

County Line Creek Stream Restoration (High Vista) 2004 Annual Monitoring Report



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NC STATE UNIVERSITY

2004 County Line Creek Monitoring Abstract

An unnamed tributary of County Line Creek was restored through the North Carolina Wetlands Restoration Program (NCWRP). The objectives of the project are to:

- 1.) Establish an stable dimension, pattern and profile on 3500 feet of an County Line Creek
- 2.) Improve habitat within the County Line Creek
- 3.) Establish an riparian buffer along the County Line Creek
- 4.) Incorporate this project into a watershed wide management plan

This is the 2nd year of the 5-year monitoring plan for the County Line Creek.

Table 1A. Background Information

Project Name	County Line Creek
Designer's Name	Kimley-Horn and Associates, Inc 3001 Weston Parkway Cary, NC 27513
Contractor's Name	Unknown
Project County	Henderson/Buncombe County, North Carolina
Directions to Project Site	From Asheville NC take Route 191 south towards Henderson. Approximately 12 mile south of Asheville, and Approximately 500 ft north of the Henderson/Buncombe County line make a right (west onto High Vista Drive) into High Vista Golf Course and Estates and the County Line Creek is located in the valley on the north side of the main entrance to High Vista Golf Course and Estates. (High Vista is a gated community)
Drainage Area	0.35 sq. mi.
USGS Hydro Unit	06010105
NCDWQ Subbasin	04-03-02 Upper French Broad River Basin
Project Length	3,500 Linear feet
Restoration Approach	3,500 ft of priority 2 Natural Channel Design (dimension, pattern, and profile)
Date of Completion	Fall 2002
Monitoring Dates	October 2003, July, 2004

Results and Discussion

Overall, while the upstream portion of the stream is functioning well and holding grade, the stream has areas of concern and areas of immediate need. Table 2 shows a summary of monitoring measurement results. The upstream reach of the stream classifies as a B4/B5 with rock cross vanes that control and hold the grade from STA: 0+00 to ~STA: 20+00. Channel dimension and pattern are similar to as-built conditions. There are areas of bank erosion in the upstream reach. The downstream reach of the stream classifies as an E5b/B5 with rock cross vanes that control and hold the grade from STA: ~20+00 to ~STA: 35+00. Channel dimension has enlarged over much of this reach and bank failure is producing a pattern this is not similar to as-built conditions. There are areas of severe bank erosion and head-cuts in much of the downstream reach. There are four structures that have completely failed in this reach causing head cuts of greater than a foot. At this point the majority of the structures are holding grade and functioning well but repairs are needed in the downstream section. Vegetation is not succeeding to levels required for mitigation credit, replanting trees to obtain mitigation requirements and live stakes only in areas where erosion is problematic. Invasive vegetation is not a major issue on this project site. The fescue should be monitored however, and may need control so more diverse herbaceous vegetation can develop.

Table 2. Summary of Channel Conditions

DIMENSION	County Line Creek Cross-section #1 Riffle		County Line Creek Cross-section #2 Pool		County Line Creek Cross-section #3 Riffle		County Line Creek Cross-section #4 Pool	
	2003	2004	2003	2004	2003	2004	2003	2004
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004
Bankfull Cross-sectional Area	N/A	2.1	N/A	2.0	N/A	18.4	N/A	25.1
Bankfull Width	N/A	3.7	N/A	6.0	N/A	18.0	N/A	11.4
Bankfull Mean Depth	N/A	0.6	N/A	0.3	N/A	1.0	N/A	2.2
Bankfull Max Depth	N/A	1.0	N/A	1.4	N/A	3.0	N/A	3.3

PATTERN	County Line Creek Design			County Line Creek As-built 2003			County Line Creek 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			50	378	124
Radius of Curvature	Not Reported			Not Reported			13	96	41
Beltwidth	Not Reported			Not Reported			15	79	26

PROFILE	County Line Creek Design			County Line Creek As-built 2003			County Line Creek 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			14	71	29
Riffle Slope	Not Reported			Not Reported			1.2%	4.3%	1.8%
Pool Length	Not Reported			Not Reported			6	40	14
Pool to Pool Spacing	Not Reported			Not Reported			29	246	100
Valley (TOB) Slope	Not Reported			Not Reported			2.7%	6.0%	4.1%
Bankfull Slope	Not Reported			Not Reported			2.5%	6.1%	4.0%

SUBSTRATE	County Line Creek Cross-section #1 Riffle		County Line Creek Cross-section #2 Pool		County Line Creek Cross-section #3 Riffle		County Line Creek Cross-section #4 Pool	
	2003	2004	2003	2004	2003	2004	2003	2004
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004
d50	N/A	1.17	N/A	1.28	N/A	0.09	N/A	1.22
d84	N/A	13.65	N/A	21.48	N/A	2.40	N/A	10.43

VEGETATION 2004 Monitoring	Quad 1 - CLC		Quad 2 - CLC		Quad 3 - CLC	
	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	0	0	910	0	0	0
Shrub Stratum (% cover)	6	n/a	60	n/a	1	n/a
Herb Stratum (% cover)	102	n/a	52	n/a	103	n/a

* Planted value represents number of stems observed alive that were planted.

The following areas of concern should be monitored closely and considered for repair as suggested:

County Line Creek

- Water piping through Rock Cross Vane structures
 - There are at least eight rock cross vanes that are allowing water to pipe under the head rock of the structure or are failing at stations 3+60, 13+10, 20+40, 27+90, 28+10, 28+60, 33+60, and 34+70
 - At station 3+60 the rock cross vane has water piping under the invert rock with a head loss of 2 inches due to the piping. At this point the structure is not at risk of complete failure due to the boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation.
 - At station 13+10 the rock cross vane has water piping under the invert rock with a head loss of 6 inches due to the piping. At this point the structure is not at risk of complete failure due to the boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation.
 - At station 20+40 the rock cross vane has water piping under the invert rock with a head loss of 2 inches due to the piping. At this point the structure is not at risk of complete failure due to the boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation.
 - At station 27+90 the rock cross vane has water piping under the invert rock with a head loss of 2 inches due to the piping. A head cut is working upstream toward this rock vane structure. There are two structures directly downstream from this structure that has failed. At this point the structure is not at risk of complete failure due to the boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation, but if the two structures downstream are not repaired this structure will most likely fail.
 - At station 28+10 the rock cross vane has failed and needs to be repaired as soon as possible the reach near this failed rock vane has a severe head-cut of about one foot.
 - At station 28+60 the rock cross vane has failed and needs to be repaired as soon as possible the reach near this failed rock vane has a severe head-cut of about one and a half foot. The banks near this reach are severely unstable and the channel is enlarged significantly
 - At station 33+60 the rock cross vane has water piping under the invert rock with a head loss of 2 inches due to the piping. At this point the structure is not at risk of complete failure due to the boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation.
 - At station 34+70 the rock cross vane has failed and needs to be repaired as soon as possible the reach near this failed rock vane has a severe head-cut of about one foot.

- Areas with bank erosion
 - Bank erosion has been noted at thirteen locations on the stream
 - There are four areas of bank erosion due to localized head cuts of 4-8 inches from the piping of water through rock cross vanes and failed structures occurred at multiple stations
 - There are two areas of bank erosion due to placement of root wads that maybe causing bank erosion
 - There are six meander bends that have severe bank erosion
 - There are two areas of major bank erosion due to the overland flow and seepage at station 11+45 on the left bank and station at 33+00 on the left bank Possible repairs would include regarding the gully, preparing this area and seeding with a tackafier and straw mulch
- Vegetation
 - Replanting trees should occur to obtain mitigation requirements
 - The site could benefit from larger containerized trees both for bank stability and aesthetics, although mitigation requirements are currently being met.
 - It is recommended to stake in areas where erosion is problematic, particularly on outside meander bends.
 - Exotic invasive vegetation is a major issue on this project site. Without control the exotic invasive vegetation will likely out-compete native vegetation for resources. A maintenance plan is recommended for control of these species.

Photos

The following are photographs of typical sections and areas of concern throughout the project.



Typical Riffle STA: 25+15



Typical Pool STA: 10+00



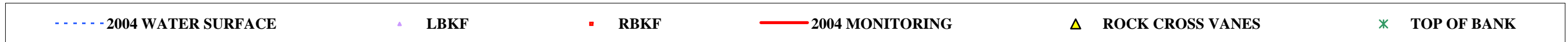
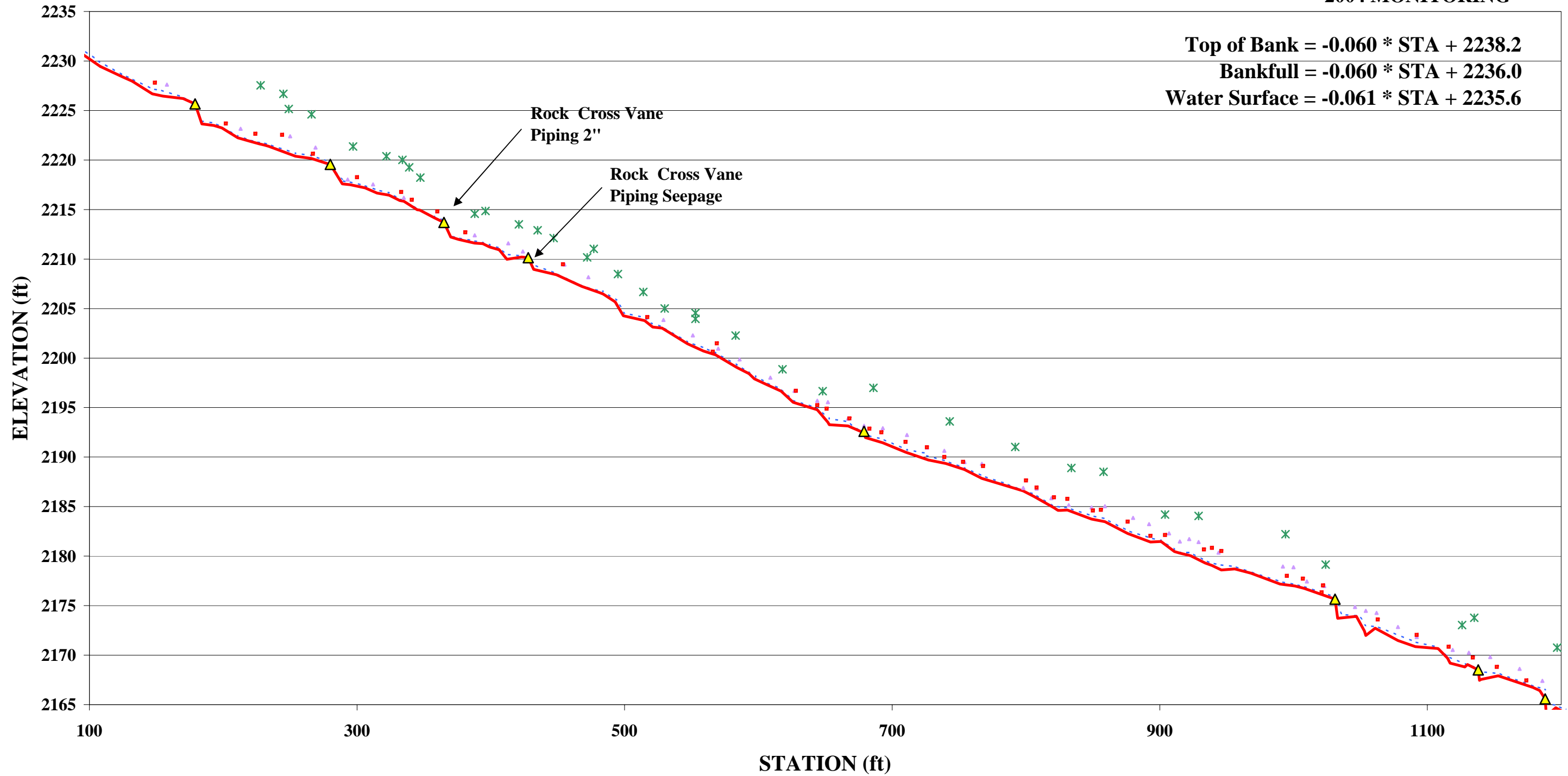
Issue Photo 1. Failed Structure STA: 35+10



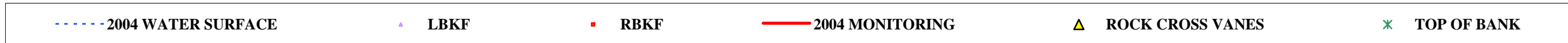
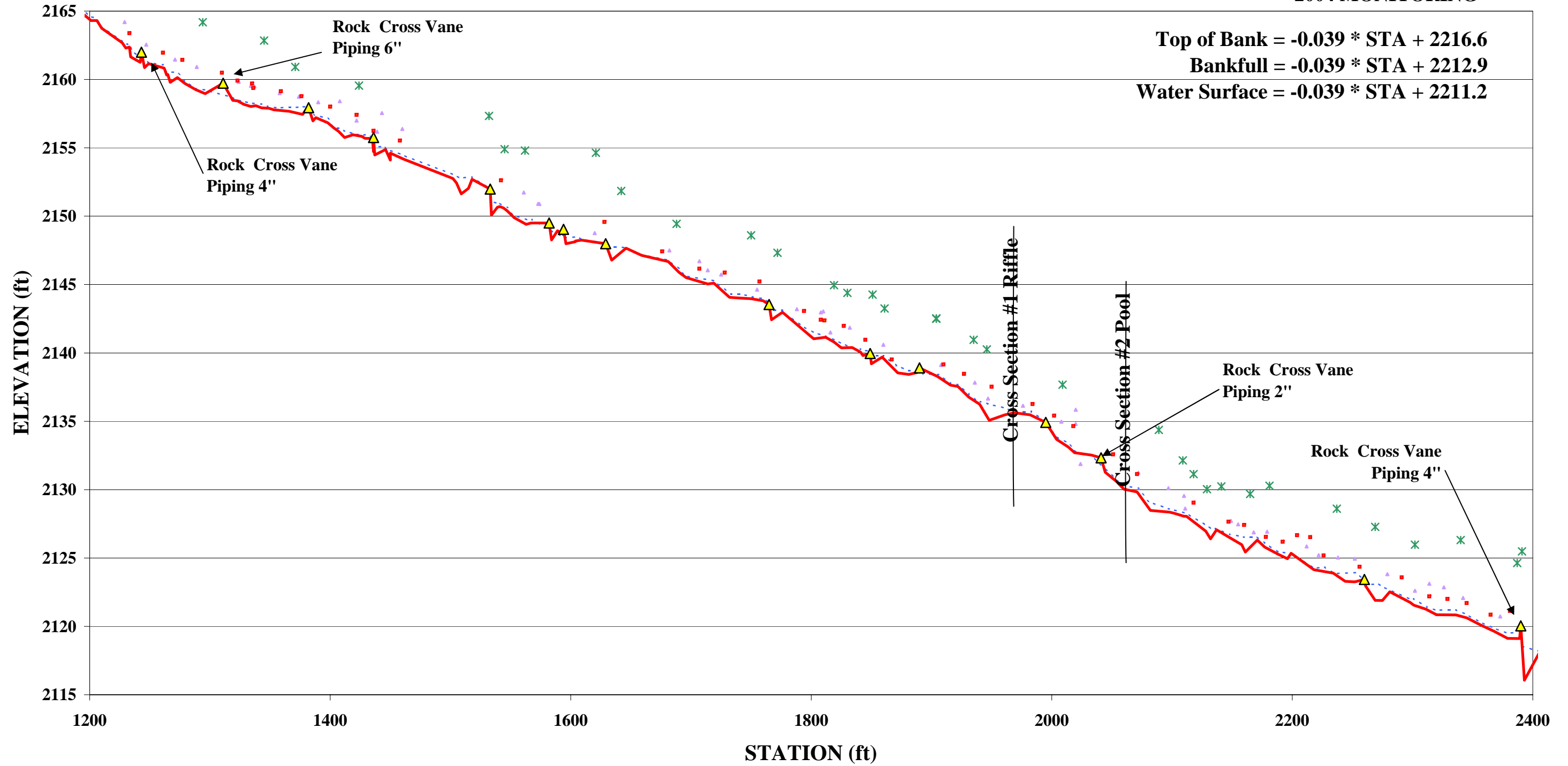
Issue Photo 2. Bank Erosion & Failed Rock Vane STA: 28+60

***There are more issue photos in the photo log of this report**

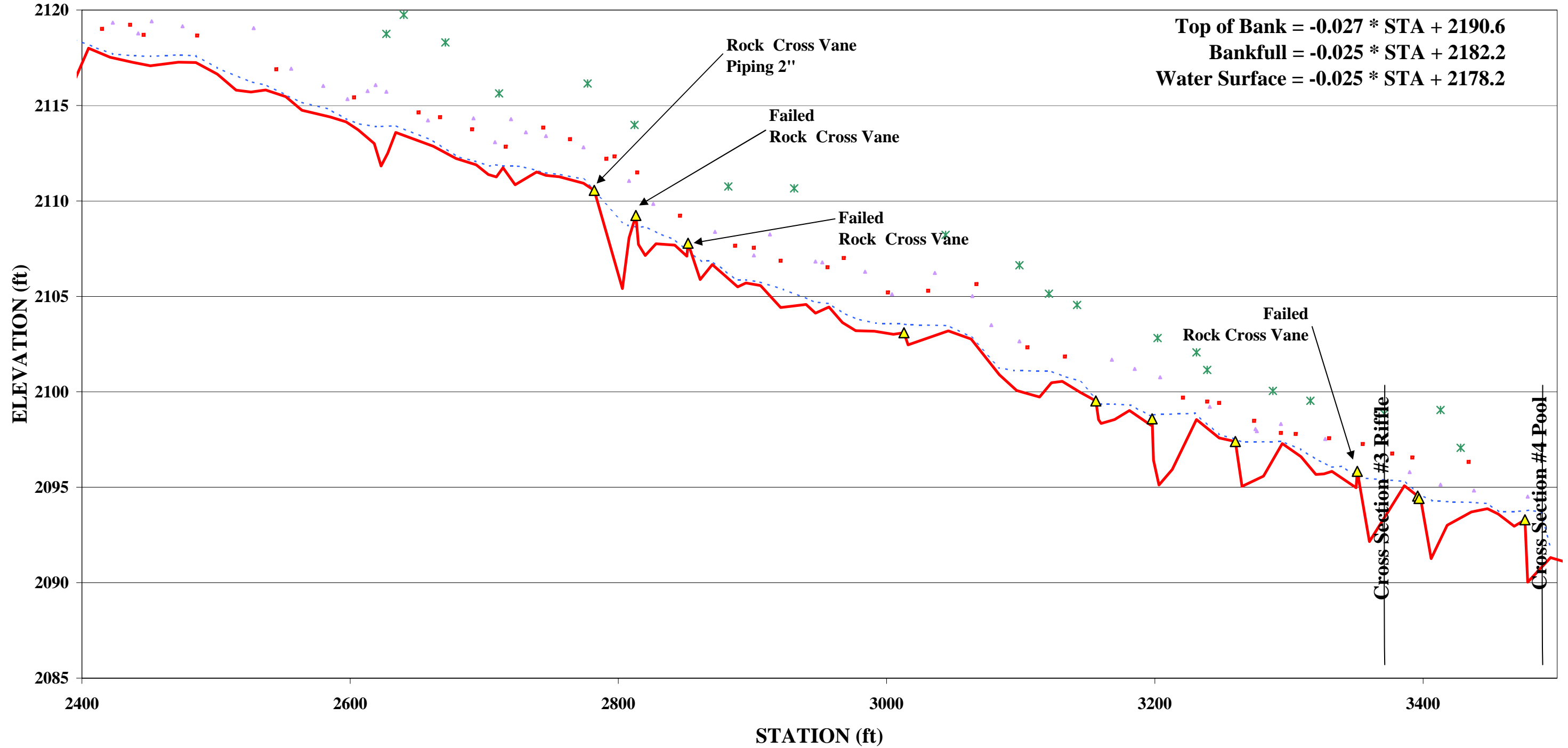
**COUNTY LINE CREEK
LONG PROFILE
DOWN-STREAM REACH
2004 MONITORING**



**COUNTY LINE CREEK
LONG PROFILE
DOWN-STREAM REACH
2004 MONITORING**



**COUNTY LINE CREEK
LONG PROFILE
DOWN-STREAM REACH
2004 MONITORING**



Top of Bank = -0.027 * STA + 2190.6
Bankfull = -0.025 * STA + 2182.2
Water Surface = -0.025 * STA + 2178.2

Rock Cross Vane
Piping 2"

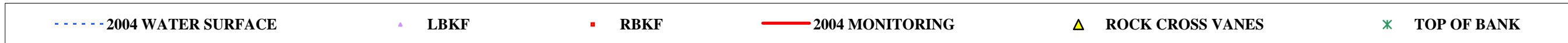
Failed
Rock Cross Vane

Failed
Rock Cross Vane

Failed
Rock Cross Vane

Cross Section #3 Riffle

Cross Section #4 Pool



**COUNTY LINE CREEK
LONG PROFILE
ENTIRE REACH
2004 MONITORING**

**Top of Bank = $-0.041 * STA + 2224.7$
Bankfull = $-0.040 * STA + 2219.8$
Water Surface = $-0.040 * STA + 2219.5$**

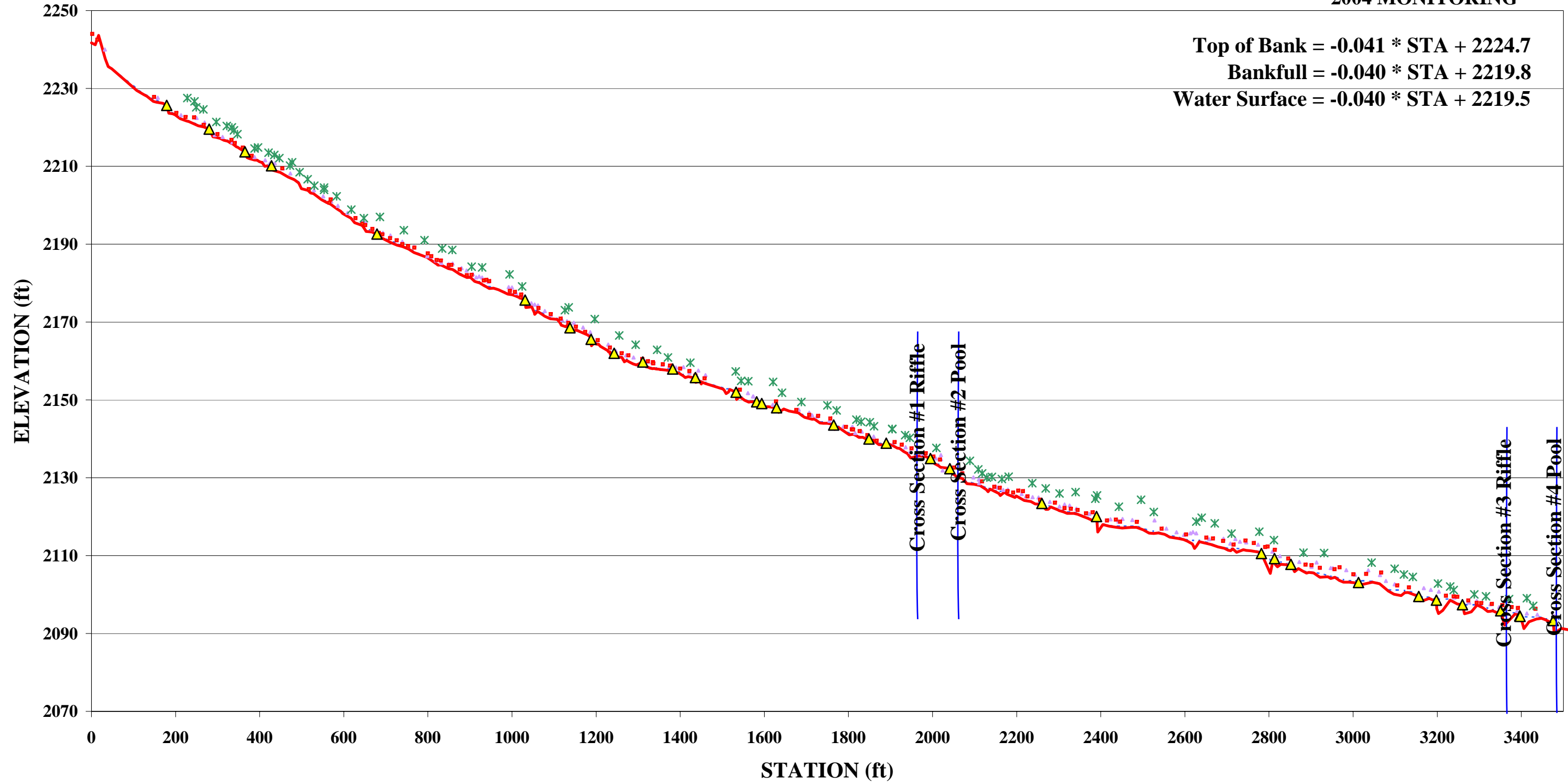


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1.0 BACKGROUND INFORMATION

Project planning was initiated for the County Line Stream Restoration in 2000 for the implementation of a stream restoration project in the property boundaries of High Vista Golf Course and Estates in Henderson and Buncombe County, North Carolina (Figure 1).

The project consisted of the analysis of the 0.35 square mile portion of the County Line Creek Watershed. The land uses within the drainage area primarily consist of single family residential, and golf course (greens, ponds and golf cart paths) land cover. The stream originates at the base of a small pond although perennial spring seeps are common in the catchment. The restoration appears to be laterally confined due to limitations of the golf course resulting in very little sinuosity and nutrient management of nonpoint source runoff seems to be problematic in the catchment. Algae blooms in the downstream pond are common. Construction was completed in July 2002

Following coordination with local leaders, the Wetlands Restoration Program and citizens groups, the project was initiated and focused on the restoration of approximately 3500 linear feet of degraded stream within the High Vista Estates. The restoration of this portion of County Line Creek, was conducted to correct identified system deficiencies including severe bank erosion, channel widening, and the loss of aquatic habitat resulting from stream channelization, the loss of riparian vegetation, and watershed development. The goal of the project was to develop a stable stream channel with reduced bank erosion, efficient sediment transport, enhanced warm water fisheries, and improved overall stream habitat and site aesthetics. Implementation of the project was completed by July 2002.

1.1 Goals and Objective

The goals and objectives of this project are as follows:

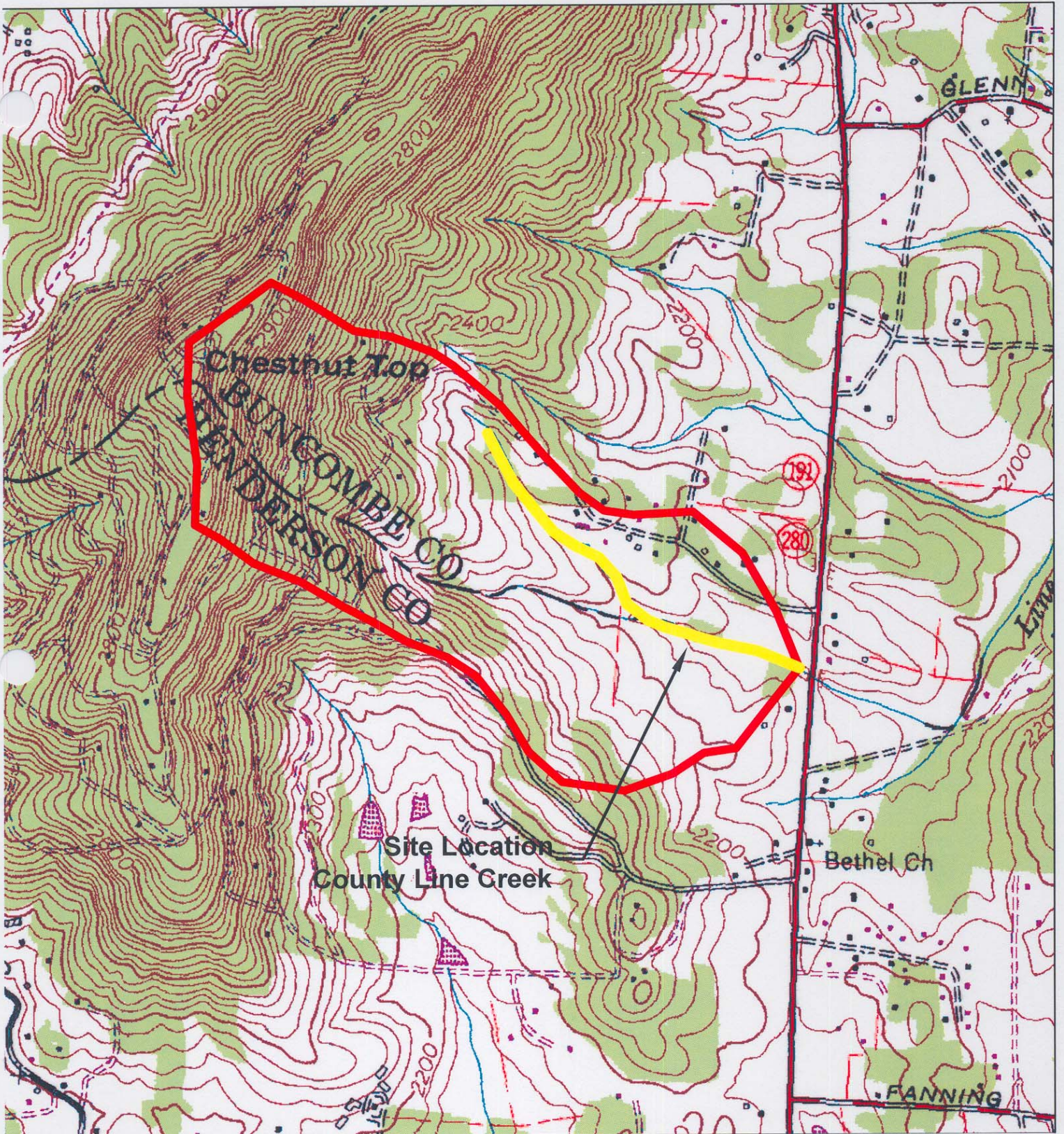
- 1.) Restore 3,500-linear feet of County Line through a priority 2 natural channel design approach.
- 2.) Establish a riparian zone surrounding restored section of County Line Improve the habitat within the channel and the riparian zone.
- 3.) Incorporate this project into a watershed wide management plan.

1.2 Project Location

The County Line Creek stream restoration is located in Henderson/Buncombe County, NC at High Vista Golf Course and Estates south of Asheville NC. From Asheville NC take Route 191 south towards Henderson. Approximately 12 mile south of Asheville, and Approximately 500 ft north of the Henderson/Buncombe County line make a right (west onto High Vista Drive) into High Vista Golf Course and Estates and the County Line Creek is located in the valley on the north side of the main entrance to High Vista Golf Course and Estates. (High Vista is a gated community)

1.3 Project Description

A previously straight and incised channel of the headwaters of County Line Creek located at High Vista Golf Course and Estates was restored using channel dimension, pattern, and profile modifications and the establishment of riparian zone adjacent to the creek. Channel profile is maintained through the use of rock cross vanes. Channel pattern is maintained through the use of single vanes and vegetation along the channel banks. Due to easement constraints, pattern modifications were limited throughout the project.



SCALE 1" = 1000'

500 0 500 1000



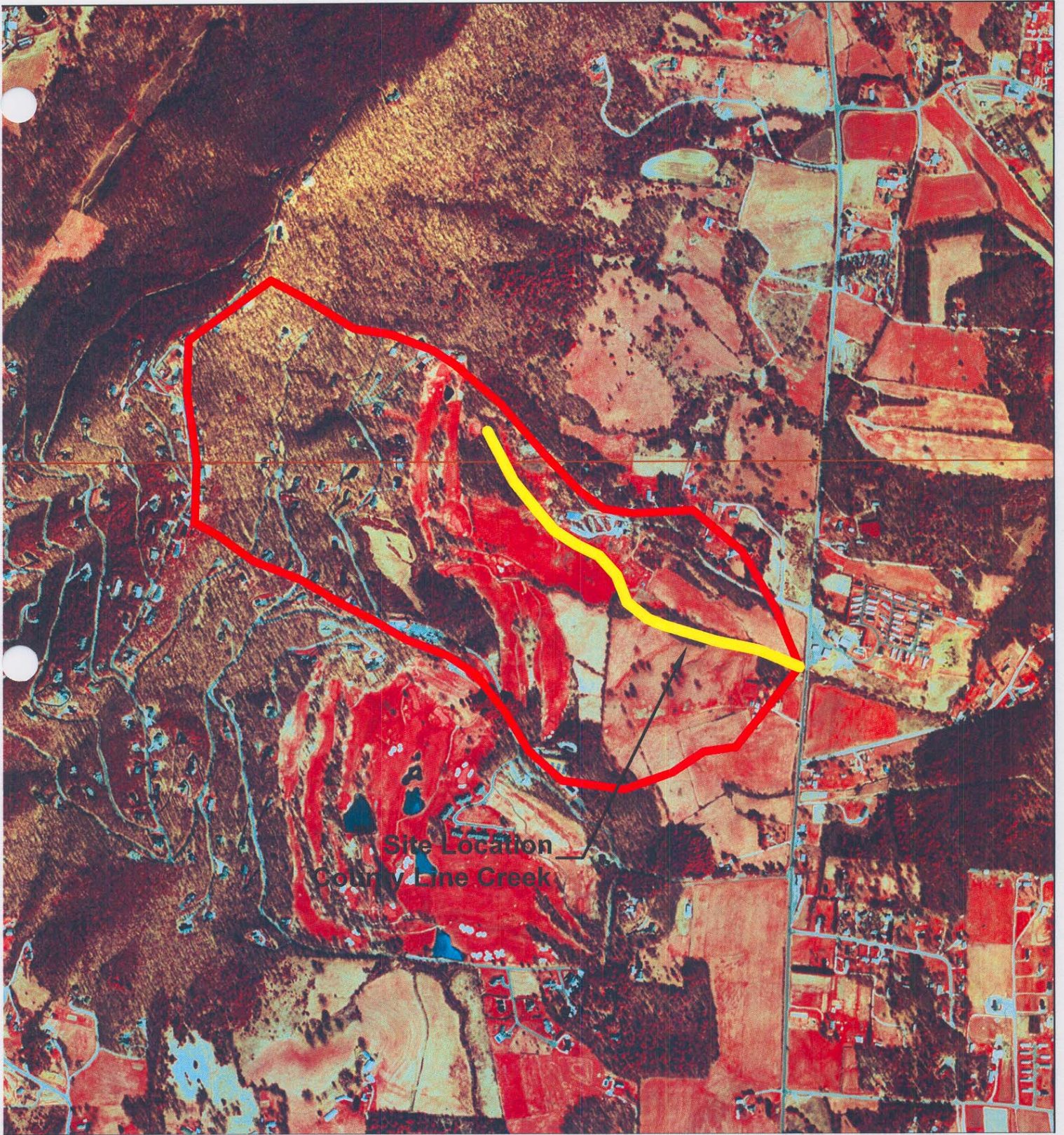
DRAWING NO.	SHEET NO.	PROJECT NO.	DATE	COUNTY LINE CREEK HIGH VISTA GOLF COURSE AND ESTATES HENDERSON/BUNCOMBE COUNTY, N.C.
			03/20/2005	
WATERSHED TOPO MAP WATERSHED 0.34 sqmiles				

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1	WATERSHED MAPS	GAT	DAB	03/30/05
NO	REVISIONS	DRN	CHK	DATE



SCALE 1" = 1000'

500 0 500 1000



DRAWING NO.	W082710 - 2
SHEET NO.	2
PLANNING CL.CWG	
PROJECT NO.	03/30/2005
DATE	03/30/2005

COUNTY LINE CREEK
HIGH VISTA GOLF COURSE AND ESTATES
HENDERSON/BUNCOMBE COUNTY, N.C.

WATERSHED ORTHO MAP
WATERSHED 0.34 sqmiles

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1	WATERSHED MAPS	GAT	DAB	03/30/05
NO	REVISIONS	DRN	CHK	DATE

2.0 YEAR 2004 RESULTS AND DISCUSSION

Year 2004 monitoring results are shown for County Line Creek Monitoring.

2.1 Vegetation

Using the Draft Vegetation Monitoring Plan for NCWRP Riparian Buffer and Wetland Restoration Projects, 3 vegetation monitoring plots were randomly located within the riparian buffer of County Line Creek. No reference area was studied; therefore no comparisons could be made to reference conditions.

2.1.1 Results and Discussion

Vegetation within the riparian buffer varied in success level. The planted native herbaceous vegetation was dense and appeared to be in an early successional state. *Erechtites* spp., *Solidago* spp., and *Helianthus* spp. are especially doing well throughout the area. Live stakes are healthy in certain areas. Where living, livestakes thrived, sending up tall stems. Planted trees and shrubs are doing poorly throughout the entire buffer. In the first and third plots, no tree stems were counted. In the second plot, 3 species were noted, 2 of which had been planted. Extrapolation from the three plots in the resulted in an overall average of approximately 40 planted trees per acre for this restoration site, with an average of 1 tree per plot.

Natural regeneration was present in the second plot, most notably *Acer rubrum*. It was noted that a few large planted *Liriodendron tulipifera* and *Populus* sp. were doing well. Overall, the area appeared to be in an early successional state.

Buffer width is inconsistent along the creek and it appears that the adjoining golf course has encroached into the riparian buffer. Mowing within the buffer is evident. Despite lack of woody vegetation, buffer was 100% covered with herbaceous vegetation.

Vegetation overall within this project has mixed success. Herbaceous vegetation, both planted and naturally regenerating, are doing extremely well and contribute to the bank stability of the project. Live stakes are healthy in areas where present. Planted tree species survival is low.

Recommendations include replanting trees to obtain mitigation requirements and stake only in areas where erosion is problematic. With the exception of encroaching golf course grass species, invasive vegetation is not a major issue on this project site. Mowing should be discontinued within the buffer boundaries.

2.2 Morphology

Restored channel dimension, pattern, profile and substrate were examined during the 2004 monitoring. Overall, while the upstream portion of the stream is functioning well and holding grade, the downstream reach has areas of concern and areas of immediate need. Table 2 shows a summary of monitoring measurement results. The upstream reach of the stream classifies as a B4/B5 with rock cross vanes that control and hold the grade from STA: 0+00 to ~STA: 20+00. Channel dimension and pattern are similar to as-built conditions. There are areas of bank erosion in the upstream reach. The downstream reach of the stream classifies as an E5b/B5 with rock cross vanes that control and hold the grade from STA: ~20+00 to ~STA: 35+00. Channel dimension has enlarged over much of this reach and bank failure is producing a pattern this is not similar to as-built conditions. There are areas of severe bank erosion and head-cuts in much of the downstream reach. There are four structures that have completely failed in this reach causing head cuts of greater than a foot. At this point the majority of the structures are holding grade and functioning well but repairs at needed in the downstream section. Vegetation is not succeeding to levels required for mitigation credit, replanting trees to obtain mitigation requirements and live stakes only in areas where erosion is problematic. Invasive vegetation is not a major issue on this project site. The fescue should be monitored however, and may need control so more diverse herbaceous vegetation can develop.

2.2.1 Results and Discussion

The of County Line Creek is a small gravel bed channel with a high percentage of sand due to imbedded sand particles from bank erosion and upland erosion. The restoration construction created a B4 channel from an existing G4 channel. The valley slope is steep with an average slope of 4.1% at the project location, the tributary was restored with an entrenchment ratio or 1.8 to 2.0 and the ratio of the top of bank height to the bankfull height is approximately 2.5. There are no major bedrock outcrops that hold grade on this reach. The channel profile along County Line Creek has shown any significant changes in between the as-build profile and this year's monitoring. The stream is moving toward a step pool and run dominated system pools are filling in and riffles are flattening. Rock cross vanes have failed and risk the stability of the project. While there are six areas where structures have piping of water occurring below the head rock, there are also three major failures with the rock cross vanes. Between the rock size, existing vegetation, and number of structures the piping and seepage occurring will not cause any of the structures a major failure, but the head-cuts could encourage a major failure of the grade control structures. The five structures that are piping have resulted in a localized head-cut of 2-6 inches. There are two other structures with seepages under the head rock but no existing head-cut. The stream profile of the as-build shows that riffles were constructed and are holding well where the downstream control structure are holding grade. The design was most likely intended to build a riffle/pool sequence plan form B4 type channel for the majority of the project, but this intent was not maintained over the monitoring period thus far. The number of riffles has decreased and only the longer and or steeper riffles remain. Unless the substrate become more course the system will stay embedded with sand and will continue to migrate toward a run dominated system. During the 2004 monitoring

period there were 25 semi-stable riffles observed and five un-stable riffles observed related to the piping of the five cross vane structures.

Cross section results were calculated using NCSU techniques for consistency purposes, there were no as-build cross sections available for analysis. Cross-sectional trends were analyzed by looking at the cross-sections, change in planform, BEHI, and the longitudinal profile. Cross-section 1 is a riffle and has a current cross sectional area of 2.1 square feet. Cross section 1 is fairly stable, has low near bank stress and a low bank erosion hazard. This first cross section classifies as a B4 channel with an ER of ~2.2, and is 20 ft upstream of a stable rock cross vane at ~STA: 19+90. Cross-section 2 is a pool and has a current cross sectional area of 2.0 square feet. Cross section 2 is fairly stable, has low near bank stress and a low bank erosion hazard. This second cross section classifies as a B4 channel with an ER of ~2.2, and is 150 ft upstream of a stable rock cross vane. Cross-section 3 is a riffle and has a current cross sectional area of 18.4 square feet. Cross section 3 is un-stable, has a high bank erosion hazard. There is a piping rock cross vane approximately 15ft upstream from cross section 3, this cross section is not functioning as a riffle. Cross-section 4 is a pool and has a current cross sectional area of 25.1 square feet. Cross section 4 is un-stable, has a high bank erosion hazard. There is a failed rock cross vane approximately 15ft upstream from cross section 4, this cross section is severely eroded and unstable This fourth cross section classifies as a B4 channel with an ER of ~1.8

The channel substrate in the riffle sections are small gravel and sand and have a D50 of 1.17 mm with a D84 of 13.7 mm. The channel substrate in the pool sections are sand and have a D50 of 1.24 mm with a D84 of 15.9 mm. The channel substrate in cross-section #3 sections has fine sand at a D50 of 0.09 mm with a D84 of 2.4 mm this due to the active erosion occurring at this section of the downstream reach.

Channel pattern does not appear to have been maintained since construction. Many of the outside meander bends are experiencing slight migration through bank slumping there is one shoot cut-off forming at STA: 30+50, and there is also a mid-channel bar forming at STA: 12+00. The pattern does not seem to align closely with the as-build pattern for the downstream reach (Figure 4). Channel banks throughout the County Line remains fairly un-stable, due to head-cuts from failing structures, floodplain constraints, and poor vegetation. Slumping and scour is also a result of a root wads being placed too high or down cutting due to piping of a structure that have exposed the lower portion of a root wad. Overall, while the upstream portion of the stream is functioning well and holding grade, the downstream reach has areas of concern and areas of immediate need.

2.3 Biological and Ecological

Post-construction biological data have been collected in 2003 and 2004 from this project. These data indicate that biological conditions have improved slightly at the upstream monitoring location (Site #1), but that conditions continue to decline at the lower monitoring location (Site #2) compared to reference data. The dominant taxa at Site #2 are filter feeding organisms which suggest that nutrient enrichment is problematic in the catchment.”

2.3.1 Results and Discussion

Country Line Creek at High Vista Estates is a small (0.35 square mile), relatively steep tributary of the French Broad River. The land uses within the drainage area primarily consist of single family residential, and golf course (greens, ponds and golf cart paths) land cover. The stream originates at the base of a small pond although perennial spring seeps are common in the catchment. The restoration appears to be laterally confined due to limitations of the golf course resulting in very little sinuosity and nutrient management of non-point source runoff seems to be problematic in the catchment. Algae blooms in the downstream pond are common. Construction was completed in July 2002 at this project and biological data were collected in December 2001 (pre-construction) and December 2003 and 2004.

Table 1. Summary statistics from the stream restoration project at High Vista Estates:

Metric	Reference			Country Line Crk. Site #1			Country Line Creek. Site #2		
	12/2001	12/2003	12/2004	12/2001	12/2003	12/2004	12/2001	12/2003	12/2004
Total Taxa Richness	34	34	38	34	31	28	29	22	14
EPT Taxa Richness	21	19	22	19	15	17	5	5	3
EPT Abundance	85	87	84	62	55	65	18	25	14
Dominant in Common Index (%)	-	-	-	24%	22%	50%	28%	17%	6%
# Keystone Taxa	16	13	17	12	9	13	0	1	1

The reference reach was moved during the 2003 survey to a nearby catchment that appeared to be a better comparison to the data collected from Country Line Creek, although these two reference reaches did have many similarities (taxa richness and abundance values are very similar). This site will be used as reference for all future investigations. Dominant in Common numbers for both Country Line Creek locations when compared to reference reach conditions were 24% and 28% respectively during the pre-construction survey. This information suggests that catchment-wide perturbations were affecting the water quality of Country Line Creek and that the upstream site on Country Line Creek (site 1) is not an appropriate reference. Dominant in Common

numbers were low when compared to the new ecoregional reference site in 2003 following construction (22 and 17%, respectively). The number of keystone or indicator species declined somewhat to 9 taxa at Site #1 and only 1 taxa at Site #2 on Country Line Creek. Some improvement is noted at Site #1 during the 2004 investigation. Both metrics increased at this location; dominate in common index to 50% and the number of keystone taxa to 13. However conditions continued to decline at Site #2.

The 2004 biological data from this project suggests that some minor improvements are noted at the upstream monitoring location above preconstruction conditions. Following construction during the 2003 investigation the numbers of mayfly and stonefly taxa were reduced, but their numbers increased during the 2004 survey. Interestingly, *Serratella deficiens* was abundant during the pre-construction survey but not collected during either of the post-construction surveys at this location. Biological conditions continue to decline at the downstream location.

The only abundant taxa at this site are filter-feeders; *Hydropsyche betteni* and *Simulium*.

Table 1. Summary of Channel Conditions

DIMENSION	County Line Creek Cross-section #1 Riffle		County Line Creek Cross-section #2 Pool		County Line Creek Cross-section #3 Riffle		County Line Creek Cross-section #4 Pool	
	2003	2004	2003	2004	2003	2004	2003	2004
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004
Bankfull Cross-sectional Area	N/A	2.1	N/A	2.0	N/A	18.4	N/A	25.1
Bankfull Width	N/A	3.7	N/A	6.0	N/A	18.0	N/A	11.4
Bankfull Mean Depth	N/A	0.6	N/A	0.3	N/A	1.0	N/A	2.2
Bankfull Max Depth	N/A	1.0	N/A	1.4	N/A	3.0	N/A	3.3

PATTERN	County Line Creek Design			County Line Creek As-built 2003			County Line Creek 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			50	378	124
Radius of Curvature	Not Reported			Not Reported			13	96	41
Beltwidth	Not Reported			Not Reported			15	79	26

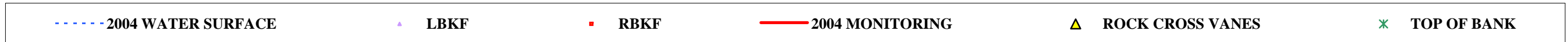
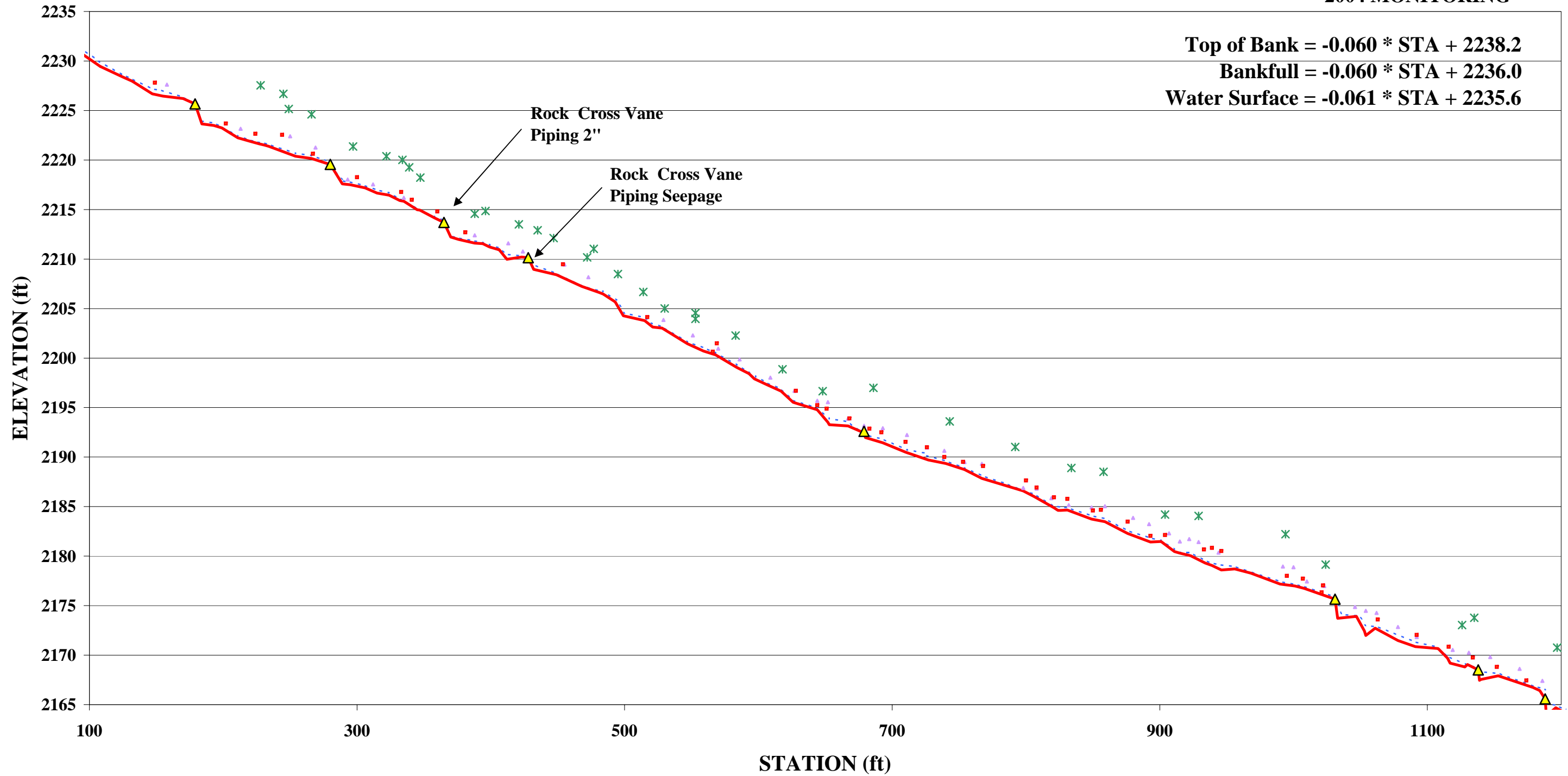
PROFILE	County Line Creek Design			County Line Creek As-built 2003			County Line Creek 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			14	71	29
Riffle Slope	Not Reported			Not Reported			1.2%	4.3%	1.8%
Pool Length	Not Reported			Not Reported			6	40	14
Pool to Pool Spacing	Not Reported			Not Reported			29	246	100
Valley (TOB) Slope	Not Reported			Not Reported			2.7%	6.0%	4.1%
Bankfull Slope	Not Reported			Not Reported			2.5%	6.1%	4.0%

SUBSTRATE	County Line Creek Cross-section #1 Riffle		County Line Creek Cross-section #2 Pool		County Line Creek Cross-section #3 Riffle		County Line Creek Cross-section #4 Pool	
	2003	2004	2003	2004	2003	2004	2003	2004
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004
d50	N/A	1.17	N/A	1.28	N/A	0.09	N/A	1.22
d84	N/A	13.65	N/A	21.48	N/A	2.40	N/A	10.43

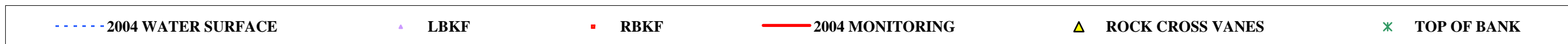
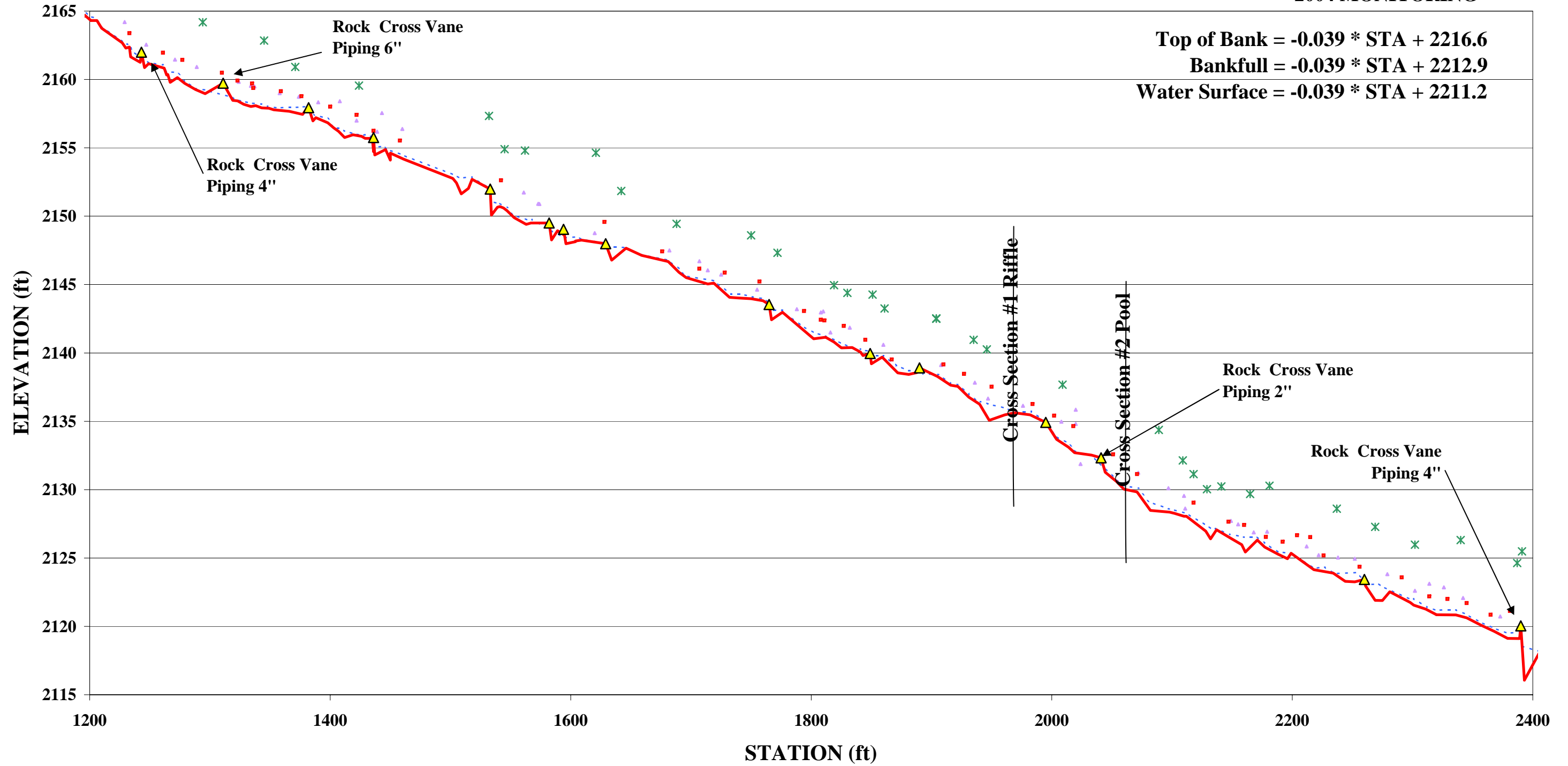
VEGETATION 2004 Monitoring	Quad 1 - CLC		Quad 2 - CLC		Quad 3 - CLC	
	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	0	0	910	0	0	0
Shrub Stratum (% cover)	6	n/a	60	n/a	1	n/a
Herb Stratum (% cover)	102	n/a	52	n/a	103	n/a

* Planted value represents number of stems observed alive that were planted.

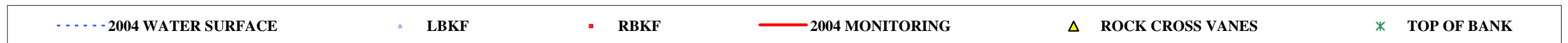
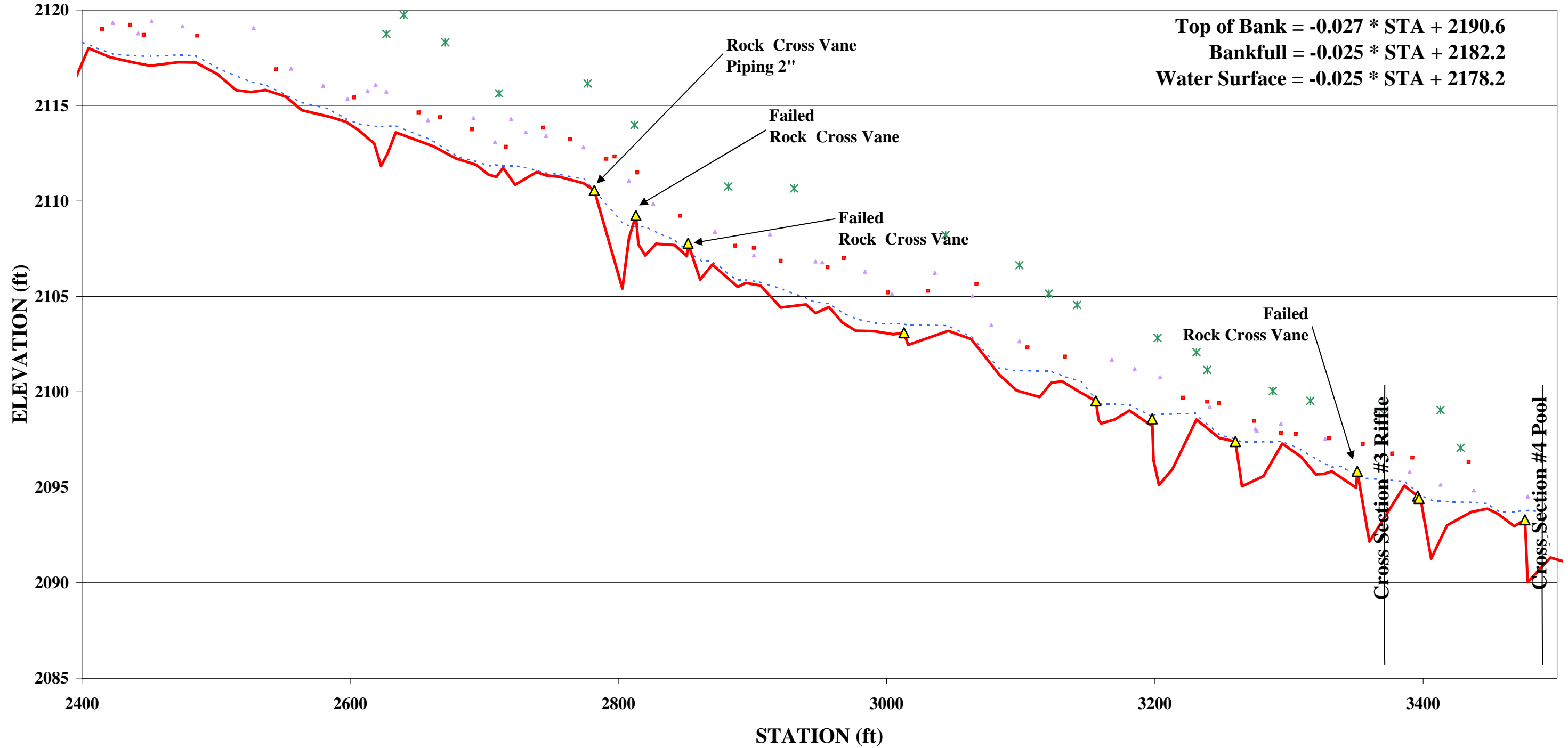
**COUNTY LINE CREEK
LONG PROFILE
DOWN-STREAM REACH
2004 MONITORING**



**COUNTY LINE CREEK
LONG PROFILE
DOWN-STREAM REACH
2004 MONITORING**

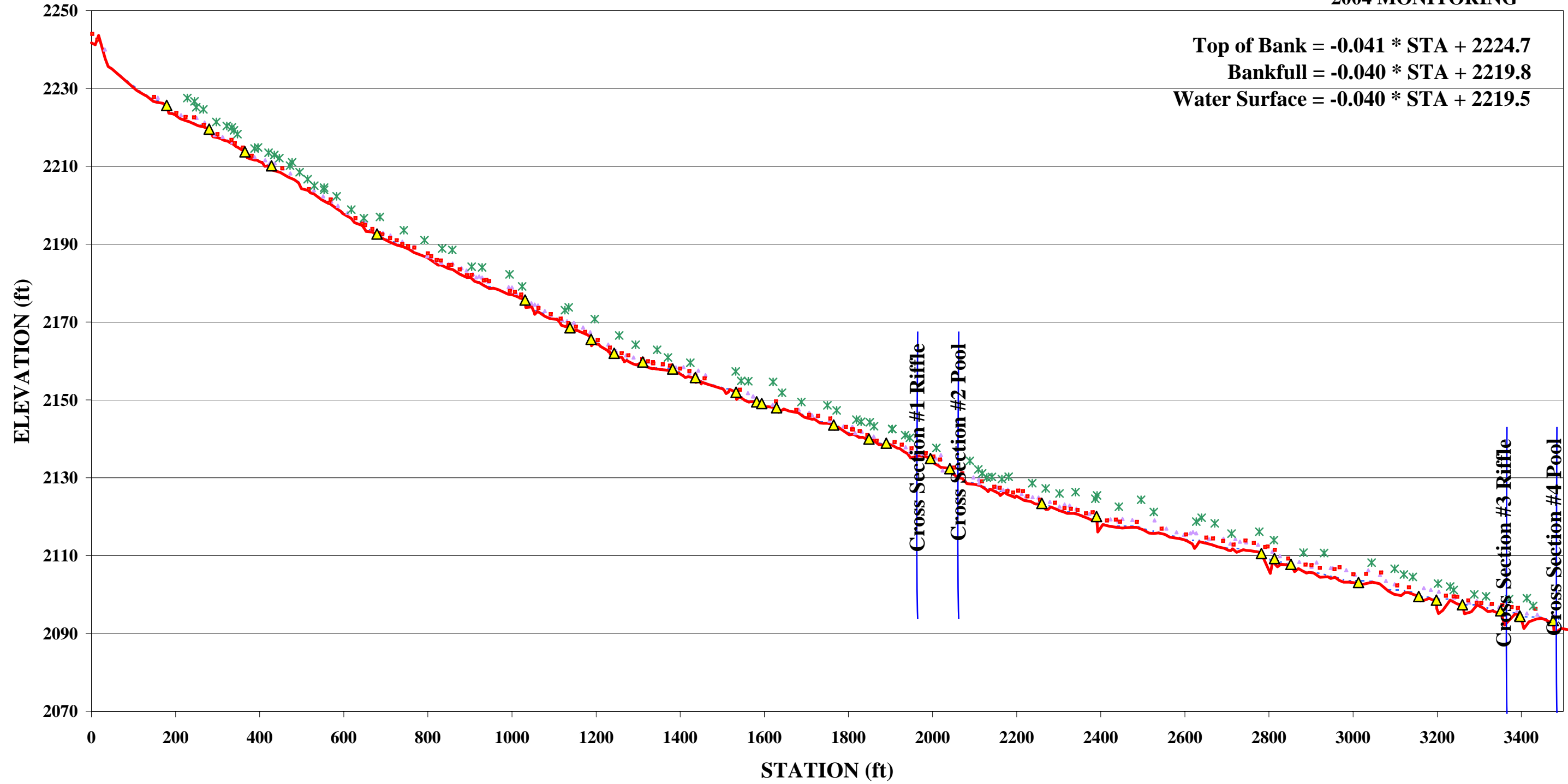


**COUNTY LINE CREEK
LONG PROFILE
DOWN-STREAM REACH
2004 MONITORING**



**COUNTY LINE CREEK
LONG PROFILE
ENTIRE REACH
2004 MONITORING**

**Top of Bank = $-0.041 * STA + 2224.7$
Bankfull = $-0.040 * STA + 2219.8$
Water Surface = $-0.040 * STA + 2219.5$**



2.3 Areas of Concern

The following areas of concern should be monitored closely and considered for repair as suggested:

County Line Creek

- Water piping through Rock Cross Vane structures
 - There are at least eight rock cross vanes that are allowing water to pipe under the head rock of the structure or are failing at stations 3+60, 13+10, 20+40, 27+90, 28+10, 28+60, 33+60, and 34+70
 - At station 3+60 the rock cross vane has water piping under the invert rock with a head loss of 2 inches due to the piping. At this point the structure is not at risk of complete failure due to the boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation.
 - At station 13+10 the rock cross vane has water piping under the invert rock with a head loss of 6 inches due to the piping. At this point the structure is not at risk of complete failure due to the boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation.
 - At station 20+40 the rock cross vane has water piping under the invert rock with a head loss of 2 inches due to the piping. At this point the structure is not at risk of complete failure due to the boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation.
 - At station 27+90 the rock cross vane has water piping under the invert rock with a head loss of 2 inches due to the piping. A head cut is working upstream toward this rock vane structure. There are two structures directly downstream from this structure that has failed. At this point the structure is not at risk of complete failure due to the boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation, but if the two structures downstream are not repaired this structure will most likely fail.
 - At station 28+10 the rock cross vane has failed and needs to be repaired as soon as possible the reach near this failed rock vane has a severe head-cut of about one foot.
 - At station 28+60 the rock cross vane has failed and needs to be repaired as soon as possible the reach near this failed rock vane has a severe head-cut of about one and a half foot. The banks near this reach are severely unstable and the channel is enlarged significantly
 - At station 33+60 the rock cross vane has water piping under the invert rock with a head loss of 2 inches due to the piping. At this point the structure is not at risk of complete failure due to the

boulder size used for the vane construction, the total number of vanes in the project, and the existing vegetation.

- At station 34+70 the rock cross vane has failed and needs to be repaired as soon as possible the reach near this failed rock vane has a severe head-cut of about one foot.
- Areas with bank erosion
 - Bank erosion has been noted at thirteen locations on the stream
 - There are four areas of bank erosion due to localized head cuts of 4-8 inches from the piping of water through rock cross vanes and failed structures occurred at multiple stations
 - There are two areas of bank erosion due to placement of root wads that maybe causing bank erosion
 - There are six meander bends that have severe bank erosion
 - There are two areas of major bank erosion due to the overland flow and seepage at station 11+45 on the left bank and station at 33+00 on the left bank Possible repairs would include regarding the gully, preparing this area and seeding with a tackafier and straw mulch
- Vegetation
 - Replanting trees should occur to obtain mitigation requirements
 - The site could benefit from larger containerized trees both for bank stability and aesthetics, although mitigation requirements are currently being met.
 - It is recommended to stake in areas where erosion is problematic, particularly on outside meander bends.
 - Exotic invasive vegetation is a major issue on this project site. Without control the exotic invasive vegetation will likely out-compete native vegetation for resources. A maintenance plan is recommended for control of these species.



PS #1 Looking Downstream from STA 19+50 Riffle Cross-Section #1



PS #2 Looking Upstream from STA 20+25 Riffle Cross-Section #1



PS #3 Looking Downstream from STA 20+50 Pool Cross-Section #2



PS #4 Looking Upstream from STA 21+10 Pool Cross-Section #2



PS #5 Looking Downstream from STA 33+50 Rifle Cross Section #3



PS #6 Looking Upstream from STA 34+25 Rifle Cross Section #3



PS #7 Looking Downstream from STA 35+10 Pool Cross Section #4



PS #8 Looking Upstream from STA 35+30 Pool Cross Section #4



PS #9 Looking Downstream from STA 2+00



PS #10 Looking Downstream from STA 15+00



PS #11 Looking Upstream from STA 34+80



STA 3+70 Looking Upstream at Rock Cross Vane and Water Piping Through Vane



STA 9+10 Looking Downstream at Meander Bend and Bank Erosion



STA 10+80 Looking Upstream at Steep Riffle and Bank Erosion on Left Bank



STA 11+40 Looking at Right Bank Upland Gully Erosion



STA 11+50 Looking Upstream at Rock Cross Vane with Right Bank Erosion



STA 12+00 Looking Upstream at Mid-Channel Bar



STA 13+20 Looking Downstream at Water Piping Through Rock Cross Vane



STA 14+40 Looking at Right Bank Hill Slope Erosion



STA 15+30 Looking Downstream at Down-Cutting and Bank Erosion



STA 15+50 Looking Downstream at Bank Erosion



STA 20+45 Looking Downstream at Undercut Log vane



STA 22+80 Looking Upstream at Rock Vane with Confined Right Bank Erosion



STA 24+25 Looking Downstream at Rock Vane with Right Bank Erosion



STA 27+30 Looking Downstream at Pool Root Wad with Bank Erosion



STA 27+60 Looking Downstream at Bankfull Bench Down-Cut



STA 27+75 Looking Downstream at Failing Rock Vane and Down-Cutting Channel



STA 28+20 Looking Upstream at Bank Erosion on Right Bank



STA 28+20 Looking Upstream at Water Piping Through Rock Cross Vane



STA 28+50 Looking Upstream at Failed Rock Cross Vane



STA 28+60 Looking Upstream from Bridge at Down-Cutting and Failed Rock Cross Vanes



STA 28+70 Looking Downstream at Bank Erosion and Failed Rock Cross Vane



STA 28+75 Looking Downstream at Enlarged Channel and Failed Rock Cross Vane



STA 29+10 Looking Downstream at Severe Bank Erosion on Left Bank



STA 29+30 Looking Downstream at Severe Bank Erosion on Left Bank and Head-Cut



STA 29+90 Looking Downstream at Severe Head-Cut that has Exposed Root Wads



STA 31+40 Looking Downstream at Bank Erosion on Left Bank and Rock Cross Vane Holding Grade



STA 31+70 Looking Downstream with Chute Cut-Off Forming



STA 31+80 Looking Downstream at Scour Pool and Rock Cross Vane



STA 32+00 Looking at Undercut Left Bank



STA 32+20 Looking Downstream at Scour Pool and Rock Cross Vane



**STA 32+90 Looking Downstream at Rock Cross Vane, Large Scour Pool,
and 24" Storm-Water CPP**



STA 33+30 Looking Downstream at Bridge and Log Debris Jam



STA 33+40 Looking Downstream at Pool Filling with Course Substrate



STA 34+90 Looking Downstream at Failed Rock Cross Vane



STA 35+00 Looking Down Stream at Failed Rock Cross Vane



STA 35+00 Looking Down Stream at Failed Rock Cross Vane from Bridge



STA 35+10 Looking Downstream Bank Erosion and Slumping



STA 35+20 Looking Upstream at Failed Rock Cross Vane

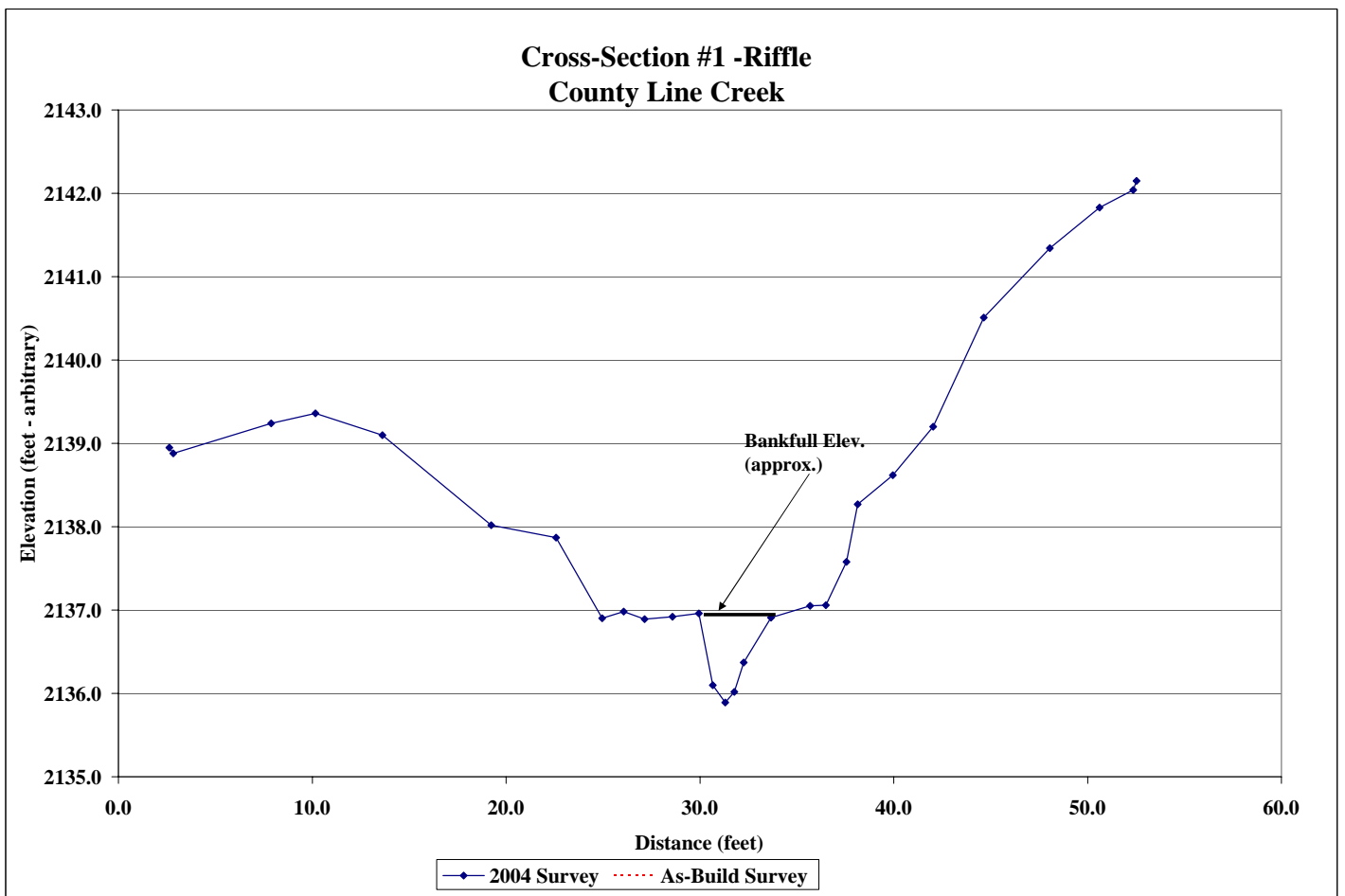
Project Name County Line Creek
Cross Section #1
Feature Riffle
Date 7/19/04
Crew Bidelspach, Clinton

2004 2004 Survey			2003 As-Build Survey			2002 As-Build Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
2.6	2139.0	LPIN						
2.8	2138.9							
7.9	2139.2							
10.2	2139.4							
13.6	2139.1							
19.2	2138.0							
22.6	2137.9							
25.0	2136.9							
26.1	2137.0							
27.2	2136.9							
28.6	2136.9							
30.0	2137.0	BKF						
30.7	2136.1	Water						
31.3	2135.9							
31.8	2136.0	Water						
32.3	2136.4							
33.7	2136.9	BKF						
35.7	2137.1							
36.5	2137.1							
37.6	2137.58							
38.1	2138.27							
40.0	2138.62							
42.0	2139.20							
44.7	2140.51							
48.1	2141.34							
50.6	2141.83							
52.4	2142.04							
52.5	2142.15	RPIN						



Photo of Cross-Section #1 - Looking Downstream @ STA 19+60

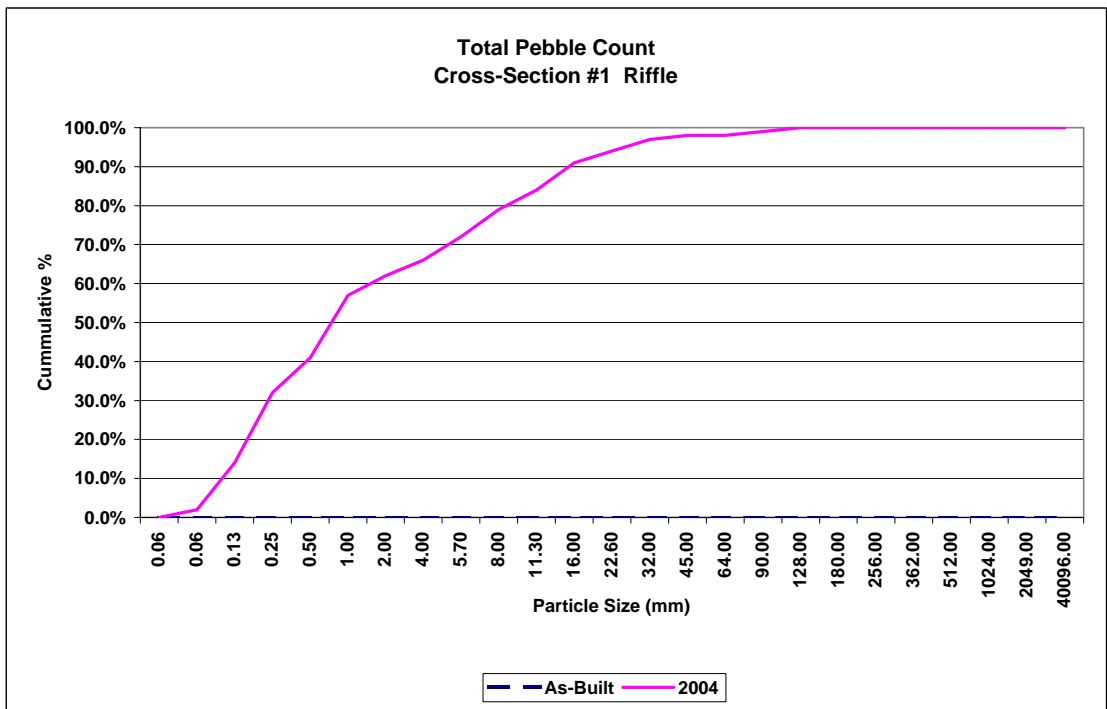
	2004
Area	2.1
Width	3.7
Mean Depth	0.6
Max Depth	1.0
W/D	6.4



Project Name	County Line Creek
Cross Section	#1
Feature	Riffle
Date	7/19/04
Crew	Bidelspach, Clinton

Description	Material	As-Built				2004			
		Size (mm)	Riffle - Bed	%	Cum %	Riffle - Bed	Riffle - Bank	%	Cum %
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	0	0.0%	0.0%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	2	2.0%	2.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	12	12.0%	14.0%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	18	18.0%	32.0%
	course sand	0.50	0	#DIV/0!	#DIV/0!	3	6	9.0%	41.0%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	14	2	16.0%	57.0%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	5	0	5.0%	62.0%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	4	0	4.0%	66.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	6	0	6.0%	72.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	7	0	7.0%	79.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	5	0	5.0%	84.0%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	7	0	7.0%	91.0%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	3	0	3.0%	94.0%
	very course gravel	32	0	#DIV/0!	#DIV/0!	3	0	3.0%	97.0%
	very course gravel	45	0	#DIV/0!	#DIV/0!	1	0	1.0%	98.0%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	0.0%	98.0%
	medium cobble	90	0	#DIV/0!	#DIV/0!	1	0	1.0%	99.0%
	large cobble	128	0	#DIV/0!	#DIV/0!	1	0	1.0%	100.0%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
TOTAL / % of whole count			0	#DIV/0!		60	40	100.0%	

	d16	d35	d50	d85	d95
2004	0.21	0.50	1.17	13.65	31.03



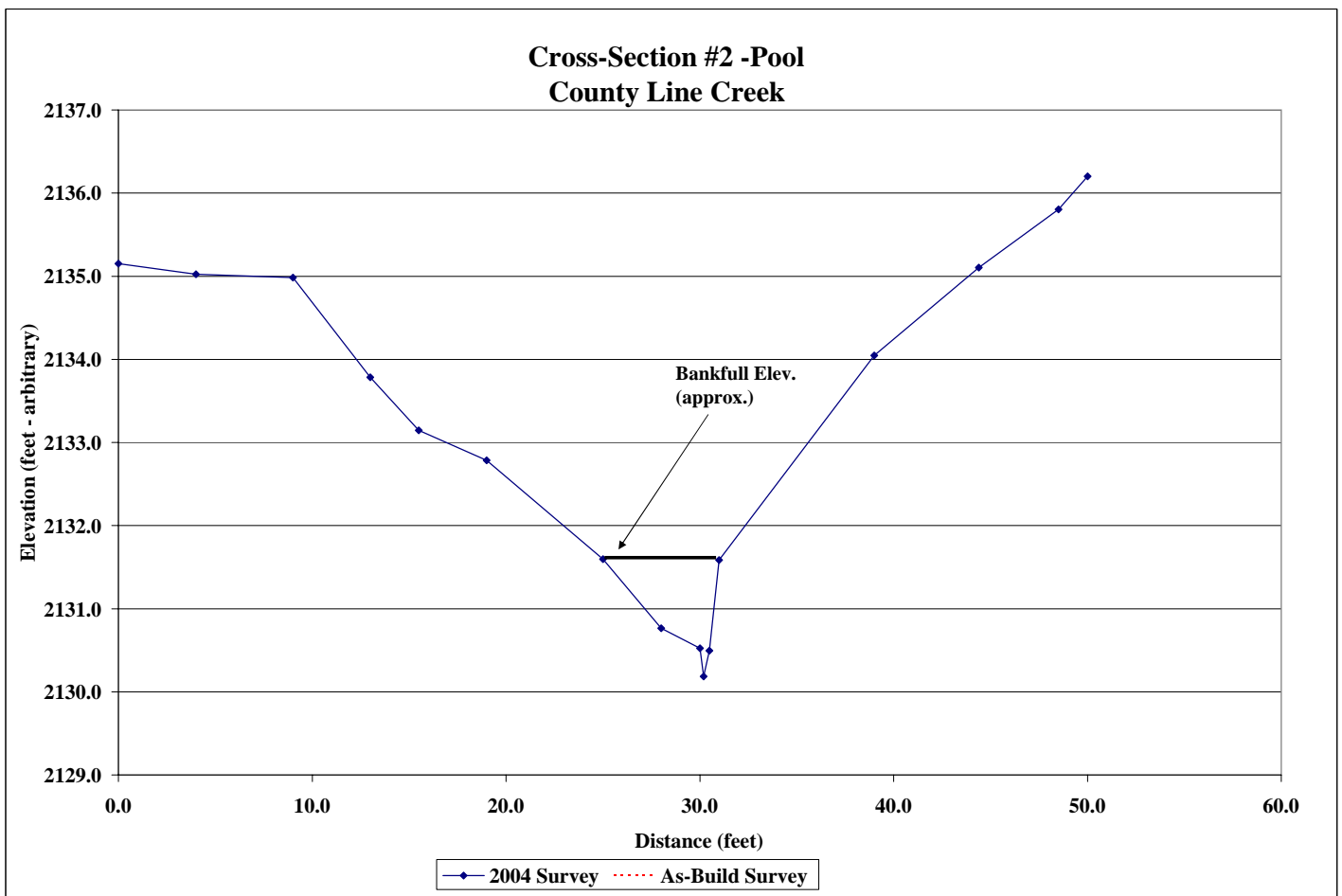
Project Name County Line Creek
Cross Section #2
Feature Pool
Date 7/19/04
Crew Bidelspach, Clinton



Photo of Cross-Section #2 - Looking Downstream @ STA 20+60

2004 2004 Survey			2003 As-Build Survey			2002 As-Build Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.0	2135.2	LPIN						
4.0	2135.0							
9.0	2135.0							
13.0	2133.8							
15.5	2133.1							
19.0	2132.8							
25.0	2131.6	BKF						
28.0	2130.8							
30.0	2130.5							
30.2	2130.2							
30.5	2130.5	Water						
31.0	2131.6	BKF						
39.0	2134.0							
44.4	2135.1							
48.5	2135.8							
50.0	2136.2	RPIN						

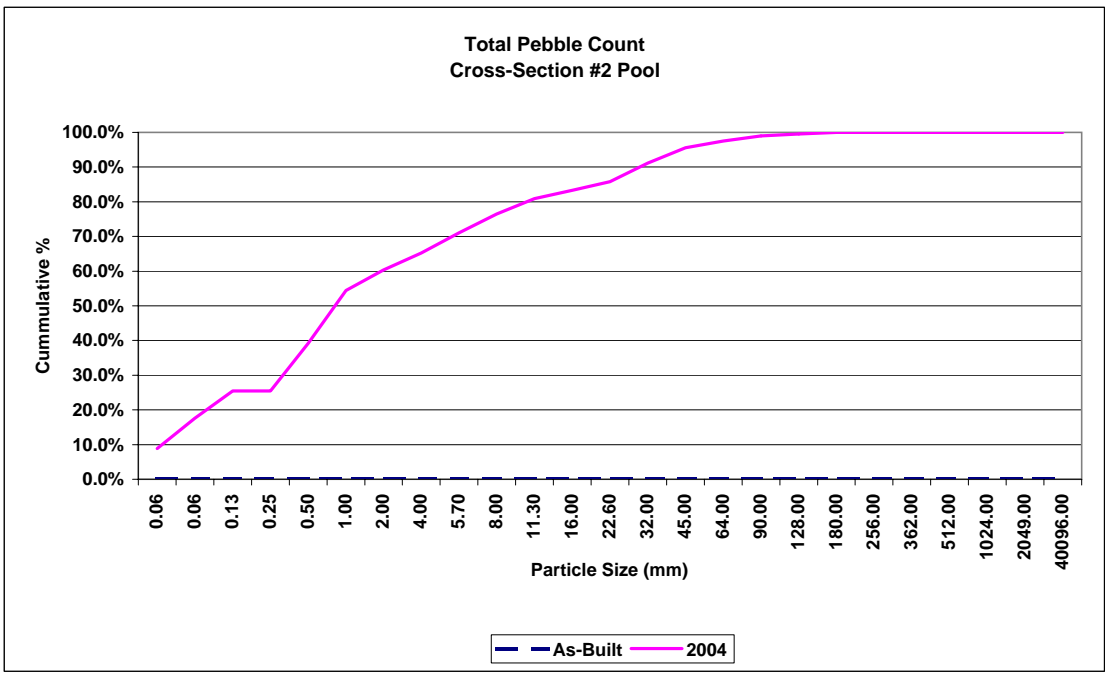
	2004
Area	2.0
Width	6.0
Mean Depth	0.3
Max Depth	1.4
W/D	18.2



Project Name	County Line Creek
Cross Section	#2
Feature	Pool
Date	7/19/04
Crew	Bidelspach, Clinton

Description	Material	As-Built				2004			
		Size (mm)	Riffle - Bed	%	Cum %	Riffle - Bed	Riffle - Bank	%	Cum %
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	6	12	8.8%	8.8%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	5	13	8.8%	17.6%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	16	7.8%	25.5%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	0	0.0%	25.5%
	course sand	0.50	0	#DIV/0!	#DIV/0!	1	27	13.7%	39.2%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	13	18	15.2%	54.4%
G r a v e l	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	4	8	5.9%	60.3%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	3	7	4.9%	65.2%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	7	5	5.9%	71.1%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	6	5	5.4%	76.5%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	8	1	4.4%	80.9%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	5	0	2.5%	83.3%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	5	0	2.5%	85.8%
	very course gravel	32	0	#DIV/0!	#DIV/0!	10	1	5.4%	91.2%
	very course gravel	45	0	#DIV/0!	#DIV/0!	9	0	4.4%	95.6%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	4	0	2.0%	97.5%
	medium cobble	90	0	#DIV/0!	#DIV/0!	3	0	1.5%	99.0%
	large cobble	128	0	#DIV/0!	#DIV/0!	1	0	0.5%	99.5%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	1	0.5%	100.0%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
TOTAL / % of whole count			0	#DIV/0!		90	114	100.0%	

	d16	d35	d50	d85	d95
2004	0.09	0.63	1.28	21.48	52.37



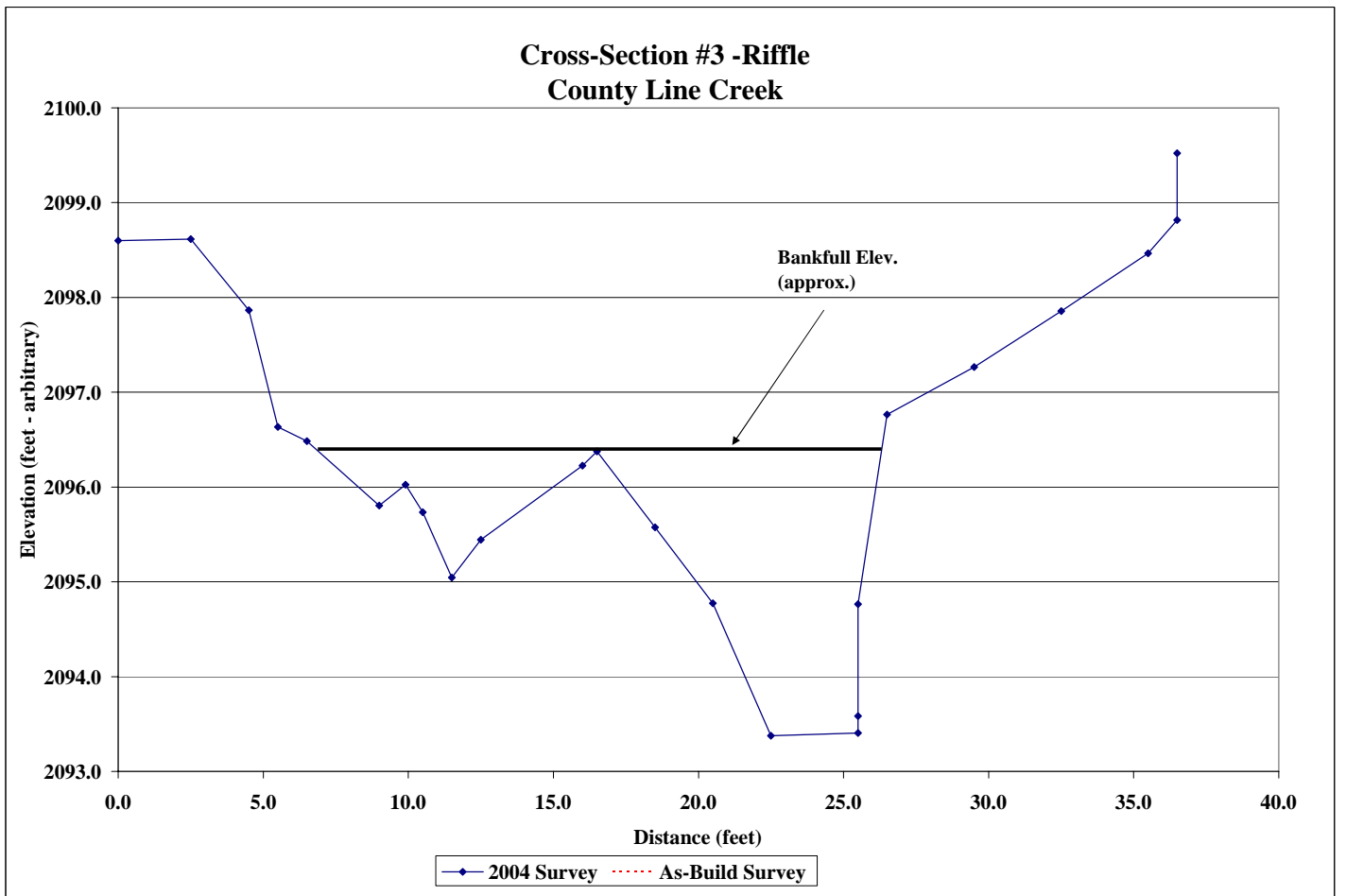
Project Name County Line Creek
Cross Section #3
Feature Riffle
Date 7/19/04
Crew Bidelspach, Clinton

2004 2004 Survey			2003 As-Build Survey			2002 As-Build Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.0	2098.6	LPIN						
2.5	2098.6							
4.5	2097.9							
5.5	2096.6							
6.5	2096.5							
9.0	2095.8							
9.9	2096.0							
10.5	2095.7							
11.5	2095.0							
12.5	2095.4							
16.0	2096.2							
16.5	2096.4	BKF						
18.5	2095.6							
20.5	2094.8	Water						
22.5	2093.4							
25.5	2093.4							
25.5	2093.6							
25.5	2094.8	Water						
26.5	2096.8							
29.5	2097.27							
32.5	2097.86							
35.5	2098.47							
36.5	2098.82							
36.5	2099.52	RPIN						



Photo of Cross-Section #3 - Looking Downstream @ STA 33+70

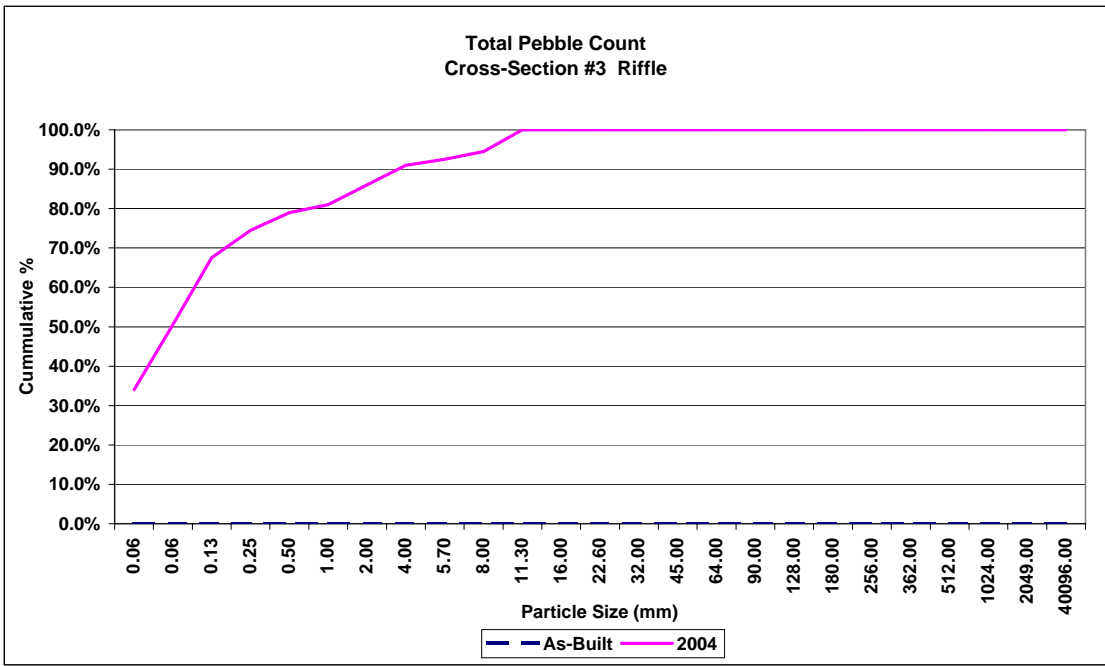
	2004
Area	18.4
Width	18.0
Mean Depth	1.0
Max Depth	3.0
W/D	17.7



Project Name	County Line Creek
Cross Section	#3
Feature	Riffle
Date	7/19/04
Crew	Bidelspach, Clinton

Description	Material	As-Built				2004			
		Size (mm)	Riffle - Bed	%	Cum %	Riffle - Bed	Riffle - Bank	%	Cum %
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	25	43	34.0%	34.0%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	7	26	16.5%	50.5%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	6	28	17.0%	67.5%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	14	7.0%	74.5%
	course sand	0.50	0	#DIV/0!	#DIV/0!	4	5	4.5%	79.0%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	3	1	2.0%	81.0%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	4	6	5.0%	86.0%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	5	5	5.0%	91.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	3	1.5%	92.5%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	1	3	2.0%	94.5%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	5	6	5.5%	100.0%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
TOTAL / %of whole count			0	#DIV/0!		60	140	100.0%	

	d16	d35	d50	d85	d95
2004	0.00	0.06	0.09	2.40	10.01



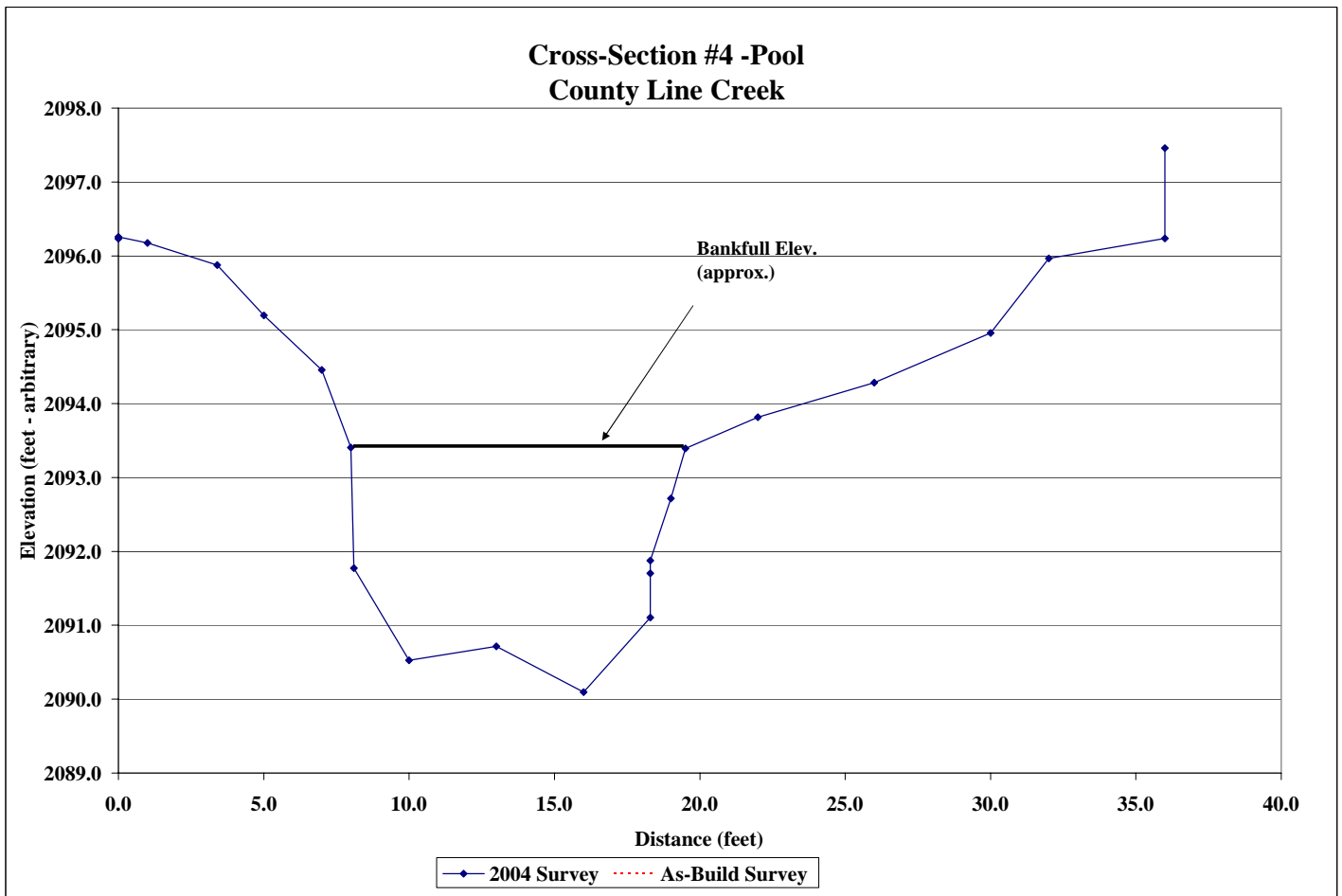
Project Name County Line Creek
Cross Section #4
Feature Pool
Date 7/19/04
Crew Bidelspach, Clinton



Photo of Cross-Section #4 - Looking Downstream @ STA 35+20

2004 2004 Survey			2003 As-Build Survey			2002 As-Build Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.0	2096.2	LPIN						
0.0	2096.3							
1.0	2096.2							
3.4	2095.9							
5.0	2095.2							
7.0	2094.5							
8.0	2093.4	BKF						
8.1	2091.8	Water						
10.0	2090.5							
13.0	2090.7							
16.0	2090.1							
18.3	2091.1							
18.3	2091.7	Water						
18.3	2091.9							
19.0	2092.7							
19.5	2093.4	BKF						
22.0	2093.8							
26.0	2094.3							
30.0	2095.0							
32.0	2095.97							
36.0	2096.24							
36.0	2097.46	RPIN						

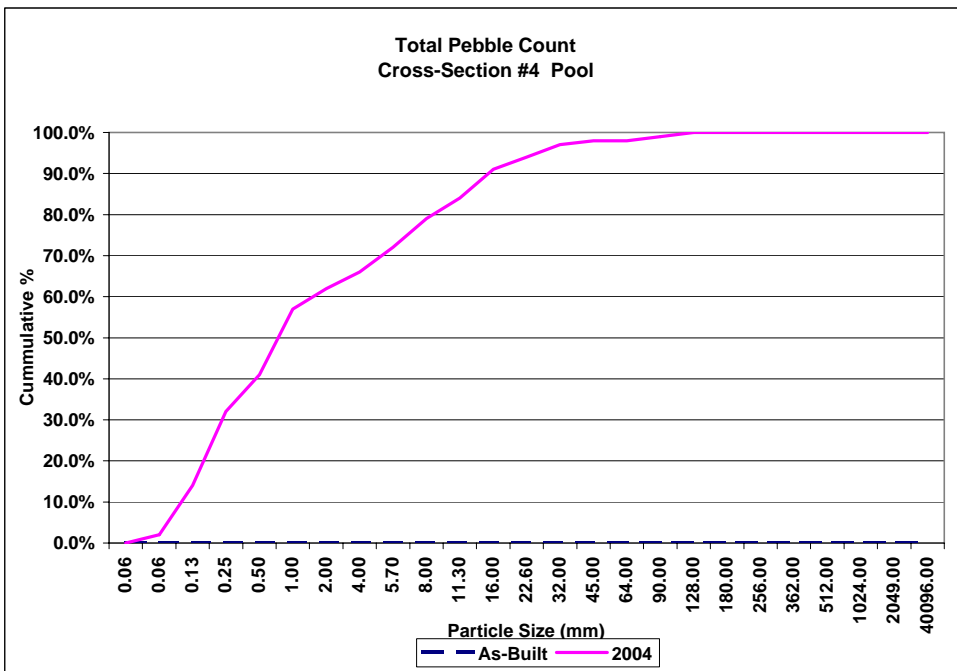
	2004
Area	25.1
Width	11.4
Mean Depth	2.2
Max Depth	3.3
W/D	5.2



Project Name	County Line Creek
Cross Section	#4
Feature	Pool
Date	7/19/04
Crew	Bidelspach, Clinton

Description	Material	As-Built				2004			
		Size (mm)	Riffle - Bed	%	Cum %	Riffle - Bed	Riffle - Bank	%	Cum %
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	10	33	20.1%	20.1%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	6	11	7.9%	28.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	2	18	9.3%	37.4%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	1	1	0.9%	38.3%
	course sand	0.50	0	#DIV/0!	#DIV/0!	13	2	7.0%	45.3%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	15	1	7.5%	52.8%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	24	11	16.4%	69.2%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	6	4	4.7%	73.8%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	8	1	4.2%	78.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	10	1	5.1%	83.2%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	9	0	4.2%	87.4%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	4	0	1.9%	89.3%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	9	0	4.2%	93.5%
	very course gravel	32	0	#DIV/0!	#DIV/0!	6	0	2.8%	96.3%
	very course gravel	45	0	#DIV/0!	#DIV/0!	5	0	2.3%	98.6%
	Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	0.0%
medium cobble		90	0	#DIV/0!	#DIV/0!	3	0	1.4%	100.0%
large cobble		128	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
very large cobble		180	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
TOTAL / %of whole count			0	#DIV/0!		131	83	100.0%	

	d16	d35	d50	d85	d95
2004	0.00	0.16	1.22	10.43	33.46



Point	Station	Elevation	Description	Point	Station	Elevation	Description	Point	Station	Elevation	Description	Point	Station	Elevation	Description
7	0	2241.69	Thalweg	15	40	2235.68	Water	13	32	2240.02	Left Bankfull	6	2	2244	Right Bankfull
8	9	2241.22	Thalweg	17	49	2235.29	Water	29	158	2227.62	Left Bankfull	9	14	2242.5	Right Bankfull
10	17	2243.62	Thalweg	19	107	2229.99	Water	43	213	2223.16	Left Bankfull	28	149	2227.81	Right Bankfull
12	33	2237.62	Thalweg	21	124	2228.64	Water	60	250	2222.4	Left Bankfull	40	202	2223.68	Right Bankfull
14	40	2235.61	Thalweg	23	132	2228.19	Water	65	269	2221.26	Left Bankfull	52	224	2222.65	Right Bankfull
16	48	2235.06	Thalweg	25	147	2227.18	Water	73	293	2218.03	Left Bankfull	53	244	2222.54	Right Bankfull
18	108	2229.46	Thalweg	27	154	2227.03	Water	82	312	2217.54	Left Bankfull	64	267	2220.62	Right Bankfull
20	125	2228.38	Thalweg	31	170	2226.35	Water	98	335	2216.19	Left Bankfull	81	300	2218.26	Right Bankfull
22	132	2227.97	Thalweg	33	179	2225.72	Water	116	388	2212.39	Left Bankfull	90	333	2216.76	Right Bankfull
24	147	2226.68	Thalweg	37	184	2223.92	Water	129	413	2211.59	Left Bankfull	102	341	2215.98	Right Bankfull
26	155	2226.46	Thalweg	39	193	2223.73	Water	132	424	2210.77	Left Bankfull	103	360	2214.8	Right Bankfull
30	170	2226.21	Thalweg	42	199	2223.34	Water	139	436	2210.76	Left Bankfull	115	381	2212.69	Right Bankfull
32	179	2225.67	Rock Vane	45	211	2222.42	Water	147	455	2209.45	Left Bankfull	141	454	2209.46	Right Bankfull
36	184	2223.84	Thalweg	49	220	2222.01	Water	153	473	2208.17	Left Bankfull	163	517	2204.13	Right Bankfull
38	193	2223.48	Thalweg	47	226	2221.8	Water	170	529	2203.85	Left Bankfull	180	566	2200.64	Right Bankfull
41	199	2223.25	Riffle	51	231	2221.72	Water	179	551	2202.29	Left Bankfull	187	569	2201.48	Right Bankfull
44	211	2222.25	Thalweg	57	235	2221.54	Water	185	570	2200.96	Left Bankfull	202	628	2196.7	Right Bankfull
48	220	2221.9	Thalweg	59	254	2220.68	Water	192	586	2199.86	Left Bankfull	203	644	2195.23	Right Bankfull
46	227	2221.62	Thalweg	62	266	2220.46	Water	198	609	2198.02	Left Bankfull	212	651	2194.89	Right Bankfull
50	231	2221.51	Thalweg	68	276	2219.96	Water	209	627	2196.69	Left Bankfull	214	668	2193.91	Right Bankfull
56	234	2221.38	Thalweg	70	290.1	2217.96	Water	210	644	2195.7	Left Bankfull	240	683	2192.87	Right Bankfull
58	254	2220.39	Thalweg	75	289	2217.89	Water	215	652	2195.55	Left Bankfull	228	692	2192.49	Right Bankfull
61	266	2220.15	Thalweg	78	294	2217.8	Water	221	667	2193.89	Left Bankfull	243	710	2191.54	Right Bankfull
67	276	2219.72	Thalweg	80	306	2217.41	Water	237	679	2193.16	Left Bankfull	252	726	2190.99	Right Bankfull
69	280	2219.56	Rock Vane	84	315	2216.97	Water	236	693	2192.92	Left Bankfull	253	739	2190.01	Right Bankfull
74	289	2217.59	Thalweg	86	324	2216.7	Water	242	711	2192.23	Left Bankfull	254	753	2189.52	Right Bankfull
77	295	2217.51	Thalweg	95	332	2216.07	Water	249	726	2190.98	Left Bankfull	262	768	2189.09	Right Bankfull
79	306	2217.19	Thalweg	89	335	2215.93	Water	250	739	2190.63	Left Bankfull	272	800	2187.64	Right Bankfull
83	315	2216.67	Thalweg	92	345	2215.07	Water	261	754	2189.49	Left Bankfull	273	808	2186.91	Right Bankfull
85	324	2216.45	Thalweg	97	347	2214.95	Water	260	767	2189.33	Left Bankfull	279	821	2185.94	Right Bankfull
94	332	2215.91	Thalweg	101	358	2214.28	Water	270	798	2186.89	Left Bankfull	278	831	2185.78	Right Bankfull
88	335	2215.83	Thalweg	106	365	2213.91	Water	271	808	2186.81	Left Bankfull	289	850	2184.6	Right Bankfull
91	345	2214.98	Thalweg	110	370	2212.33	Water	277	819	2185.84	Left Bankfull	298	856	2184.67	Right Bankfull
96	347	2214.94	Thalweg	113	376	2212.11	Water	285	832	2185.15	Left Bankfull	301	876	2183.48	Right Bankfull
100	358	2214.15	Thalweg	114	387	2211.85	Water	295	849	2184.91	Left Bankfull	304	893	2182.04	Right Bankfull
105	365	2213.7	Rock Vane	118	394	2211.68	Water	296	859	2185.04	Left Bankfull	311	904	2182.13	Right Bankfull
109	370	2212.22	Thalweg	122	399	2211.46	Water	297	880	2183.86	Left Bankfull	321	933	2180.67	Right Bankfull
111	376	2211.97	Thalweg	127	406	2211.11	Water	307	892	2183.24	Left Bankfull	325	939	2180.82	Right Bankfull
112	388	2211.6	Thalweg	125	412	2210.46	Water	308	907	2182.3	Left Bankfull	338	965	2178	Right Bankfull
117	394	2211.55	Thalweg	131	424	2210.31	Water	314	915	2181.47	Left Bankfull	344	1007	2177.72	Right Bankfull
121	399	2211.22	Thalweg	137	432	2209.41	Water	317	922	2181.72	Left Bankfull	342	1021	2176.34	Right Bankfull
126	406	2210.94	Thalweg	143	449	2208.54	Water	320	929	2181.42	Left Bankfull	343	1021	2176.34	Right Bankfull
124	406	2210.97	Thalweg	146	468	2207.29	Water	327	944	2180.36	Left Bankfull	341	1022	2177.04	Right Bankfull
123	412	2209.98	Thalweg	149	481	2206.79	Water	335	962	2178.95	Left Bankfull	366	1063	2173.6	Right Bankfull
130	423	2210.2	Thalweg	152	484	2206.74	Water	334	1000	2178.88	Left Bankfull	373	1092	2172.04	Right Bankfull
133	428	2210.13	Rock Vane	156	494	2205.86	Water	342	1010	2177.44	Left Bankfull	2121	1116	2170.84	Right Bankfull
136	432	2208.95	Thalweg	162	500	2204.55	Water	345	1023	2176.98	Left Bankfull	2127	1134	2169.76	Right Bankfull
142	449	2208.41	Thalweg	160	516	2204.07	Water	350	1046	2174.86	Left Bankfull	2142	1152	2168.8	Right Bankfull
145	468	2207.23	Thalweg	172	520	2203.53	Water	356	1054	2174.47	Left Bankfull	2141	1174	2167.44	Right Bankfull
148	481	2206.62	Thalweg	167	528	2203.17	Water	359	1062	2174.26	Left Bankfull	2160	1204	2165.32	Right Bankfull
151	484	2206.47	Thalweg	175	547	2201.63	Water	372	1078	2172.84	Left Bankfull	2020	1233	2163.39	Right Bankfull
155	493	2205.68	Thalweg	177	559	2201.04	Water	374	1092	2171.82	Left Bankfull	2034	1261	2161.96	Right Bankfull
161	499	2204.28	Thalweg	184	568	2200.54	Water	2125	1119	2170.52	Left Bankfull	2042	1277	2161.43	Right Bankfull
159	515	2203.79	Thalweg	189	584	2199.3	Water	2126	1131	2170.24	Left Bankfull	2044	1310	2160.49	Right Bankfull
171	521	2203.13	Thalweg	191	593	2198.59	Water	2137	1147	2169.81	Left Bankfull	2167	1323	2159.91	Right Bankfull
166	528	2203.02	Thalweg	195	598	2198.14	Water	2139	1169	2168.61	Left Bankfull	2165	1335	2159.7	Right Bankfull
174	547	2201.44	Thalweg	197	607	2197.46	Water	2150	1186	2167.4	Left Bankfull	2053	1336	2159.38	Right Bankfull
176	559	2200.71	Thalweg	200	617	2196.89	Water	2157	1203	2165.34	Left Bankfull	2168	1359	2159.14	Right Bankfull
183	568	2200.33	Thalweg	205	626	2195.73	Water	2017	1229	2164.2	Left Bankfull	2170	1376	2158.77	Right Bankfull
188	584	2199.04	Thalweg	208	644	2194.95	Water	2023	1247	2162.55	Left Bankfull	2171	1400	2158.01	Right Bankfull
190	593	2198.43	Thalweg	223	653	2193.88	Water	2030	1271	2161.45	Left Bankfull	2173	1422	2157.41	Right Bankfull
194	597	2197.9	Thalweg	218	667	2193.56	Water	2043	1289	2160.91	Left Bankfull	2176	1436	2156.24	Right Bankfull
196	607	2197.27	Thalweg	227	678	2192.43	Water	2050	1323	2159.92	Left Bankfull	2181	1458	2155.53	Right Bankfull
199	617	2196.66	Thalweg	234	680	2192.23	Water	2166	1324	2159.83	Left Bankfull	388	1542	2152.62	Right Bankfull
204	626	2195.53	Thalweg	232	693	2191.81	Water	2052	1334	2159.54	Left Bankfull	423	1628	2149.58	Right Bankfull
207	644	2194.78	Thalweg	239	711	2190.74	Water	2169	1337	2159.49	Left Bankfull	435	1676	2147.42	Right Bankfull
219	652	2193.52	Head of Pool	248	725	2190.4	Water	2172	1358	2159	Left Bankfull	445	1707	2146.16	Right Bankfull
222	653	2193.27	Max Pool	245	726	2190.14	Water	2175	1374	2158.74	Left Bankfull	453	1728	2145.87	Right Bankfull
217	667	2193.14	Thalweg	247	739	2189.66	Water	2174	1390	2158.33	Left Bankfull	462	1757	2145.22	Right Bankfull
226	678	2192.49	Thalweg	259	754	2188.92	Water	2177	1408	2158.41	Left Bankfull	478	1794	2143.06	Right Bankfull
229	679	2192.61	Rock Vane	256	767	2188.13	Water	2178	1422	2157	Left Bankfull	481	1808	2142.43	Right Bankfull
233	680	2191.98	Thalweg	265	786	2187.27	Water	2180	1439	2156.18	Left Bankfull	468	1811	2142.38	Right Bankfull
231	693	2191.45	Thalweg	267	797	2186.66	Water	2179	1443	2157.54	Left Bankfull	491	1827	2141.97	Right Bankfull
238	710	2190.49	Thalweg	269	807	2186.22	Water	2182	1460	2156.38	Left Bankfull	502	1845	2140.96	Right Bankfull
244	727	2189.71	Thalweg	275	820	2185.07	Water	394	1561	2151.73	Left Bankfull	510	1867	2139.52	Right Bankfull
246	740	2189.35	Thalweg	287	826	2184.95	Water	403	1573	2150.9	Left Bankfull	529	1910	2139.16	Right Bankfull
258	754	2188.75	Thalweg	281	831	2184.9	Water	406	1574	2150.89	Left Bankfull	536	1927	2138.46	Right Bankfull
255	767	2187.84	Thalweg	293	849	2184.07	Water	422	1620	2148.76	Left Bankfull	556	1950	2137.52	Right Bankfull
264	786	2187.08	Thalweg	291	859	2183.8	Water	436	1682	2147.5	Left Bankfull	568	1984	2136.26	Right Bankfull
266	798	2186.58	Thalweg	300	876	2182.57	Water	444	1707	2146.71	Left Bankfull	574	2002	2135.41	Right Bankfull
268	806	2186.02	Riffle	303	893	2181.83	Water	448	1714	2146.05	Left Bankfull	581	2018	2134.65	Right Bankfull
274	821	2184.88	Thalweg	306	901	2181.6	Water	452	1725	2145.73	Left Bankfull	608	2051	2132.58	Right Bankfull
283	824	2184.62	Head of Pool	310	911	2180.69	Water	461	1755	2144.63	Left Bankfull				

354	1053	2172.44	Riffle	2136	1154	2168.14	Water	655	2179	2126.93	Left Bankfull	803	2651	2114.63	Right Bankfull
364	1054	2171.98	Max Pool	2144	1179	2166.87	Water	668	2212	2125.85	Left Bankfull	804	2667	2114.38	Right Bankfull
362	1061	2172.73	Riffle	2146	1185	2166.66	Water	672	2222	2125.21	Left Bankfull	815	2691	2113.75	Right Bankfull
368	1078	2171.48	Thalweg	2149	1188	2166.51	Water	680	2238	2125.03	Left Bankfull	822	2716	2112.84	Right Bankfull
370	1091	2170.86	Thalweg	2152	1189	2165.11	Water	681	2252	2124.95	Left Bankfull	832	2744	2113.84	Right Bankfull
375	1108	2170.67	Thalweg	2153	1192	2165.01	Water	699	2279	2123.82	Left Bankfull	839	2764	2113.23	Right Bankfull
2117	1115	2169.7	Thalweg	2156	1196	2164.97	Water	707	2302	2122.6	Left Bankfull	847	2791	2112.2	Right Bankfull
2122	1117	2169.19	Thalweg	2159	1201	2164.59	Water	710	2314	2123.12	Left Bankfull	850	2797.1	2112.33	Right Bankfull
2119	1128	2168.8	Thalweg	2164	1205	2164.5	Water	716	2326	2122.86	Left Bankfull	856	2814	2111.49	Right Bankfull
2124	1130	2169.05	Riffle	2162	1210	2163.87	Water	721	2342	2122.08	Left Bankfull	871	2846	2109.22	Right Bankfull
2128	1138	2168.51	Rock Vane	2016	1227	2162.78	Water	734	2373	2120.73	Left Bankfull	868	2887	2107.65	Right Bankfull
2133	1139	2167.45	Thalweg	2014	1231	2162.6	Water	750	2423	2119.34	Left Bankfull	892	2901	2107.54	Right Bankfull
2131	1140	2167.55	Thalweg	2019	1234	2162.51	Water	751	2442	2118.78	Left Bankfull	895	2921	2106.86	Right Bankfull
2135	1153	2167.92	Thalweg	2022	1235	2162.07	Water	758	2452	2119.41	Left Bankfull	906	2956	2106.52	Right Bankfull
2143	1179	2166.73	Thalweg	2025	1244	2161.55	Water	763	2475	2119.15	Left Bankfull	913	2968	2107.01	Right Bankfull
2145	1184	2166.43	Thalweg	2033	1249	2161.22	Water	773	2528	2119.05	Left Bankfull	922	3001	2105.2	Right Bankfull
2148	1188	2165.58	Rock Vane	2036	1261	2161.06	Water	781	2558	2118.93	Left Bankfull	933	3031	2105.29	Right Bankfull
2151	1189	2163.88	Max Pool	2039	1264	2160.58	Water	784	2580	2118.03	Left Bankfull	936	3067	2105.64	Right Bankfull
2155	1196	2164.69	Thalweg	358	1273	2160.5	Water	791	2598	2115.34	Left Bankfull	943	3105	2102.33	Right Bankfull
2158	1201	2164.31	Thalweg	361	1279	2159.91	Water	805	2613	2115.76	Left Bankfull	950	3133	2101.84	Right Bankfull
2163	1206	2164.31	Thalweg	2046	1288	2159.33	Water	802	2619	2116.07	Left Bankfull	987	3221	2099.69	Right Bankfull
2161	1210	2163.75	Thalweg	2048	1296	2159.24	Water	808	2627	2115.72	Left Bankfull	990	3239	2099.49	Right Bankfull
2015	1227	2162.68	Thalweg	2055	1319	2158.67	Water	806	2658	2114.22	Left Bankfull	991	3248	2099.41	Right Bankfull
2013	1230	2162.3	Thalweg	2057	1323	2158.5	Water	816	2692	2114.33	Left Bankfull	1003	3274	2098.48	Right Bankfull
2018	1233	2162.37	Thalweg	2059	1328	2158.39	Water	821	2708	2113.08	Left Bankfull	1010	3294	2097.84	Right Bankfull
2021	1234	2161.66	Thalweg	2061	1333	2158.28	Water	828	2720	2114.28	Left Bankfull	1016	3305	2097.79	Right Bankfull
2024	1242	2161.26	Thalweg	2063	1343	2158.2	Water	833	2731	2113.6	Left Bankfull	1023	3330	2097.57	Right Bankfull
2026	1243	2161.99	Rock Vane	2069	1348	2158.03	Water	838	2746	2113.4	Left Bankfull	1032	3355	2097.26	Right Bankfull
2028	1245.6	2160.86	Thalweg	2067	1355	2157.93	Water	842	2774	2112.81	Left Bankfull	1035	3377	2096.76	Right Bankfull
2032	1249	2161.15	Thalweg	2071	1367	2157.95	Water	851	2808	2111.05	Left Bankfull	1058	3392	2096.56	Right Bankfull
2035	1262	2160.83	Thalweg	2075	1376	2157.98	Water	866	2826	2109.85	Left Bankfull	1067	3434	2096.32	Right Bankfull
2038	1264	2160.33	Thalweg	2073	1380	2158.01	Water	880	2872	2108.38	Left Bankfull				
2037	1265	2160.36	Thalweg	2078	1382	2157.87	Water	891	2901	2107.15	Left Bankfull				
2040	1267	2159.79	Thalweg	2080	1387	2157.41	Water	898	2913	2108.25	Left Bankfull				
357	1273	2160.14	Riffle	2084	1398	2157.15	Water	904	2947	2106.83	Left Bankfull				
360	1279	2159.71	Thalweg	2086	1403	2156.47	Water	912	2952	2106.78	Left Bankfull				
2045	1288	2159.26	Thalweg	2088	1407	2156.45	Water	916	2984	2106.29	Left Bankfull				
2047	1296	2158.96	Thalweg	2090	1412	2156.22	Water	919	3004	2105.11	Left Bankfull				
367	1311	2159.73	Rock Vane	2092	1418	2156.07	Water	934	3036	2106.23	Left Bankfull				
2054	1319	2158.47	Thalweg	2094	1426	2155.92	Water	942	3064	2105.01	Left Bankfull				
2056	1323	2158.44	Riffle	2096	1429	2155.95	Water	947	3078	2103.5	Left Bankfull				
2058	1328	2158.18	Thalweg	2098	1435	2155.8	Water	944	3099	2102.65	Left Bankfull				
2060	1334	2158.02	Thalweg	2106	1436	2155.1	Water	966	3168	2101.68	Left Bankfull				
2062	1338	2158.08	Thalweg	2100	1436	2155.81	Water	969	3185	2101.2	Left Bankfull				
2064	1343	2157.92	Thalweg	2102	1437	2155.05	Water	977	3204	2100.76	Left Bankfull				
2068	1349	2157.9	Thalweg	2108	1445	2155.12	Water	995	3241	2099.22	Left Bankfull				
2066	1353	2157.79	Thalweg	2115	1449	2154.53	Water	1000	3275	2098.05	Left Bankfull				
2070	1366	2157.67	Thalweg	2112	1449	2154.84	Water	1004	3276	2097.94	Left Bankfull				
2074	1377	2157.44	Thalweg	2110	1460	2154.49	Water	1012	3294	2098.32	Left Bankfull				
2072	1380	2157.81	Thalweg	2193	1502	2153.05	Water	1022	3327	2097.53	Left Bankfull				
2076	1382	2157.94	Rock Vane	2199	1508	2152.78	Water	1031	3347	2096.77	Left Bankfull				
2077	1385.6	2156.97	Thalweg	2197	1518	2152.87	Water	1055	3390	2095.8	Left Bankfull				
2079	1388	2157.21	Thalweg	2203	1533	2151.99	Water	1064	3413	2095.14	Left Bankfull				
2083	1398	2156.83	Thalweg	2205	1534	2151.08	Water	1071	3438	2094.83	Left Bankfull				
2085	1403	2156.46	Thalweg	2209	1538	2150.95	Water	1082	3478	2094.51	Left Bankfull				
2087	1407	2156.21	Thalweg	387	1541	2150.93	Water								
2089	1412	2155.75	Thalweg	393	1547	2150.63	Water								
2091	1419	2155.95	Thalweg	396	1552	2150.11	Water								
2093	1426	2155.84	Thalweg	399	1564	2149.73	Water								
2095	1429	2155.69	Thalweg	401	1568	2149.76	Water								
2097	1435	2155.69	Thalweg	404	1584	2148.93	Water								
2105	1436	2154.71	Thalweg	415	1595	2148.42	Water								
2099	1436	2155.75	Rock Vane	419	1606	2148.49	Water								
2101	1437	2154.48	Max Pool	421	1609	2148.3	Water								
2107	1446	2154.88	Thalweg	425	1630	2148.03	Water								
2114	1450	2154.1	Thalweg	427	1632	2147.75	Water								
2111	1450	2154.61	Thalweg	432	1646	2147.71	Water								
2109	1461	2154.18	Thalweg	431	1646	2147.63	Water								
2192	1502	2152.76	Thalweg	434	1659	2147.18	Water								
2194	1505	2152.44	Thalweg	438	1681	2146.78	Water								
2198	1509	2151.63	Head of Pool	440	1690	2146.17	Water								
2200	1515	2152.03	Thalweg	442	1695	2145.63	Water								
2198	1518	2152.7	Riffle	450	1719	2145.28	Water								
2202	1533	2151.98	Rock Vane	455	1733	2144.31	Water								
2204	1534	2150.08	Head of Pool	458	1741	2144.32	Water								
2208	1539	2150.66	Thalweg	460	1751	2144.1	Water								
389	1541	2150.7	Thalweg	464	1760	2143.96	Water								
386	1541	2150.71	Thalweg	466	1766	2143.67	Water								
2211	1544	2150.61	Thalweg	470	1767	2143.14	Water								
392	1547	2150.41	Thalweg	476	1776	2143.13	Water								
395	1553	2149.89	Thalweg	474	1776	2143.02	Water								
398	1563	2149.4	Thalweg	477	1793	2141.94	Water								
400	1567	2149.5	Thalweg	480	1802	2141.5	Water								
402	1582	2149.5	Rock Vane	483	1812	2141.23	Water								
405	1584	2148.26	Thalweg	488	1820	2140.93	Water								
409	1589	2148.94	Thalweg	490	1825	2140.7	Water								
410	1594	2148.65	Thalweg	495	1834	2140.4	Water								
411	1594	2149.04	Rock Vane	497	1841	2140.28	Water								
414	1596	2147.99	Thalweg	499	1843	2140.18	Water								
418	1604	2148.14	Thalweg	501	1848	2140.14	Water								
417	1604	2148.19	Thalweg	504	1850	2139.8	Water								
420	1609	2148.25	Thalweg	506	1855	2139.8	Water								
424	1629	2147.99	Rock Vane	509	1860	2139.8	Water								
426	1634	2146.79	Head of Pool	513	1871	2139.07	Water								
430	1646	2147.66	Thalweg	516	1881	2138.72	Water								

473 1776 2142.98 Thalweg

567 1996 2134.96 Water

Point	Station	Elevation	Description	Point	Station	Elevation	Description	Point	Station	Elevation	Description
2312	1965.0	2140.77	X1	32	179.0	2225.67	Rock Vane	54	228	2227.55	Top of Bank
2311	1965.0	2139.59	X1	69	280.0	2219.56	Rock Vane	55	245	2226.68	Top of Bank
2310	1965.0	2137.12	X1	105	365.0	2213.7	Rock Vane	63	249	2225.16	Top of Bank
2309	1966.0	2136.41	X1	133	428.0	2210.13	Rock Vane	66	266	2224.62	Top of Bank
2308	1967.0	2135.7	X1	229	679.0	2192.61	Rock Vane	76	297	2221.37	Top of Bank
532	1970.0	2136.08	X1	346	1031.0	2175.65	Rock Vane	87	322	2220.38	Top of Bank
535	1966.0	2142.15	X1	2128	1138.0	2168.51	Rock Vane	93	334	2220.01	Top of Bank
537	1967.0	2135.59	X1	2148	1188.0	2165.58	Rock Vane	99	347.3	2218.23	Top of Bank
551	1966.0	2135.85	X1	2026	1243.0	2161.99	Rock Vane	104	339	2219.26	Top of Bank
545	1967.0	2135.57	X1	367	1311.0	2159.73	Rock Vane	119	388	2214.57	Top of Bank
548	2060.0	2130.32	X2	2076	1382.0	2157.94	Rock Vane	120	396	2214.85	Top of Bank
2006	2060.0	2132.82	X2	2099	1436.0	2155.75	Rock Vane	128	421	2213.5	Top of Bank
541	2061.0	2131.21	X2	2202	1533.0	2151.98	Rock Vane	138	435	2212.91	Top of Bank
540	2063.0	2134.2	X2	402	1582.0	2149.5	Rock Vane	140	447	2212.11	Top of Bank
542	2052.0	2132.82	X2	411	1594.0	2149.04	Rock Vane	154	472	2210.17	Top of Bank
607	2065.0	2136.03	X2	424	1629.0	2147.99	Rock Vane	144	477	2211.03	Top of Bank
600	2065.0	2136.16	X2	465	1765.0	2143.54	Rock Vane	150	495	2208.48	Top of Bank
602	2065.0	2136.03	X2	500	1849.0	2139.96	Rock Vane	157	514	2206.67	Top of Bank
601	2065.0	2136.2	X2	519	1890.0	2138.9	Rock Vane	173	530	2205.01	Top of Bank
2188	2061.0	2130.17	X2	566	1995.0	2134.92	Rock Vane	181	553	2204.55	Top of Bank
597	3372.0	2097.1	X3	580	2041.0	2132.33	Rock Vane	158	553	2203.95	Top of Bank
598	3372.0	2098.13	X3	687	2260.0	2123.43	Rock Vane	165	583	2202.27	Top of Bank
599	3373.0	2094.31	X3	740	2390.0	2120.04	Rock Vane	169	618	2198.87	Top of Bank
383	3373.0	2096.07	X3	843	2782	2110.55	Rock Vane	178	648	2196.66	Top of Bank
603	3373.0	2096.07	X3	855	2813	2109.24	Rock Vane	182	686	2196.99	Top of Bank
1040	3373.0	2094.33	X3	873	2852	2107.78	Rock Vane	186	743	2193.6	Top of Bank
1039	3373.0	2096.2	X3	928	3013	2103.09	Rock Vane	193	792	2191.03	Top of Bank
1053	3374.0	2095.63	X3	954	3156	2099.52	Rock Vane	201	834	2188.9	Top of Bank
1041	3376.0	2098.22	X3	975	3198	2098.58	Rock Vane	206	858	2188.52	Top of Bank
1045	3376.0	2098.6	X3	996	3260	2097.4	Rock Vane	211	904	2184.2	Top of Bank
1048	3372.0	2099.52	X3	1030	3351	2095.83	Rock Vane	216	929	2184.05	Top of Bank
1052	3373.0	2094.02	X3	1054	3396	2094.54	Rock Vane	230	994	2182.22	Top of Bank
1049	3372.0	2095.19	X3	1056	3397	2094.41	Rock Vane	235	1024	2179.14	Top of Bank
1042	3373.0	2095.2	X3	1083	3476	2093.3	Rock Vane	241	1126	2173.03	Top of Bank
1038	3374.0	2095.08	X3					251	1135	2173.77	Top of Bank
1037	3488.0	2094.47	X4					257	1197	2170.76	Top of Bank
1046	3489.0	2093.26	X4					263	1255	2166.56	Top of Bank
1044	3489.0	2090.86	X4					276	1294	2164.19	Top of Bank
1043	3489.0	2096.31	X4					282	1345	2162.85	Top of Bank
1047	3489.0	2095.66	X4					288	1371	2160.91	Top of Bank
1093	3489.0	2093.52	X4					294	1424	2159.55	Top of Bank
1095	3490.0	2094.21	X4					2210	1532	2157.33	Top of Bank
1101	3490.0	2094.1	X4					391	1545	2154.9	Top of Bank
1089	3488.0	2096.23	X4					397	1562	2154.8	Top of Bank
1088	3491.0	2097.46	X4					413	1621	2154.64	Top of Bank
1100	3488.0	2089.16	X4					416	1642	2151.85	Top of Bank
1094	3488.0	2090.68	X4					443	1688	2149.44	Top of Bank
1099	3489.0	2091.73	X4					451	1750	2148.6	Top of Bank
1078	3489.0	2091.61	X4					456	1772	2147.32	Top of Bank
1086								486	1819	2144.95	Top of Bank
1096								493	1830	2144.39	Top of Bank
1098								507	1851	2144.27	Top of Bank
1097								514	1861	2143.25	Top of Bank
1102								525	1904	2142.53	Top of Bank
								526	1904	2142.5	Top of Bank
								544	1935	2140.96	Top of Bank
								557	1946	2140.26	Top of Bank
								577	2009	2137.68	Top of Bank
								621	2089	2134.37	Top of Bank
								622	2109	2132.14	Top of Bank
								632	2118	2131.14	Top of Bank
								635	2129	2130.04	Top of Bank
								644	2141	2130.23	Top of Bank
								651	2165	2129.68	Top of Bank
								658	2181	2130.29	Top of Bank
								673	2237	2128.6	Top of Bank
								697	2269	2127.28	Top of Bank
								718	2302	2125.98	Top of Bank
								725	2340	2126.31	Top of Bank
								742	2387	2124.64	Top of Bank
								729	2391	2125.49	Top of Bank
								749	2443	2122.56	Top of Bank
								767	2496	2124.37	Top of Bank
								768	2526	2121.19	Top of Bank

810	2627	2118.75	Top of Bank
790	2640	2119.75	Top of Bank
807	2671	2118.3	Top of Bank
825	2711	2115.63	Top of Bank
844	2777	2116.15	Top of Bank
854	2812	2113.98	Top of Bank
885	2882	2110.76	Top of Bank
905	2931	2110.66	Top of Bank
937	3044	2108.22	Top of Bank
970	3099	2106.63	Top of Bank
951	3121	2105.14	Top of Bank
974	3142	2104.55	Top of Bank
973	3202	2102.82	Top of Bank
979	3231	2102.07	Top of Bank
994	3239	2101.15	Top of Bank
1011	3288	2100.05	Top of Bank
1017	3316	2099.53	Top of Bank
1036	3371	2098.85	Top of Bank
1063	3413	2099.05	Top of Bank
1068	3428	2097.07	Top of Bank

County Line Creek
Buncombe County, NC

Quad 1

Tree Stratum

Species

Height (cm)

Diameter (mm)

Radius (mm)

Overall Total

(no trees in plot)

Total Trees per acre

Planted trees per acre

Natural regen. trees per acre

Shrub Stratum

Species

Cover (%)

Rel. cover (%)

Density

Sambucus canadensis

1

16.7

5.0

Cornus amomum

5

83.3

15.0

Total

6

100.0

20.0

Herb Stratum

Species

Cover (%)

Rel. cover (%)

Rank (Importance)

Carex sp.

1

1.0

5.0

Microstegium vimineum

5

4.9

3.0

Juncus sp.

1

1.0

5.0

Ludwigia spp.

1

1.0

5.0

Polygonum sagittatum

20

19.6

2.0

Solidago sp.

1

1.0

5.0

Scirpus sp.

70

68.6

1.0

Polygonum sp.

2

2.0

4.0

Trifolium repens

1

1.0

5.0

Total

102

100

County Line Creek
 Buncombe County, NC

Quad 2

Tree Stratum

<u>Species</u>	<u>Height (cm)</u>	<u>Diameter (mm)</u>	<u>Radius (mm)</u>	<u>Σ X-sec. (mm²)</u>
Acer rubrum	10	0.5	0.25	0.2
	6	0.5	0.25	0.2
	5	0.5	0.25	0.2
	9	0.5	0.25	0.2
	10	0.5	0.25	0.2
	11	0.5	0.25	0.2
	12	0.5	0.25	0.2
	10	0.5	0.25	0.2
	8	0.5	0.25	0.2
	7	0.5	0.25	0.2
	5	0.5	0.25	0.2
	4	0.5	0.25	0.2
	6	0.5	0.25	0.2
	7	0.5	0.25	0.2
	5	0.5	0.25	0.2
	4	0.5	0.25	0.2
	3	0.5	0.25	0.2
	5	0.5	0.25	0.2
	4	0.5	0.25	0.2
	42	3	1.5	7.1
	53	4	2	12.6
	81	4	2	12.6
	9	0.5	0.25	0.2
Total				36.1
Liriodendron tulipifera	75	7	3.5	38.5
	73	17	8.5	227.0
	47	7	3.5	38.5
Total				303.9
Populus sp.	540	25	12.5	490.9
	180	10	5	78.5
Total				569.4
Overall Total				909.5
Total Trees per acre				
Planted trees per acre				
Natural regen. trees per acre				

Shrub Stratum

<u>Species</u>	<u>Cover (%)</u>	<u>Rel. cover (%)</u>	<u>Density</u>	<u>Rel. Density (%)</u>
Cornus amomum	30	50.0	23	71.9
Sambucus canadensis	20	33.3	7	21.9
Salix nigra	5	8.3	1	3.1
Hamamelis virginiana	5	8.3	1	3.1
Total	60	100	32	100

Herb Stratum

<u>Species</u>	<u>Cover (%)</u>	<u>Rel. cover (%)</u>	<u>Rank (Importance)</u>
Polygonum sagittatum	30	57.7	1
Trifolium repens	21	40.4	2
Solidago sp.	1	1.9	3
Total	52	100	

County Line Creek
Buncombe County, NC

Quad 3

Tree Stratum

Species

Height (cm)

Diameter (mm)

Radius (mm)

Overall Total

(no trees in plot)

Total Trees per acre

Planted trees per acre

Natural regen. trees per acre

Shrub Stratum

Species

Cover (%)

Rel. cover (%)

Density

Sambucus canadensis

0.5

50.0

5.0

Cornus amomum

0.5

50.0

5.0

Total

1

100.0

10.0

Herb Stratum

Species

Cover (%)

Rel. cover (%)

Rank (Importance)

Digitaria sp.

100

97.1

1.0

Impatiens sp.

1

1.0

2.0

Erechtites hieracifolia

1

1.0

2.0

Echinochloa sp.

1

1.0

2.0

Total

103

100