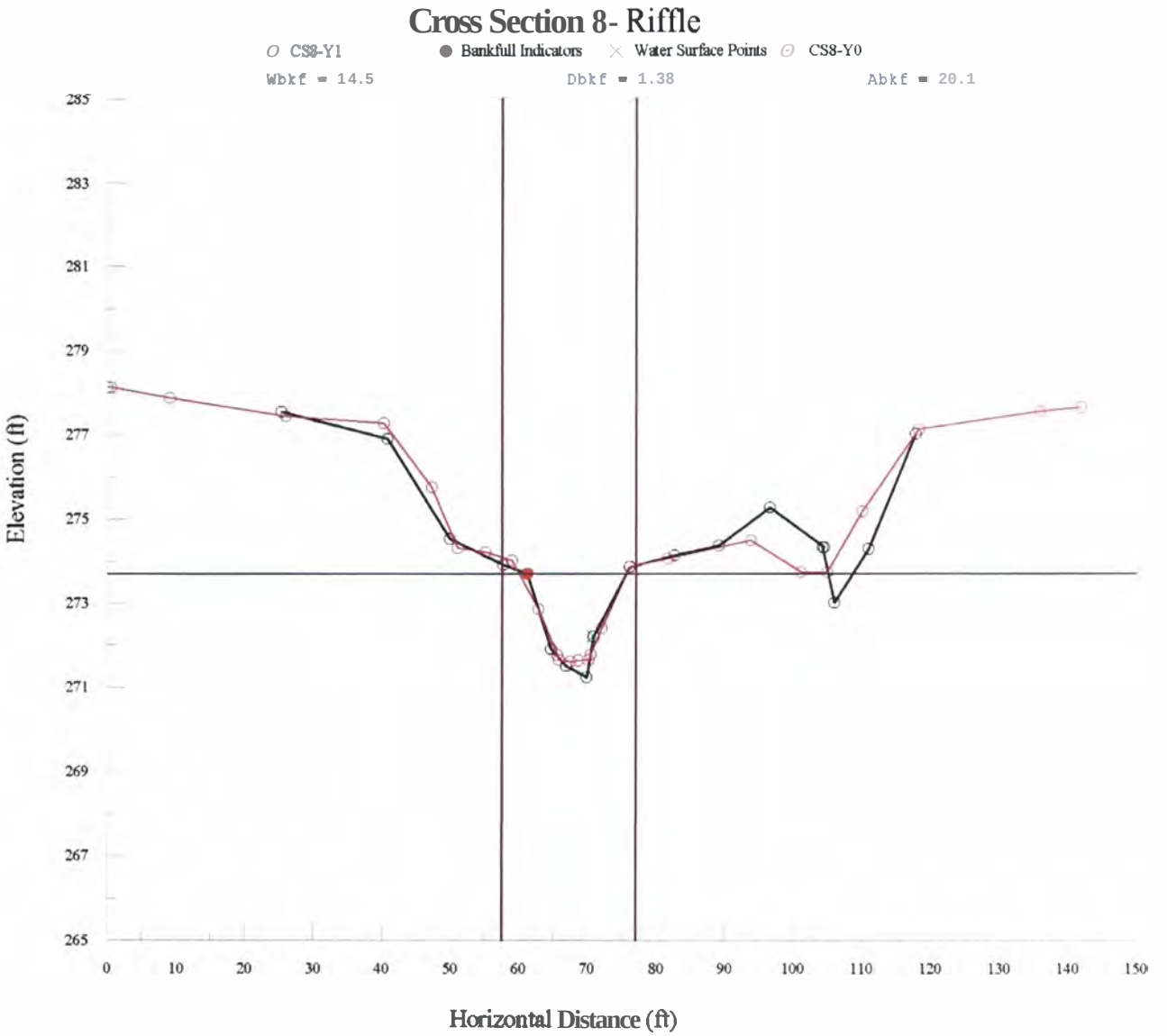
Cross Section Data Entry

TAPE	FS	ELEV	NOTE
25.324	0	277.547	
40.752	0	276.899	
49.89	0	274.526	
57.682	0	273.906	BKF
61.183	0	273.698	
64.709	0	271.909	
66.921	0	271.5	
69.9	0	271.234	
70.922	0	272.209	LEW
76.163	0	273.852	
82.659	0	274.132	
89.153	0	274.365	
96.616	0	275.268	
104.537	0	274.329	
104.3	0	274.327	
106.021	0	273.007	
111.011	0	274.291	
117.843	0	277.02	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	276.59	276.59	276.59
Bankfull Elevation (ft)	273.91	273.91	273.91
Floodprone Width (ft)	74.8	-----	-----
Bankfull Width (ft)	19.46	9.73	9.73
Entrenchment Ratio	3.84	-----	-----
Mean Depth (ft)	1.21	1.05	1.38
Maximum Depth (ft)	2.68	2.45	2.68
Width/Depth Ratio	16.08	9.27	7.05
Bankfull Area (sq ft)	23.62	10.22	13.39
Wetted Perimeter (ft)	20.6	12.65	12.85
Hydraulic Radius (ft)	1.15	0.81	1.04
Begin BKF Station	57.63	57.63	67.36
End BKF Station	77.09	67.36	77.09

Cross Section 8 Year 0 (magenta)
Cross Section 8 Year 1 (black)



Cross Section Summary
UT1 Little Beaver Creek Cross Section 1

River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-T1
Survey Date: 02/16/07

Cross Section Data Entry

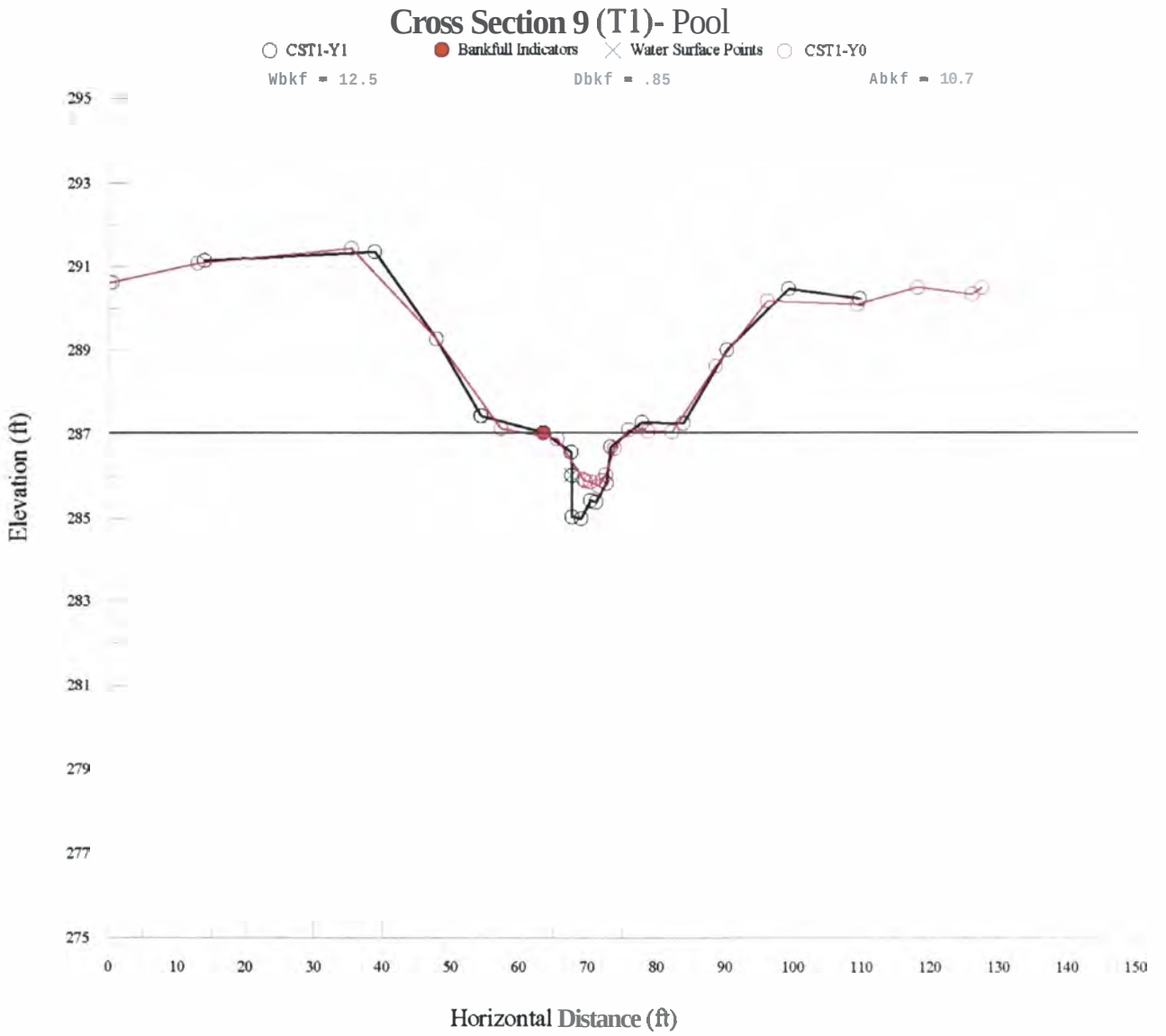
BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
13.848	0	291.146	
38.653	0	291.354	
47.673	0	289.276	
54.181	0	287.45	
54.276	0	287.437	
63.34	0	287.041	BKF
67.412	0	286.578	
67.498	0	286.024	LEW
67.551	0	285.04	
68.876	0	285.001	
70.254	0	285.429	
71.042	0	285.388	
72.563	0	285.838	
73.202	0	286.704	
77.752	0	287.285	
83.723	0	287.262	
90.119	0	289.013	
99.126	0	290.469	
109.517	0	290.228	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	289.08	289.08	289.08
Bankfull Elevation (ft)	287.04	287.04	287.04
Floodprone Width (ft)	42.15	-----	-----
Bankfull Width (ft)	12.48	6.24	6.24
Entrenchment Ratio	3.38	-----	-----
Mean Depth (ft)	0.85	0.82	0.89
Maximum Depth (ft)	2.04	2.04	1.82
Width/Depth Ratio	14.68	7.61	7.01
Bankfull Area (sq ft)	10.66	5.13	5.53
Wetted Perimeter (ft)	14.51	9.53	8.61
Hydraulic Radius (ft)	0.73	0.54	0.64
Begin BKF Station	63.35	63.35	69.59
End BKF Station	75.83	69.59	75.83

Trib 1 Cross Section 1 Year 0 (magenta)
Trib 1 Cross Section 1 Year 1 (Mack)



Cross Section Summary
UT1 Little Beaver Creek Cross Section 2

River Name: Little Beaver Creek
Reach Name: MY1_reach1
Cross Section Name: CS-T2
Survey Date: 02/16/07

Cross Section Data Entry

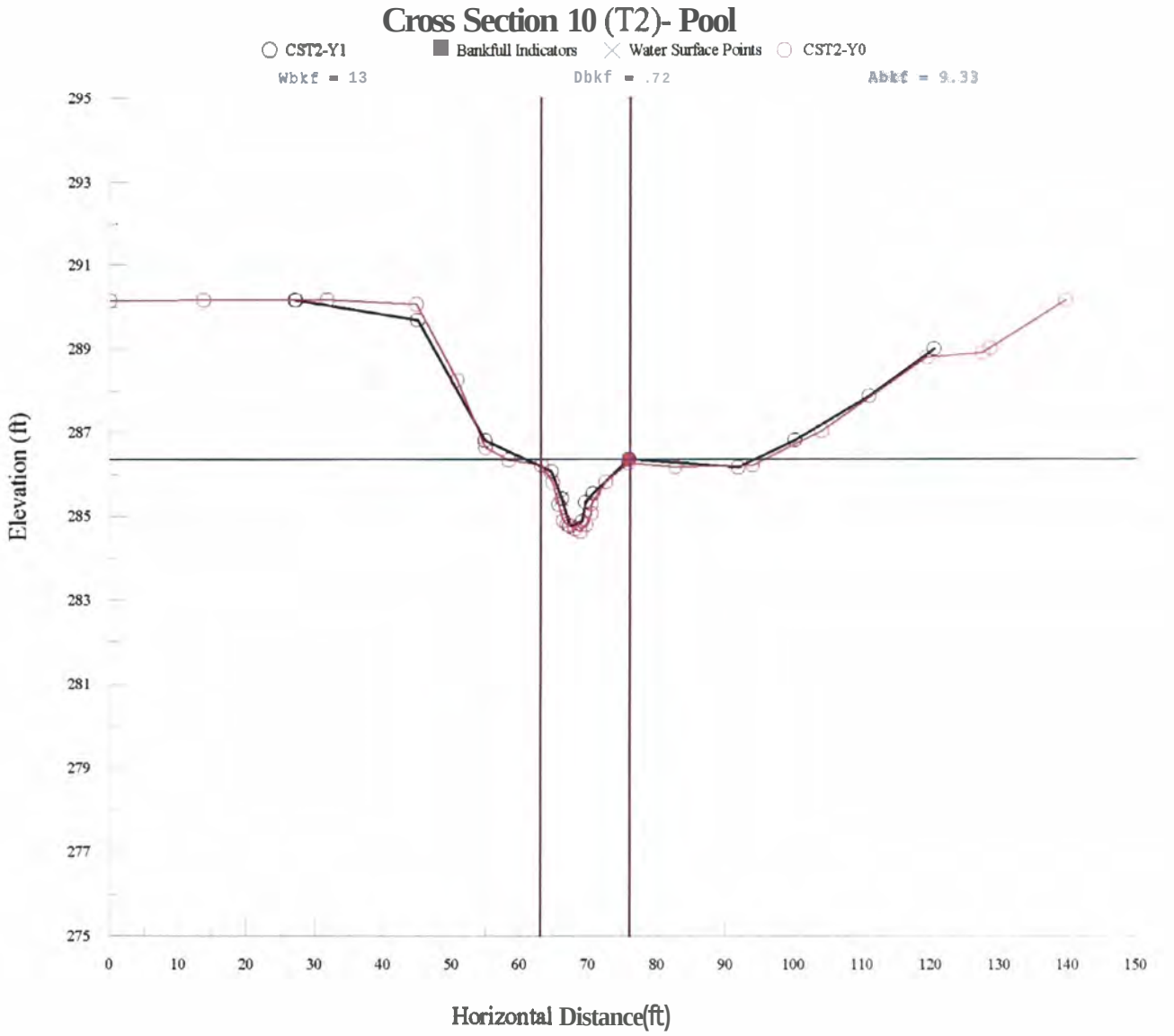
BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
27.185	0	290.163	
27.046	0	290.17	
44.945	0	289.687	
54.845	0	286.808	
64.579	0	286.071	BKF
66.135	0	285.416	LEW
67.29	0	284.765	
69.111	0	284.876	
69.615	0	285.335	
70.662	0	285.54	
75.88	0	286.359	
91.882	0	286.166	
100.17	0	286.814	
111.043	0	287.875	
120.497	0	289.001	

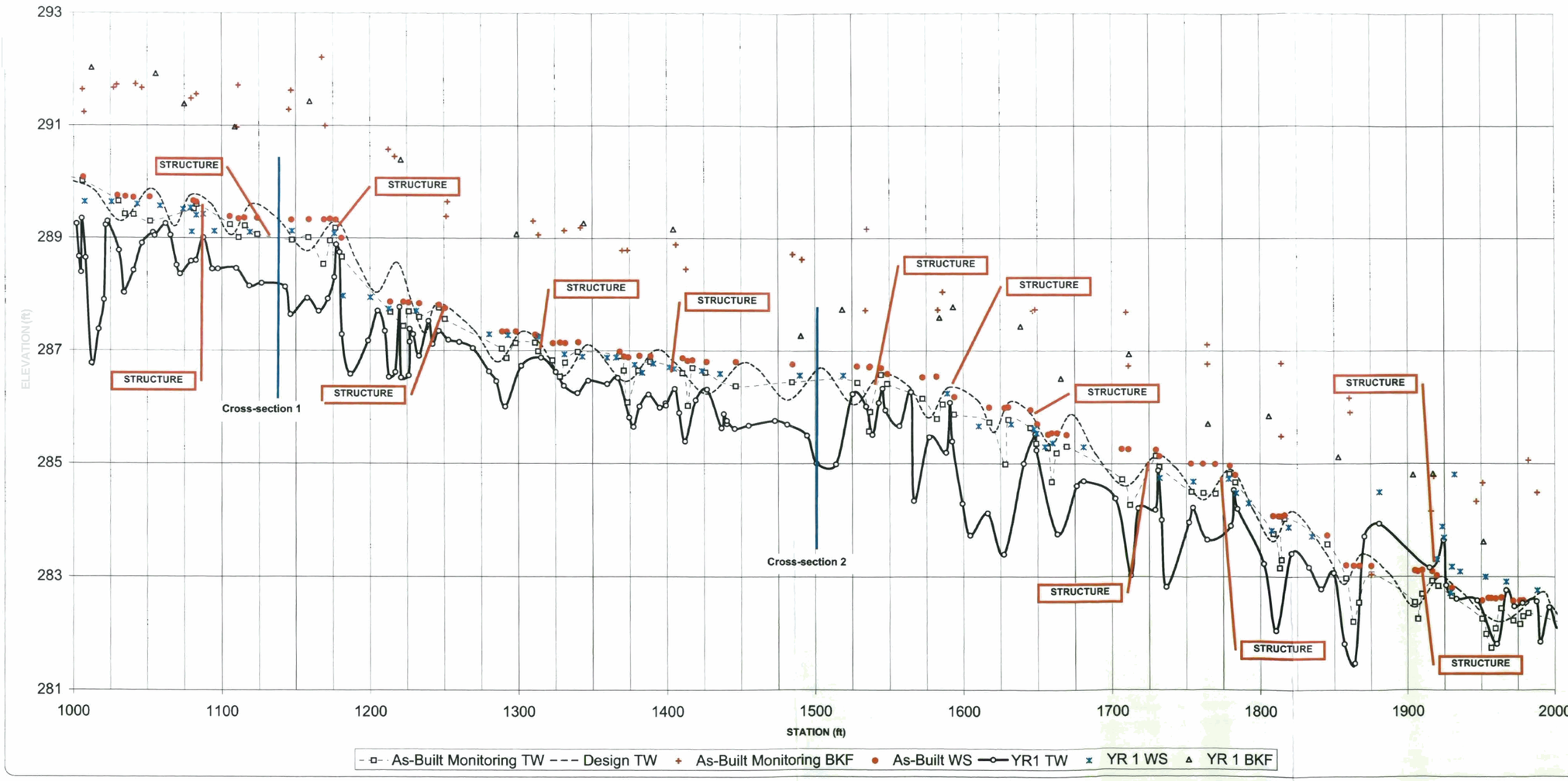
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	287.38	287.38	287.38
Bankfull Elevation (ft)	286.07	286.07	286.07
Floodprone Width (ft)	53.02	-----	-----
Bankfull Width (ft)	9.46	4.73	4.73
Entrenchment Ratio	5.61	-----	-----
Mean Depth (ft)	0.63	0.87	0.39
Maximum Depth (ft)	1.31	1.31	1.01
Width/Depth Ratio	15.02	5.44	12.13
Bankfull Area (sq ft)	5.96	4.13	1.82
Wetted Perimeter (ft)	10	6.12	5.91
Hydraulic Radius (ft)	0.6	0.68	0.31
Begin BKF Station	64.58	64.58	69.31
End BKF Station	74.04	69.31	74.04

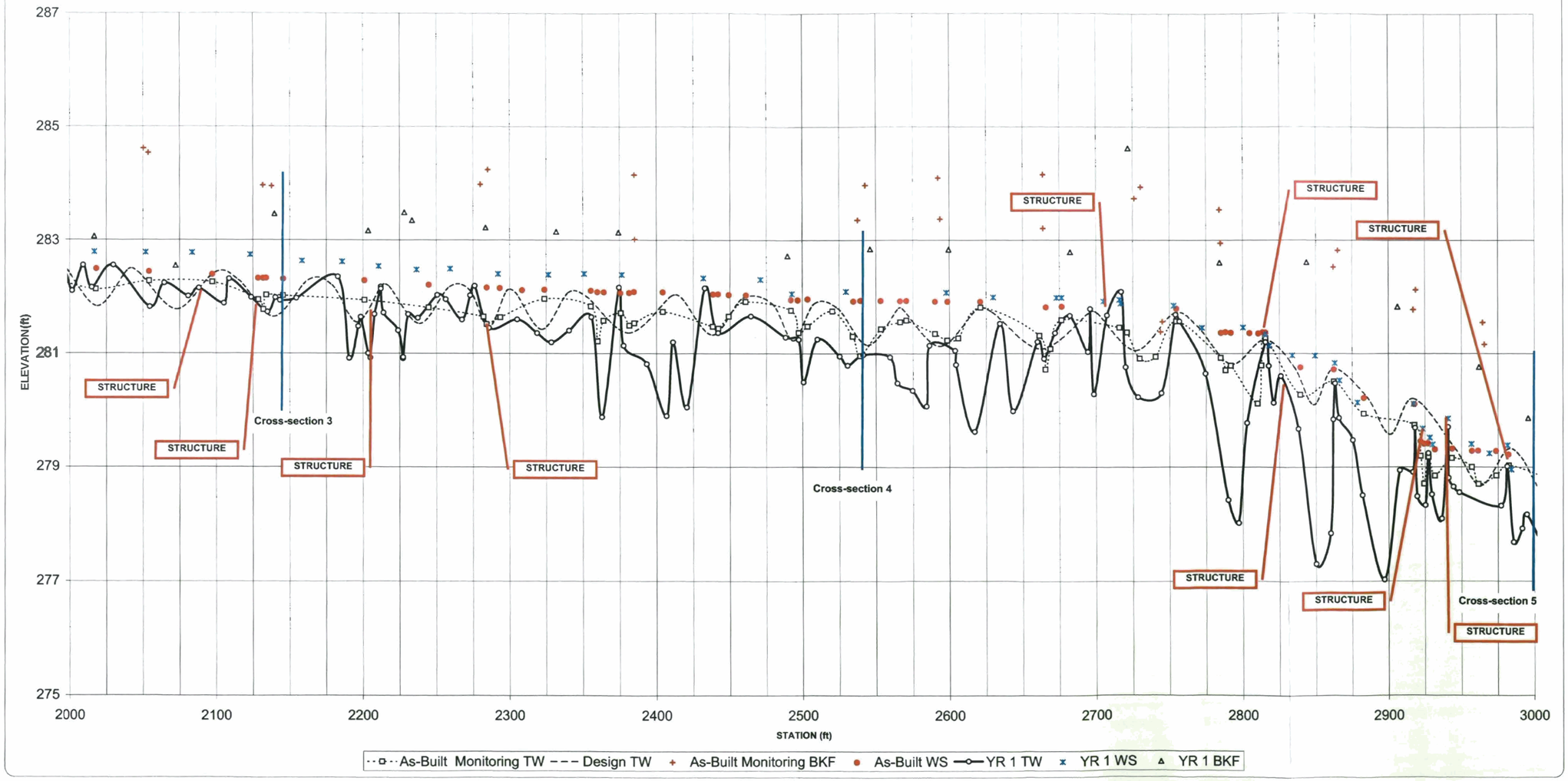
Trib 1 Cross Section 2 Year 0 (magenta)
Trib 1 Cross Section 1 Year 2 (black)



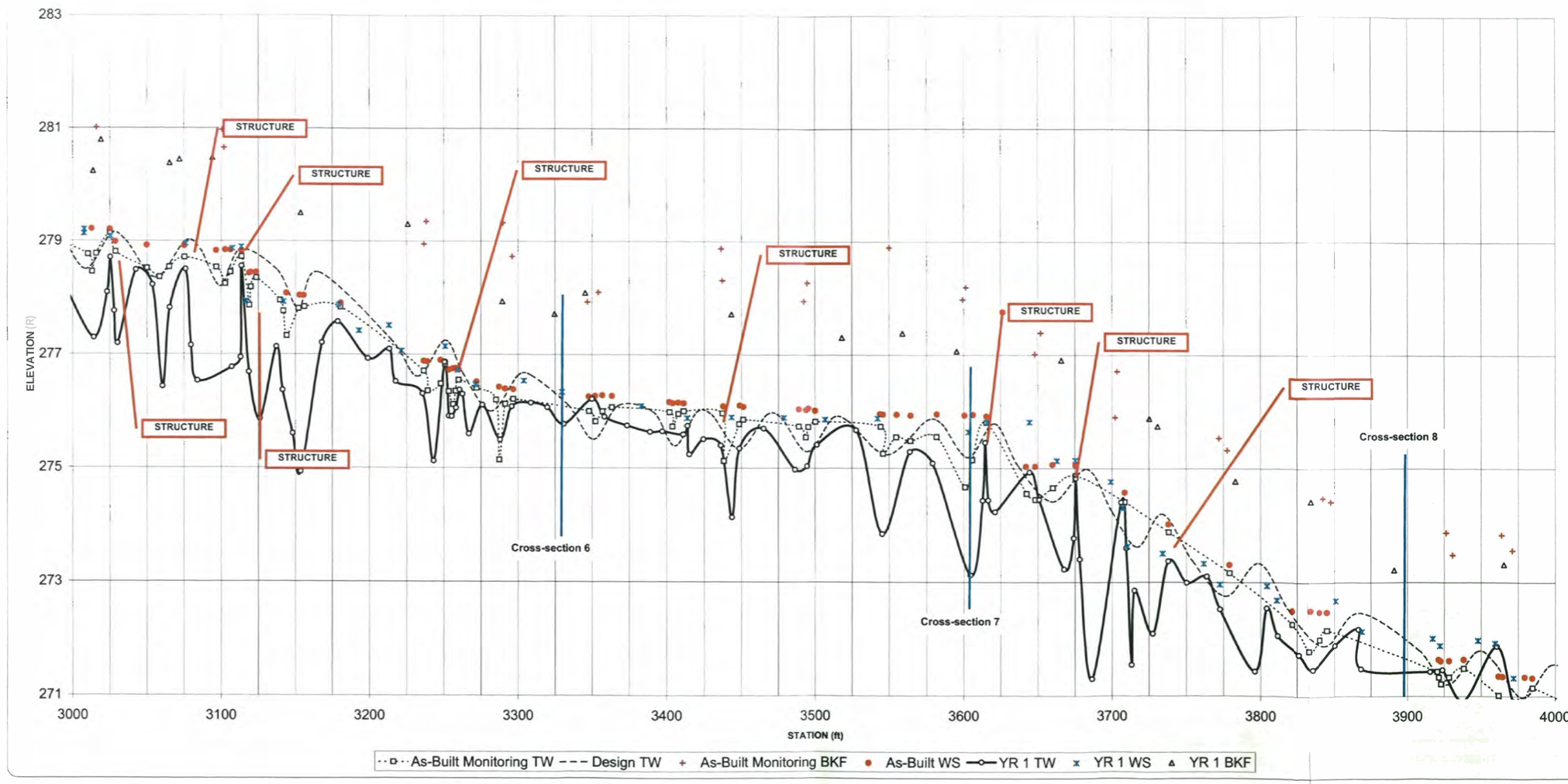
LITTLE BEAVER CREEK LONG PROFILE- YEAR 1 MONITORING

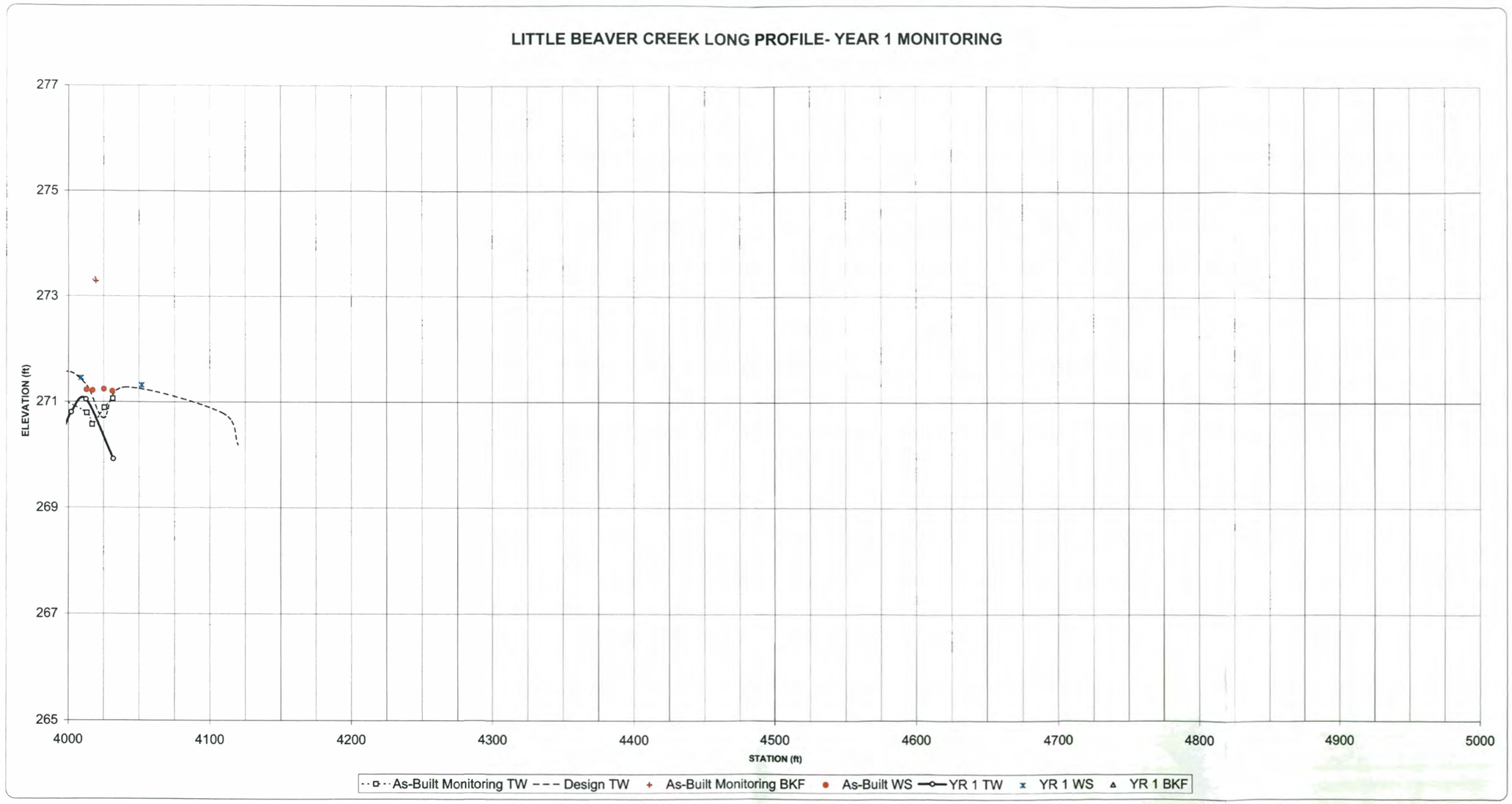


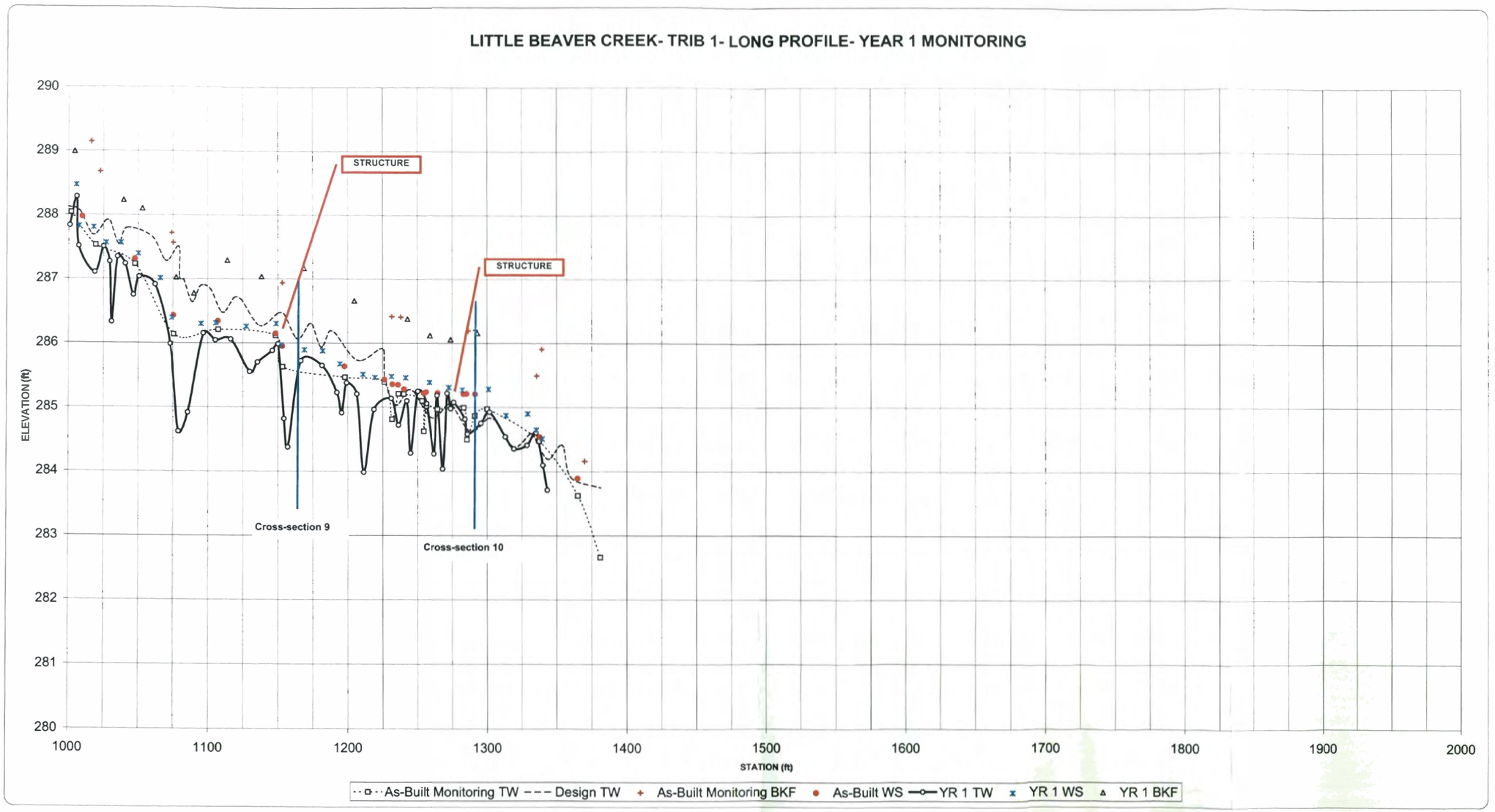
LITTLE BEAVER CREEK LONG PROFILE- YEAR 1 MONITORING



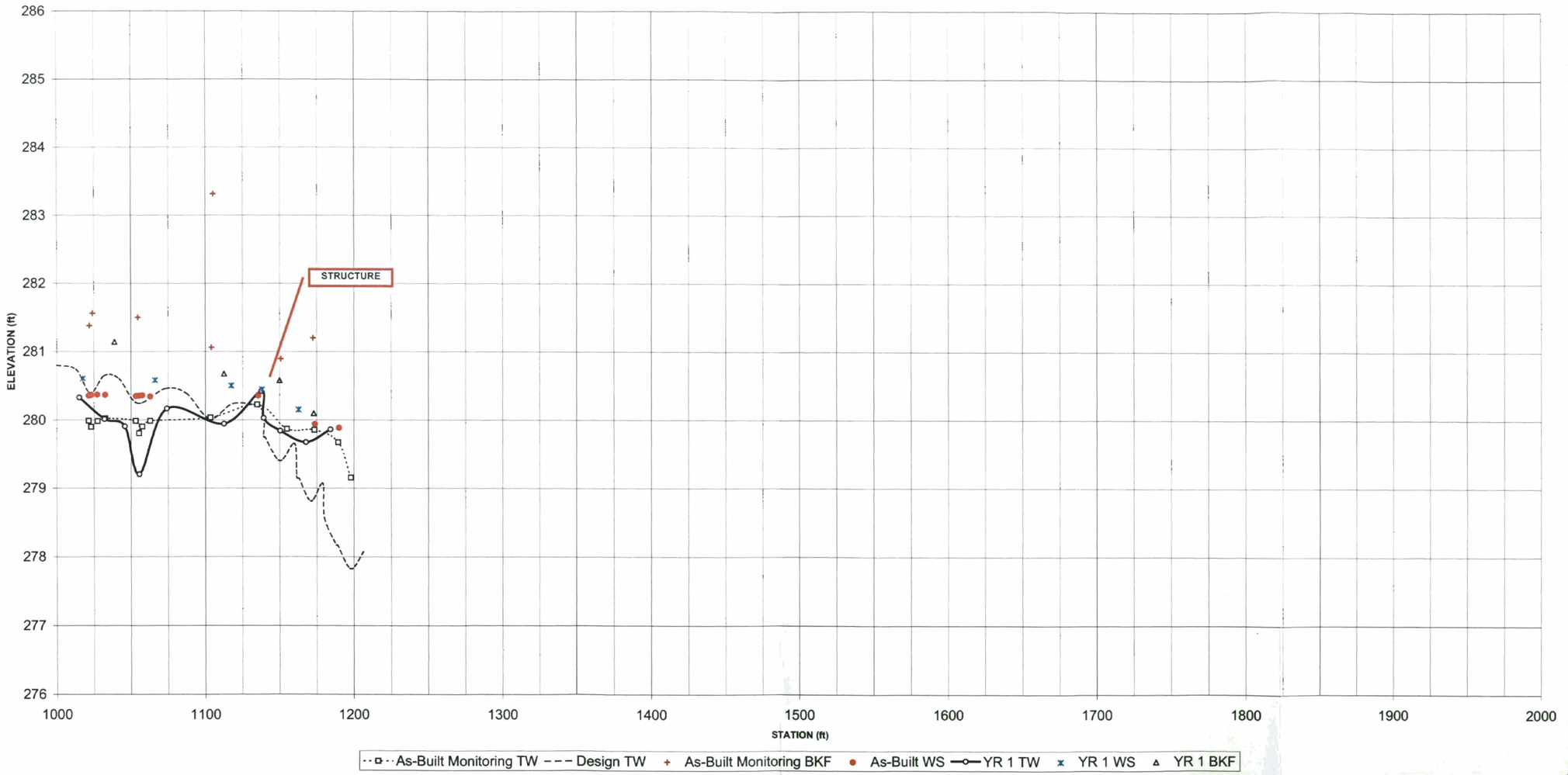
LITTLE BEAVER CREEK LONG PROFILE- YEAR 1 MONITORING




LITTLE BEAVER CREEK LONG PROFILE- YEAR 1 MONITORING
277
275
273
271
269
267
265
ELEVATION (ft)
4000
4100
4200
4300
4400
4500
4600
4700
4800
4900
5000
STATION (ft)
As-Built Monitoring TW
Design TW
As-Built Monitoring BKF
As-Built WS
YR 1 TW
YR 1 WS
YR 1 BKF


LITTLE BEAVER CREEK- TRIB 1- LONG PROFILE- YEAR 1 MONITORING
ELEVATION (ft)
290
289
288
287
286
285
284
283
282
281
280
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
STATION (ft)
STRUCTURE
STRUCTURE
Cross-section 9
Cross-section 10
As-Built Monitoring TW
Design TW
As-Built Monitoring BKF
As-Built WS
YR 1 TW
YR 1 WS
YR 1 BKF

LITTLE BEAVER CREEK-TRIB 2- LONG PROFILE- YEAR 1 MONITORING



Structure Location	
TW Station	Elevation
10+80	289.6
11+43	289.7
11+80	288.89
12+46	287.8
13+10	287.1
14+05	286.6
15+45	286.3
15+90.92	286.078
16+48.54	285.519
17+31.08	284.879
17+82.17	284.53
19+18	283.04
19+52	281.72
21+23	283.45
22+12.15	282.173
22+12.23	282.138
23+09	282.54
26+96.00	281.784
27+17.16	282.088
28+15.44	281.2
28+63.11	280.476
29+18.08	279.689
29+27.23	279.24
29+40.76	279.703
29+81.19	279.013
30+25.32	278.71
30+73	278.77
31+13.65	278.557
31+41.28	276.369
32+60.65	276.376
34+13.72	275.745
36+14.60	275.453
36+75.51	274.823
37+32	273.94
11+50 T1	286.1
12+72 T1	285.24
11+36 T2	280.33

TW	TW	WS	WS	BKF	BKF
Station	Elevation	Station	Elevation	Station	Elevation
10+02.16	289.25	10+07.75	289.644	10+12.22	292.029
10+03.68	288.666	10+25.88	289.638	10+55.79	291.92
10+05.13	288.392	10+43.21	289.602	10+74.96	291.386
10+05.59	289.345	10+58.74	289.572	11+08.90	290.974
10+08.16	288.647	10+74.27	289.513	11+59.35	291.431
10+12.25	286.775	10+79.12	289.542	12+20.97	290.393
10+16.99	287.375	10+80.06	289.112	12+98.99	289.073
10+20.59	287.901	10+83.08	289.408	13+44.21	289.265
10+21.75	289.228	10+87.74	289.426	14+04.38	289.16
10+23.03	289.294	10+95.19	289.123	14+90.48	287.269
10+30.78	288.779	11+19.12	289.107	15+18.41	287.736
10+33.91	288.034	11+47.51	289.126	15+83.87	287.591
10+34.33	288.028	11+76.11	289.082	15+93.16	287.78
10+40.66	288.422	11+81.82	287.972	16+38.66	287.431
10+46.37	288.907	12+00.37	287.949	16+65.69	286.508
10+53.86	289.096	12+12.84	287.745	17+11.49	286.945
10+54.98	289.041	12+31.42	287.708	17+64.79	285.706
10+62.35	289.256	12+80.37	287.294	18+05.86	285.843
10+65.64	289.05	12+93.06	287.276	18+52.81	285.115
10+69.73	288.516	13+13.90	287.248	19+03.70	284.799
10+72.05	288.36	13+31.19	286.938	19+17.22	284.818
10+79.49	288.588	13+43.18	286.897	19+51.49	283.618
10+82.69	288.602	13+59.92	286.879	20+16.76	283.062
10+87.73	289.009	13+65.97	286.88	20+72.23	282.547
10+93.57	288.449	13+78.44	286.753	21+39.64	283.46
10+97.48	288.451	13+83.45	286.61	22+03.67	283.164
11+09.75	288.462	13+90.97	286.773	22+28.21	283.484
11+18.55	288.149	14+01.83	286.708	22+33.47	283.346
11+26.80	288.199	14+04.80	286.681	22+83.65	283.218
11+42.69	288.131	14+06.45	289.692	23+31.85	283.146
11+46.31	287.643	14+23.69	286.645	23+74.24	283.132
11+57.65	287.933	14+35.96	286.592	24+89.66	282.723
11+65.33	287.703	14+89.94	286.563	25+46.10	282.841
11+71.52	287.922	15+19.23	286.566	25+99.45	282.833
11+75.92	288.302	15+89.24	286.244	26+82.46	282.787
11+77.23	288.885	16+10.48	285.664	27+21.84	284.622
11+79.48	288.746	16+32.34	285.697	27+84.17	282.601
11+80.89	287.289	16+47.75	285.61	28+43.66	282.609
11+86.68	286.584	16+49.34	285.537	29+06.17	281.826
11+98.63	287.176	16+55.08	285.298	29+62.08	280.764
12+05.16	287.708	16+60.13	285.364	29+95.62	279.864
12+09.99	287.348	16+81.00	285.297	30+13.70	280.238
12+12.66	286.532	17+32.23	284.75	30+19.07	280.793
12+17.09	286.617	17+54.96	284.687	30+65.36	280.381
12+19.88	287.774	17+78.83	284.731	30+71.91	280.444
12+20.90	286.521	17+83.82	284.483	30+94.13	280.477
12+26.09	286.557	17+92.30	284.3	31+53.61	279.502
12+26.71	287.157	18+07.64	283.819	32+25.92	279.302
12+26.71	287.385	18+19.15	283.88	32+89.35	277.938

Longitudinal Plots and Raw Data Tables

TW	TW	WS	WS	BKF	BKF
Station	Elevation	Station	Elevation	Station	Elevation
12+29.13	287.292	18+34.90	283.716	33+24.69	277.716
12+33.07	286.907	18+80.96	284.495	33+45.44	278.09
12+39.45	287.526	19+19.88	283.309	34+43.24	277.717
12+42.21	287.117	19+23.68	283.886	35+18.21	277.307
12+46.43	287.349	19+24.82	283.691	35+58.90	277.381
12+52.84	287.193	19+29.04	282.715	35+95.31	277.069
12+60.18	287.153	19+30.14	283.178	36+65.85	276.909
12+69.29	287.046	19+32.04	284.806	37+25.14	275.882
12+80.19	286.632	19+35.69	283.094	37+30.68	275.746
12+85.08	286.458	19+53.09	283.002	37+83.05	274.773
12+91.00	286.008	19+67.06	282.915	38+34.14	274.422
13+01.94	286.73	19+88.28	282.761	38+90.84	273.214
13+15.39	286.877	20+16.98	282.788	39+65.32	273.311
13+25.25	286.623	20+51.98	282.78		
13+30.70	286.379	20+83.71	282.775		
13+39.79	286.249	21+23.27	282.739		
13+47.08	286.469	21+58.58	282.63		
13+59.87	286.41	21+86.01	282.616		
13+66.95	286.519	22+10.81	282.537		
13+74.53	285.815	22+36.63	282.475		
13+77.41	285.649	22+59.55	282.493		
13+81.52	286.012	22+92.25	282.402		
13+87.61	286.225	23+26.64	282.388		
13+95.10	285.991	23+50.95	282.404		
13+98.95	286.069	23+76.59	282.386		
13+99.26	286.03	24+31.95	282.329		
14+05.19	286.324	24+48.75	283.509		
14+06.31	289.255	24+71.05	282.305		
14+06.78	289.132	24+92.79	282.051		
14+08.18	285.897	25+29.81	282.092		
14+12.07	285.391	25+97.98	282.072		
14+19.28	286.121	26+29.92	281.991		
14+26.96	286.312	26+73.20	281.982		
14+36.75	285.628	26+76.56	281.982		
14+38.35	285.877	27+05.05	281.92		
14+40.41	285.701	27+16.05	281.95		
14+40.41	285.758	27+16.89	281.884		
14+45.68	285.616	27+53.12	281.845		
14+55.07	285.671	27+72.35	281.455		
14+72.73	285.758	28+00.30	281.459		
14+81.12	285.693	28+15.01	281.335		
14+94.56	285.498	28+17.99	281.134		
15+00.94	285.007	28+33.87	280.97		
15+14.08	284.985	28+49.47	280.964		
15+25.40	286.235	28+63.05	280.833		
15+34.40	286.012	28+66.38	280.528		
15+38.60	285.509	28+78.77	280.14		
15+42.85	286.077	29+17.35	280.113		
15+45.41	286.331	29+23.58	279.675		
15+47.30	285.946	29+28.32	279.517		
15+56.69	285.666	29+30.24	279.395		

Longitudinal Plots and Raw Data Tables

TW	TW	WS	WS	BKF	BKF
Station	Elevation	Station	Elevation	Station	Elevation
15+57.77	287.074	29+40.88	279.851		
15+64.61	286.267	29+56.97	279.405		
15+66.36	284.34	29+69.24	279.244		
15+76.84	285.467	29+81.58	279.385		
15+77.49	290.422	29+84.22	278.961		
15+88.26	285.192	30+07.58	279.129		
15+90.92	286.078	30+07.83	279.204		
15+92.42	285.391	30+25.69	279.082		
15+99.26	284.289	30+76.40	278.956		
16+04.43	283.729	31+07.58	278.871		
16+16.30	284.121	31+13.63	278.898		
16+27.22	283.393	31+16.81	277.942		
16+40.71	284.997	31+42.11	277.929		
16+48.54	285.519	31+79.48	277.874		
16+49.24	285.235	31+93.13	277.42		
16+63.17	283.75	32+13.28	277.513		
16+76.20	284.603	32+21.69	277.063		
16+80.85	284.689	32+51.20	277.144		
17+02.25	284.384	32+59.40	276.722		
17+12.60	283.022	32+71.46	276.469		
17+17.59	284.21	33+03.97	276.536		
17+29.11	284.183	33+29.85	276.339		
17+31.08	284.879	33+83.12	276.091		
17+33.36	284.003	34+13.67	275.881		
17+36.42	282.821	34+43.48	275.896		
17+51.87	283.961	34+78.92	275.891		
17+54.57	284.221	35+06.95	275.859		
17+64.08	283.653	35+42.35	275.878		
17+80.10	283.896	36+03.49	275.641		
17+82.17	284.53	36+15.89	275.804		
17+84.65	284.198	36+44.47	275.816		
18+02.29	283.227	36+62.90	275.134		
18+10.40	282.049	36+75.24	275.142		
18+21.03	283.411	36+99.23	274.768		
18+32.85	283.164	37+07.10	274.301		
18+41.01	282.78	37+10.51	273.631		
18+49.60	283.064	37+34.19	273.507		
18+56.71	281.816	37+61.80	273.334		
18+63.87	281.475	37+72.68	272.965		
18+70.49	283.712	38+04.43	272.94		
18+80.61	283.936	38+10.97	272.689		
19+14.78	283.159	38+50.98	272.679		
19+24.35	283.642	38+68.95	272.139		
19+26.13	282.845	39+17.18	272.015		
19+33.05	282.608	39+22.20	271.89		
19+47.15	282.58	39+47.91	271.982		
19+60.54	281.816	39+59.47	271.933		
19+66.93	282.76	39+71.88	271.324		
19+72.42	282.478	40+09.14	271.45		
19+77.97	282.538	40+52.10	271.317		
19+87.60	282.564				

Longitudinal Plots and Raw Data Tables

TW	TW	WS	WS	BKF	BKF
Station	Elevation	Station	Elevation	Station	Elevation
19+90.10	281.852				
19+96.15	282.461				
20+01.59	282.098				
20+09.15	282.552				
20+15.03	282.159				
20+29.83	282.552				
20+54.57	281.817				
20+64.51	282.238				
20+80.84	282.005				
20+88.08	282.146				
20+98.63	271.23				
21+05.20	281.879				
21+08.75	282.311				
21+23.76	281.983				
21+34.95	281.727				
21+40.27	281.981				
21+43.33	281.932				
21+54.52	281.97				
21+82.93	282.35				
21+90.58	280.914				
21+96.79	281.477				
21+98.45	281.639				
22+03.49	281				
22+04.98	280.922				
22+07.81	281.689				
22+07.81	281.69				
22+12.15	282.173				
22+12.23	282.138				
22+13.99	281.715				
22+23.95	281.403				
22+27.25	280.911				
22+27.31	280.931				
22+30.76	281.688				
22+37.33	281.622				
22+50.59	282.027				
22+56.35	281.952				
22+67.46	281.594				
22+73.00	282.023				
22+76.13	282.19				
22+85.90	281.449				
23+05.20	281.6				
23+18.81	281.357				
23+28.51	281.195				
23+40.54	281.403				
23+55.73	281.642				
23+62.87	279.879				
23+74.55	282.163				
23+77.68	281.138				
23+93.38	280.813				
24+06.76	279.901				
24+11.21	281.198				

Longitudinal Plots and Raw Data Tables

TW Station	TW Elevation	WS Station	WS Elevation	BKF Station	BKF Elevation
24+20.52	280.052				
24+32.77	282.152				
24+41.83	281.362				
24+45.97	0				
24+64.36	281.656				
24+88.16	281.283				
24+97.38	281.245				
25+00.63	280.495				
25+10.16	281.25				
25+25.32	280.949				
25+30.67	280.788				
25+41.40	280.974				
25+59.44	280.935				
25+64.36	280.479				
25+74.68	280.348				
25+84.19	280.073				
25+86.28	281.141				
26+03.79	281.051				
26+04.40	280.802				
26+17.09	279.624				
26+34.42	281.525				
26+43.25	279.986				
26+60.07	281.205				
26+64.55	280.908				
26+72.08	281.36				
26+82.20	281.663				
26+94.42	281.028				
26+96.00	281.784				
26+98.44	280.285				
27+07.47	281.671				
27+17.16	282.088				
27+20.06	280.761				
27+28.48	280.234				
27+44.39	280.303				
27+54.12	281.683				
27+56.80	281.566				
27+74.57	280.645				
27+89.90	278.42				
27+90.67	0				
27+96.98	278.019				
28+02.85	279.776				
28+15.44	281.2				
28+17.61	280.782				
28+20.94	280.134				
28+25.90	280.603				
28+37.95	279.674				
28+50.04	277.304				
28+60.05	277.839				
28+61.86	279.841				
28+63.11	280.476				
28+65.86	279.867				
28+75.42	279.475				
28+81.98	278.505				
28+97.03	277.025				
29+07.63	278.94				
29+16.64	278.909				
29+18.08	279.689				
29+19.51	278.481				
29+25.21	278.328				
29+27.23	279.24				
29+29.61	278.515				
29+36.46	278.091				
29+40.76	279.703				
29+41.09	278.806				
29+44.42	278.651				
29+48.44	278.553				
29+76.98	278.321				
29+81.19	279.013				

Longitudinal Plots and Raw Data Tables

TW	TW	WS	WS	BKF	BKF
Station	Elevation	Station	Elevation	Station	Elevation
29+85.61	277.682				
29+91.54	277.921				
29+94.72	278.168				
30+14.15	277.291				
30+23.12	278.095				
30+25.32	278.71				
30+27.93	277.763				
30+30.22	277.193				
30+42.63	278.491				
30+53.76	278.227				
30+60.53	276.433				
30+65.36	277.821				
30+76.06	278.502				
30+79.68	277.156				
30+84.03	276.534				
31+07.13	276.771				
31+13.06	276.945				
31+13.65	278.557				
31+18.62	276.687				
31+26.06	275.862				
31+37.10	277.134				
31+41.28	276.369				
31+48.07	275.603				
31+53.57	274.928				
31+67.93	277.206				
31+78.74	277.578				
31+98.95	276.928				
32+13.36	277.096				
32+17.54	276.524				
32+35.74	276.307				
32+43.21	275.121				
32+50.69	276.863				
32+53.49	275.914				
32+55.46	275.907				
32+58.32	276.057				
32+60.65	276.376				
32+62.70	276.302				
32+66.96	275.6				
32+75.97	276.109				
32+87.80	275.494				
32+95.70	276.083				
33+08.56	276.148				
33+19.73	276.068				
33+30.86	275.775				
33+49.94	276.217				
33+58.37	275.902				
33+73.53	275.748				
33+88.89	275.636				
33+97.15	275.646				
34+11.04	275.592				
34+13.72	275.745				
34+14.92	275.24				
34+24.31	275.509				
34+36.06	275.401				
34+43.68	274.129				
34+48.64	275.348				
34+64.97	275.7				
34+86.28	274.973				
34+94.50	275.035				
35+01.26	275.414				
35+27.78	275.671				
35+45.22	273.843				
35+63.85	275.289				
35+79.11	275.086				
36+04.50	273.124				
36+12.84	274.43				
36+14.60	275.453				
36+16.59	274.435				

Longitudinal Plots and Raw Data Tables

TW	TW	WS	WS	BKF	BKF
Station	Elevation	Station	Elevation	Station	Elevation
36+21.13	274.229				
36+44.42	274.929				
36+50.96	274.446				
36+67.61	273.226				
36+74.13	273.769				
36+75.51	274.823				
36+78.17	273.4				
36+86.42	271.301				
37+06.14	274.402				
37+09.59	273.598				
37+13.17	271.549				
37+15.05	272.854				
37+27.41	272.094				
37+37.87	273.368				
37+50.20	272.994				
37+63.76	273.107				
37+72.58	272.525				
37+96.15	271.434				
38+04.11	272.548				
38+11.50	272.062				
38+26.10	271.733				
38+35.48	271.468				
38+50.26	271.892				
38+66.45	272.175				
38+68.21	271.481				
39+15.39	271.432				
39+23.73	271.465				
39+38.30	270.922				
39+60.45	271.879				
39+71.75	270.864				
39+86.15	269.961				
40+01.94	270.799				
40+12.42	271.042				
40+31.85	269.92				

TW	TW	WS	WS	BKF	BKF
Station	Elevation	Station	Elevation	Station	Elevation
10+00.90	287.83	1005.615	288.467	1004.296	288.991
10+05.83	288.28	1007.572	287.823	1039.544	288.232
10+07.21	287.51	1018.027	287.803	1053.032	288.1
10+18.81	287.102	1027.028	287.562	1077.555	287.024
10+25.11	287.503	1037.824	287.564	1090.208	286.776
10+29.49	287.269	1050.191	287.393	1113.977	287.292
10+30.90	286.328	1065.972	287.012	1138.368	287.036
10+35.08	287.346	1074.312	286.394	1168.744	287.167
10+40.69	287.236	1095.363	286.303	1204.781	286.66
10+46.55	286.749	1105.817	286.313	1242.909	286.379
10+50.64	287.035	1127.533	286.259	1259.219	286.118
10+62.16	286.913	1148.937	286.304	1274	286.058
10+73.04	285.986	1152.706	285.973	1293.066	286.161
10+78.95	284.621	1169.125	285.894		
10+85.82	284.916	1182.268	285.879		
10+96.94	286.155	1194.619	285.676		
11+05.42	286.046	1211.128	285.513		
11+16.42	286.06	1219.614	285.464		
11+29.89	285.554	1231.454	285.48		
11+35.44	285.701	1241.685	285.461		
11+46.10	285.882	1258.938	285.387		
11+50.23	285.986	1272.714	285.308		
11+54.40	284.819	1277.58	288.506		
11+57.08	284.376	1277.862	288.961		
11+66.55	285.723	1282.311	285.27		
11+81.69	285.65	1301.121	285.282		
11+92.25	285.228	1313.754	284.874		
11+95.62	284.912	1329.265	284.902		
11+99.24	285.38	1335.441	284.648		
12+06.58	285.206	1339.684	284.511		
12+11.37	283.986				
12+18.80	284.964				
12+31.15	285.138				
12+36.31	284.72				
12+42.35	285.098				
12+45.01	284.285				
12+50.23	285.249				
12+56.83	285.056				
12+61.87	284.273				
12+64.24	285.185				
12+68.13	284.039				
12+71.49	285.217				
12+73.90	284.979				
12+76.10	285.077				
12+77.86	288.757				
12+78.33	289.845				
12+84.07	284.814				
12+85.81	284.582				
12+95.51	284.751				
13+01.74	284.925				
13+12.94	284.542				
13+19.14	284.355				
13+28.66	284.41				
13+35.12	284.604				
13+40.07	284.098				
13+43.23	283.712				

Trib 2

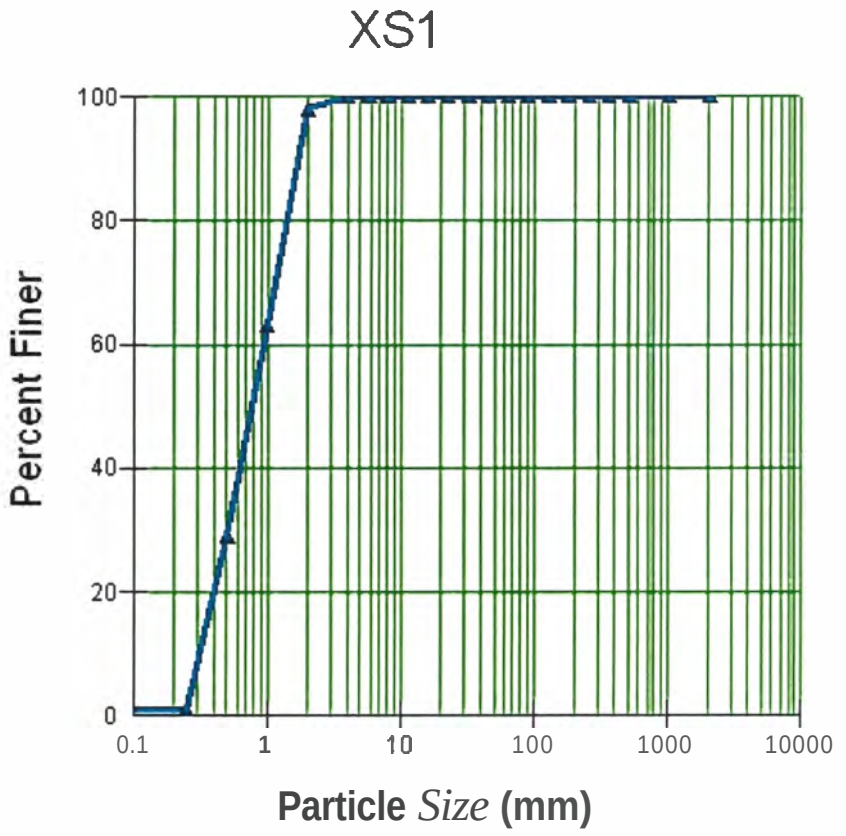
TW	TW	WS	WS	BKF	BKF
Station	Elevation	Station	Elevation	Station	Elevation
1015.137	280.329	1017.772	280.607	1038.921	281.142
1032.13	280.014	1066.33	280.581	1112.554	280.676
1045.825	279.906	1117.525	280.503	1149.844	280.579
1055.593	279.203	1138.188	280.446	1172.956	280.096
1074.203	280.166	1162.828	280.151		
1112.53	279.943				
1137.519	280.421				
1139.178	280.028				
1150.289	279.84				
1167.684	279.674				
1184.203	279.862				

River Name: Little Beaver Creek
Reach Name: MY1_reach1
Sample Name: XS1

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	1	1.00	1.00
0.25 - 0.50	28	28.00	29.00
0.50 - 1.0	34	34.00	63.00
1.0 - 2.0	35	35.00	98.00
2.0 - 4.0	2	2.00	100.00
4.0 - 5.7	0	0.00	100.00
5.7 - 8.0	0	0.00	100.00
8.0 - 11.3	0	0.00	100.00
11.3 - 16.0	0	0.00	100.00
16.0 - 22.6	0	0.00	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	0.38		
D35 (mm)	0.59		
D50 (mm)	0.81		
D84 (mm)	1.6		
D95 (mm)	1.91		
D100 (mm)	4		
Silt/Clay (%)	0		
Sand (%)	98		
Gravel (%)	2		
Cobble (%)	0		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 100.

Cross Section 1 Pebble Count

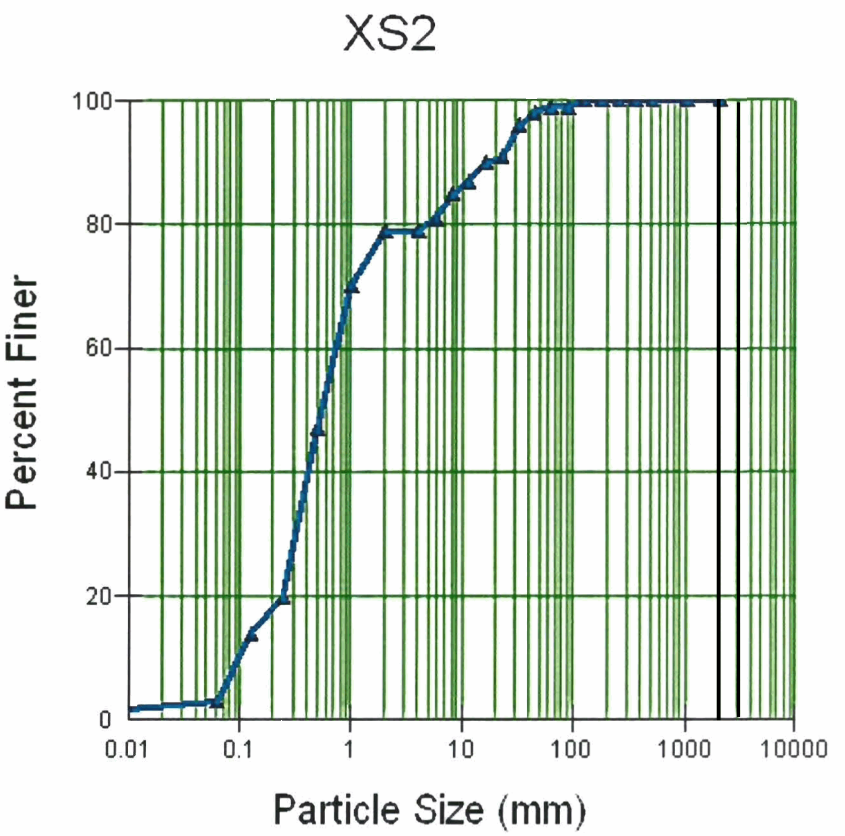


River Name: Little Beaver Creek
Reach Name: MY1_reach1
Sample Name: XS2

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	3	3.00	3.00
0.062 - 0.125	11	11.00	14.00
0.125 - 0.25	6	6.00	20.00
0.25 - 0.50	27	27.00	47.00
0.50 - 1.0	23	23.00	70.00
1.0 - 2.0	9	9.00	79.00
2.0 - 4.0	0	0.00	79.00
4.0 - 5.7	2	2.00	81.00
5.7 - 8.0	4	4.00	85.00
8.0 - 11.3	2	2.00	87.00
11.3 - 16.0	3	3.00	90.00
16.0 - 22.6	1	1.00	91.00
22.6 - 32.0	5	5.00	96.00
32 - 45	2	2.00	98.00
45 - 64	1	1.00	99.00
64 - 90	0	0.00	99.00
90 - 128	1	1.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	0.17		
D35 (mm)	0.39		
D50 (mm)	0.57		
D84 (mm)	7.42		
D95 (mm)	30.12		
D100 (mm)	128		
Silt/Clay (%)	3		
Sand (%)	76		
Gravel (%)	20		
Cobble (%)	1		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 100.

Cross Section 2 Pebble Count

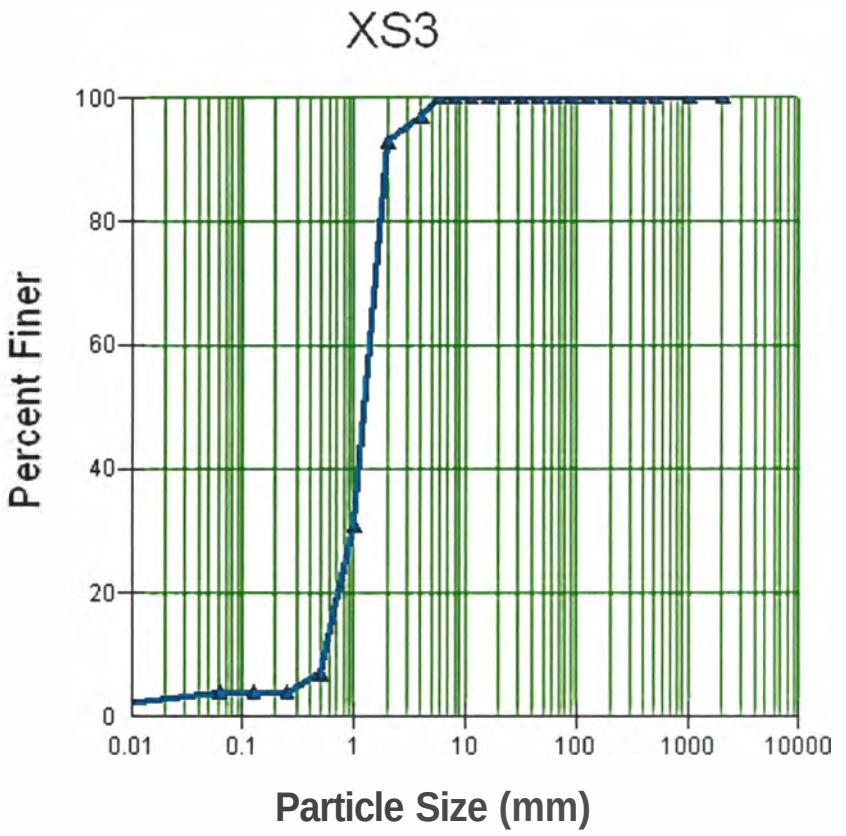


River Name: Little Beaver Creek
Reach Name: MY1_reach1
Sample Name: XS3

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	4	4.00	4.00
0.062 - 0.125	0	0.00	4.00
0.125 - 0.25	0	0.00	4.00
0.25 - 0.50	3	3.00	7.00
0.50 - 1.0	24	24.00	31.00
1.0 - 2.0	62	62.00	93.00
2.0 - 4.0	4	4.00	97.00
4.0 - 5.7	3	3.00	100.00
5.7 - 8.0	0	0.00	100.00
8.0 - 11.3	0	0.00	100.00
11.3 - 16.0	0	0.00	100.00
16.0 - 22.6	0	0.00	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	0.69		
D35 (mm)	1.06		
D50 (mm)	1.31		
D84 (mm)	1.85		
D95 (mm)	3		
D100 (mm)	5.7		
Silt/Clay (%)	4		
Sand (%)	89		
Gravel (%)	7		
Cobble (%)	0		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 100.

Cross Section 3 Pebble Count

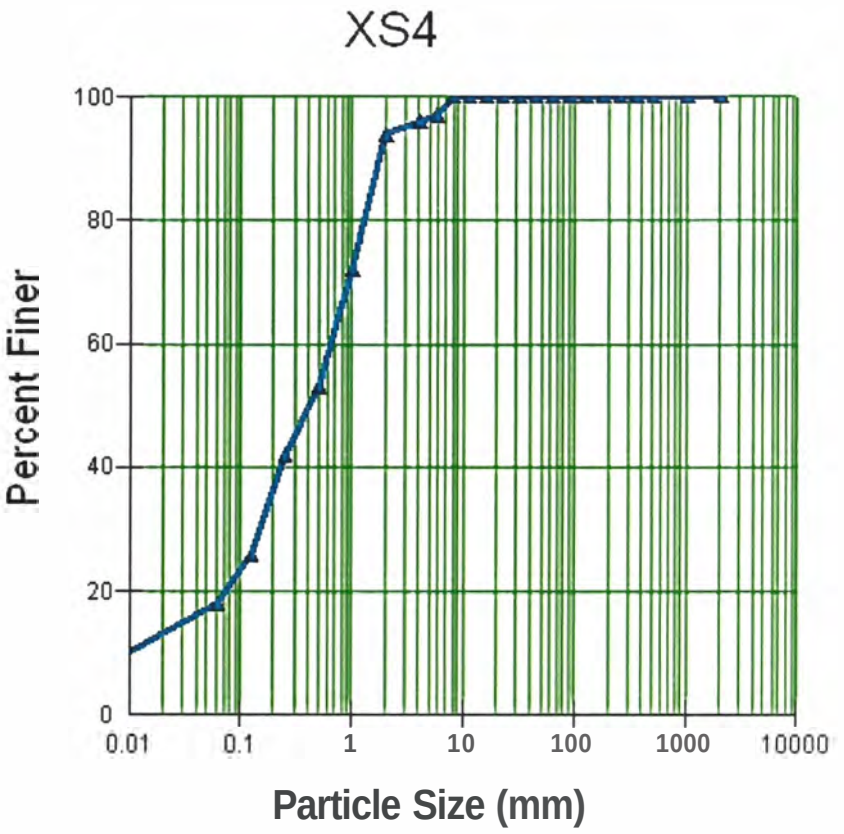


River Name: Little Beaver Creek
Reach Name: MY1_reach1
Sample Name: XS4

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	18	18.00	18.00
0.062 - 0.125	8	8.00	26.00
0.125 - 0.25	16	16.00	42.00
0.25 - 0.50	11	11.00	53.00
0.50 - 1.0	19	19.00	72.00
1.0 - 2.0	22	22.00	94.00
2.0 - 4.0	2	2.00	96.00
4.0 - 5.7	1	1.00	97.00
5.7 - 8.0	3	3.00	100.00
8.0 - 11.3	0	0.00	100.00
11.3 - 16.0	0	0.00	100.00
16.0 - 22.6	0	0.00	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	0.06		
D35 (mm)	0.2		
D50 (mm)	0.43		
D84 (mm)	1.55		
D95 (mm)	3		
D100 (mm)	8		
Silt/Clay (%)	18		
Sand (%)	76		
Gravel (%)	6		
Cobble (%)	0		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 100.

Cross Section 4 Pebble Count

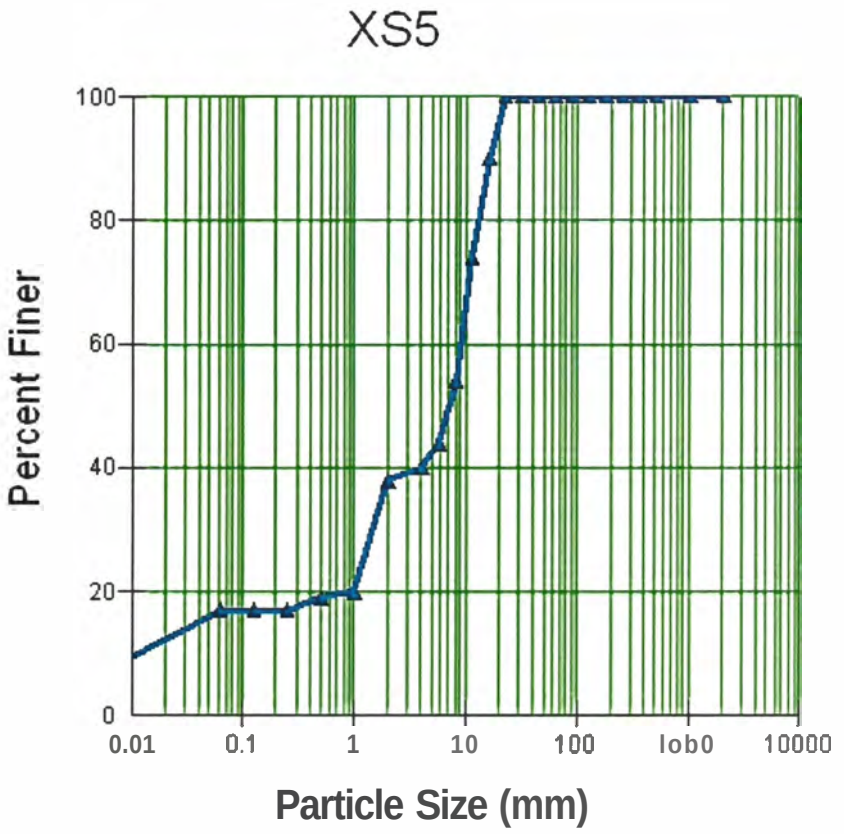


River Name: Little Beaver Creek
Reach Name: MY1_reach1
Sample Name: XS5

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	17	17.00	17.00
0.062 - 0.125	0	0.00	17.00
0.125 - 0.25	0	0.00	17.00
0.25 - 0.50	2	2.00	19.00
0.50 - 1.0	1	1.00	20.00
1.0 - 2.0	18	18.00	38.00
2.0 - 4.0	2	2.00	40.00
4.0 - 5.7	4	4.00	44.00
5.7 - 8.0	10	10.00	54.00
8.0 - 11.3	20	20.00	74.00
11.3 - 16.0	16	16.00	90.00
16.0 - 22.6	10	10.00	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	0.06		
D35 (mm)	1.83		
D50 (mm)	7.08		
D84 (mm)	14.24		
D95 (mm)	19.3		
D100 (mm)	22.6		
Silt/Clay (%)	17		
Sand (%)	21		
Gravel (%)	62		
Cobble (%)	0		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 100.

Cross Section 5 Pebble Count

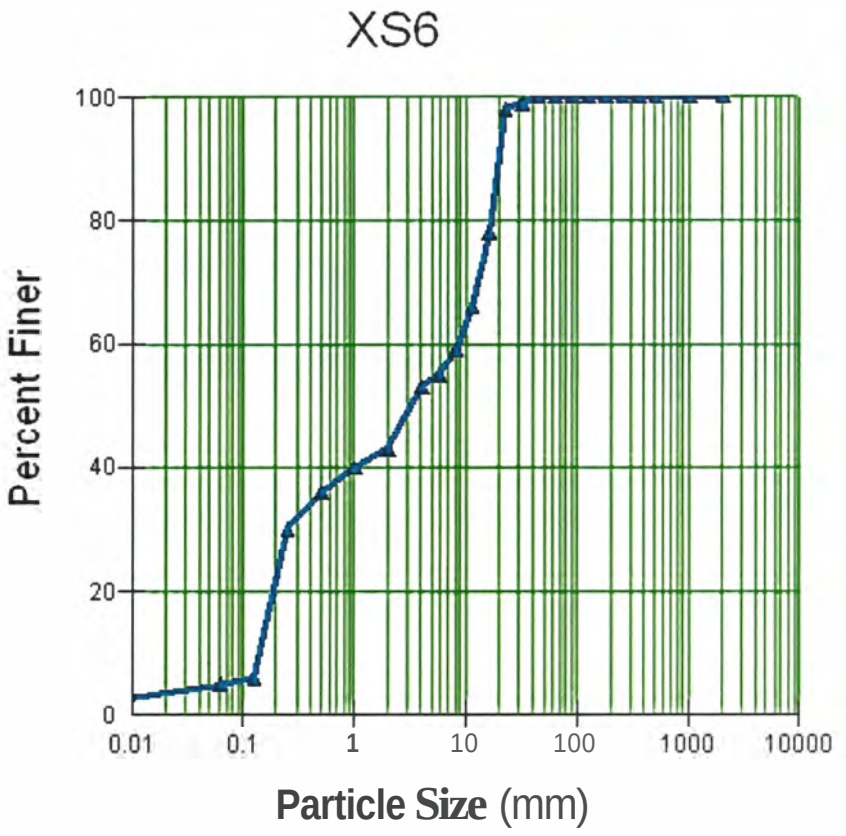


River Name: Little Beaver Creek
Reach Name: MY1_reach1
Sample Name: XS6

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	5	5.00	5.00
0.062 - 0.125	1	1.00	6.00
0.125 - 0.25	24	24.00	30.00
0.25 - 0.50	6	6.00	36.00
0.50 - 1.0	4	4.00	40.00
1.0 - 2.0	3	3.00	43.00
2.0 - 4.0	10	10.00	53.00
4.0 - 5.7	2	2.00	55.00
5.7 - 8.0	4	4.00	59.00
8.0 - 11.3	7	7.00	66.00
11.3 - 16.0	12	12.00	78.00
16.0 - 22.6	20	20.00	98.00
22.6 - 32.0	1	1.00	99.00
32 - 45	1	1.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	0.18		
D35 (mm)	0.46		
D50 (mm)	3.4		
D84 (mm)	17.98		
D95 (mm)	21.61		
D100 (mm)	45		
Silt/Clay (%)	5		
Sand (%)	38		
Gravel (%)	57		
Cobble (%)	0		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 100.

Cross Section 6 Pebble Count

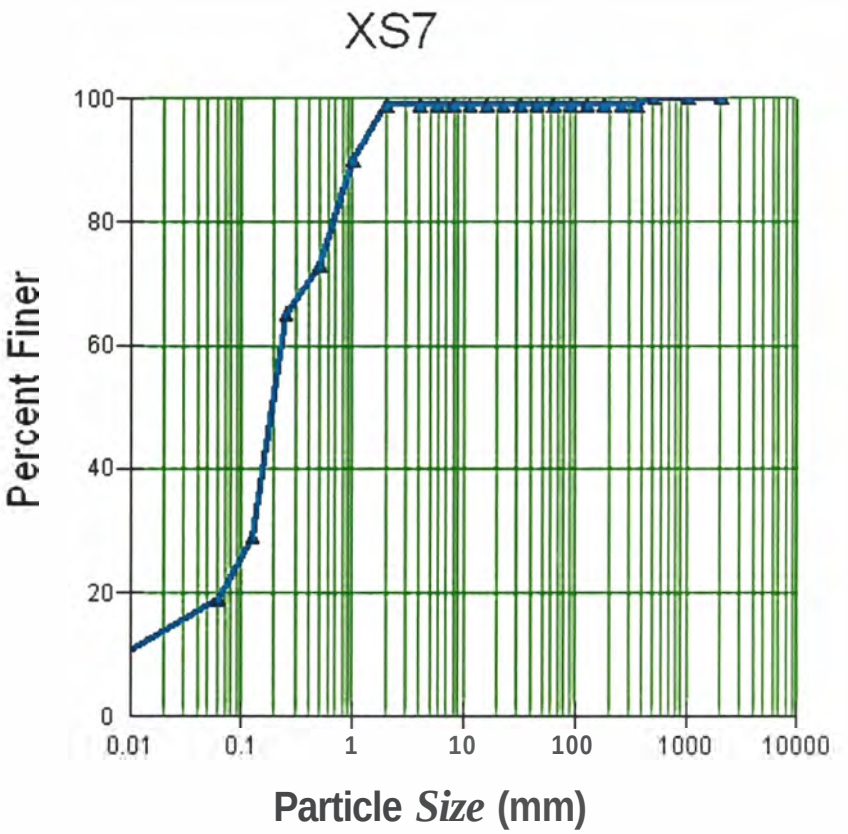


River Name: Little Beaver Creek
Reach Name: MY1_reach1
Sample Name: XS7

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	19	19.00	19.00
0.062 - 0.125	10	10.00	29.00
0.125 - 0.25	36	36.00	65.00
0.25 - 0.50	8	8.00	73.00
0.50 - 1.0	17	17.00	90.00
1.0 - 2.0	9	9.00	99.00
2.0 - 4.0	0	0.00	99.00
4.0 - 5.7	0	0.00	99.00
5.7 - 8.0	0	0.00	99.00
8.0 - 11.3	0	0.00	99.00
11.3 - 16.0	0	0.00	99.00
16.0 - 22.6	0	0.00	99.00
22.6 - 32.0	0	0.00	99.00
32 - 45	0	0.00	99.00
45 - 64	0	0.00	99.00
64 - 90	0	0.00	99.00
90 - 128	0	0.00	99.00
128 - 180	0	0.00	99.00
180 - 256	0	0.00	99.00
256 - 362	0	0.00	99.00
362 - 512	1	1.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	0.05		
D35 (mm)	0.15		
D50 (mm)	0.2		
D84 (mm)	0.82		
D95 (mm)	1.56		
D100 (mm)	511.98		
Silt/Clay (%)	19		
Sand (%)	80		
Gravel (%)	0		
Cobble (%)	0		
Boulder (%)	1		
Bedrock (%)	0		

Total Particles = 100.

Cross Section 7 Pebble Count

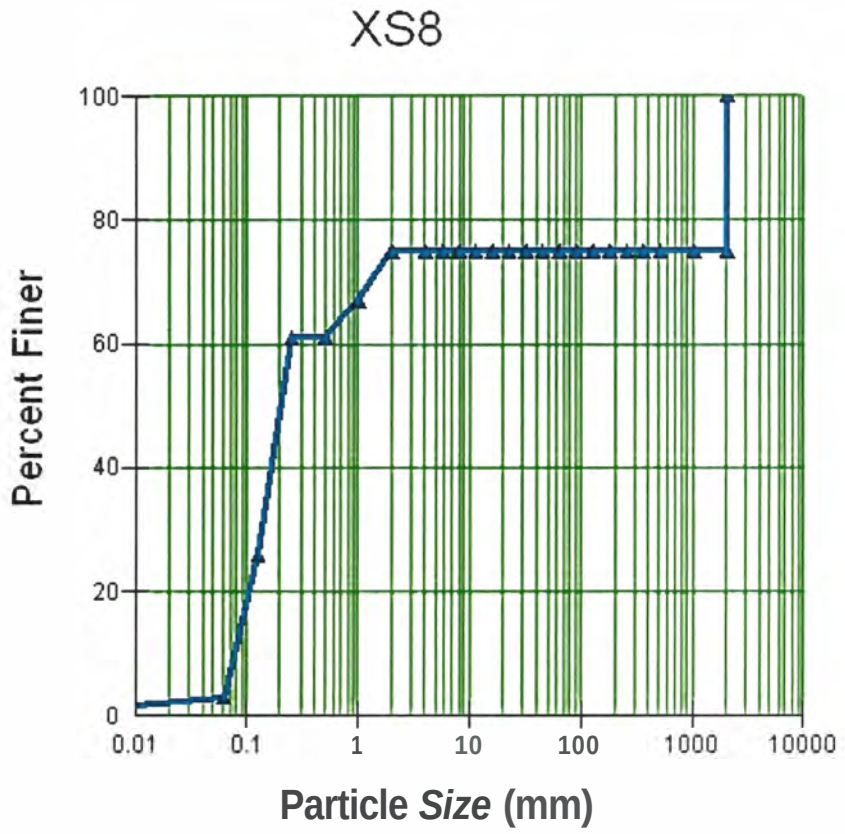


River Name: Little Beaver Creek
Reach Name: MY1_reach1
Sample Name: XS8

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	3	3.00	3.00
0.062 - 0.125	23	23.00	26.00
0.125 - 0.25	35	35.00	61.00
0.25 - 0.50	0	0.00	61.00
0.50 - 1.0	6	6.00	67.00
1.0 - 2.0	8	8.00	75.00
2.0 - 4.0	0	0.00	75.00
4.0 - 5.7	0	0.00	75.00
5.7 - 8.0	0	0.00	75.00
8.0 - 11.3	0	0.00	75.00
11.3 - 16.0	0	0.00	75.00
16.0 - 22.6	0	0.00	75.00
22.6 - 32.0	0	0.00	75.00
32 - 45	0	0.00	75.00
45 - 64	0	0.00	75.00
64 - 90	0	0.00	75.00
90 - 128	0	0.00	75.00
128 - 180	0	0.00	75.00
180 - 256	0	0.00	75.00
256 - 362	0	0.00	75.00
362 - 512	0	0.00	75.00
512 - 1024	0	0.00	75.00
1024 - 2048	0	0.00	75.00
Bedrock	25	25.00	100.00
D16 (mm)	0.1		
D35 (mm)	0.16		
D50 (mm)	0.21		
D84 (mm)	Bedrock		
D95 (mm)	Bedrock		
D100 (mm)	Bedrock		
Silt/Clay (%)	3		
Sand (%)	72		
Gravel (%)	0		
Cobble (%)	0		
Boulder (%)	0		
Bedrock (%)	25		

Total Particles = 100.

Cross Section 8 Pebble Count

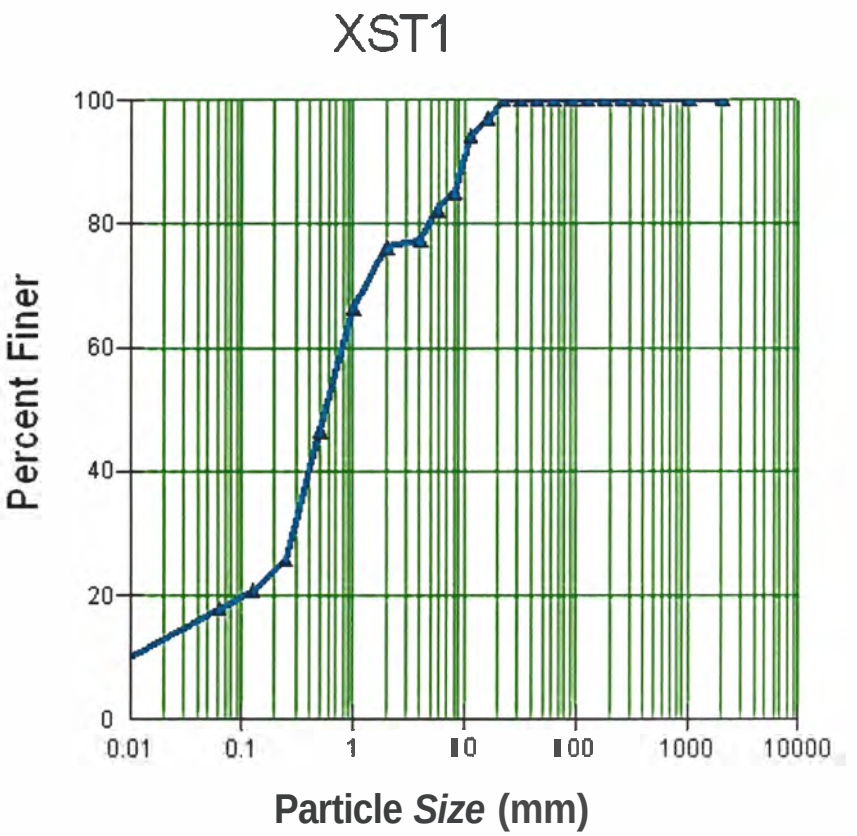


River Name: Little Beaver Creek
Reach Name: MY1_trib1
Sample Name: XST1

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	18	17.82	17.82
0.062 - 0.125	3	2.97	20.79
0.125 - 0.25	5	4.95	25.74
0.25 - 0.50	21	20.79	46.53
0.50 - 1.0	20	19.80	66.34
1.0 - 2.0	10	9.90	76.24
2.0 - 4.0	1	0.99	77.23
4.0 - 5.7	5	4.95	82.18
5.7 - 8.0	3	2.97	85.15
8.0 - 11.3	9	8.91	94.06
11.3 - 16.0	3	2.97	97.03
16.0 - 22.6	3	2.97	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	0.06		
D35 (mm)	0.36		
D50 (mm)	0.59		
D84 (mm)	7.11		
D95 (mm)	12.79		
D100 (mm)	22.6		
Silt/Clay (%)	17.82		
Sand (%)	58.42		
Gravel (%)	23.76		
Cobble (%)	0		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 101.

Trib 1 Cross Section 1 Pebble Count

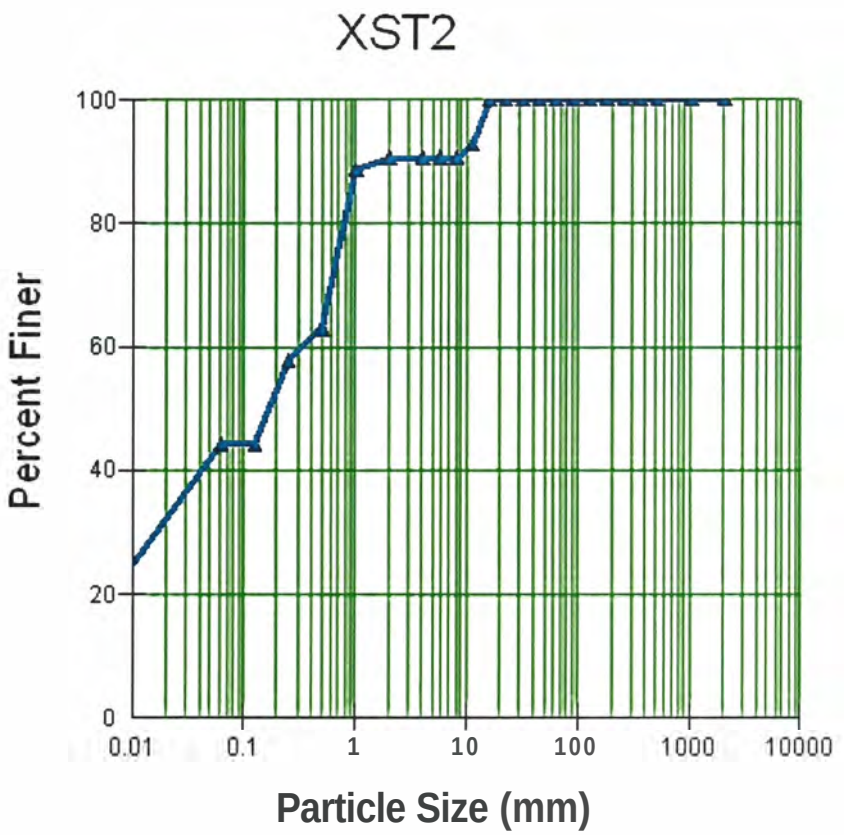


River Name: Little Beaver Creek
Reach Name: MY1_trib1
Sample Name: XST2

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	43	44.33	44.33
0.062 - 0.125	0	0.00	44.33
0.125 - 0.25	13	13.40	57.73
0.25 - 0.50	5	5.15	62.89
0.50 - 1.0	25	25.77	88.66
1.0 - 2.0	2	2.06	90.72
2.0 - 4.0	0	0.00	90.72
4.0 - 5.7	0	0.00	90.72
5.7 - 8.0	0	0.00	90.72
8.0 - 11.3	2	2.06	92.78
11.3 - 16.0	7	7.22	100.00
16.0 - 22.6	0	0.00	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	0.02		
D35 (mm)	0.05		
D50 (mm)	0.18		
D84 (mm)	0.91		
D95 (mm)	12.75		
D100 (mm)	16		
Silt/Clay (%)	44.33		
Sand (%)	46.39		
Gravel (%)	9.28		
Cobble (%)	0		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 97.

Trib 1 Cross Section 2 Pebble Count

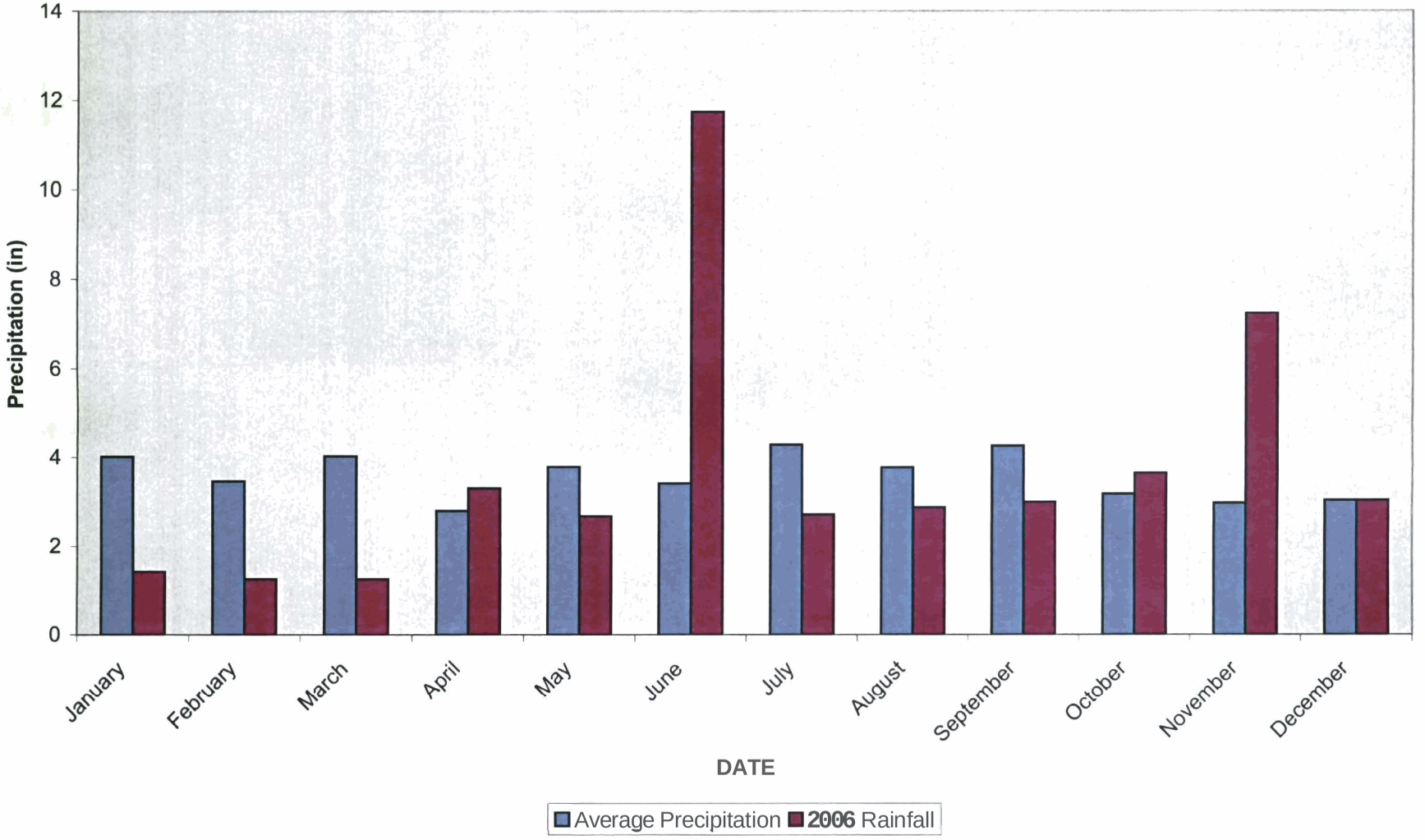


APPENDIX C

C-1 Precipitation-Water Level Plots

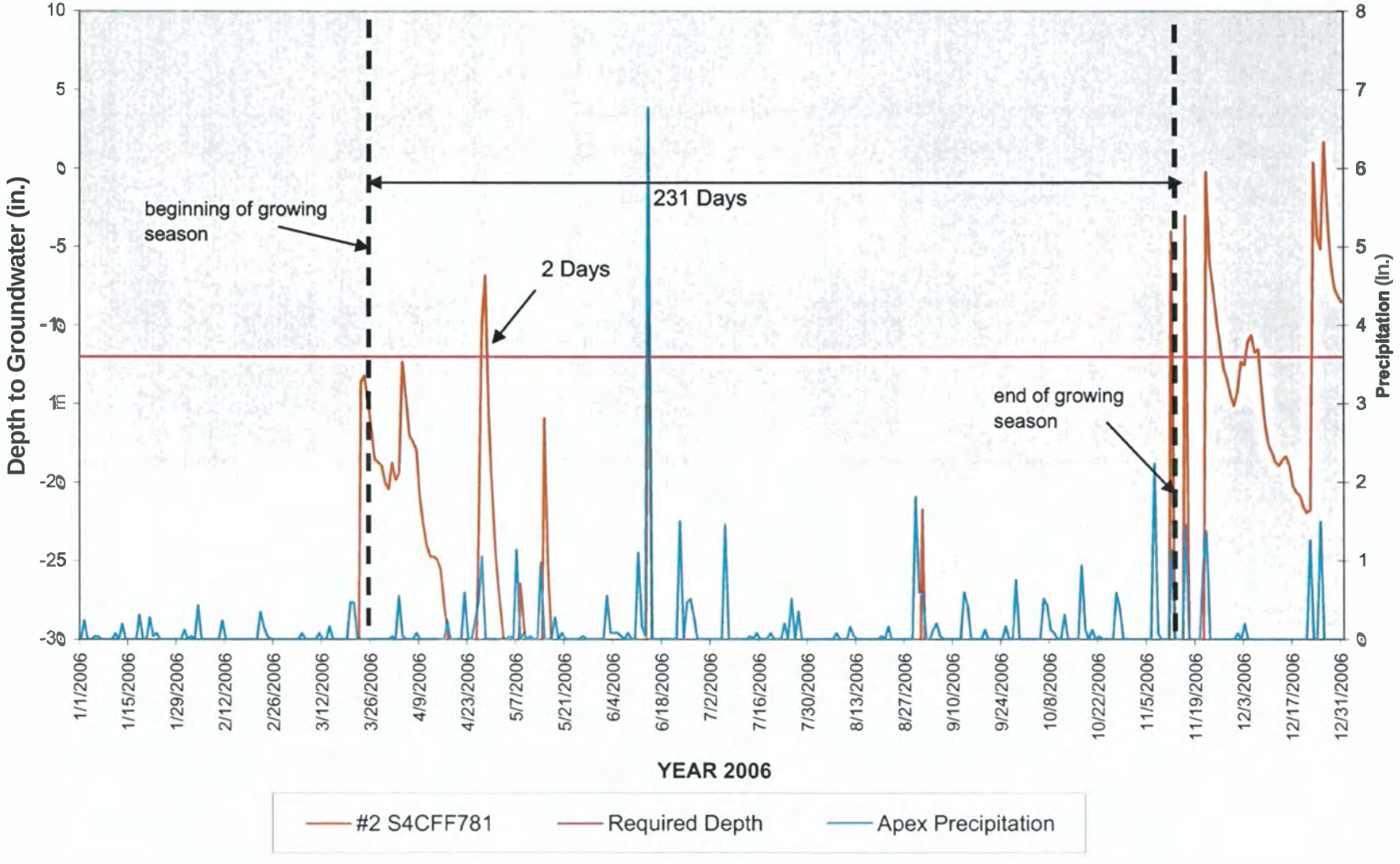
C-2 Data Tables for Hydrological Data

Little Beaver Creek Precipitation Graph
Apex, NC Data



Little Beaver Creek Stream Restoration Site
Year 1 Monitoring Report
Appendix C-1
Precipitation-Water Level Plots

Little Beaver Creek - Gauge 2



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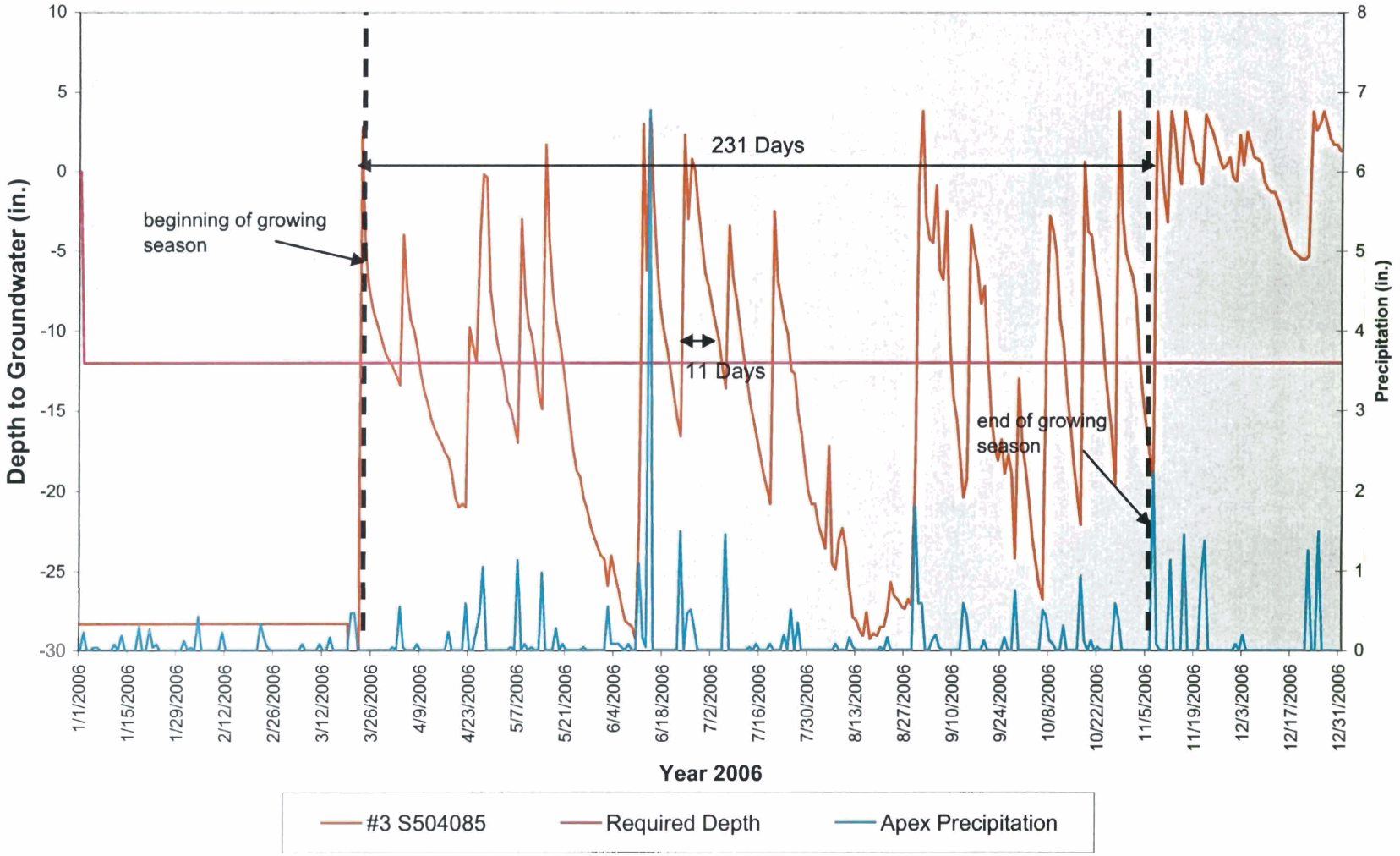
Appendix C-1
Precipitation-Water Level Plots

Little Beaver Creek - Gauge 3



Little Beaver Creek Stream Restoration Site
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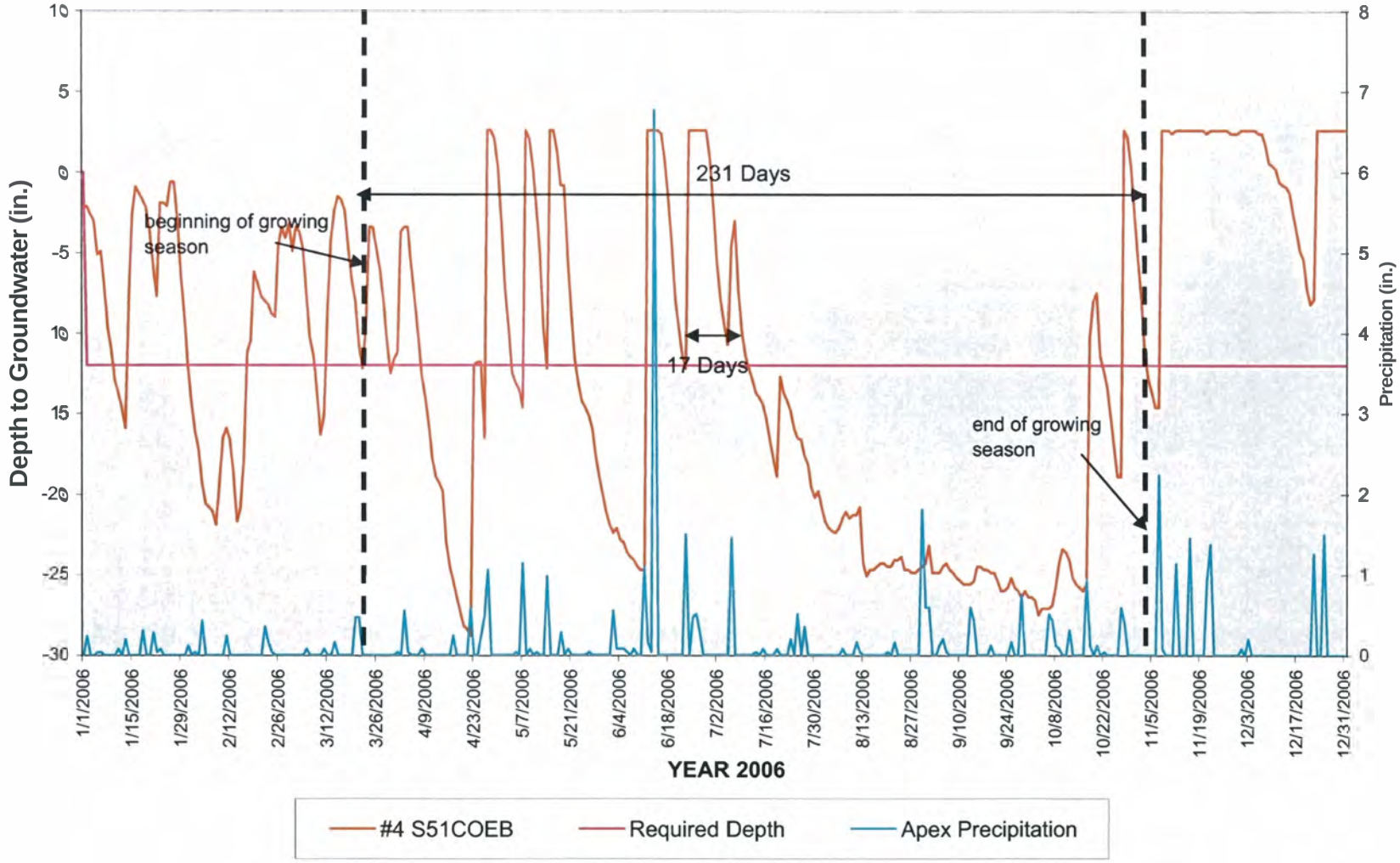
Appendix C-1
Precipitation-Water Level Plots

Little Beaver Creek - Gauge 4



Little Beaver Creek Stream Restoration Site
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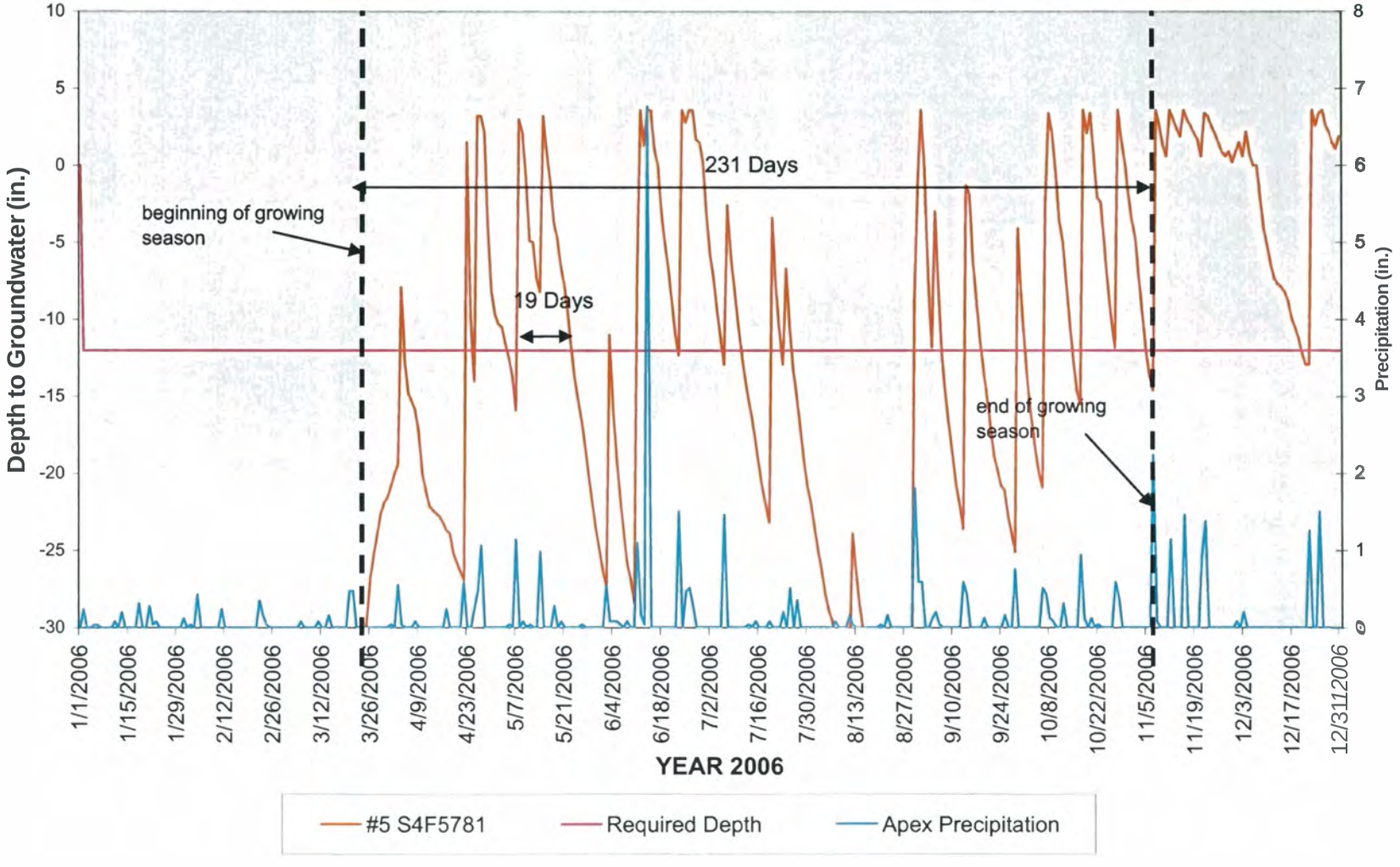
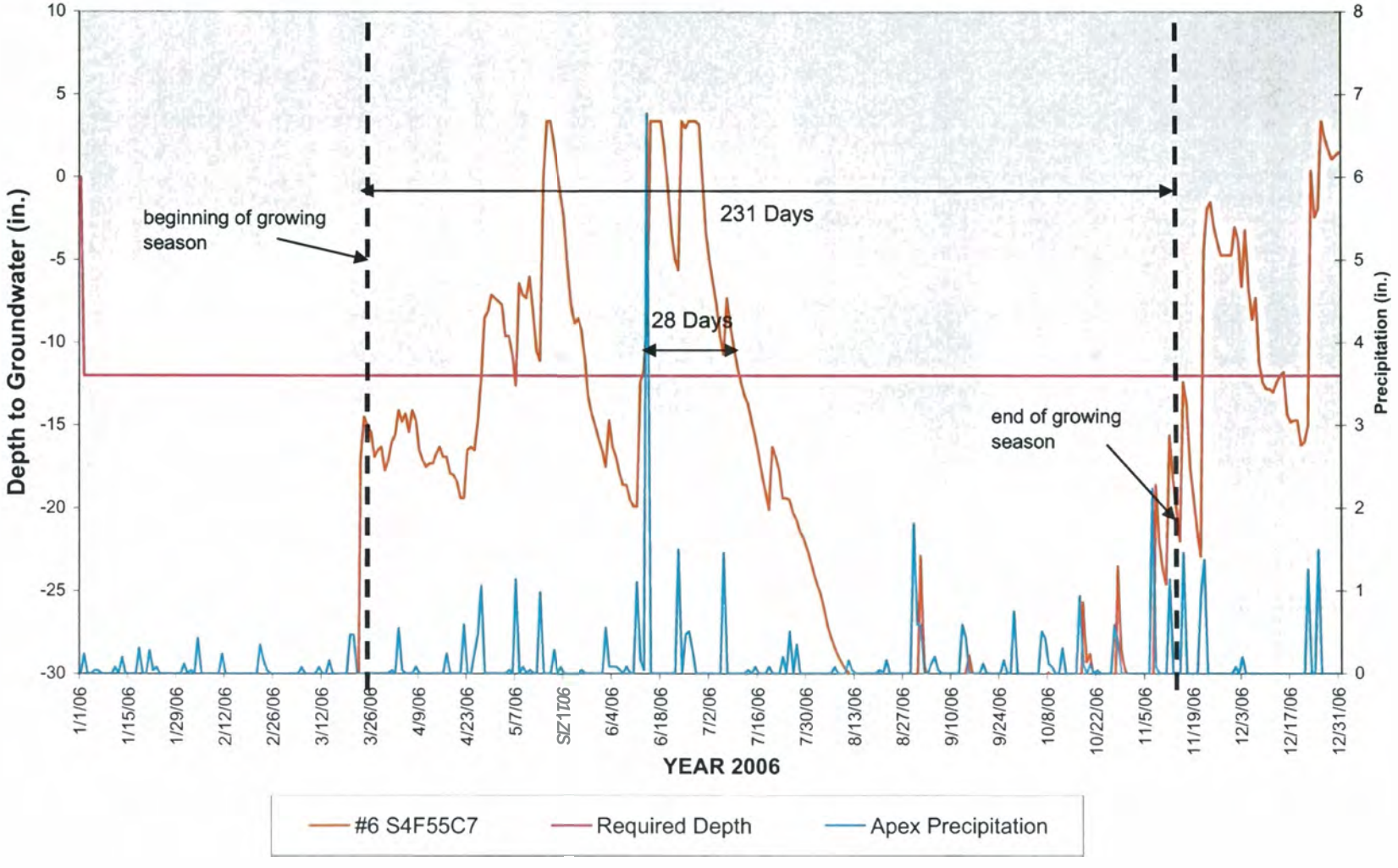
Precipitation-Water Level Plots

Little Beaver Creek - Gauge 5

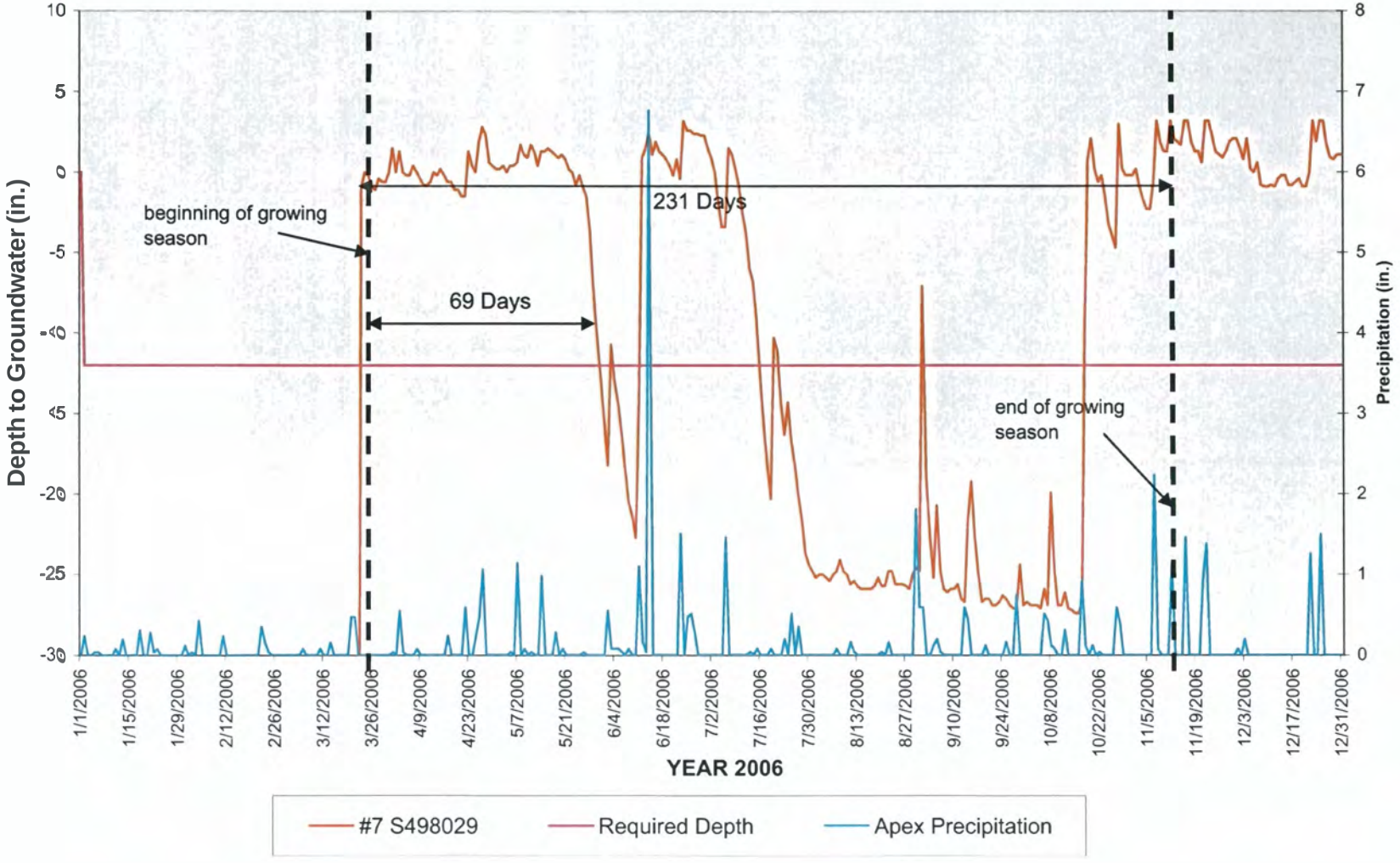


Little Beaver Creek - Gauge 6

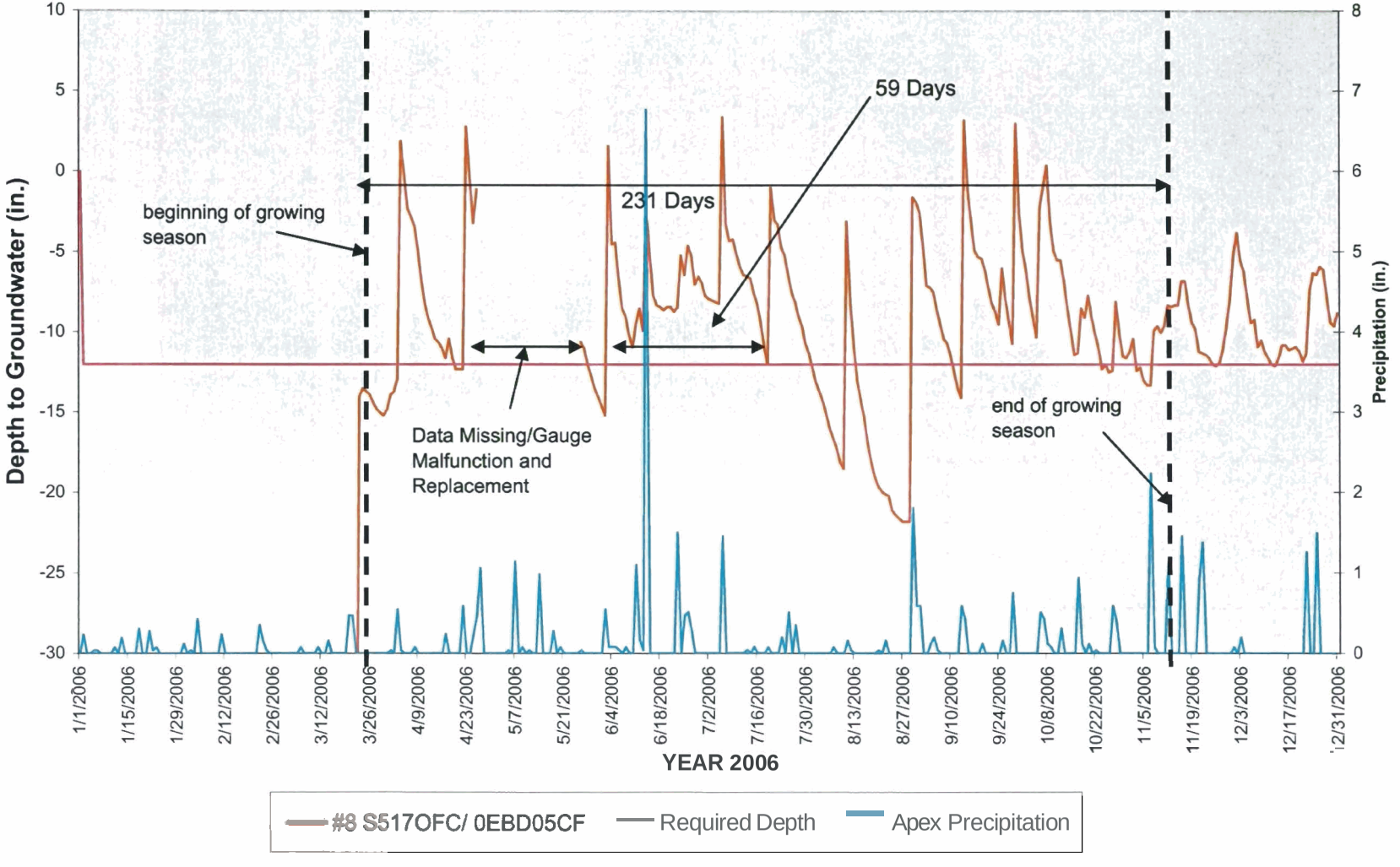


Little Beaver Creek Stream Restoration Site
Year 1 Monitoring Report
Appendix C-1
Precipitation-Water Level Plots

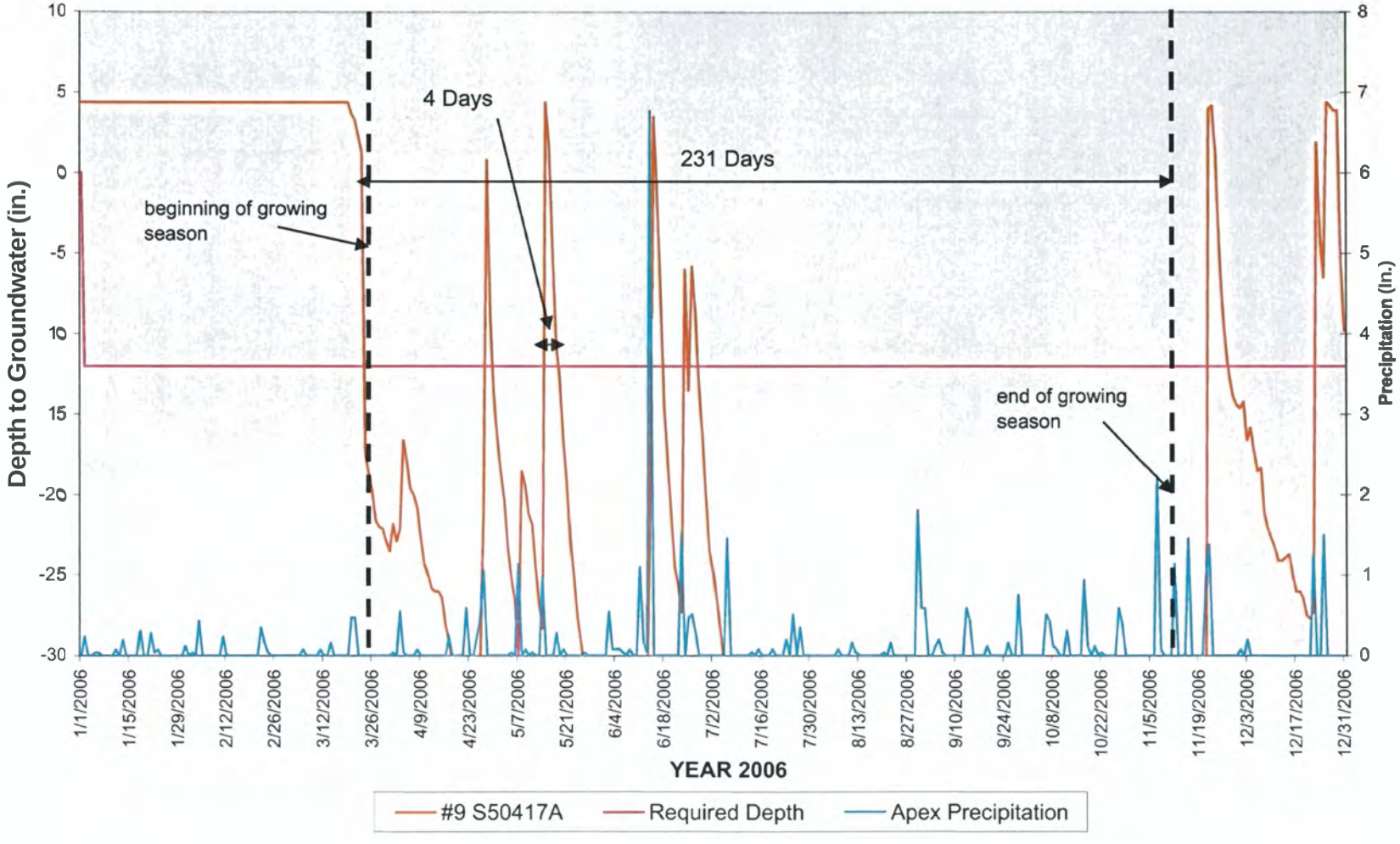
Little Beaver Creek - Gauge 7



Little Beaver Creek - Gauge 8



Little Beaver Creek - Gauge 9



Little Beaver Creek Stream Restoration Site
Mitigation Report
Appendix C-2
Hydrological Data Tables

Growing Season March 25 to Nov 10	#2 S4CFF781	#3 S504085	#4 S51COEB	#5 S4F5781	#6 S4F55C7	#7 S498029	#8 S517OFC/ 0EBD05CF	#9 S50417A	Apex Precipitation (inches)
1-Jan-06	-38.1	-28.3	-2.2	-38.1	-40.4	-41.7	-41.6	4.4	0
2-Jan-06	-38.3	-28.3	-2.1	-38.3	-40.8	-41.7	-41.6	4.4	0.24
3-Jan-06	-38.5	-28.3	-2.6	-38.5	-41	-41.7	-41.4	4.4	0
4-Jan-06	-38.5	-28.3	-3	-38.5	-41	-41.7	-41.6	4.4	0
5-Jan-06	-38.5	-28.3	-5.1	-38.5	-41	-41.7	-41.6	4.4	0.04
6-Jan-06	-38.5	-28.3	-4.9	-38.5	-41	-41.7	-41.6	4.4	0.04
7-Jan-06	-38.7	-28.3	-7.1	-38.7	-41	-41.9	-41.2	4.4	0
8-Jan-06	-38.7	-28.3	-9.7	-38.7	-41	-41.7	-41.6	4.4	0
9-Jan-06	-38.7	-28.3	-11	-38.7	-41	-41.7	-41.4	4.4	0
10-Jan-06	-38.7	-28.3	-12.9	-38.7	-41	-41.9	-41.4	4.4	0
11-Jan-06	-38.7	-28.3	-13.7	-38.7	-40.6	-41.7	-41	4.4	0.08
12-Jan-06	-38.7	-28.3	-14.6	-38.7	-40	-41.9	-41.4	4.4	0
13-Jan-06	-38.7	-28.3	-15.9	-38.7	-39.3	-41.7	-41.6	4.4	0.2
14-Jan-06	-38.7	-28.3	-8	-38.7	-39.5	-41.7	-41.6	4.4	0
15-Jan-06	-38.9	-28.3	-2.6	-38.9	-39.3	-41.7	-41.4	4.4	0
16-Jan-06	-38.7	-28.3	-0.9	-38.7	-39.1	-41.7	-41.6	4.4	0
17-Jan-06	-38.9	-28.3	-1.3	-38.9	-38.7	-41.7	-41.6	4.4	0
18-Jan-06	-38.5	-28.3	-1.7	-38.5	-38.3	-41.7	-41	4.4	0.31
19-Jan-06	-38.5	-28.3	-2.2	-38.5	-38.5	-41.7	-41	4.4	0
20-Jan-06	-38.5	-28.3	-3.6	-38.5	-38.5	-41.7	-41.2	4.4	0
21-Jan-06	-38.7	-28.3	-5.8	-38.7	-38.5	-41.9	-41.6	4.4	0.28
22-Jan-06	-38.9	-28.3	-7.7	-38.9	-38.5	-41.7	-41.4	4.4	0.04
23-Jan-06	-38.7	-28.3	-1.9	-38.7	-38.1	-41.7	-41.2	4.4	0.08
24-Jan-06	-38.9	-28.3	-1.9	-38.9	-38.3	-41.7	-41.6	4.4	0
25-Jan-06	-38.7	-28.3	-2.1	-38.7	-38.5	-41.7	-41.6	4.4	0
26-Jan-06	-38.9	-28.3	-0.6	-38.9	-38.7	-41.7	-41.6	4.4	0
27-Jan-06	-38.7	-28.3	-0.6	-38.7	-38.5	-41.7	-41.4	4.4	0
28-Jan-06	-38.5	-28.3	-3	-38.5	-38.5	-41.7	-41.6	4.4	0
29-Jan-06	-38.3	-28.3	-6.5	-38.3	-38.5	-41.7	-41.6	4.4	0
30-Jan-06	-38.1	-28.3	-9	-38.1	-38.5	-41.9	-41.6	4.4	0
31-Jan-06	-38.3	-28.3	-12.2	-38.3	-38.3	-41.7	-41.4	4.4	0.12
1-Feb-06	-38.3	-28.3	-14.4	-38.3	-38	-41.7	-41.6	4.4	0
2-Feb-06	-38.3	-28.3	-16.1	-38.3	-38.3	-41.7	-41.6	4.4	0.04
3-Feb-06	-40.6	-28.3	-17.2	-40.6	-38.3	-41.7	-41.6	4.4	0
4-Feb-06	-40.4	-28.3	-19.3	-40.4	-38.3	-41.9	-41.6	4.4	0.43
5-Feb-06	-40.6	-28.3	-20.6	-40.6	-38.1	-41.7	-41.6	4.4	0
6-Feb-06	-41	-28.3	-20.8	-41	-38.1	-41.7	-41.6	4.4	0
7-Feb-06	-40.4	-28.3	-21.1	-40.4	-37.4	-41.7	-41.6	4.4	0
8-Feb-06	-40.8	-28.3	-21.9	-40.8	-37.8	-41.9	-41.6	4.4	0
9-Feb-06	-40.8	-28.3	-19.3	-40.8	-37.8	-41.7	-41.6	4.4	0
10-Feb-06	-41	-28.3	-16.5	-41	-38	-41.7	-41.6	4.4	0
11-Feb-06	-40.8	-28.3	-15.9	-40.8	-38	-41.9	-41.7	4.4	0.24
12-Feb-06	-40.8	-28.3	-16.6	-40.8	-37.8	-41.7	-40	4.4	0
13-Feb-06	-41	-28.3	-18.7	-41	-37.6	-41.7	-41	4.4	0

14-Feb-06	-40.8	-28.3	-21.7	-40.8	-37.2	-41.7	-41.4	4.4	0
15-Feb-06	-41	-28.3	-20.9	-41	-37.6	-41.7	-41.2	4.4	0
16-Feb-06	-36.5	-28.3	-17.8	-36.5	-37.4	-41.7	-41	4.4	0
17-Feb-06	-37.6	-28.3	-11.2	-37.6	-35.9	-41.7	-41.2	4.4	0
18-Feb-06	-38.3	-28.3	-10.5	-38.3	-35.9	-41.7	-41.4	4.4	0
19-Feb-06	-38.7	-28.3	-6.2	-38.7	-35.9	-41.7	-41.4	4.4	0
20-Feb-06	-39.6	-28.3	-6.9	-39.6	-35.7	-41.7	-41.2	4.4	0
21-Feb-06	-40.8	-28.3	-7.7	-40.8	-36.5	-41.9	-41.4	4.4	0
22-Feb-06	-40.4	-28.3	-8	-40.4	-36.6	-41.7	-41.7	4.4	0.35
23-Feb-06	-40.4	-28.3	-8.2	-40.4	-36.8	-41.7	-41.6	4.4	0.16
24-Feb-06	-40.8	-28.3	-8.8	-40.8	-36.8	-41.7	-41.4	4.4	0.04
25-Feb-06	-40.8	-28.3	-9	-40.8	-37	-41.9	-41.4	4.4	0
26-Feb-06	-40.2	-28.3	-4.5	-40.2	-38.1	-41.9	-41.7	4.4	0
27-Feb-06	-40.2	-28.3	-3.4	-40.2	-36.8	-41.7	-41.6	4.4	0
28-Feb-06	-40	-28.3	-4.1	-40	-39.5	-41.7	-41.6	4.4	0
1-Mar-06	-40.8	-28.3	-3.2	-40.8	-41	-41.9	-41.6	4.4	0
2-Mar-06	-41	-28.3	-4.9	-41	-41.2	-41.7	-41.7	4.4	0
3-Mar-06	-39.8	-28.3	-3.4	-39.8	-40.2	-41.7	-41.6	4.4	0
4-Mar-06	-40.8	-28.3	-3.7	-40.8	-41.2	-41.9	-41.4	4.4	0
5-Mar-06	-40.8	-28.3	-4.7	-40.8	-41	-41.7	-41.6	4.4	0
6-Mar-06	-41	-28.3	-7.5	-41	-41	-41.7	-41.6	4.4	0.08
7-Mar-06	-41	-28.3	-10.3	-41	-41	-41.9	-41.6	4.4	0
8-Mar-06	-41	-28.3	-11.4	-41	-41	-41.7	-41.4	4.4	0
9-Mar-06	-41	-28.3	-13.7	-41	-41	-41.9	-41.6	4.4	0
10-Mar-06	-41	-28.3	-16.3	-41	-41	-41.7	-41.6	4.4	0
11-Mar-06	-41	-28.3	-15.1	-41	-41	-41.9	-41.7	4.4	0.08
12-Mar-06	-41	-28.3	-8.8	-41	-41	-41.9	-41.6	4.4	0
13-Mar-06	-41	-28.3	-4.3	-41	-41	-41.7	-41.6	4.4	0
14-Mar-06	-41	-28.3	-2.4	-41	-41	-41.9	-41.6	4.4	0.16
15-Mar-06	-41	-28.3	-1.5	-41	-41	-41.9	-41.7	4.4	0
16-Mar-06	-41	-28.3	-1.7	-41	-41	-41.9	-41.6	4.4	0
17-Mar-06	-41	-28.3	-2.4	-41	-41	-41.7	-41.6	4.4	0
18-Mar-06	-41	-28.3	-4.7	-41	-41	-41.7	-41.6	4.4	0
19-Mar-06	-41	-28.3	-6.7	-41	-41	-41.9	-41.6	4.4	0
20-Mar-06	-41.1	-41.7	-8	-41.1	-41.3	-41.9	-41.6	3.7	0.47
21-Mar-06	-41.1	-41.5	-10.7	-41.1	-41.3	-41.7	-41.6	3.3	0.47
22-Mar-06	-40.8	-40.4	-12.2	-40.8	-40.6	-41.9	-41.7	2.3	0
23-Mar-06	-13.6	2.8	-9.7	-34	-17.1	-0.9	-14	1.3	0
24-Mar-06	-13.2	-4.9	-3.4	-32	-14.5	0	-13.5	-17.5	0
25-Mar-06	-14.7	-7.2	-3.4	-29.2	-15	-0.2	-13.7	-18.7	0
26-Mar-06	-16.6	-8.5	-4.7	-26.7	-15.4	-0.9	-13.9	-19.8	0
27-Mar-06	-18.5	-9.3	-6	-25.2	-16.9	-1.1	-14.4	-21.6	0
28-Mar-06	-18.7	-10	-7.9	-23.9	-16.5	-0.4	-14.8	-22	0
29-Mar-06	-18.9	-10.8	-10.5	-22.6	-16.3	-0.6	-15	-22.1	0
30-Mar-06	-20	-11.5	-12.5	-21.9	-17.7	-0.6	-15.2	-22.9	0
31-Mar-06	-20.4	-11.9	-11.6	-21.5	-17.1	0	-14.8	-23.5	0
1-Apr-06	-18.7	-12.3	-11.2	-20.8	-16	1.5	-13.9	-21.8	0.04
2-Apr-06	-19.8	-12.8	-3.7	-20	-15.6	0	-13.7	-22.9	0
3-Apr-06	-19.4	-13.4	-3.4	-19.4	-14.1	1.3	-12.9	-22.1	0.55

4-Apr-06	-12.3	-4	-3.4	-7.9	-14.8	0	1.9	-16.6	0.04
5-Apr-06	-14.5	-7.4	-5.8	-12.7	-14.3	-0.2	-0.2	-17.9	0
6-Apr-06	-17	-9.3	-7.9	-14.8	-15.4	-0.2	-2.3	-19.6	0
7-Apr-06	-17.4	-10	-10.1	-15.3	-14.1	0.4	-2.8	-20	0
8-Apr-06	-17.9	-11.1	-12.7	-15.9	-14.7	0	-3.4	-20.8	0.08
9-Apr-06	-21	-12.7	-14	-17.4	-16.5	-0.4	-4.9	-22.7	0
10-Apr-06	-22.7	-13.8	-15.7	-20	-17.1	-0.8	-6.8	-24.3	0
11-Apr-06	-24	-14.5	-17.8	-21.1	-17.5	-0.8	-8.2	-25	0
12-Apr-06	-24.7	-15.5	-18.9	-22.1	-17.3	-0.6	-9.1	-25.8	0
13-Apr-06	-24.7	-16.1	-19.3	-22.4	-17.3	0	-9.7	-26	0
14-Apr-06	-24.9	-16.6	-19.8	-22.6	-16.7	-0.2	-10.4	-26	0
15-Apr-06	-25.5	-17	-23	-22.8	-16.3	0.2	-10.6	-26.4	0
16-Apr-06	-27.8	-17.6	-24.5	-23.2	-16.9	-0.2	-11	-28.1	0
17-Apr-06	-29.5	-17.9	-25.4	-23.7	-16.9	-0.6	-11.6	-29.1	0.24
18-Apr-06	-31.2	-18.9	-26.4	-23.9	-17.9	-0.6	-10.4	-30.6	0
19-Apr-06	-32.1	-20.4	-27.3	-25.2	-18	-1.1	-11.6	-31.2	0
20-Apr-06	-32.9	-21	-28.2	-25.8	-18.4	-1.1	-12.3	-32.2	0
21-Apr-06	-33.8	-20.8	-28.4	-26.4	-19.4	-1.5	-12.3	-33.3	0
22-Apr-06	-34.9	-21	-28.8	-26.9	-19.4	-1.5	-12.3	-34.3	0.59
23-Apr-06	-31.7	-9.8	-12	1.5	-16.5	1.3	2.8	-32	0
24-Apr-06	-32.9	-11	-11.8	-9.9	-16.3	0.4	-0.4	-32	0
25-Apr-06	-34	-11.9	-11.8	-14	-16.5	0	-3.2	-33.3	0.24
26-Apr-06	-23.2	-4.3	-16.5	3.2	-14.8	1.9	-1.1	-29.8	0.47
27-Apr-06	-10	-0.2	2.6	3.2	-12.2	2.8		-20.6	1.06
28-Apr-06	-6.8	-0.4	2.6	2.2	-8.5	2.3		0.8	0
29-Apr-06	-15.9	-7.4	2.1	-4.1	-8.1	0.6		-9	0
30-Apr-06	-20.8	-9.3	0.4	-8.2	-7.1	0.4		-13.9	0
1-May-06	-24.7	-10.8	-3.2	-9.7	-7.3	0.2		-16.6	0
2-May-06	-27.4	-11.7	-7.3	-10.3	-7.5	0.2		-18.7	0
3-May-06	-29.5	-12.8	-9.7	-10.5	-7.7	0.4		-20.4	0
4-May-06	-32.7	-14.4	-12.5	-11.6	-9.6	0		-23.3	0
5-May-06	-35.7	-14.9	-13.1	-12.5	-9.6	0.4		-25.2	0.04
6-May-06	-36.4	-15.9	-13.5	-13.7	-10.7	0.4		-26.6	0
7-May-06	-36.4	-17	-14.6	-15.9	-12.6	0.6		-30	1.14
8-May-06	-26.4	-3	2.6	3	-6.4	1.7		-18.5	0
9-May-06	-28.9	-7.7	2.1	2.1	-7.1	1.1		-19.4	0.08
10-May-06	-31.5	-9.6	0.4	-0.9	-7.3	0.9		-21.2	0
11-May-06	-32.3	-10.4	-2.1	-4.9	-6	1.7		-21.8	0.04
12-May-06	-33.8	-11.9	-4.9	-5	-8.1	1.3		-24.5	0
13-May-06	-36.6	-14	-9.7	-7.3	-10.5	0.4		-26.8	0
14-May-06	-36.4	-14.9	-12.2	-8.2	-11.1	1.3		-28.3	0.98
15-May-06	-15.9	1.7	2.6	3.2	-0.2	1.3		4.4	0
16-May-06	-25.1	-4.3	2.6	0.9	3.4	1.5		1.7	0
17-May-06	-30.2	-7.7	1.3	-1.1	3.4	1.3		-4.8	0
18-May-06	-32.5	-9.4	-0.8	-3.7	2.1	1.1		-10.6	0.28
19-May-06	-33.8	-10.6	-0.8	-4.7	0.6	0.9		-12.7	0
20-May-06	-36.3	-12.1	-5.2	-6.5	-0.9	1.1		-16.4	0.08
21-May-06	-36.6	-13.8	-8.6	-7.7	-2.4	0.8		-19.1	0
22-May-06	-36.6	-15.7	-11.6	-9.5	-5.3	0.2		-22.9	0

23-May-06	-36.6	-17.4	-13.1	-11.8	-7.7	0		-25.2	0
24-May-06	-36.6	-18.7	-14.2	-13.8	-8.8	-0.8		-27.7	0
25-May-06	-36.4	-19.1	-14.6	-15.3	-8.5	-0.2		-29.3	0
26-May-06	-36.6	-20.4	-15.1	-16.6	-9.2	-0.9	-10.6	-31.2	0.04
27-May-06	-36.6	-21.1	-15.9	-18.3	-10.9	-1.5	-11	-32.3	0
28-May-06	-36.6	-22.1	-17.6	-20.2	-13.3	-3.6	-12	-33.3	0
29-May-06	-36.6	-22.8	-18.9	-21.9	-14.3	-7.3	-12.7	-33.7	0
30-May-06	-36.6	-23.4	-20	-23.6	-15	-10.1	-13.5	-33.9	0
31-May-06	-36.6	-24	-21.1	-24.9	-15.8	-12.6	-14	-33.7	0
1-Jun-06	-36.6	-24.2	-21.9	-26.4	-16.5	-15.4	-14.6	-33.9	0
2-Jun-06	-36.6	-25.9	-22.4	-27.3	-17.5	-18.2	-15.2	-33.9	0.55
3-Jun-06	-36.3	-24	-22.1	-11	-14.7	-10.7	1.6	-33.5	0.08
4-Jun-06	-36.3	-25.1	-22.8	-15.7	-16.3	-13	-4.5	-33.7	0.08
5-Jun-06	-36.3	-26.1	-23	-18.9	-16.9	-14.3	-4.4	-33.7	0.08
6-Jun-06	-36.4	-27.2	-23.6	-21.5	-17.9	-16.2	-6.7	-33.7	0.04
7-Jun-06	-35.9	-28.1	-23.9	-23.7	-18.6	-18.4	-8.5	-33.5	0
8-Jun-06	-35.9	-28.3	-24.1	-25.8	-18.6	-20.5	-9	-33.5	0.08
9-Jun-06	-36.1	-28.5	-24.5	-26.9	-19.5	-21.4	-10.2	-33.3	0
10-Jun-06	-36.1	-29.3	-24.7	-28.4	-19.9	-22.7	-10.9	-33.5	0
11-Jun-06	-36.1	-21.7	-24.7	-7.1	-19.9	-14.1	-9.4	-33.3	1.1
12-Jun-06	-36.3	3	2.6	3.6	-12.4	0.9	-8.5	-34.5	0.16
13-Jun-06	-36.4	-6.2	2.6	1.3	-11.7	1.5	-9.9	-32.3	0.04
14-Jun-06	1.1	3.8	2.6	3.6	-8.5	2.4	-2.4	-19.3	6.77
15-Jun-06	-35.9	-1.7	2.6	3.6	3.4	1.1	-5.2	3.5	0
16-Jun-06	-35.9	-5.7	2.4	1.1	3.4	1.9	-7.7	-1.3	0
17-Jun-06	-36.1	-8.5	0.7	0	3.4	1.3	-8.3	-7.7	0
18-Jun-06	-36.1	-10	-1.7	-3	3.4	1.1	-8.4	-14.4	0
19-Jun-06	-36.1	-11.1	-4.5	-5	1.7	0.8	-8.6	-17.9	0
20-Jun-06	-36.1	-12.5	-7.9	-6.7	-0.6	0.4	-8.4	-21.2	0
21-Jun-06	-36.1	-14	-9.7	-8.8	-3.2	-0.2	-8.4	-24.5	0
22-Jun-06	-36.1	-15.5	-11.4	-11	-4.9	0.8	-8.7	-25.6	0
23-Jun-06	-36.1	-16.6	-12.2	-12.3	-5.6	-0.4	-8.4	-27.3	1.5
24-Jun-06	-35.9	2.3	2.6	3.6	3.4	3.2	-5.2	-6	0
25-Jun-06	-35.7	-3	2.6	2.8	3	2.6	-6.4	-13.5	0.47
26-Jun-06	-35.7	0.8	2.6	3.6	3.4	2.6	-4.6	-5.8	0.51
27-Jun-06	-35.7	0	2.6	3.6	3.4	2.4	-5.2	-8.7	0.28
28-Jun-06	-35.9	-2.5	2.6	1.7	3.4	2.4	-7	-13.1	0
29-Jun-06	-35.9	-4.5	2.6	1.5	3.2	2.3	-6.5	-16.2	0
30-Jun-06	-35.9	-6.4	0.9	0.2	-0.2	2.3	-6.9	-20	0
1-Jul-06	-35.9	-7.2	-2.1	-3.2	-3.4	1.5	-7.7	-23.5	0
2-Jul-06	-35.7	-8.5	-5.6	-5.8	-5.1	0.9	-7.9	-24.8	0
3-Jul-06	-35.7	-9.6	-7.9	-7.3	-6.4	0	-8	-26.6	0
4-Jul-06	-35.7	-10.6	-9.4	-9.4	-7.7	-1.9	-8.1	-28.5	0
5-Jul-06	-35.9	-12.3	-10.7	-11.2	-9.6	-3.4	-8.2	-30.4	0
6-Jul-06	-35.7	-13.6	-4.5	-12.9	-10.7	-3.4	3.4	-32	1.46
7-Jul-06	-35.1	-3.4	-3	-2.6	-7.3	1.5	-3.3	-35.2	0
8-Jul-06	-35.1	-6.6	-7.3	-5.8	-9	1.1	-4.3	-35.4	0
9-Jul-06	-35.1	-7.9	-9.9	-7.9	-10.3	0.2	-4.2	-35.2	0
10-Jul-06	-35.5	-9.6	-11.4	-10.1	-11.5	-0.9	-5.1	-35.2	0

11-Jul-06	-35.5	-11.3	-12.2	-12	-12.4	-2.6	-5.9	-35.2	0
12-Jul-06	-35.5	-12.8	-12.9	-13.7	-13.2	-3.8	-6.4	-35.2	0
13-Jul-06	-35.5	-14.4	-13.7	-15.1	-13.7	-6	-6.5	-35.2	0.04
14-Jul-06	-35.3	-15.5	-14	-16.3	-14.7	-6.8	-6.6	-35	0
15-Jul-06	-35.5	-16.6	-14.4	-17.8	-15.6	-9.2	-7.5	-35	0.08
16-Jul-06	-35.5	-17.7	-15.3	-19.4	-16.7	-12.6	-8.2	-35	0
17-Jul-06	-35.5	-18.9	-16.6	-20.9	-17.9	-15.6	-9.3	-35	0
18-Jul-06	-35.5	-19.8	-17.8	-22.1	-19	-18.2	-10.9	-34.9	0
19-Jul-06	-35.5	-20.8	-18.9	-23.2	-20.1	-20.3	-12	-35	0.08
20-Jul-06	-35.5	-2.5	-12.7	-3.4	-16.3	-10.3	-1	-35.4	0
21-Jul-06	-35.7	-6.8	-13.7	-7.9	-16.9	-11.1	-3	-35.2	0
22-Jul-06	-35.9	-8.1	-14.2	-10.7	-17.7	-14.3	-3.3	-35.2	0
23-Jul-06	-35.7	-9.4	-14.8	-12.9	-19.4	-16.3	-4.7	-35.2	0.2
24-Jul-06	-35.5	-10.2	-15.9	-6.7	-19.4	-14.3	-5.2	-35	0
25-Jul-06	-35.5	-12.5	-16.5	-10.5	-19.5	-16.7	-6.4	-35	0.51
26-Jul-06	-35.5	-12.7	-16.6	-13.3	-20.3	-18.2	-7.5	-35	0
27-Jul-06	-35.5	-15.1	-17.6	-15	-20.7	-20.1	-8.1	-34.9	0.35
28-Jul-06	-35.7	-16.4	-18.1	-17	-21.4	-21.6	-9	-34.9	0
29-Jul-06	-35.7	-18.3	-19.6	-19.1	-21.8	-23.7	-9.6	-34.9	0
30-Jul-06	-35.7	-20	-20.2	-20.8	-22.4	-24.4	-10.7	-34.9	0
31-Jul-06	-35.7	-20.8	-19.8	-21.9	-23.1	-24.8	-11.3	-35	0
1-Aug-06	-35.7	-20.8	-20.8	-23.4	-23.9	-25.2	-12.2	-35	0
2-Aug-06	-35.7	-22.1	-21.7	-24.9	-24.6	-25	-13.1	-34.9	0
3-Aug-06	-35.7	-22.8	-22.1	-26.2	-25.2	-25	-13.7	-34.9	0
4-Aug-06	-35.7	-23.6	-22.3	-27.7	-26.1	-25.2	-14.3	-34.9	0
5-Aug-06	-35.7	-17.2	-22.4	-28.8	-27.1	-25.4	-15.1	-34.9	0
6-Aug-06	-35.5	-24.5	-22.1	-29.5	-27.8	-25	-16	-34.9	0
7-Aug-06	-35.5	-24.9	-21.5	-30.5	-28.4	-24.8	-16.6	-34.7	0.08
8-Aug-06	-35.3	-23	-21.1	-31.4	-28.9	-24.1	-17.2	-34.7	0
9-Aug-06	-35.5	-22.3	-21.5	-32	-29.3	-24.8	-18.1	-34.7	0
10-Aug-06	-35.5	-23.6	-21.3	-32.4	-29.7	-25	-18.5	-34.7	0
11-Aug-06	-35.5	-26.1	-21.3	-32.5	-29.9	-25.6	-3.1	-34.5	0.16
12-Aug-06	-35.5	-27.9	-20.8	-23.9	-30.6	-25.4	-8	-34.5	0.04
13-Aug-06	-35.3	-28.1	-24.3	-26.4	-31.2	-25.7	-10.8	-34.5	0
14-Aug-06	-35.1	-28.7	-25.1	-28.6	-31.4	-25.9	-13	-34.1	0
15-Aug-06	-35.3	-29.1	-24.7	-30.1	-31.4	-25.9	-14.2	-33.9	0
16-Aug-06	-35.5	-27.6	-24.7	-31.2	-32.1	-25.9	-15.3	-34.5	0
17-Aug-06	-35.5	-29.3	-24.5	-32.7	-32.3	-25.9	-16.9	-34.7	0
18-Aug-06	-35.5	-28.9	-24.3	-33.7	-32.9	-25.7	-18.1	-34.7	0
19-Aug-06	-35.3	-29.1	-24.3	-33.7	-32.9	-25.2	-19	-34.7	0
20-Aug-06	-35.5	-28.5	-24.5	-33.7	-33.4	-25.7	-19.6	-34.3	0.04
21-Aug-06	-35.7	-28.5	-24.5	-33.8	-34	-25.7	-19.9	-34.5	0
22-Aug-06	-35.3	-27.6	-24.1	-33.7	-34.2	-24.8	-20.1	-34.5	0.16
23-Aug-06	-35.1	-25.7	-24.1	-33.7	-34.2	-24.8	-20.2	-34.1	0
24-Aug-06	-35.5	-26.6	-23.9	-33.8	-34.6	-25.6	-21.1	-34.3	0
25-Aug-06	-35.5	-26.8	-24.7	-33.8	-35	-25.6	-21.4	-34.3	0
26-Aug-06	-35.5	-27.2	-24.7	-33.8	-35.5	-25.6	-21.6	-34.1	0
27-Aug-06	-35.7	-27.4	-24.9	-34	-35.5	-25.7	-21.8	-34.3	0
28-Aug-06	-35.5	-26.8	-24.9	-33.8	-35.7	-25.9	-21.8	-34.3	0

29-Aug-06	-35.5	-27.2	-24.7	-33.8	-35.5	-25	-21.8	-34.3	0
30-Aug-06	-35.3	-19.4	-24.5	-9	-35.1	-24.6	-1.6	-35.4	1.81
31-Aug-06	-35.7	-0.6	-24.3	-1.5	-31.6	-24.8	-1.9	-35.4	0.59
1-Sep-06	-21.7	3.8	-23.2	3.6	-22.9	-7.1	-2.5	-35	0.59
2-Sep-06	-35.7	-2.8	-24.9	-0.2	-29.5	-18.8	-4.5	-35.4	0
3-Sep-06	-35.7	-4.3	-24.9	-7.3	-30.4	-22.6	-7.1	-35.4	0
4-Sep-06	-35.7	-4.5	-24.9	-11.8	-31	-25.2	-7.2	-35.2	0.12
5-Sep-06	-35.5	-0.9	-24.5	-3	-30.4	-20.7	-7.5	-35.4	0.2
6-Sep-06	-35.9	-6.2	-24.3	-8.2	-30.1	-24.8	-8.6	-35.6	0.04
7-Sep-06	-35.7	-6.8	-24.7	-12.5	-30.6	-25.9	-9.5	-35.6	0
8-Sep-06	-35.7	-2.5	-24.9	-15	-31.6	-26.1	-10.4	-35.2	0
9-Sep-06	-35.5	-10.6	-25.2	-17	-31.9	-25.9	-10.7	-35.6	0
10-Sep-06	-35.7	-14.2	-25.4	-18.9	-32.5	-25.9	-11.5	-35.2	0
11-Sep-06	-35.7	-15.5	-25.6	-20.8	-32.9	-25.6	-12.5	-35.4	0
12-Sep-06	-35.5	-17.9	-25.6	-22.1	-33.4	-26.5	-13.5	-35	0
13-Sep-06	-35.5	-20.4	-25.6	-23.6	-33.6	-26.7	-14.1	-34.9	0.59
14-Sep-06	-35.3	-19.3	-25.4	-1.3	-29.9	-21.6	3.2	-35	0.43
15-Sep-06	-35.5	-3.4	-24.5	-1.9	-28.9	-19.2	-1.1	-35	0
16-Sep-06	-35.5	-4.9	-24.5	-6.2	-30.1	-22.7	-3.1	-35.2	0
17-Sep-06	-35.5	-6	-24.7	-8.8	-30.8	-25	-4.9	-35.2	0
18-Sep-06	-35.7	-8.3	-24.7	-11.4	-31.2	-26.7	-5.3	-35.2	0
19-Sep-06	-35.9	-7.2	-24.9	-13.3	-31.4	-26.5	-5.4	-35	0.12
20-Sep-06	-35.9	-11.5	-24.9	-15.1	-32.1	-26.5	-6.1	-35	0
21-Sep-06	-35.7	-15.3	-25.4	-17	-33.3	-26.9	-7.2	-35.2	0
22-Sep-06	-35.7	-17.2	-26	-18.9	-33.6	-26.9	-8.2	-35.2	0
23-Sep-06	-35.9	-18.1	-26	-19.8	-33.6	-26.7	-8.7	-35.2	0
24-Sep-06	-36.1	-16.8	-25.8	-20.8	-33.6	-26.3	-9.5	-35.2	0
25-Sep-06	-35.9	-18.9	-25.2	-21.1	-33.8	-26.5	-6	-35.4	0.16
26-Sep-06	-36.1	-17.7	-25.8	-22.8	-34.4	-26.9	-8	-35.6	0
27-Sep-06	-35.7	-18.9	-26	-23.9	-35.1	-27.1	-9.4	-35.4	0
28-Sep-06	-35.9	-24.2	-26.4	-25.1	-35.5	-27.1	-10.7	-35.2	0.75
29-Sep-06	-35.9	-13	-26	-4.1	-32.7	-24.4	3	-35.6	0
30-Sep-06	-36.1	-17	-26.4	-8.6	-34.2	-26.9	-2.6	-35.6	0
1-Oct-06	-36.1	-18.5	-26.4	-11.8	-35	-26.7	-4.9	-35.6	0
2-Oct-06	-36.1	-20.4	-26.6	-14.6	-35.7	-26.9	-6.1	-35.8	0
3-Oct-06	-36.1	-22.8	-27.5	-16.6	-35.9	-26.9	-7.8	-35.8	0
4-Oct-06	-36.1	-24.4	-27.1	-18.5	-36.1	-26.9	-9.1	-35.8	0
5-Oct-06	-36.3	-25.9	-27.1	-20	-36.1	-27.1	-10.3	-35.8	0
6-Oct-06	-36.1	-26.8	-27.1	-20.9	-34.6	-25.9	-2.2	-35.8	0.51
7-Oct-06	-36.1	-11	-26.9	-2.4	-33.3	-26.9	-0.9	-36	0.43
8-Oct-06	-35.9	-2.8	-25.8	3.4	-29.9	-19.9	0.4	-35.8	0.12
9-Oct-06	-36.1	-3.8	-24.3	2.1	-31.4	-24.8	-3.1	-35.8	0.08
10-Oct-06	-36.1	-5.3	-23.4	-0.4	-31.9	-26.9	-4.9	-35.8	0
11-Oct-06	-36.1	-9.3	-23.6	-3.6	-32.3	-26.9	-5.5	-35.8	0
12-Oct-06	-35.9	-10.8	-24.1	-4.9	-32.5	-26.1	-5.5	-35.6	0.31
13-Oct-06	-36.1	-13.8	-25.2	-7.5	-33.6	-27.1	-6.8	-35.8	0
14-Oct-06	-36.3	-15.9	-25.6	-10.1	-34.4	-27.2	-8.5	-36	0
15-Oct-06	-36.4	-18.3	-25.8	-12.5	-35.1	-27.4	-9.9	-36	0
16-Oct-06	-36.4	-20.2	-26	-14.6	-35.5	-27.4	-11.4	-36.2	0

17-Oct-06	-36.3	-22.1	-25.6	-15.5	-35.5	-26.7	-11.3	-36	0.94
18-Oct-06	-36.1	0.6	-10.3	3.6	-25.7	-10	-8.5	-35.8	0.12
19-Oct-06	-36.3	-3.8	-8	2.1	-29.3	0.8	-9.1	-35.6	0
20-Oct-06	-36.1	-4	-7.5	3.4	-28.8	2.1	-7.7	-35.8	0.12
21-Oct-06	-36.3	-5.9	-11.4	0.6	-30.3	0.2	-9.1	-35.8	0
22-Oct-06	-36.3	-7.2	-12.3	-2.1	-30.3	-0.6	-10.1	-35.8	0.04
23-Oct-06	-36.3	-9.3	-13.3	-2.4	-31.2	-0.2	-11	-35.6	0
24-Oct-06	-36.4	-12.3	-15.1	-5	-32.1	-1.5	-12.3	-36	0
25-Oct-06	-36.4	-14.4	-17	-7.7	-33.1	-3.2	-12	-36.2	0
26-Oct-06	-36.6	-16.4	-18.9	-9.9	-33.6	-3.9	-12.5	-36.2	0
27-Oct-06	-36.4	-19.6	-18.9	-11.8	-33.8	-4.7	-12.4	-35.2	0.59
28-Oct-06	-36.3	3.8	2.6	3.6	-23.5	3	-8.1	-35.4	0.39
29-Oct-06	-36.4	-2.8	2.2	1.7	-28.6	0.2	-10.1	-35.6	0
30-Oct-06	-36.4	-5.1	0.4	0.2	-29.7	-0.2	-11.5	-35.4	0
31-Oct-06	-36.4	-5.9	-2.6	-1.9	-30.3	-0.2	-11.6	-35.4	0
1-Nov-06	-36.4	-6.6	-5.4	-3.6	-30.4	-0.2	-11.2	-35.4	0
2-Nov-06	-36.4	-7.9	-7.9	-4.7	-30.6	0.2	-10.4	-34.3	0
3-Nov-06	-36.6	-11.7	-11.4	-7.3	-31.9	-0.9	-12.4	-34.3	0
4-Nov-06	-36.6	-14.2	-12.9	-9.7	-32.9	-1.7	-12.2	-34.9	0
5-Nov-06	-36.8	-16.1	-13.7	-12	-33.3	-2.3	-13	-35	0
6-Nov-06	-36.6	-17.7	-14.6	-13.7	-33.6	-2.3	-13.3	-35.6	0
7-Nov-06	-36.6	-19.3	-14.6	-14.6	-33.4	-0.6	-13.3	-35.6	2.24
8-Nov-06	-36.1	3.8	2.6	3.6	-18.6	3.2	-9.9	-36	0.08
9-Nov-06	-36.3	1.1	2.6	2.6	-22	1.9	-9.6	-35.8	0
10-Nov-06	-36.3	-1.3	2.6	1.3	-23.7	1.3	-10	-35.2	0
11-Nov-06	-36.4	-3.2	2.4	0.6	-24.6	1.3	-9.6	-35.2	0
12-Nov-06	-4	3.8	2.6	3.6	-15.6	3.2	-8.3	-35.6	1.14
13-Nov-06	-36.3	2.5	2.6	3	-18.2	2.1	-8.4	-35.4	0
14-Nov-06	-36.3	0.2	2.6	2.4	-20.1	1.9	-8.3	-35.4	0
15-Nov-06	-36.3	-0.8	2.6	1.9	-22	1.7	-8.3	-35.6	0
16-Nov-06	-3	3.8	2.6	3.6	-12.4	3.2	-6.8	-35.6	1.46
17-Nov-06	-29.8	2.8	2.6	3	-13.7	3.2	-6.8	-35.4	0
18-Nov-06	-34.6	1.9	2.6	2.6	-17.5	1.9	-8.3	-35.6	0
19-Nov-06	-36.4	0.6	2.6	2.1	-19.5	1.3	-9.4	-35.6	0
20-Nov-06	-36.4	0.4	2.6	1.7	-21.4	1.3	-9.8	-35.4	0
21-Nov-06	-36.4	-0.8	2.4	0.6	-22.9	0.6	-11.2	-36.2	0.94
22-Nov-06	-0.2	3.6	2.6	3.4	-4.5	3.2	-11.3	4	1.38
23-Nov-06	-5.9	3	2.6	3.2	-1.9	3.2	-11.4	4.2	0
24-Nov-06	-7.6	2.5	2.6	2.6	-1.5	2.3	-11.6	1.3	0
25-Nov-06	-9.6	1.7	2.6	2.1	-3	1.3	-12	-4.4	0
26-Nov-06	-11.3	0.9	2.6	1.5	-3.9	1.1	-12.1	-8.3	0
27-Nov-06	-12.7	0.2	2.6	0.9	-4.7	0.9	-11.9	-11	0
28-Nov-06	-13.4	0.4	2.4	0.6	-4.7	1.3	-11	-12.7	0
29-Nov-06	-14.4	0.9	2.4	0.9	-4.7	1.9	-9.6	-13.9	0
30-Nov-06	-15.1	-0.4	2.4	0.2	-4.7	2.1	-7.9	-14.4	0
1-Dec-06	-14.2	-0.6	2.6	0.9	-3	2.1	-5.2	-14.6	0.08
2-Dec-06	-12.3	2.3	2.6	1.5	-3.8	1.5	-3.8	-14.2	0
3-Dec-06	-12.5	0.4	2.6	0.6	-6.6	0.8	-5.5	-16.6	0.2
4-Dec-06	-11	2.5	2.6	2.2	-3.2	2.1	-6.2	-15.8	0

5-Dec-06	-10.6	1.7	2.6	0.7	-6.8	0.2	-7.9	-17.3	0
6-Dec-06	-11.7	0.9	2.4	0	-8.6	0	-9.4	-18.5	0
7-Dec-06	-11.5	0.8	2.4	0	-7.3	0.6	-9.2	-18.3	0
8-Dec-06	-14.2	0.6	1.7	-2.1	-11.3	-0.8	-10.9	-21.2	0
9-Dec-06	-16.4	-0.6	0.6	-4.1	-12.4	-0.9	-10.5	-22.1	0
10-Dec-06	-17.6	-1.1	0.4	-5.2	-12.8	-0.9	-11.2	-22.7	0
11-Dec-06	-18.1	-1.3	0.2	-6.4	-12.8	-0.8	-11.6	-23.3	0
12-Dec-06	-18.7	-1.3	-0.6	-7.3	-13	-0.9	-12	-24.1	0
13-Dec-06	-18.9	-1.9	-0.8	-7.7	-12.4	-0.4	-12.1	-24.1	0
14-Dec-06	-18.5	-2.5	-0.9	-7.9	-12	-0.2	-11.6	-23.9	0
15-Dec-06	-18.3	-3.4	-1.3	-8.2	-11.8	-0.2	-10.8	-23.7	0
16-Dec-06	-18.9	-4.2	-2.6	-8.8	-14.3	-0.8	-10.8	-25	0
17-Dec-06	-20.2	-4.9	-3.7	-9.9	-14.8	-0.8	-11.1	-26	0
18-Dec-06	-20.6	-5.1	-4.9	-10.5	-14.7	-0.6	-11	-26	0
19-Dec-06	-20.8	-5.3	-5.4	-11.2	-14.7	-0.4	-10.9	-26.4	0
20-Dec-06	-21.5	-5.5	-7.3	-12.2	-16.2	-0.9	-11.2	-27.5	0
21-Dec-06	-21.9	-5.5	-8.2	-12.9	-16	-0.9	-11.8	-27.7	0
22-Dec-06	-21.7	-5.3	-7.9	-12.9	-15	0	-11.3	-27.2	1.26
23-Dec-06	0.4	3.8	2.6	3.6	0.4	3.2	-7.4	1.9	0
24-Dec-06	-4.3	2.6	2.6	2.6	-2.4	1.9	-6.3	-3.8	0
25-Dec-06	-5.1	3	2.6	3.4	-1.9	3.2	-6.4	-6.5	1.5
26-Dec-06	1.7	3.8	2.6	3.6	3.4	3.2	-5.9	4.4	0
27-Dec-06	-3	3	2.6	2.6	2.4	1.7	-6.1	4.2	0
28-Dec-06	-6	2.1	2.6	2.1	1.7	0.9	-7.9	3.9	0
29-Dec-06	-7.6	1.7	2.6	1.5	1.1	0.8	-9.4	3.9	0
30-Dec-06	-8.1	1.7	2.6	1.1	1.3	1.1	-9.6	-5.6	0
31-Dec-06	-8.5	1.3	2.6	1.9	1.5	1.1	-8.8	-9.8	0