UT to TAR RIVER (Louisburg)
FINAL MONITORING REPORT
YEAR 4 OF 5
2009

EEP Project # 234
Franklin County, North Carolina

Submitted to:

NCDENR-EEP
1652 Mail Service Center
Raleigh, NC 27699

Monitoring Firm:

1025 Wade Avenue
Raleigh, NC 27605
Phone: (919) 789-9977
Project Manager:
Phillip Todd
ptodd@sepiengineering.com

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APPENDICES

MONITORING SUMMARY

The Unnamed Tributary to Tar River Restoration Site is located within the town of Louisburg, Franklin County, North Carolina. The site was constructed between January 2005 and June 2005. The Priority II restoration involved the conversion of 1,792 linear feet of impaired channel into 1,937 linear feet with improved pattern, dimension, and profile. Rock grade control vanes and rootwads were incorporated for aquatic habitat enhancement and bed and bank stability. A variable width riparian buffer was planted on either side of the stream with native vegetation in December 2005. This project has the following goals and objectives:

- 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.
- Improve water quality and reduce further property loss by stabilizing eroding streambanks.
- Reconnect the stream to its floodplain and/or establish a new floodplain at a lower elevation.
- Improve aquatic habitat with the use of natural material stabilization structures such as root wads, cross-vanes, woody debris, and a riparian buffer.
- Provide aesthetic value, wildlife habitat, and bank stability through the creation of a riparian zone.
- Stabilize and enhance the tributary and small drainage that enters the site.

There are two areas of bare/eroding terrace along the right side (facing downstream) of the project. The first area (Station 14+45) is starting to heal, and vegetation is starting to cover the bare soil. The second area (Station 16+40) exhibited significant erosion of the terrace and appears to be moving toward instability as opposed to healing. Dense loblolly pine (*Pinus taeda*) thickets that are growing in the project corridor are a concern because they are suppressing the growth of more ideal late successional species along the middle sections of the project (see Appendix B Vegetation Problem Area Plan Views). The planted stem densities for all the Vegetation Plots (VP), except VP 1 and 2, were below the Monitoring Year 5 goal of 260 stems/acre. Planted stem density across all vegetation plots in Monitoring Year 4 was 120 stems per acre. It should be noted that there were several species for which 'volunteer' individuals were noted in all vegetation plots. With the inclusion of these 'volunteers,' all of the vegetation plots exceed the Monitoring Year 5 stem density goal. Noted volunteer species include: *Alnus serrulata (VP 6), Baccharis halimifolia (VP 1-9), Betula nigra (VP 2, 7), Cephalanthus occidentalis (VP 6), Fraxinus pennsylvanica (VP 4-9), Liquidambar styraciflua (VP 1,2,6-9), Liriodendron tulipifera (VP 6), Myrica cerifera (VP 9), Platanus occidentalis (VP 7,8), Pinus taeda (VP 1-8), Quercus phellos (VP 6), Quercus pagoda (VP 3,5), Quercus spp. (VP 1-3), Prunus caroliniana (VP 1, 2, 6), Prunus serotina (VP 1,2, 4), and Ulmus rubra (VP 1).*

Most of the UT to Tar River project reach appears to have remained stable through Monitoring Year 4. Overall, only 2% of banks were noted to have bank erosion in 2009. However, there were two bank erosion areas of severe concern and some sand/gravel aggradation that is worth noting. The most severe section of erosion is located at the upstream end of the reach, on the left bank, where the terrace has experienced mass wasting just downstream of the culvert outlet. This terrace erosion is encroaching on Burnette Road. Also there is a section of severe erosion on the right bank just downstream of here (Station 10+38). In addition, it was found that the culvert outlet pool, that used to exist as the first channel unit along the profile below the culvert at the upstream end of the reach, is completely filled in with sediment and now exists as riffle habitat. This high sediment load is apparent downstream for approximately 140 linear feet. Also there is a section of severe erosion of the left bank, erosion of the right bank, and excess sedimentation just downstream of the confluence with the stormwater tributary that drains the adjacent shopping

center. The tributary confluence is located at Station 24+19 along the thalweg. This tributary probably has very flashy flows during storm events due to the high percentage of impervious area within its watershed, and is presumably the main agent contributing to the problems just downstream. The sedimentation and severe erosion areas have been noted as concerns since 2007. It is recommended that these sections be reviewed to determine if repair work is necessary. The sediment contributing to these areas probably came from a combination of an upstream source and the severe bank erosion along the project. It appears that the stream pattern remained consistent between the monitoring years. The profile appears to have remained as stable as can be expected for a sand bed stream, with the exception of some apparent aggradation within the first 100 feet of channel and the complete filling in of the culvert outlet pool at the head of the reach, turning it into a riffle (see longitudinal profile overlay). The overall dimension of the stream appears to have remained consistent, with the exception of an apparent decrease in bankfull width and bankfull area at cross sections 1 and 2. However, this observation is not alarming because the annual cross section overlay figures show that there was significant deposition on the bankfull bench, creating levees, but the channel bottom was consistent with previous monitoring years. This deposition also serves as evidence that an over-bankfull flow occurred during Monitoring Year 4, depositing sediment along the edge of the floodplain (i.e. top of bank). This deposition is apparent and was verified in the field. The structures appear to be in good physical condition.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEPs website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

METHODOLOGY

Vegetation Methodology

The following methodology was used for the planted woody stem count. The configuration of the vegetation plots was marked out with tape to measure 10 meters by 10 meters (or equivalent to 100 square meters) depending on buffer width. The planted material in the plot was marked with flagging. The targeted vegetation was then identified by species and a tally of each species was kept and recorded in a field book.

Stream Methodology

The project monitoring for the stream channel included a longitudinal survey, cross-sectional surveys, problem area identification, and photo documentation. The specific methodology for each portion of the stream monitoring is described in detail below.

Longitudinal Profile

A longitudinal profile was surveyed with a Nikon DTM-520 Total Station, prism, and a TDS Recon Pocket PC. The heads of features (i.e. riffles, runs, pools, and glides) were surveyed, as well as the point of maximum depth of each pool, boundaries of problem areas, and any other significant slope-breaks or points of interest. At the head of each feature and at the maximum pool depth, thalweg, water surface, edge of water, left and right bankfull, and left and right top of bank (if different than bankfull) were surveyed. All profile measurements were extracted from this survey, including channel and valley length and length of each feature, water surface slope for each reach and feature, bankfull slope for the reach, and pool spacing. This survey also was used to draw plan view figures with Microstation v8 (Bentley Systems, Inc., Exton, PA). Stationing was calculated along the thalweg. All pattern measurements (i.e., meander length, radius of curvature, belt width, meander width ratio, and sinuosity) were extracted from the plan view.

Permanent Cross Sections

Five permanent cross sections (three riffles, one pool, and one run) were surveyed. The beginning and end of each permanent cross section were originally marked with a wooden stake and conduit. Cross sections were installed perpendicular to the stream flow. Each cross section survey noted all changes in slopes, tops of both banks (if different from bankfull), left and right bankfull, edges of water, thalweg and water surface. The cross sections were then plotted and Monitoring Year 4 monitoring data was overlain on data from all previous monitoring years. All dimension measurements (i.e., bankfull width, floodprone width, bankfull mean depth, cross sectional area, width-to-depth ratio, entrenchment ratio, bank height ratio, wetted perimeter, and hydraulic radius) were extracted from these plots and compared to all previous monitoring data.

2.2.3 Pebble Counts

Based on the fact that UT Tar River is a sandbed stream, it was determined that pebble counts were unnecessary as they would fail to detect changes in the amounts of fine sediments in the bed load. Therefore, pebble counts were not performed for Monitoring Year 4.

Photo Documentation

Permanent photo points were established during Monitoring Year 1. Two photographs (facing upstream and facing downstream) were taken at each photo point with a digital camera. A set of three photographs were taken at each cross-section (facing upstream, facing downstream, and facing the channel). A representative photograph of each vegetation plot was taken at the designated corner of the vegetation plot and in the same direction as the Monitoring Year 1 photograph. Photos were also taken of all significant stream and vegetation problem areas.

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DeLorme. 1997. *The North Carolina Atlas and Gazateer*.

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Rosgen, D.L. 1994. *A Classification of Natural River*. Catena, Volume 22: 166-169, Elsevier Science, B.V. Amsterdam.

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APPENDIX A

GENERAL FIGURES AND PLAN VIEWS

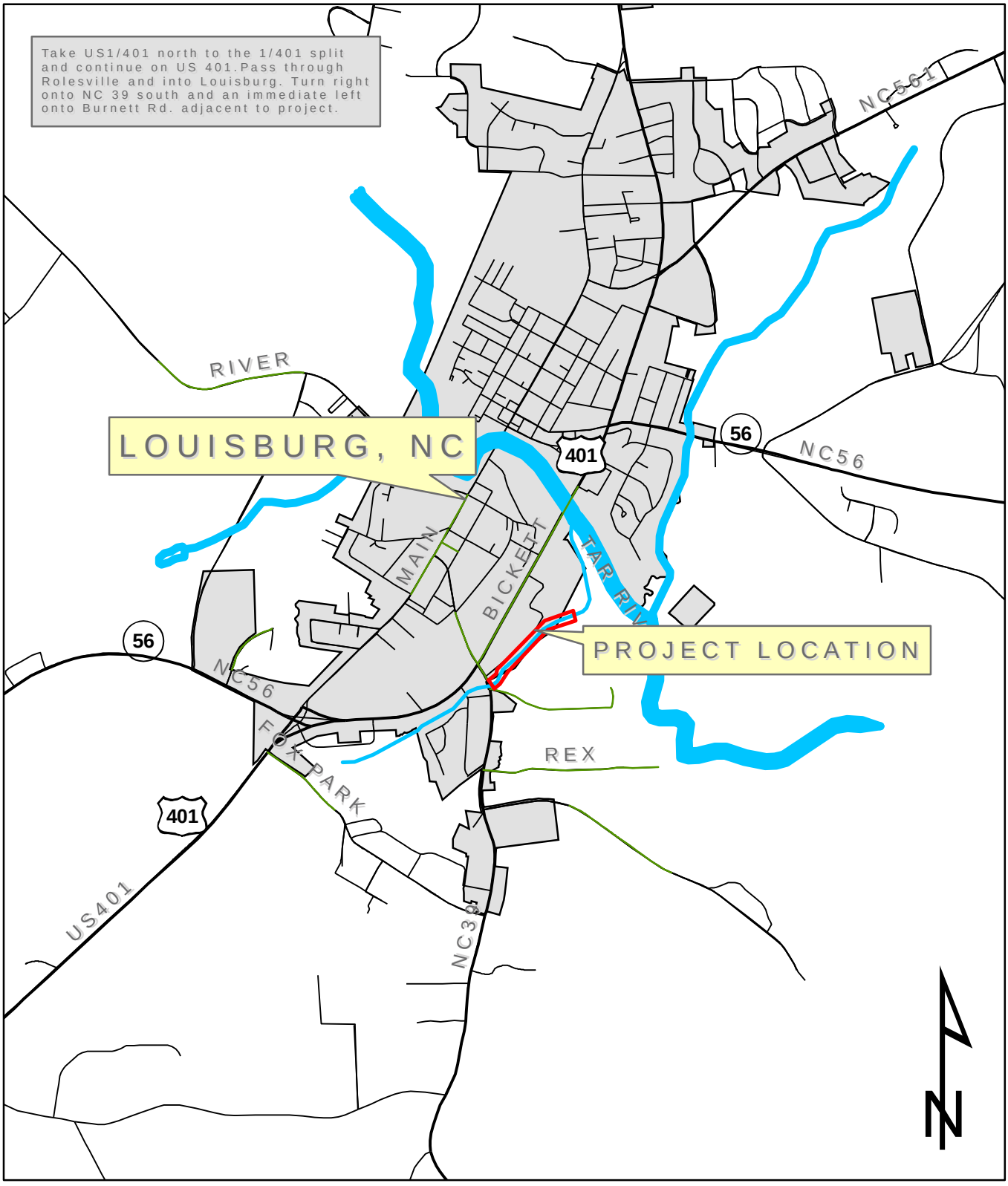
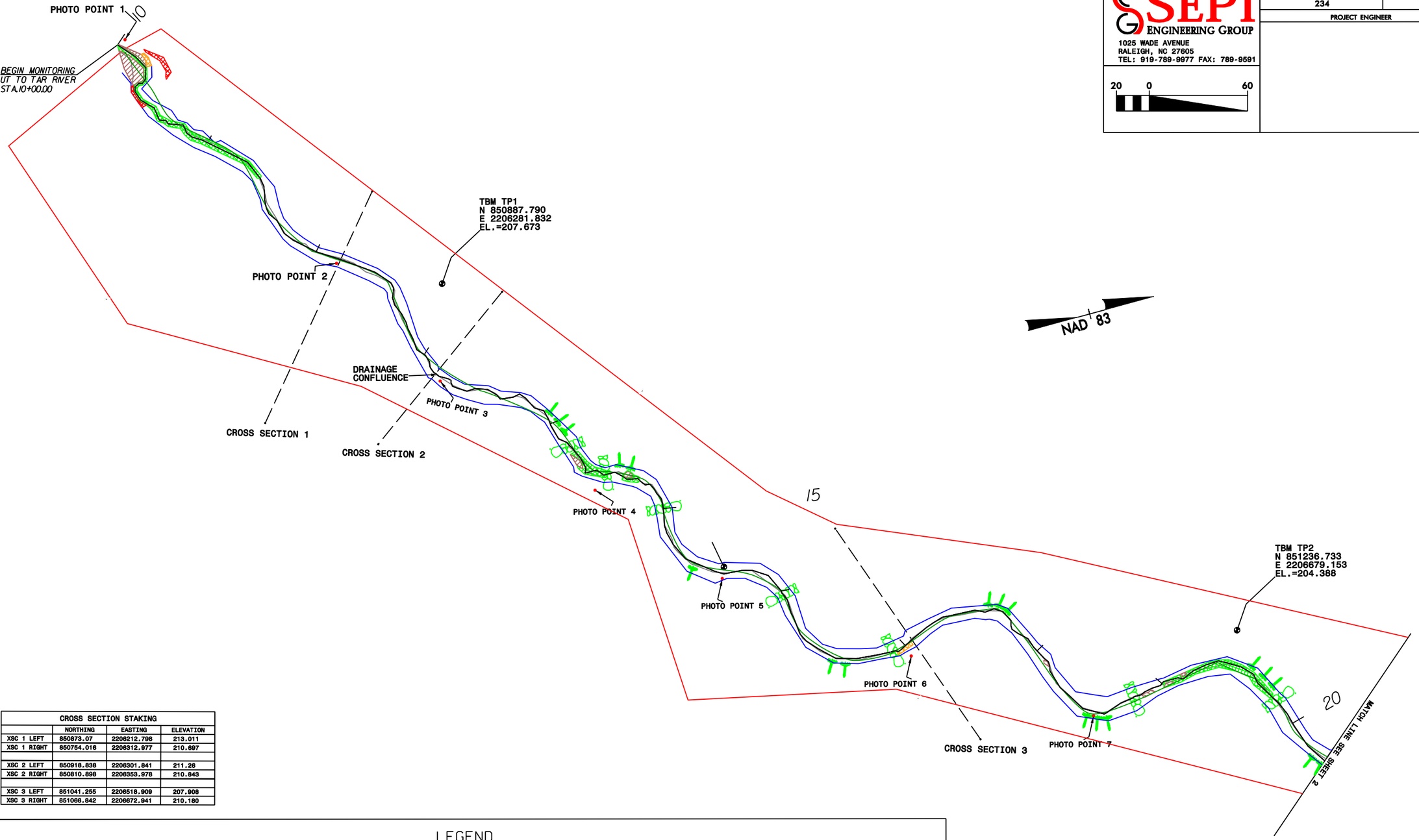


FIGURE 1
PROJECT LOCATION MAP
UT to Tar River Louisburg, NC



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 1 LEFT	850873.07	2206212.798	213.011
XSC 1 RIGHT	850754.016	2206312.977	210.697
XSC 2 LEFT	850918.838	2206301.841	211.26
XSC 2 RIGHT	850810.898	2206353.978	210.843
XSC 3 LEFT	851041.255	2206518.909	207.908
XSC 3 RIGHT	851068.842	2206672.941	210.180

LEGEND

STREAM FEATURES

- THALWEG AS-BUILT
- THALWEG 2008
- THALWEG 2009
- BANKFULL 2009
- BANK EROSION
- SEVERE BANK EROSION
- UNDERCUT BANKS
- AGGRADATION
- BAR FORMATION

PROJECT ELEMENTS

- CROSS-SECTIONS
- CONTROL POINT/ BENCHMARK (TBM)
- PHOTO POINT
- EASEMENT BOUNDARY

STRUCTURE TYPES

- ROCK SILL
- ROOTWAD

COLOR CODE FOR STRUCTURES

- GOOD STRUCTURE (ACTUAL LOCATION)
- STRUCTURE WITH POTENTIAL PROBLEM (ACTUAL LOCATION)
- FAILING STRUCTURE (ACTUAL LOCATION)

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

20 0 60

PROJECT REFERENCE NO.	SHEET NO.
234	1
PROJECT ENGINEER	

Ecosystem Enhancement PROGRAM

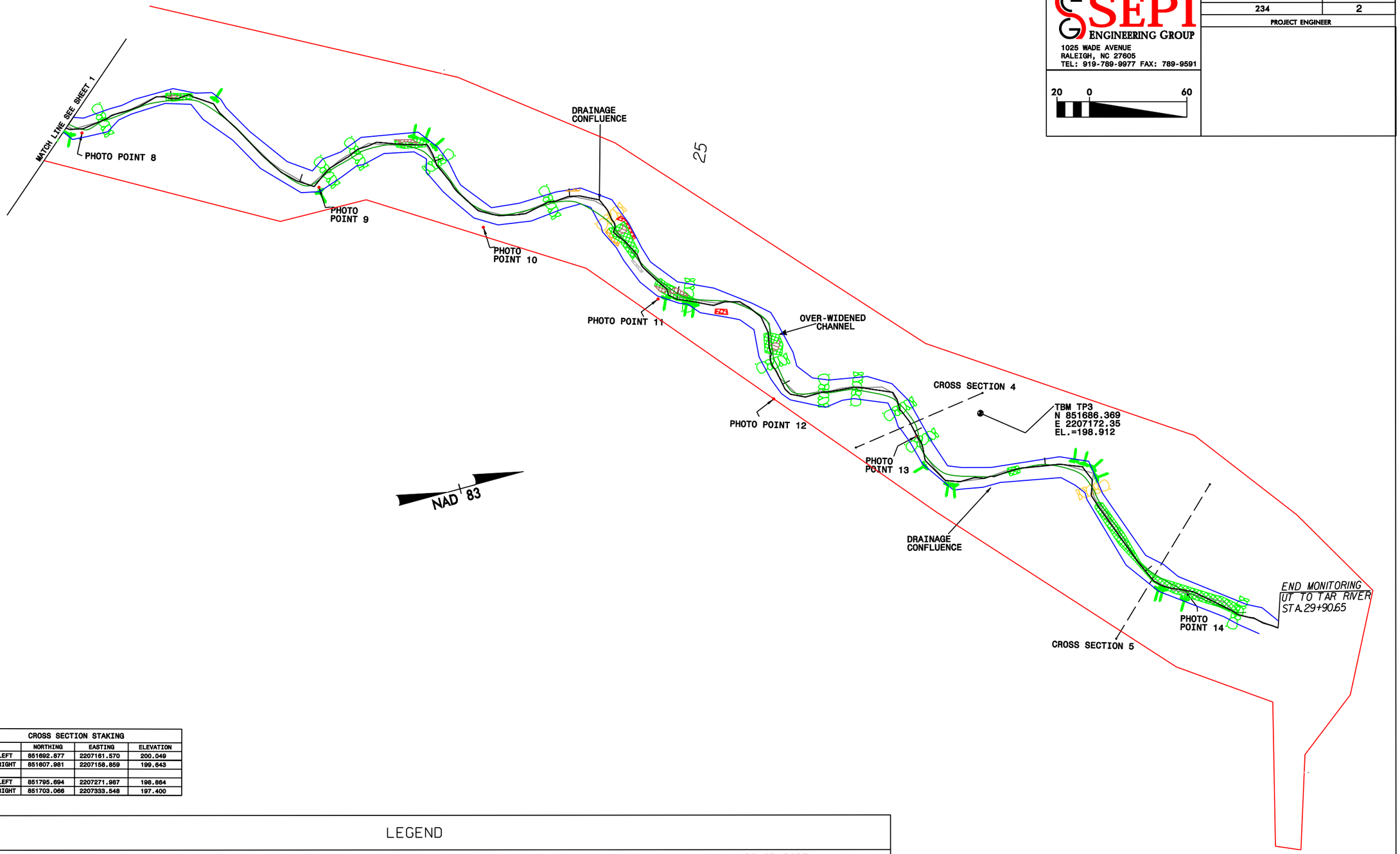
LOCATION:
UT TO TAR RIVER
CURRENT CONDITIONS PLAN VIEW
STREAM ASSESSMENT - YEAR 4

PROJ #:	COUNTY:
234	FRANKLIN
PREPARED BY: IPJ	
CHECKED BY: PDB	DATE: 7/2/2009

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
234	2
PROJECT ENGINEER	

20 0 60



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 4 LEFT	851692.877	2207161.570	200.049
XSC 4 RIGHT	851807.981	2207158.859	199.643
XSC 5 LEFT	851795.694	2207271.987	198.864
XSC 5 RIGHT	851703.066	2207333.548	197.400

LEGEND

STREAM FEATURES
- THALWEG AS-BUILT
- THALWEG 2008
- THALWEG 2009
- BANKFULL 2009
- BANK EROSION
- SEVERE BANK EROSION
- UNDERCUT BANKS
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- ROCK SILL
- ROOTWAD

COLOR CODE FOR STRUCTURES
- GOOD STRUCTURE (ACTUAL LOCATION)
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- FAILING STRUCTURE (ACTUAL LOCATION)

Ecosystem Enhancement PROGRAM

LOCATION:
UT TO TAR RIVER
CURRENT CONDITIONS PLAN VIEW
STREAM ASSESSMENT - YEAR 4

PROJ #:	COUNTY:
234	FRANKLIN
PREPARED BY: IPJ	
CHECKED BY: PDB	DATE: 7/2/2009

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
234	1
PROJECT ENGINEER	

20 0 60

BEGIN MONITORING
UT TO TAR RIVER
STA.10+00.00

10

TBM TP1
N 850887.790
E 2206281.832
EL.=207.673

NAD 83

15

VP 1

VP 2

VP 3

20

TBM TP2
N 851236.733
E 2206679.153
EL.=204.388

MATCH LINE SEE SHEET 2

VEGETATION PLOT STAKING*		
	NORTHING	EASTING
VP 1	850990.634	2206471.134
VP 2	851160.243	2206627.064
VP 3	851297.827	2206717.471

*COORDINATES REPRESENT WESTERN-MOST CORNER OF PLOT

LEGEND

THALWEG 2009

BANKFULL 2009

VEGETATION PLOT

VEGETATION PLOT NOT MEETING SUCCESS REQUIREMENTS

PINUS TAEDA THICKET

BARE FLOODPLAIN

SEVERE TERRACE EROSION

STRUCTURE TYPES

ROCK SILL

ROOTWAD

Ecosystem Enhancement PROGRAM

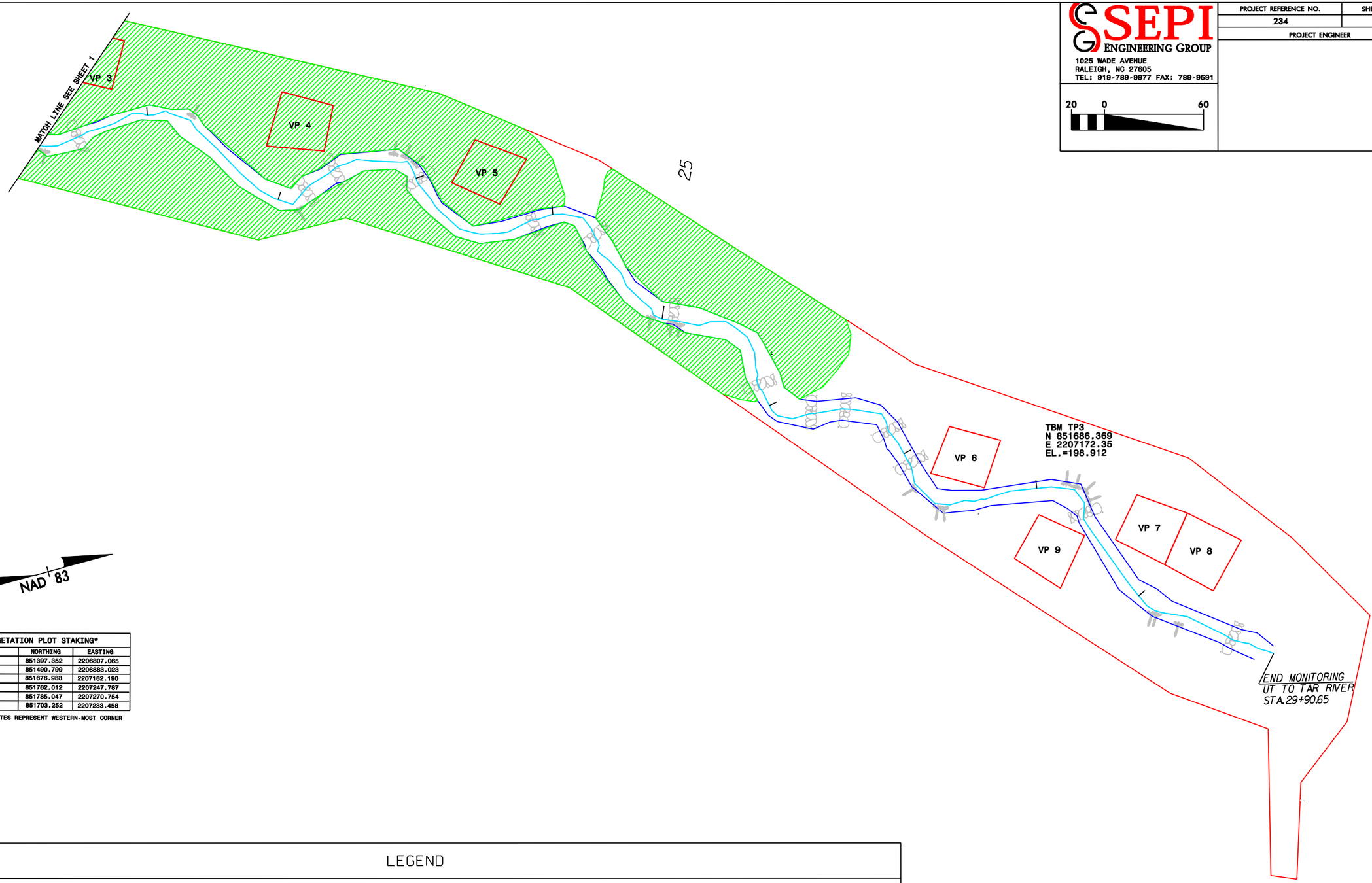
LOCATION:
UT TO TAR RIVER
CURRENT CONDITIONS PLAN VIEW
VEGETATION ASSESSMENT - YEAR 4

PROJ #:	COUNTY:
234	FRANKLIN
PREPARED BY: IPJ	
CHECKED BY: PDB	DATE: 7/2/2009

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
234	2
PROJECT ENGINEER	

20 0 60



NAD 83

VEGETATION PLOT STAKING*		
	NORTHING	EASTING
VP 4	851397.352	2206807.065
VP 5	851490.799	2206883.023
VP 6	851676.983	2207162.190
VP 7	851762.012	2207247.787
VP 8	851785.047	2207270.754
VP 9	851703.252	2207233.458

*COORDINATES REPRESENT WESTERN-MOST CORNER OF PLOT

LEGEND

THALWEG 2009

BANKFULL 2009

VEGETATION PLOT

VEGETATION PLOT NOT MEETING SUCCESS REQUIREMENTS

PINUS TAEDA THICKET

BARE FLOODPLAIN

SEVERE TERRACE EROSION

STRUCTURE TYPES

ROCK SILL

ROOTWAD

Ecosystem Enhancement PROGRAM

LOCATION:
UT TO TAR RIVER
CURRENT CONDITIONS PLAN VIEW
VEGETATION ASSESSMENT - YEAR 4

PROJ #:	COUNTY:
234	FRANKLIN
PREPARED BY: IPJ	
CHECKED BY: PDB	DATE: 7/2/2009

APPENDIX B

GENERAL PROJECT TABLES

Table 1. Project Restoration Components UT Tar River Stream Mitigation Site/Project No. 234							
Project Segment or Reach ID	**Pre-Existing Footage**	**Type**	**Approach**	**As-Built Footage**	**As-Built Stationing**	**Monitoring Year 4 Stationing**	**Comments**
UT to Tar River	1,792	Restoration	P II	1,937.13	10+00 – 29+37.13	10+00 – 29+90.65	

Table 2. Project Activity and Reporting History UT to Tar River/EEP Project No. 234			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion Date**
Restoration Plan	NA	NA	June 2003
Final Design - 90%	NA	NA	Unknown
Construction	NA	NA	7/26/2005
Temporary S&E and Permanent seed mix applied	NA	NA	Throughout Construction
Containerized, B&B, livestake planting	NA	NA	12/22/2005
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	April 2006	April 2006	May 2006
Year 1 Monitoring	Fall 2006	January 2007	January 2007
Year 2 Monitoring	Fall 2007	September 2007	December 2007
Year 3 Monitoring	Fall 2008	October 2008	November 15, 2008
Year 4 Monitoring	Fall 2009	October 2009	November 15, 2009
Year 5 Monitoring	Fall 2010		

Table 3. Project Contact Table UT to Tar River/EEP Project No. 234	
Designer	Earth Tech 701 Corporate Center Drive Suite 475 Raleigh, NC 27607
Construction Contractor	McQueen Construction 619 Patrick Road Bahama, NC 27503
Planting Contractor	Carolina Environmental Contracting, Inc. P.O. Box 1905 Mount Airy, NC 27030
Seeding Contractor	Erosion Control Solutions 5508 Peakton Dr. Raleigh, NC 27614
2006 Monitoring Performers	Earth Tech 701 Corporation Center Drive, Suite 475 Raleigh, NC 27607
2007-2008 Monitoring Performer	SEPI Engineering Group 1025 Wade Avenue Raleigh, NC 27605 Phillip Todd (919) 789-9977
Stream Monitoring POC	Ira Poplar-Jeffers (919) 573-9914
Vegetation Monitoring POC	Phil Beach (919) 573-9936
Wetland Monitoring POC	N/A

Table 4. Project Background Table UT to Tar River /EEP Project No. 234	
Project County	Franklin County, NC
Drainage Area	0.61 square miles
Drainage impervious cover estimate (%)	> 30 %
Stream Order	1st order
Physiographic Region	Piedmont
Ecoregion	Northern Outer Piedmont
Rosgen Classification of As-Built	C
Cowardin Classification	NA
Dominant Soil Types	Chewacla and Wehadkee loam; Wedowee-Urbanland_Udorthents complex
Reference site ID	C5 UT Lake Lynn (Wake), C4 UT Hare Snipe Creek (Wake)
USGS HUC for Project	03020101
USGS HUC for References	03020201
NCDWQ Sub-basin for Project	03-03-01
NCDWQ Sub-basin for References	03-04-02
NCDWQ Classification for Project	Not Assigned
NCDWQ Classification for Reference	UT Lake Lynn: B-NSW; UT Hare Snipe Creek: C-NSW
Any portion of any project segment 303D listed?	No
Any portion of any project segment upstream of a 303D listed segment?	No
Reasons for 303D listing or stressor	N/A
% of project easement fenced	<5
% of project easement demarcated with bollards (if fencing absent)	0

APPENDIX C

VEGETATION ASSESSMENT DATA

Table 5. Vegetation Plot Mitigation Success Summary Table			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean (Stems per Acre)**
UT to Tar River	1	Yes	120
	2	Yes	
	3	No	
	4	No	
	5	No	
	6	No	
	7	No	
	8	No	
	9	No	

APPENDIX C
PHOTOLOG - UT to TAR RIVER

VEGETATION PLOTS


Photo 1: Vegetation Plot 1 (9-28-2009).


Photo 2: Vegetation Plot 2 (9-28-2009).


Photo 3: Vegetation Plot 3 (9-8-2008).


Photo 4: Vegetation Plot 4 (9-28-2009).


Photo 5: Vegetation Plot 5 (9-28-2009).


Photo 6: Vegetation Plot 6 (9-28-2009).

Photo 7: Vegetation Plot 7 (9-28-2009).

Photo 8: Vegetation Plot 8 (9-28-2009).

Photo 9: Vegetation Plot 9 (9-28-2009).

Table A1. Stem counts for each species arranged by plot for UT Tar River

Species	Plots									Initial Totals	Year 1 Totals	Year 2 Totals	Year 3 Totals	Year 4 Totals	Survival %
	1	2	3	4	5	6	7	8	9						
Shrubs															
Myrica cerifera										5	2	2	1	0	0.0%
Alnus serrulata										3	3	0	0	0	0.0%
Sambucus canadensis										2	1	0	0	0	0.0%
Clematis virginiana										4	0	0	0	0	0.0%
Viburnum nudum										5	1	0	0	0	0.0%
Trees															
Fraxinus pennsylvanica	3	1			1	2	1			7	8	8	8	8	100.0%
Betula nigra	1	4				1				17	11	8	6	6	35.3%
Quercus phellos	2	1								8	4	3	3	3	37.5%
Quercus pagoda	0	1		0		2				10	6	5	5	3	30.0%
Quercus nigra	1									8	6	1	1	1	12.5%
Nyssa sylvatica										13	5	0	0	0	0.0%
Platanus occidentalis		3				1			1	9	9	5	5	5	55.6%
Celtis laevigata	0								1	10	1	1	1	1	10.0%
Total per plot	7	10	0	0	1	6	1	0	2	101	57	33	37	27	26.7%
Stems per acre	280	400	0	0	40	240	40	0	80	466	263	189	189	120.0	

**Volunteers of the following species, not initially recorded as planted, were counted: Alnus serrulata (VP 6), Baccharis halimifolia (VP 1-9), Betula nigra (VP 2, 7), Cephalanthus occidentalis (VP 6), Fraxinus pennsylvanica (VP 4-9), Liquidambar styraciflua (VP 1,2,6-9), Liriodendron tulipifera (VP 6), Myrica cerifera (VP 9), Platanus occidentalis (VP 7,8), Pinus taeda (VP 1-8), Quercus phellos (VP 6), Quercus pagoda (VP 3,5), Quercus spp. (VP 1-3), Prunus caroliniana (VP 1, 2, 6), Prunus serotina (VP 1,2, 4), and Ulmus rubra (VP 1).*

**Fraxinus pennsylvanica, Liquidambar styraciflua,* and *Baccharis halimifolia* were too numerous to count in VP 7 and 8. *Pinus taeda* were too numerous to count in VP 2, 3, and 5.

APPENDIX D

STREAM ASSESSMENT DATA

APPENDIX D
PHOTOLOG - UT Tar River

Cross Sections/Photo Points


Cross-Section 1: View Upstream (6-22-2009).


Cross-Section 2: View Upstream (6-22-2009).


Cross-Section 1: View Downstream (6-22-2009).


Cross-Section 2: View Downstream (6-22-2009).


Cross-Section 1: Facing Stream (6-22-2009).


Cross-Section 2: Facing Stream (6-22-2009).

Cross-Section 3: View Upstream (6-23-2009).

Cross-Section 4: View Upstream (6-25-2009).

Cross-Section 3: View Downstream (6-23-2009).

Cross-Section 4: View Downstream (6-25-2009).

Cross-Section 3: Facing Stream (6-23-2009).

Cross-Section 4: Facing Stream (6-25-2009).

Cross-Section 5: View Upstream (6-25-2009).

Photo Point 1: View Downstream (6-22-2009).

Cross-Section 5: View Downstream (6-25-2009).

Photo Point 2: View Upstream (6-22-2009).

Cross-Section 5: Facing Stream (6-25-2009).

Photo Point 2: View Downstream (6-22-2009).

Photo Point 3: View Upstream (6-22-2009).

Photo Point 3: View Downstream (6-22-2009).

Photo Point 4: View Upstream (6-24-2009).

Photo Point 4: View Downstream (6-24-2009).

Photo Point 5: View Upstream (6-24-2009).

Photo Point 5: View Downstream (6-24-2009).

Photo Point 6: View Upstream (6-24-2009).

Photo Point 6: View Downstream (6-24-2009).

Photo Point 7: View Upstream (6-24-2009).

Photo Point 7: View Downstream (6-24-2009).

Photo Point 8: View Upstream (6-24-2009).

Photo Point 8: View Downstream (6-24-2009).

Photo Point 9: View Upstream (6-24-2009).

Photo Point 9: View Downstream (6-24-2009).

Photo Point 10: View Upstream (6-24-2009).

Photo Point 10: View Downstream (6-24-2009).

Photo Point 11: View Upstream (6-25-2009).

Photo Point 11: View Downstream (6-25-2009).

Photo Point 12: View Upstream (6-25-2009).

Photo Point 12: View Downstream (6-25-2009).

Photo Point 13: View Upstream (6-25-2009).

Photo Point 13: View Downstream (6-25-2009).

Photo Point 14: View Upstream (6-25-2009).

Photo Point 14: View Downstream (6-25-2009).

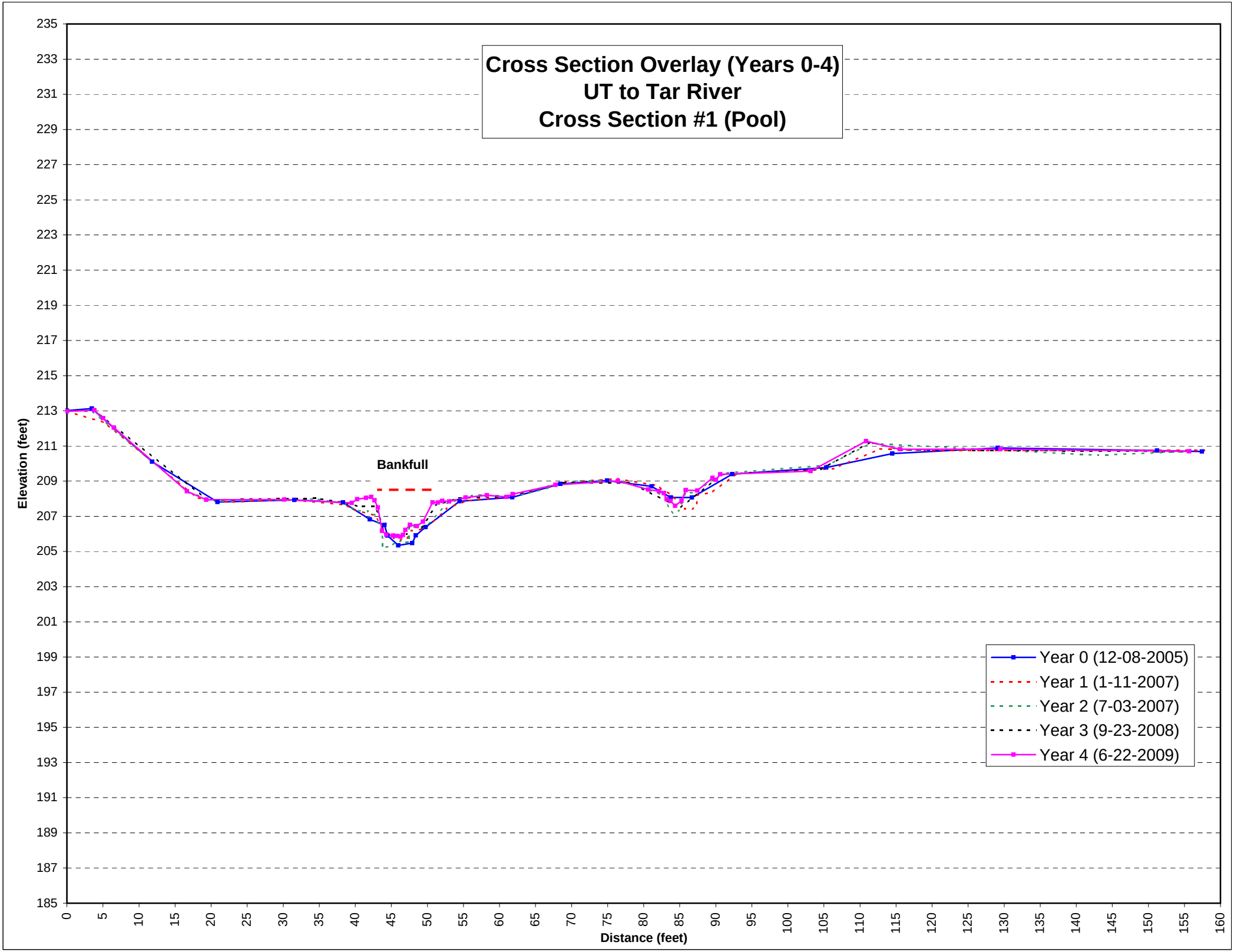
Table B2. Visual Morphological Stability Assessment

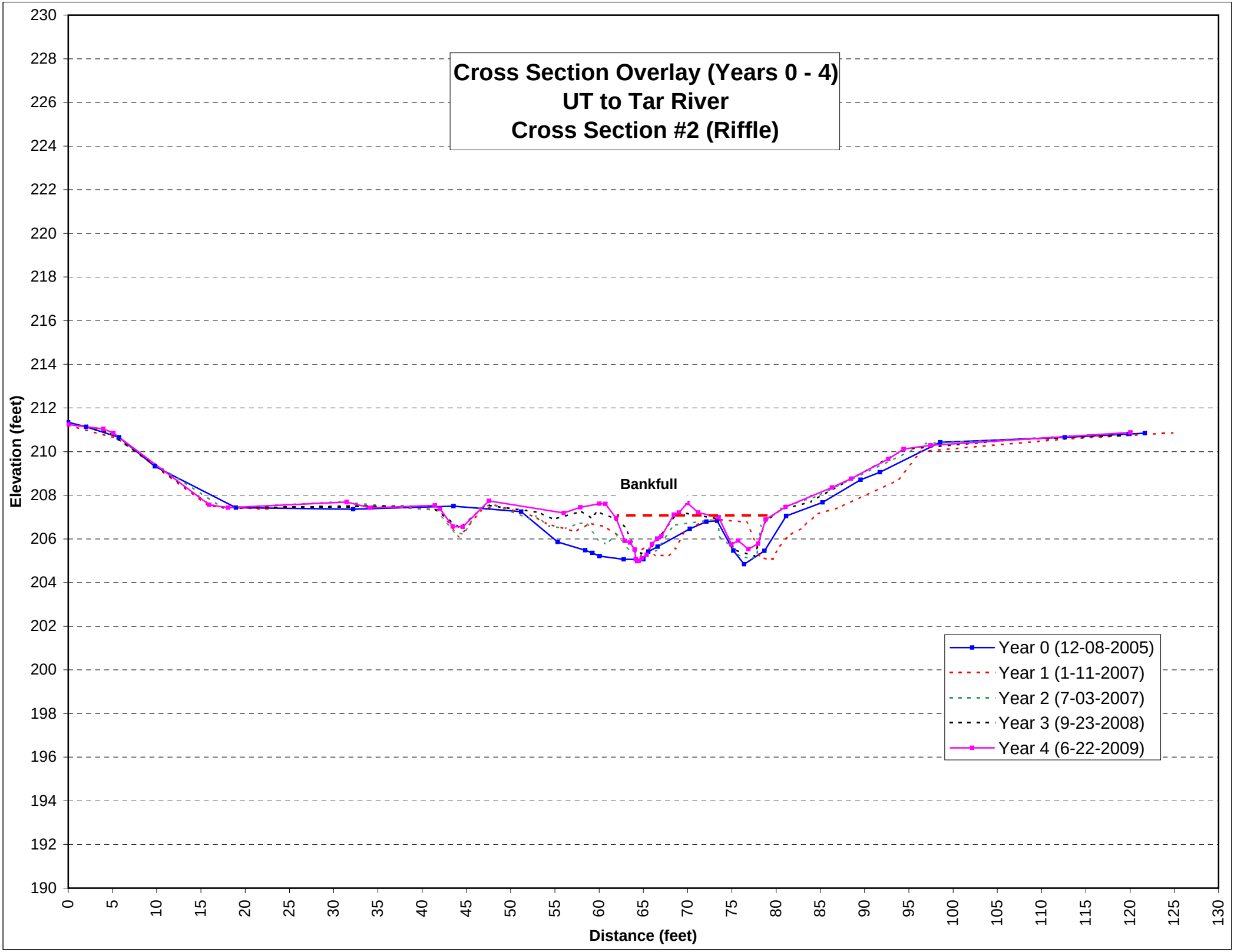
UT Tar River

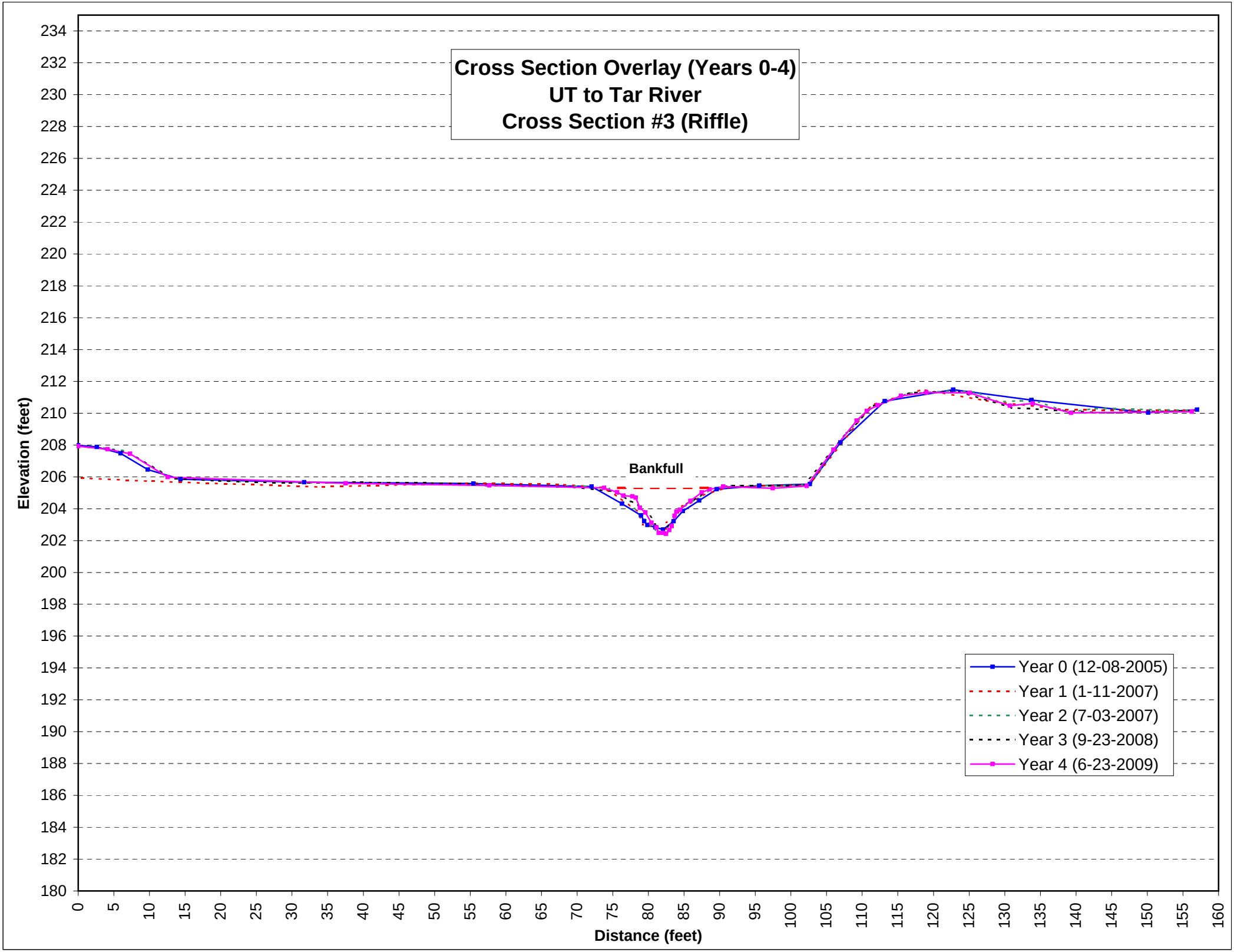
Segment/Reach: UT Tar River (1,960 feet)

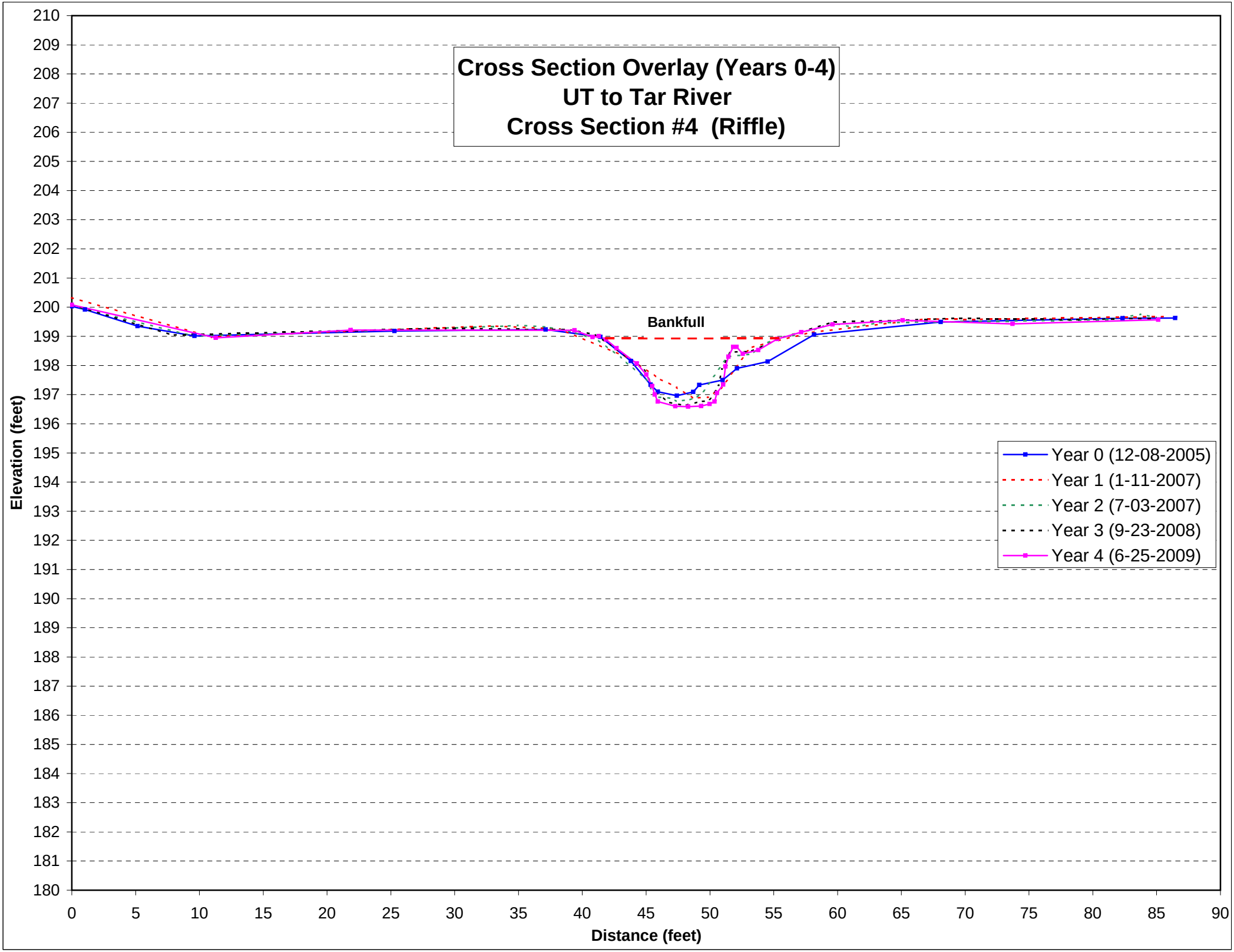
Feature Category	Metric (per As-built and reference baselines)	(#Stable) Number Performing as Intended	Total Number per As-built*	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performance Mean or Total
A. Riffles	1. Present	16	19	NA	84%	
	2. Armor stable	14	19	NA	74%	
	3. Facet grade appears stable	12	19	NA	63%	
	4. Minimal evidence of embedding/fining	13	19	NA	68%	
	5. Length appropriate	10	19	NA	53%	**68%**
B. Pools	1. Present	28	32	NA	88%	
	2. Sufficiently deep	28	32	NA	88%	
	3. Length appropriate	11	32	NA	34%	**70%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	13	13	NA	100%	
	2. Downstream of meander (glide/inflection) centering	12	14	NA	86%	**93%**
D. Meanders	1. Outer bend in state of limited/controlled erosion	22	26	NA	85%	
	2. Of those eroding, # w/concomitant point bar formation	2	4	NA	50%	
	3. Apparent Rc within specifications	21	26	NA	81%	
	4. Sufficient floodplain access and relief	26	26	NA	100%	**79%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	12/411.5	79%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting	NA	NA	0/0	100%	**90%**
F. Bank Condition	1. Actively eroding, wasting, or slumping bank	NA	NA	7/82	98%	**98%**
G. Vanes / J Hooks etc.	1. Free of back or arm scour	22	24	NA	92%	
	2. Height appropriate	24	24	NA	100%	
	3. Angle and geometry appear appropriate	23	24	NA	96%	
	4. Free of piping or other structural failures	24	24	NA	100%	**97%**
H. Wads and Boulders	1. Free of scour	57	57	NA	100%	
	2. Footing stable	57	57	NA	100%	**100%**

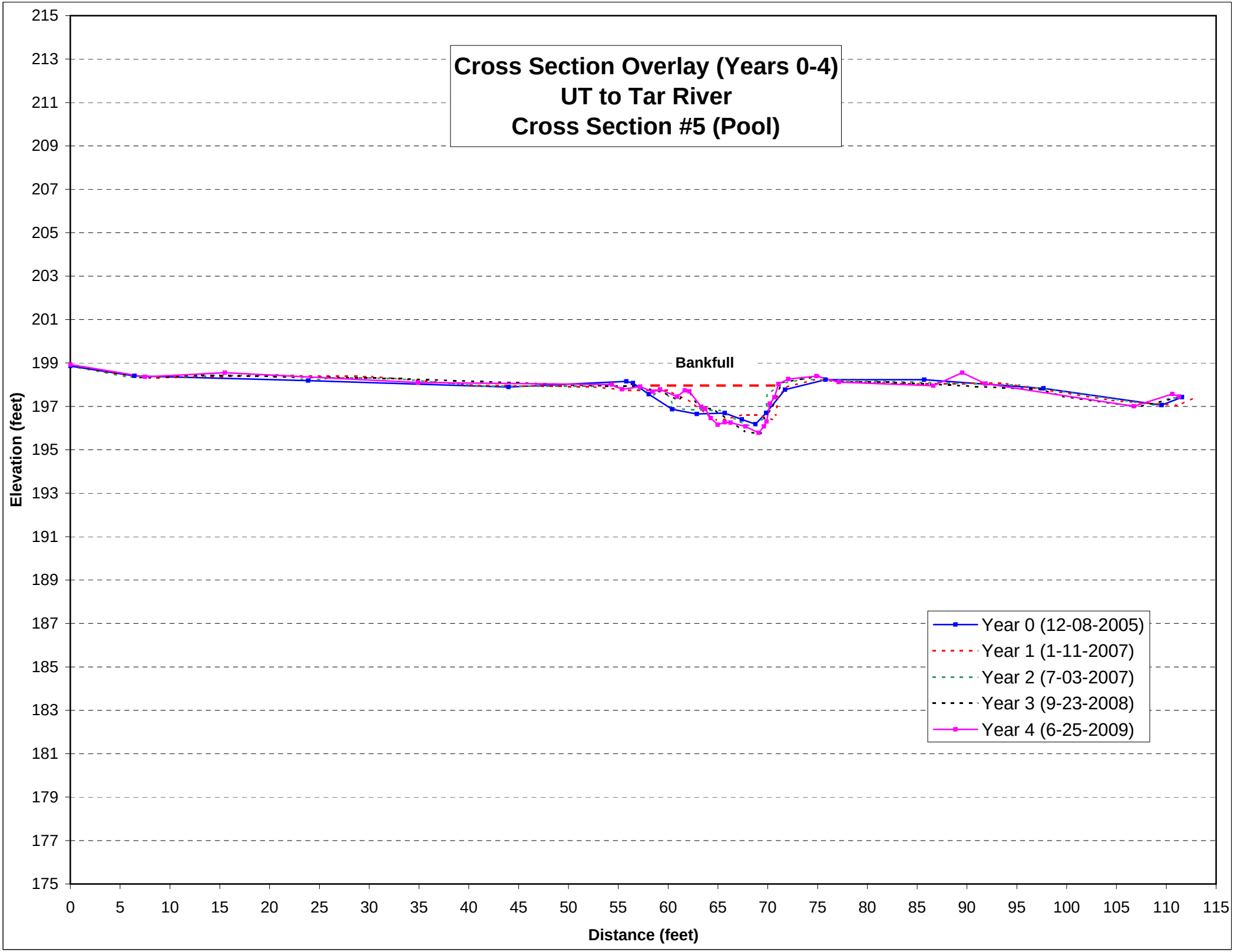
Table V. Verification of Bankfull Events			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo # (if available)**
1/3/2007	Unknown date in 2006	Photographic – Near Bankfull; wrack lines observed	See Monitoring Year 1 Report
6/4/2007	6/3/2007	Result of 1.5' rainfall event; wrack lines observed.	None
10/1/2008	6/30/2008	According to NCDC Station Coop ID 315123 - Louisburg NC , 2.0 inches of precipitation fell over this 24 hour period. It was assumed, but not verified, that this rainfall produced a bankfull event.	None
10/1/2008	9/6/2008	According to NCDC Station Coop ID 315123 - Louisburg NC , 3.27 inches of precipitation fell over this 24 hour period. It was assumed, but not verified, that this rainfall produced a bankfull event.	None
6/23/2009	Uknown date after January 27, 2009 and before June 22, 2009.	Crest gauge reading of 1 foot 10 inches on gauge stick (bankfull datum set at 11 inches). Date of over-bankfull flow is unknown, but most likely occurred during or just after the dates of March 1-3, 2009 when 5.2 inches of snow, ice, and rainfall fell according to NCDC Station Coop ID 315123 - Louisburg NC.	Photo 5 in 'Stream Problem Area' photolog (digital submission only)


Cross Section Overlay (Years 0-4)
UT to Tar River
Cross Section #1 (Pool)
Elevation (feet)
Distance (feet)
Bankfull
Year 0 (12-08-2005)
Year 1 (1-11-2007)
Year 2 (7-03-2007)
Year 3 (9-23-2008)
Year 4 (6-22-2009)


Cross Section Overlay (Years 0 - 4)
UT to Tar River
Cross Section #2 (Riffle)
Elevation (feet)
Distance (feet)
Bankfull
Year 0 (12-08-2005)
Year 1 (1-11-2007)
Year 2 (7-03-2007)
Year 3 (9-23-2008)
Year 4 (6-22-2009)


Cross Section Overlay (Years 0-4)
UT to Tar River
Cross Section #3 (Riffle)
Bankfull
Elevation (feet)
Distance (feet)
Year 0 (12-08-2005)
Year 1 (1-11-2007)
Year 2 (7-03-2007)
Year 3 (9-23-2008)
Year 4 (6-23-2009)


Cross Section Overlay (Years 0-4)
UT to Tar River
Cross Section #4 (Riffle)
Bankfull
Year 0 (12-08-2005)
Year 1 (1-11-2007)
Year 2 (7-03-2007)
Year 3 (9-23-2008)
Year 4 (6-25-2009)
Elevation (feet)
Distance (feet)
210
209
208
207
206
205
204
203
202
201
200
199
198
197
196
195
194
193
192
191
190
189
188
187
186
185
184
183
182
181
180
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90


Cross Section Overlay (Years 0-4)
UT to Tar River
Cross Section #5 (Pool)
Bankfull
Elevation (feet)
Distance (feet)
215
213
211
209
207
205
203
201
199
197
195
193
191
189
187
185
183
181
179
177
175
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
Year 0 (12-08-2005)
Year 1 (1-11-2007)
Year 2 (7-03-2007)
Year 3 (9-23-2008)
Year 4 (6-25-2009)

Longitudinal Profile Overlay Page 1 of 2 (Years 0 - 4)
UT to Tar River

Elevation (feet)

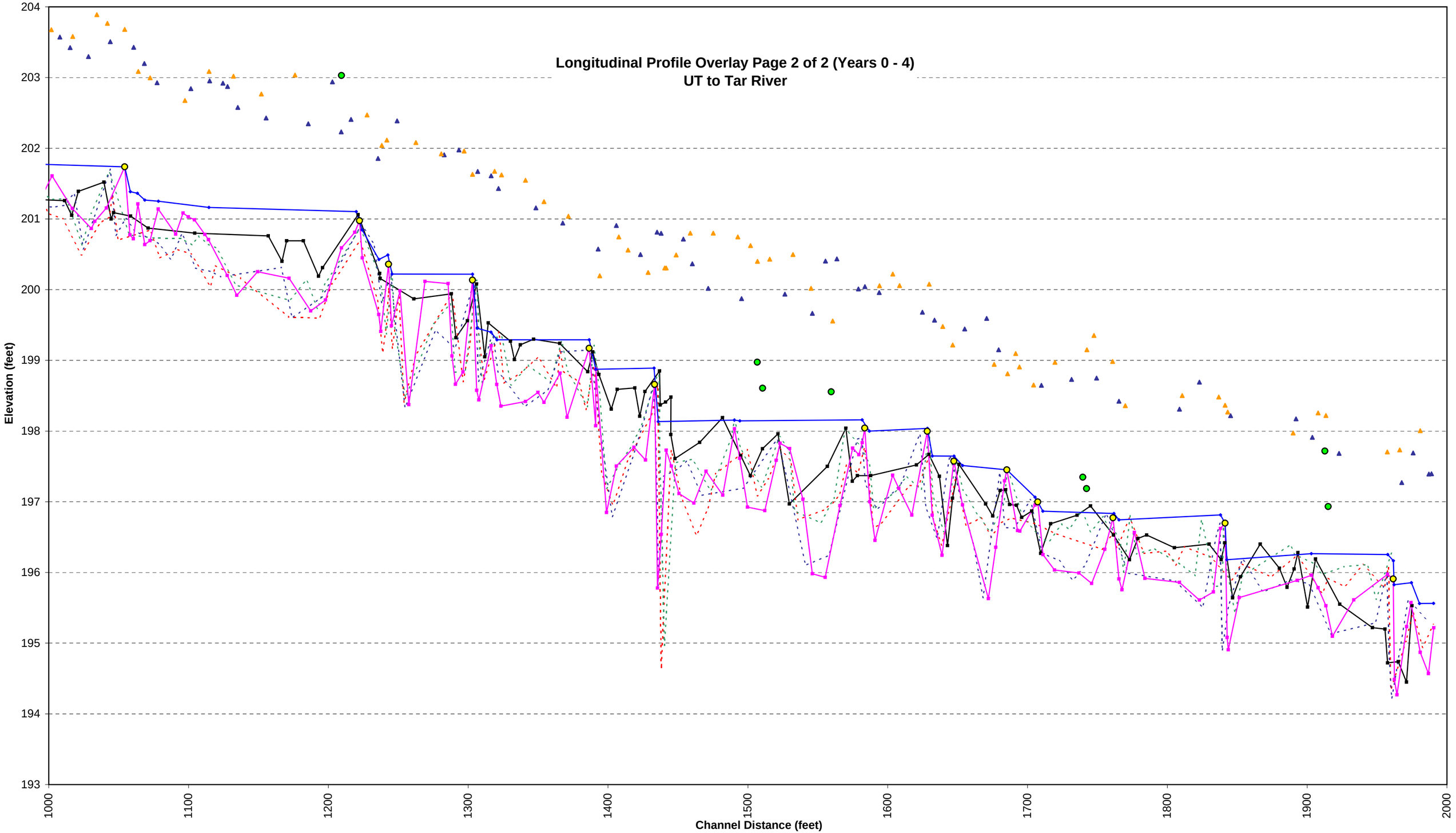
211
210
209
208
207
206
205
204
203
202
201
200

0 100 200 300 400 500 600 700 800 900 1000

Channel Distance (feet)

Thalweg Year 0 (12-08-2005)
Thalweg Year 1 (1-11-2007)
Thalweg Year 2 (7-03-2007)
Thalweg Year 3 (9-23-2008)
Thalweg Year 4 (7-25-2009)
Water Surface Year 4
Left Bankfull Year 4
Right Bankfull Year 4
Rock Sill
Rootwad
Crest Gauge

Longitudinal Profile Overlay Page 2 of 2 (Years 0 - 4)
UT to Tar River



Pebble counts were not performed for UT Tar River during Monitoring Year 4 because it is a sandbed stream and the counts would not successfully detect changes in the amounts of fine sediments in the channel bed.