Smith and Austin Stream Restoration
2004 Annual Monitoring Report

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Prepared by: Biological & Agricultural Engineering
Water Resources Research Institute
North Carolina State University
Campus Box 7625
Raleigh, NC 27695

April, 2005

Ecosystem Enhancement PROGRAM

NCDENR

NC STATE UNIVERSITY

2004 Smith and Austin Creeks Monitoring Abstract

Smith and Austin Creeks were restored through the North Carolina Ecosystem Enhancement Program (NCEEP). The objectives of the project are to:

1.) Establish an stable dimension, pattern and profile on 11,000 feet Smith Creek and Austin Creek
2.) Improve habitat within Smith and Austin Creeks
3.) Establish an riparian buffer along Smith and Austin Creeks
4.) Incorporate this project into a watershed wide management plan

This is the 2nd year of the 5-year monitoring plan for the Smith and Austin Creeks

Table 1A. Background Information

Project Name	Smith and Austin Creeks
Designer's Name	Buck Engineering 8000 Regency Parkway Suite 200 Cary, NC 27511
Contractor's Name	Unknown
Project County	Wake County, North Carolina
Directions to Project Site	From Raleigh NC take US 1 / Capital Boulevard North to right on US 1-A at Wake Forest. Go approximately 3/4 mile. Turn right on Rogers Road. The end of the project is located ¼ before the Forestville Road intersection where Smith Creek is curveted under Rogers Road. At the Forestville Road intersect with Rogers Road the Heritage Wake Forest's main entrance is located to the west (left) on Heritage Lake Road. Follow Heritage Lake Road to parking area at Soccer fields on the left.
Drainage Area	12.6 sq. mi (Smith Reach ~3.6 sq. mi) (Austin Reach ~8.4 sq. mi)
USGS Hydro Unit	30202030
NCDWQ Subbasin	03-04-02 Neuse River Basin
Project Length	11,000 Linear feet
Restoration Approach	11,000 ft of priority 1 Natural Channel Design (dimension, pattern, and profile) and priority 3 Channel Enhancement
Date of Completion	Summer 2002
Monitoring Dates	September 2003, July 2004

Results and Discussion

Overall, while the majority 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 majority of the restored stream classifies as a C5 with and rock cross vanes that control and hold the grade. There were six beaver dams located on Smith Creek that have created a backwater effect and sediment transport problems in Smith Reach-2 and Austin Reach-3. Channel pattern is similar to as-built condition. There are a few isolated areas of bank erosion. Most of the bank erosion on the project is localized and a result of the formation of mid channel bars or near structures. The channel dimension for much of the restored section has changed significantly with a net decrease of cross-sectional area. The changes in channel dimension for some of the cross-sections represent an increase in cross-sectional stability. For the majority of the project the channel profile is losing defined bed features and is beginning to become dominated by runs and pools. There were less stable riffles located on the restored reach during the 2004 monitoring period than during the 2003 monitoring period. Placed structures are holding grade and functioning well. While existence of the beaver dams are creating new habitat for diversity of wetland flora and fauna, the dams must be removed and repairs will need to be made on the channels to obtain a stable stream corridor. Vegetation is not succeeding to levels required for mitigation credit. Supplemental planting is needed to obtain levels required for mitigation. Additional live stakes are also needed 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 2a. Summary of Channel Conditions Smith Reach-1

DIMENSION	Smith Reach 1 Cross-section #2 Riffle			Smith Reach 1 Cross-section #3 Riffle			Smith Reach 1 Cross-section #4 Pool			Smith Reach 1 Cross-section #5 Pool		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	55.9	60.8	59.6	36.6	47.5	44.9	43.8	69.3	57.9	78.9	123.2	109.2
Bankfull Width	25.1	23.6	23.5	25.9	25.6	31.3	45.1	47.4	46.5	43.2	44.2	41.8
Bankfull Mean Depth	2.2	2.6	2.5	1.4	1.9	1.4	1.0	1.5	1.2	1.8	2.8	2.6
Bankfull Max Depth	3.1	3.7	3.7	2.4	2.7	2.8	3.7	4.1	3.8	3.1	5.1	4.8

PATTERN	Smith Reach 1 AS-BUILT			Smith Reach 1 2003			Smith Reach 1 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			90	248	172
Radius of Curvature	Not Reported			Not Reported			20	64	36
Beltwidth	Not Reported			Not Reported			38	139	89

PROFILE	Smith Reach 1 Design			Smith Reach 1 As-built 2003			Smith Reach 1 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			15	39	18
Riffle Slope	Not Reported			Not Reported			0.7%	3.9%	1.3%
Pool Length	Not Reported			Not Reported			6	76	33
Pool to Pool Spacing	Not Reported			Not Reported			16	149	60
Valley (TOB) Slope	Not Reported			Not Reported			0.30%	0.60%	0.45%
Bankfull Slope	Not Reported			Not Reported			0.20%	0.51%	0.26%

SUBSTRATE	Smith Reach 1 Cross-section #2 Riffle		Smith Reach 1 Cross-section #3 Riffle		Smith Reach 1 Cross-section #4 Pool		Smith Reach 1 Cross-section #5 Pool	
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004
d50	N/A	0.56	N/A	0.82	N/A	1.07	N/A	0.32
d84	N/A	2.04	N/A	2.65	N/A	2.72	N/A	1.83

VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

Table 2b. Summary of Channel Conditions Smith Reach-2

DIMENSION	Smith Reach 2 Cross-section #1 Riffle			Smith Reach 2 Cross-section #2 Pool			Smith Reach 2 Cross-section #3 Pool			Smith Reach 2 Cross-section #4 Riffle		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	44.9	45.9	46.5	60.8	59.2	48.5	52.4	59.6	64.0	38.4	42.7	38.9
Bankfull Width	20.0	20.2	33.2	25.7	26.2	26.9	36.3	37.7	39.1	18.4	18.9	18.7
Bankfull Mean Depth	2.2	2.3	1.4	2.4	2.3	1.8	1.4	1.6	1.6	2.1	2.3	2.1
Bankfull Max Depth	3.9	3.3	3.1	4.6	3.8	3.8	3.4	4.2	4.1	3.2	3.3	3.1

PATTERN	Smith Reach 2 AS-BUILT			Smith Reach 2 2003			Smith Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			204	398	309
Radius of Curvature	Not Reported			Not Reported			42	97	62
Beltwidth	Not Reported			Not Reported			67	140	95

PROFILE	Smith Reach 2 Design			Smith Reach 2 As-built 2003			Smith Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			N/A	N/A	N/A
Riffle Slope	Not Reported			Not Reported			N/A	N/A	N/A
Pool Length	Not Reported			Not Reported			23	83	43
Pool to Pool Spacing	Not Reported			Not Reported			40	120	89
Valley (TOB) Slope	Not Reported			Not Reported			0.25%		
Bankfull Slope	Not Reported			Not Reported			0.27%	0.36%	0.32%

SUBSTRATE	Smith Reach 2 Cross-section #1 Riffle		Smith Reach 2 Cross-section #2 Pool		Smith Reach 2 Cross-section #3 Pool		Smith Reach 2 Cross-section #4 Riffle	
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004
d50	N/A	0.28	N/A	0.10	N/A	Beaver Dam	N/A	Beaver Dam
d84	N/A	2.27	N/A	0.73	N/A	Beaver Dam	N/A	Beaver Dam

VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

Table 2c. Summary of Channel Conditions Austin Reach-1

DIMENSION	Austin Reach 1 Cross-section #2 Riffle			Austin Reach 1 Cross-section #3 Riffle			Austin Reach 1 Cross-section #4 Pool		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	62.4	51.2	49.0	52.7	51.2	49.8	38.3	38.5	38.2
Bankfull Width	29.5	31.1	32.4	22.8	23.8	24.4	22.7	22.5	23.3
Bankfull Mean Depth	2.1	1.6	1.5	2.3	2.2	2.0	1.7	1.7	1.6
Bankfull Max Depth	4.0	3.8	3.9	3.9	3.2	3.2	2.8	2.5	2.5

PATTERN	Austin Reach 1 AS-BUILT			Austin Reach 1 2003			Austin Reach 1 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			N/A	N/A	N/A
Radius of Curvature	Not Reported			Not Reported			N/A	N/A	N/A
Beltwidth	Not Reported			Not Reported			N/A	N/A	N/A

PROFILE	Austin Reach 1 Design			Austin Reach 1 As-built 2003			Austin Reach 1 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			10	55	15
Riffle Slope	Not Reported			Not Reported			1.1%	6.4%	4.2%
Pool Length	Not Reported			Not Reported			13	72	31
Pool to Pool Spacing	Not Reported			Not Reported			23	287	64
Valley (TOB) Slope	Not Reported			Not Reported			0.32%		
Bankfull Slope	Not Reported			Not Reported			0.32%		

SUBSTRATE	Austin Reach 1 Cross-section #2		Austin Reach 1 Cross-section #3		Austin Reach 1 Cross-section #4	
	Riffle		Riffle		Pool	
Monitoring Year	2003	2004	2003	2004	2003	2004
d50	N/A	N/A	N/A	0.07	N/A	0.22
d84	N/A	N/A	N/A	2.31	N/A	2.54

VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

Table 2d. Summary of Channel Conditions Austin Reach-2

DIMENSION	Austin Reach 2 Cross-section #1 Riffle			Austin Reach 2 Cross-section #2 Pool			Austin Reach 2 Cross-section #3 Riffle		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	62.1	45.4	48.1	43.9	36.9	37.1	53.9	56.4	54.4
Bankfull Width	20.8	18.8	19.3	17.3	19.7	21.3	24.1	24.0	24.9
Bankfull Mean Depth	3.0	2.4	2.5	2.5	1.9	1.7	2.2	2.4	2.2
Bankfull Max Depth	4.0	3.6	3.6	3.4	3.5	3.6	3.2	3.2	3.1

PATTERN	Austin Reach 2 AS-BUILT			Austin Reach 2 2003			Austin Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			N/A	N/A	N/A
Radius of Curvature	Not Reported			Not Reported			N/A	N/A	N/A
Beltwidth	Not Reported			Not Reported			N/A	N/A	N/A

PROFILE	Austin Reach 2 Design			Austin Reach 2 As-built 2003			Austin Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			8	10	9
Riffle Slope	Not Reported			Not Reported			5.4%	7.3%	6.3%
Pool Length	Not Reported			Not Reported			21	48	22
Pool to Pool Spacing	Not Reported			Not Reported			59	157	102
Valley (TOB) Slope	Not Reported			Not Reported			0.32%		
Bankfull Slope	Not Reported			Not Reported			0.26%		

SUBSTRATE	Austin Reach 2 Cross-section #1		Austin Reach 2 Cross-section #2		Austin Reach 2 Cross-section #3	
	Riffle		Pool		Riffle	
Monitoring Year	2003	2004	2003	2004	2003	2004
d50	N/A	N/A	N/A	0.70	N/A	0.64
d84	N/A	N/A	N/A	2.02	N/A	1.90

VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

Table 2e. Summary of Channel Conditions Austin Reach-3

DIMENSION	Austin Reach 3 Cross-section #1 Pool			Austin Reach 3 Cross-section #2 Riffle			Austin Reach 3 Cross-section #3 Pool		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	72.7	87.5	97.1	97.1	125.1	126.5	93.0	151.2	153.8
Bankfull Width	39.6	41.2	37.3	35.5	37.2	38.4	39.1	39.4	38.5
Bankfull Mean Depth	1.8	2.1	2.6	2.7	3.4	3.3	2.4	3.8	4.0
Bankfull Max Depth	3.8	4.8	4.8	3.8	5.3	5.3	3.8	7.1	7.1

DIMENSION	Austin Reach 3 Cross-section #4 Riffle			Austin Reach 3 Cross-section #5 Riffle			Austin Reach 3 Cross-section #6 Pool		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	63.7	77.4	78.8	88.9	116.0	99.9	70.0	108.9	135.7
Bankfull Width	35.1	34.1	31.6	35.6	39.1	34.3	56.9	58.4	58.3
Bankfull Mean Depth	1.8	2.3	2.5	2.5	3.0	2.9	1.2	1.9	2.3
Bankfull Max Depth	3.3	4.0	4.0	3.9	4.7	4.2	3.4	6.7	6.9

PATTERN	Austin Reach 3 AS-BUILT			Austin Reach 3 2003			Austin Reach 3 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			321	507	346
Radius of Curvature	Not Reported			Not Reported			87	178	99
Beltwidth	Not Reported			Not Reported			77	239	95

PROFILE	Austin Reach 3 Design			Austin Reach 3 As-built 2003			Austin Reach 3 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			21	36	28
Riffle Slope	Not Reported			Not Reported			1.2%	1.7%	1.4%
Pool Length	Not Reported			Not Reported			14	89	26
Pool to Pool Spacing	Not Reported			Not Reported			32	492	113
Valley (TOB) Slope	Not Reported			Not Reported			0.32%		
Bankfull Slope	Not Reported			Not Reported			0.17%		

SUBSTRATE	Austin Reach 3 Cross-section #1 Pool		Austin Reach 3 Cross-section #2 Riffle		Austin Reach 3 Cross-section #3 Pool		Austin Reach 3 Cross-section Riffle		Austin Reach 3 Cross-section Riffle		Austin Reach 3 Cross-section Pool	
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
d50	N/A	N/A	N/A	0.56	N/A	1.10	N/A	N/A	N/A	0.75	N/A	0.47
d84	N/A	N/A	N/A	3.00	N/A	2.89	N/A	N/A	N/A	2.28	N/A	1.95

VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

Areas of Concern

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

Smith and Austin Creek

- Beaver Dams
  - There are six beaver dams located on Smith Reach-2 at stations 26+50, 28+00, 38+60, 41+50, 43+50 and 45+50
    - At station 26+50 the beaver dam has a head of 13 inches and has produced a backwater effect greater than 400 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
    - At station 28+00 the beaver dam has a head of 4 inches and has produced a backwater effect greater than 130 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
    - At station 38+60 the beaver dam has a head of 30 inches and has produced a backwater effect greater than 1000 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
    - At station 41+50 the beaver dam has a head of 7 inches and has produced a backwater effect greater than 250 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
    - At station 43+50 the beaver dam has a head of 9 inches and has produced a backwater effect greater than 200 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
    - At station 45+50 the beaver dam has a head of 14 inches and has produced a backwater effect greater than 200 ft along the long-profile of Smith Creek and greater than 500ft along the long-profile of Austin Creek. The backwater has changed the dimension and profile of both streams.
- Bank Erosion and Mid Channel Bars
  - Bank erosion has been noted at four locations on the reaches of Smith Creek due to the formation of mid-channel bars
    - At Station 10+50 there is a mid-channel bar forming that has dimensions of 4ft wide by 15ft along the profile of the stream
    - At Station 12+20 there is a mid-channel bar forming that has dimensions of 3ft wide by 15ft along the profile of the stream
    - At Station 15+50 there is a mid-channel bar forming that has dimensions of 3ft wide by 15ft along the profile of the stream
    - At Station 20+80 there is a mid-channel bar forming that has dimensions of 2ft wide by 10ft along the profile of the stream
  - Bank erosion has been noted at six locations on the reaches of Austin Creek due to the formation of mid-channel bars
    - At Station 9+75 there is a mid-channel bar forming that has dimensions of 3ft wide by 20ft along the profile of the stream
    - At Station 18+30 there is a mid-channel bar forming that has dimensions of 2ft wide by 15ft along the profile of the stream

        - At Station 27+40 there is a mid-channel bar forming that has dimensions of 8ft wide by 40ft along the profile of the stream
        - At Station 29+10 there is a mid-channel bar forming that has dimensions of 7ft wide by 35ft along the profile of the stream
        - At Station 31+80 there is a mid-channel bar forming that has dimensions of 5ft wide by 15ft along the profile of the stream
        - At Station 32+60 there is a mid-channel bar forming that has dimensions of 8ft wide by 40ft along the profile of the stream
    - There were three additional locations of significant mid-channel bars forming on Austin Creek that are currently not producing significant bank erosion
        - At Station 37+40 there is a mid-channel bar forming that has dimensions of 8ft wide by 45ft along the profile of the stream
        - At Station 47+00 there is a mid-channel bar forming that has dimensions of 4ft wide by 70ft along the profile of the stream
        - At Station 49+30 there is a mid-channel bar forming that has dimensions of 3ft wide by 70ft along the profile of the stream
- Vegetation
    - Replanting trees should occur to obtain mitigation requirements
    - The site could benefit from larger containerized trees both for bank stability and aesthetics.
    - It is recommended to stake in areas where erosion is problematic, particularly on outside meander bends.
    - Although invasive vegetation is not a major issue on this project site, *Microstegium vimineum* and *Sorghum halepense* should be monitored.

Example Issue Photos

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

Typical Riffle

Typical Pool

Issue Photo 1. Beaver Dam at Confluence

Issue Photo 2. Mid-Channel Bar STA: 9+75

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

SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

SMITH AND AUSTIN
PLAN SHEET AUSTIN CREEK–1

DATE 04/16/2005

PROJECT NO.

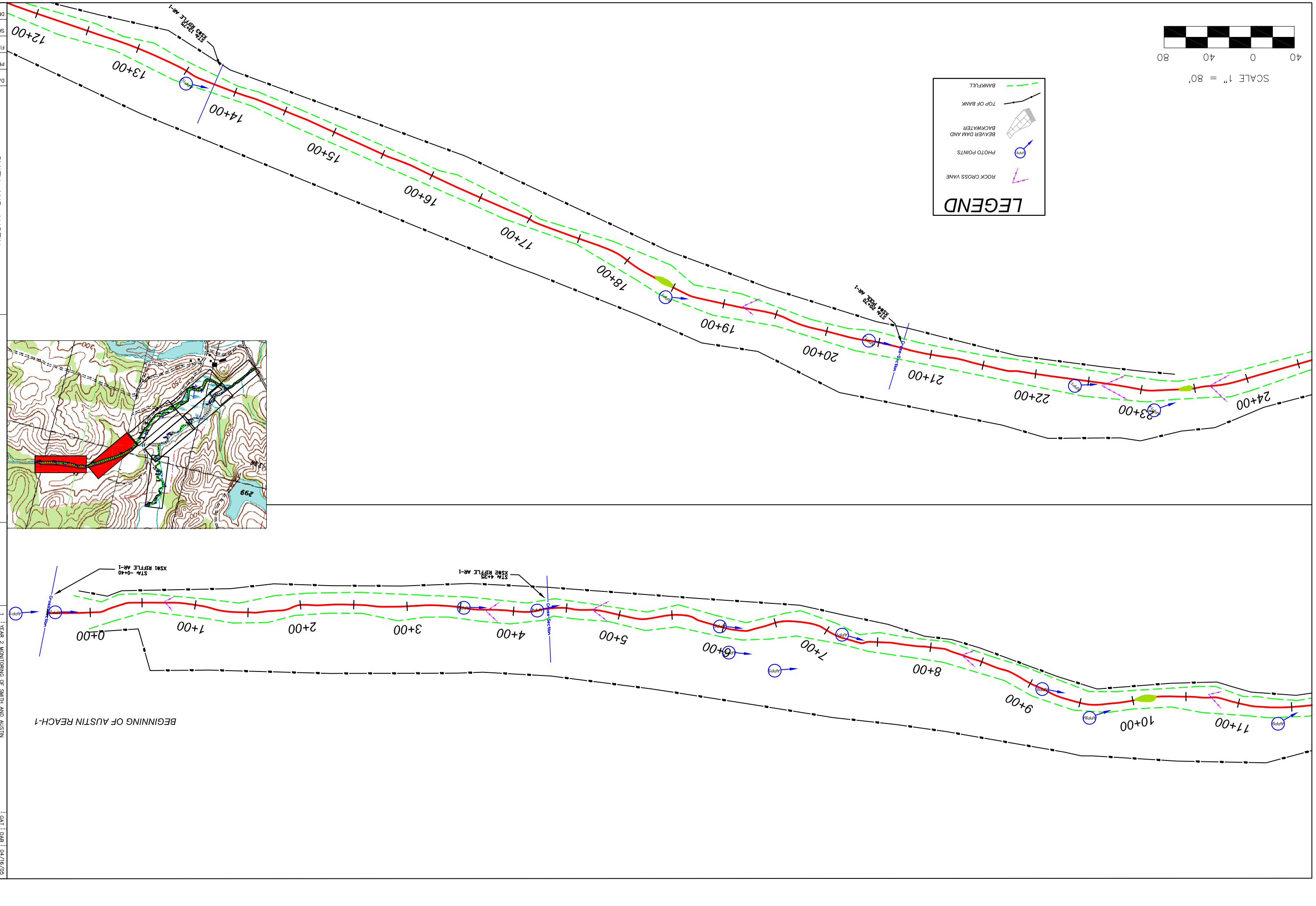
FILENAME SMITH AND AUSTIN.DWG

SHEET NO. PG - 6

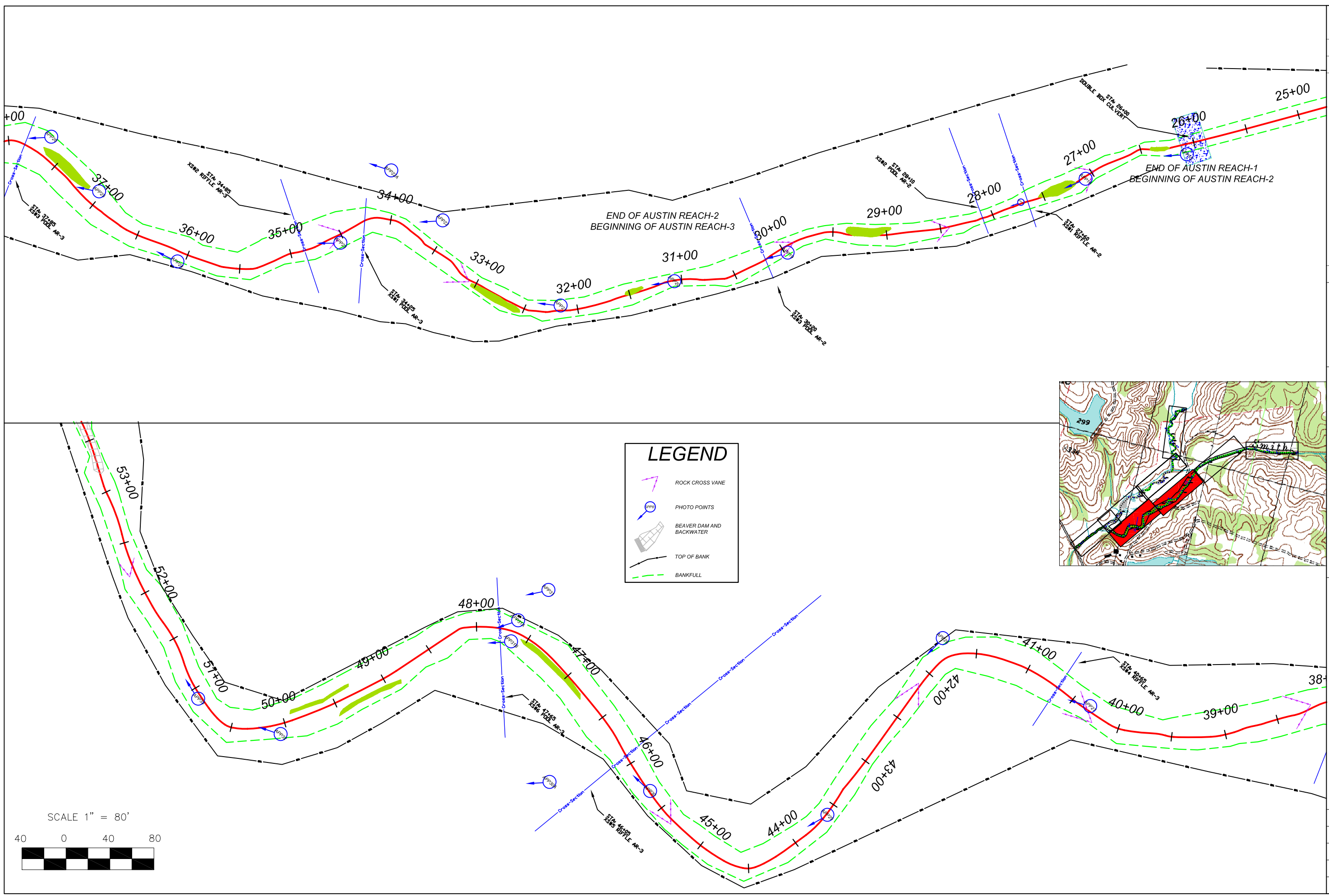
DRAWING NO.

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

NC STATE UNIVERSITY



NO	REVISIONS	DRN	CHK	DATE
1	YEAR 2 MONITORING OF SMITH AND AUSTIN	GAT	DAB	04/16/05



NO	REVISIONS	DRN	CHK	DATE
1	YEAR 2 MONITORING OF SMITH AND AUSTIN	GAT	DAB	04/16/05

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

SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

SMITH AND AUSTIN
PLAN SHEET AUSTIN CREEK-2

DATE	04/16/2005
PROJECT NO.	
FILENAME	SMITH AND AUSTIN.DWG
SHEET NO.	PC - 7
DRAWING NO.	

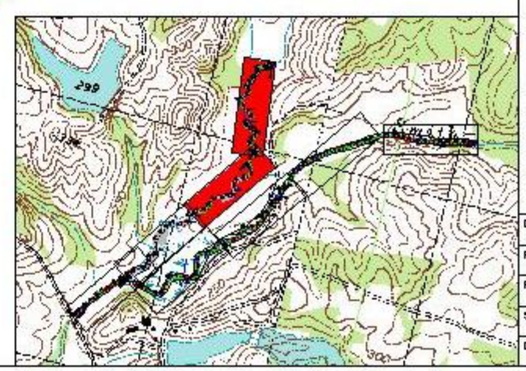
BEGINNING OF SMITH REACH-1

END OF SMITH REACH-1
BEGINNING OF SMITH REACH-2

LEGEND

SCALE 1" = 80'

40 0 40 80



NO	REVISIONS	DRN	CHK	DATE
1	YEAR 2 MONITORING OF SMITH AND AUSTIN	DAT	DAB	04/19/05

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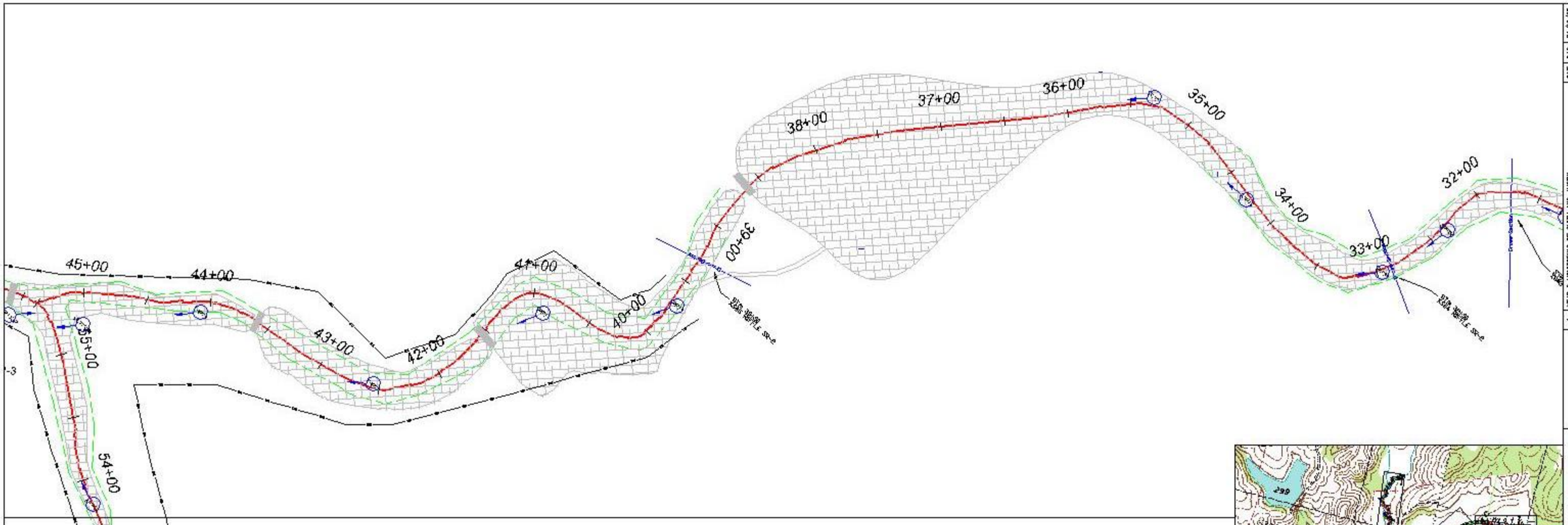
Weaver Labs Campus Box 7625
North Carolina State University
Raleigh, NC 27695

SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

SMITH AND AUSTIN
PLAN SHEET SMITH CREEK-1

DATE	04/19/2005
PROJECT NO.	
FILENAME	SMITH AND AUSTIN.DWG
SHEET NO.	PC - 8
DRAWING NO.	



NO	DAT	DAB	DATE
1			04/16/05

REVISIONS

1 YEAR 2 MONITORING OF SMITH AND AUSTIN

NC STATE UNIVERSITY

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

SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

SMITH AND AUSTIN
PLAN SHEET SMITH CREEK-2

DATE 04/16/2005
PROJECT NO.
FILENAME SMITH AND AUSTIN.DWG
SHEET NO. PS - 2
DRAWING NO.

Table of Contents

Tables and Figures

1.0 BACKGROUND INFORMATION

Project planning was initiated for the Smith and Austin Creek Stream Restoration in 2001 for the implementation of a developing watershed stream restoration project in Wake Forest, North Carolina (Figure 1).

The project consisted of the analysis of the 12.6 square mile portion of the Smith and Austin Creek watersheds (located within USGS Hydrologic Unit Code 030202030, NCDWQ Sub-basin 03-04-02 of the Neuse River Basin) that contribute drainage to the project site. The watershed analysis, including the assessment of stream channel, was conducted for the purpose of developing a clear understanding of existing system characteristics. The resulting Restoration Plan identified opportunities to improve water quality and overall system functions including targeted strategies such as wetland/riparian buffer preservation, stormwater BMP development/retrofitting, stream restoration, and community education. Since construction of this project there has been ongoing development and construction of the Heritage sub-division and golf course that is adjacent to the restoration project.

Following coordination with local leaders, the Wetlands Restoration Program and citizens groups, the project was initiated and focused on the restoration of approximately 11,000 linear feet of degraded stream. Detailed environmental assessments and engineering studies were conducted and design plans and documents were prepared to facilitate the stream and riparian buffer restoration. Implementation of the project was completed by August 2002. Due to large storms after construction, the project was repaired in January of 2003.

The restoration of these portions of Smith and Austin Creek, located in Wake Forest near Heritage Development, 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 August 2002.

1.1 Goals and Objective

Smith and Austin Creeks were restored through the North Carolina Wetlands Restoration Program (NCWRP). The objectives of the project are to:

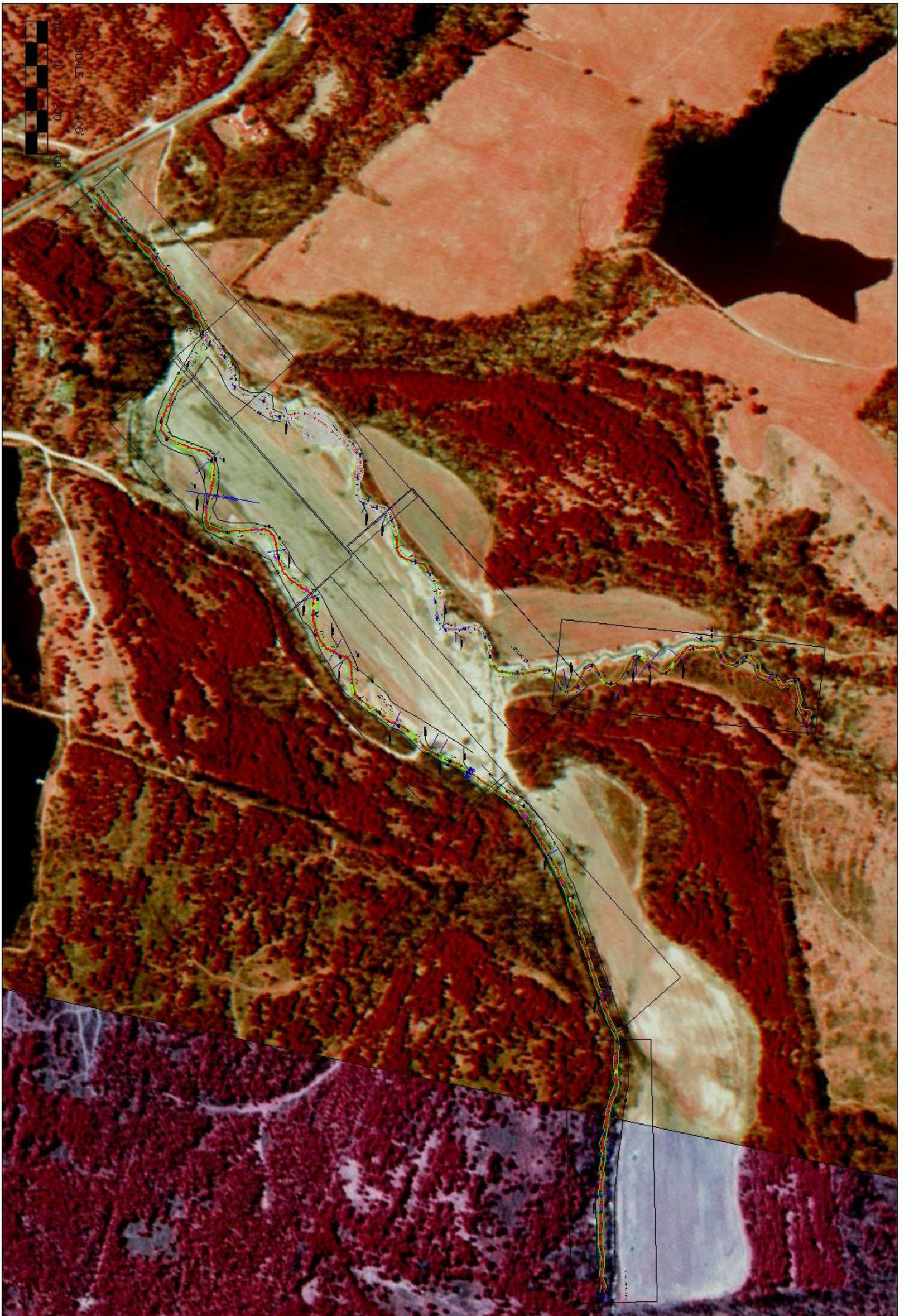
1.) Establish an stable dimension, pattern and profile on 11,000 feet Smith Creek and Austin Creek
2.) Improve habitat within Smith and Austin Creeks
3.) Establish an riparian buffer along Smith and Austin Creeks
4.) Incorporate this project into a watershed wide management plan

1.2 Project Location

The Smith and Austin Creek stream restoration project is located in Wake County, NC at Heritage Development and Golf course south of Wake Forest. From Raleigh NC take US 1 / Capital Boulevard North to right on US 1-A at Wake Forest. Go approximately 3/4 mile. Turn right on Rogers Road. The end of the project is located ¼ before the Forestville Road intersection where Smith Creek is curveted under Rogers Road. At the Forestville Road intersect with Rogers Road the Heritage Wake Forest's main entrance is located to the west (left) on Heritage Lake Road. Follow Heritage Lake Road to parking area at Soccer fields on the left.

1.3 Project Description

A previously straight and incised channel Smith and Austin Creeks were 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 Austin Reaches one and two of the project.



SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

SMITH AND AUSTIN CREEK
STREAM RESTORATION

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1	YEAR 2 MONITORING OF SMITH AND AUSTIN	CAT	DAB	04/19/06

DRAWING NO. SL - 5
SHEET NO.
FILENAME SMITH AND AUSTIN.DWG
PROJECT NO.
DATE 04/19/2005

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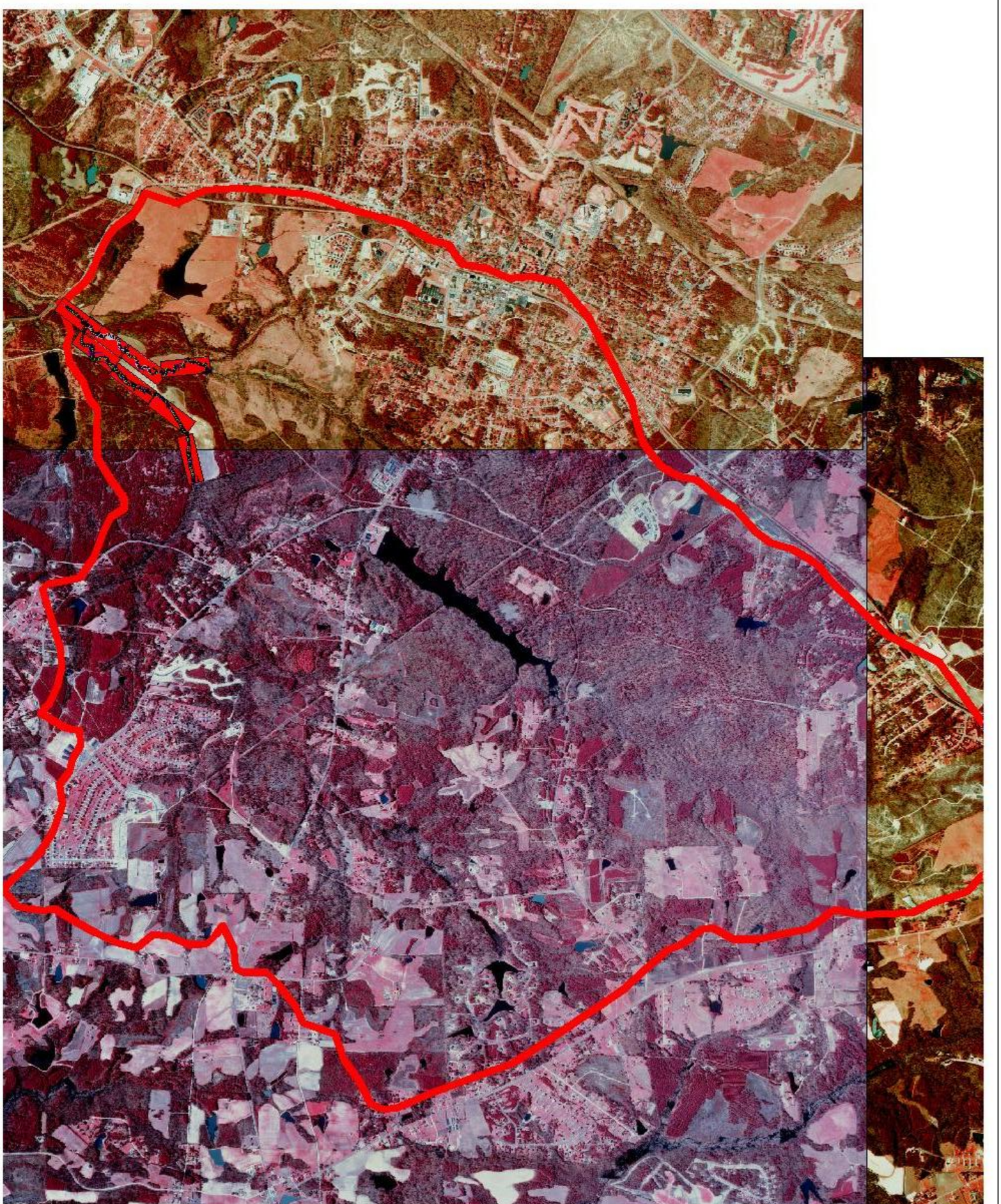

SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

12.9 SQUARE MILES
WATERSHED WITH ORTHO-PHOTO

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1	YEAR 2 MONITORING OF SMITH AND AUSTIN	CAT	DAB	04/19/05

DRAWING NO.
SHEET NO. FIG-4
FILENAME SMITH AND AUSTIN.DWG
PROJECT NO.
DATE 04/19/2005

SCALE 1" = 25000'

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NO	REVISIONS	DAT	DAB	DATE
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SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

12.9 SQUARE MILES
WATERSHED WITH USGS OVERLAY

DATE	04/16/2005
PROJECT NO.	
FILENAME	SMITH AND AUSTIN.DWG
SHEET NO.	FIG-3
DRAWING NO.	

SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

SMITH AND AUSTIN
PLAN SHEET AUSTIN CREEK–1

DATE 04/16/2005

PROJECT NO.

FILENAME SMITH AND AUSTIN.DWG

SHEET NO. PG - 6

DRAWING NO.

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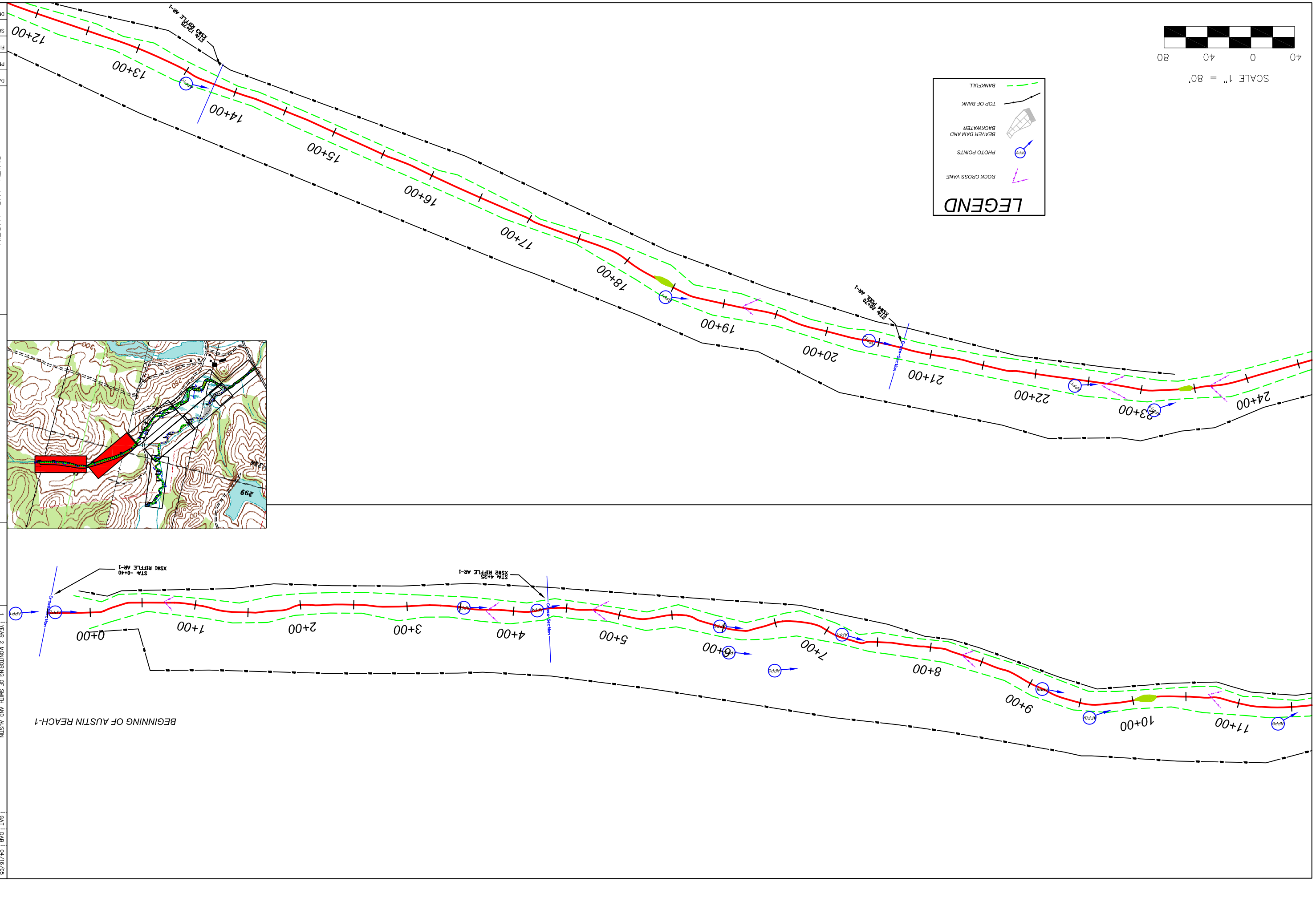

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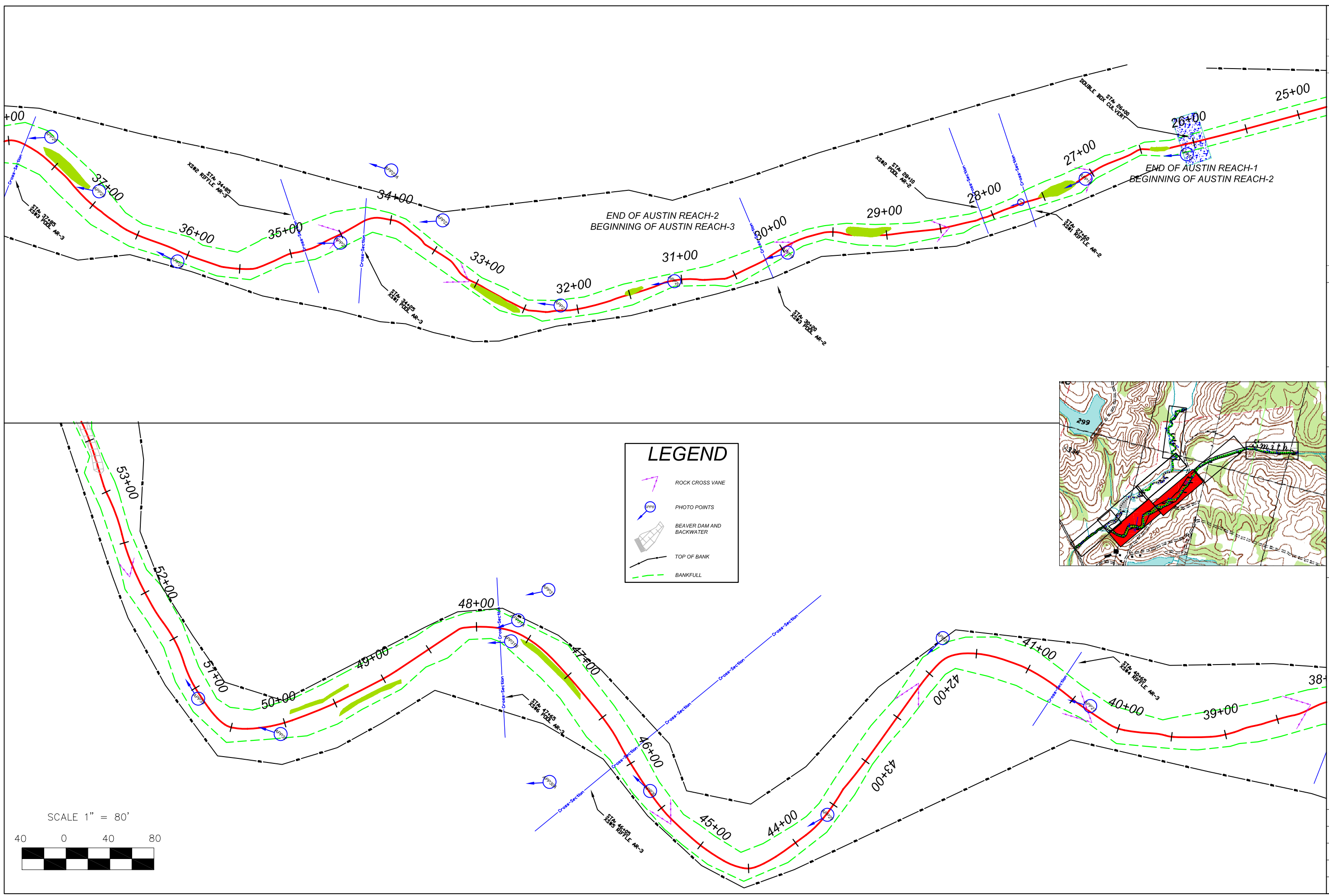

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1	YEAR 2 MONITORING OF SMITH AND AUSTIN	GAT	DAB	04/16/05

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SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

SMITH AND AUSTIN
PLAN SHEET AUSTIN CREEK-2

DATE	04/16/2005
PROJECT NO.	
FILENAME	SMITH AND AUSTIN.DWG
SHEET NO.	PC - 7
DRAWING NO.	

BEGINNING OF SMITH REACH-1

END OF SMITH REACH-1
BEGINNING OF SMITH REACH-2

LEGEND

SCALE 1" = 80'

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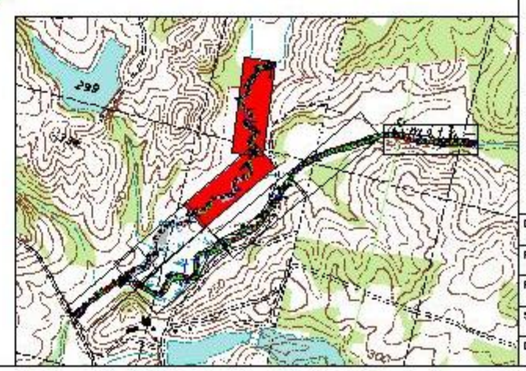

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1	YEAR 2 MONITORING OF SMITH AND AUSTIN	DAT	DAB	04/19/05

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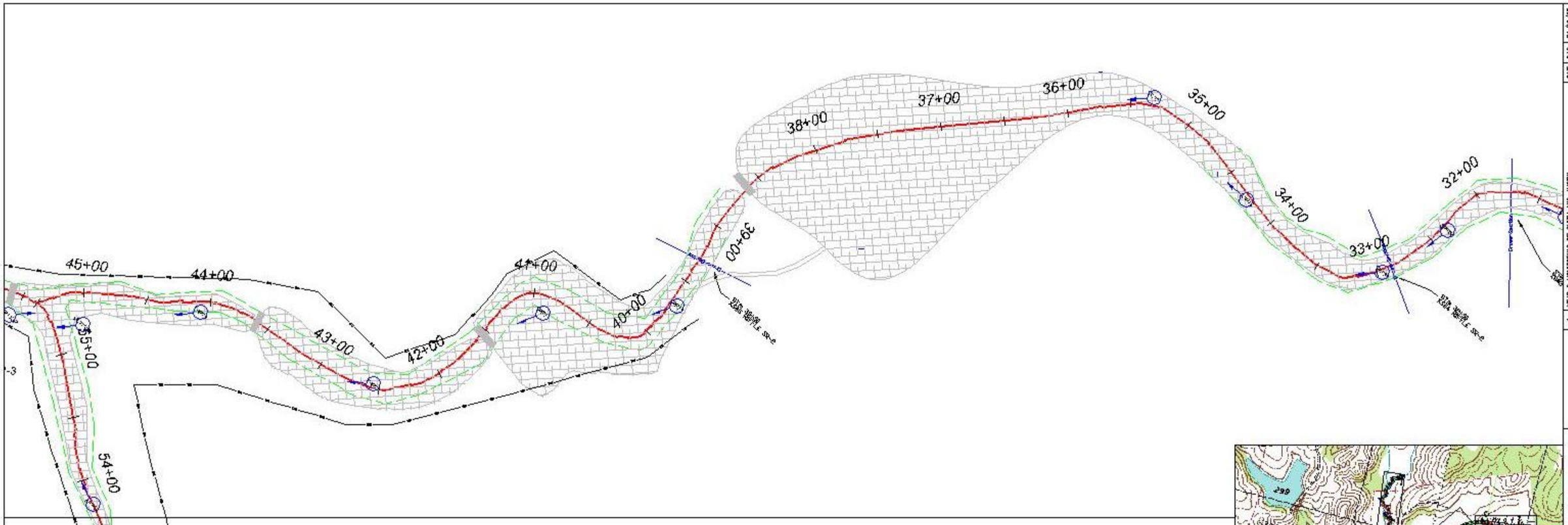
SMITH AND AUSTIN
WAKE FOREST
WAKE COUNTY, N.C.

SMITH AND AUSTIN
PLAN SHEET SMITH CREEK-1

DATE	04/19/2005
PROJECT NO.	
FILENAME	SMITH AND AUSTIN.DWG
SHEET NO.	PC - 8
DRAWING NO.	



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REVISIONS

1 YEAR 2 MONITORING OF SMITH AND AUSTIN

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WAKE FOREST
WAKE COUNTY, N.C.

SMITH AND AUSTIN
PLAN SHEET SMITH CREEK-2

DATE 04/16/2005
PROJECT NO.
FILENAME SMITH AND AUSTIN.DWG
SHEET NO. PS - 2
DRAWING NO.

2.0 YEAR 2004 RESULTS AND DISCUSSION

Year 2004 monitoring results are shown for the Smith and Austin Creek stream restoration project.

2.1 Vegetation

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

2.1.1 Results and Discussion

Austin Creek

Vegetation within the riparian buffer of Austin Creek varied in success level. The planted native herbaceous vegetation was dense in some areas and sparse in others. Festuca spp. (fescue) appeared to be prevalent in many areas, although early successional species such as Solidago spp. (goldenrods) and Eupatorium capillifolium (dog fennel) are especially doing well throughout the area. Live stakes were performing poorly throughout most areas. Planted trees and shrubs are doing poorly throughout the entire buffer. Surveyed shrub density was very low. In the two plots, only 4 planted tree stems were counted. It should be noted that the trees protected by tree guards were alive and growing, although they appeared to have been planted in a denser cluster than those planted throughout the rest of the project. Further, of the shrub and tree stems found alive, most had been browsed. Planted trees were not considered successful. Extrapolation from the two plots resulted in an overall average of approximately 80 planted trees per acre for this restoration site, with an average of 2 trees per plot.

Natural regeneration seems to be playing an important role in the recovery of this stream. Fraxinus spp. (ashes) is the dominant tree species within the area. Extrapolation from the two plots in the resulted in an overall average of approximately 1040 naturally regenerated trees per acre for this restoration site, with an average of 26 trees per plot. Overall, the area appeared to be in an early successional state.

Smith Creek

Vegetation within the riparian buffer of Smith Creek varied in success level, as well. The planted native herbaceous vegetation was dense in some areas and sparse in others. Festuca spp. was not as prevalent in the surveyed areas. Early successional species, namely Eupatorium capillifolium, were especially doing well throughout the area. Live stakes were performing poorly throughout most areas. Planted trees and shrubs are doing poorly throughout the entire buffer. Surveyed shrub density was low. In the two plots, only 6 planted tree stems were counted. Plot 1contained 5 living planted species, some of which were protected by tree guards. Plot 2 only contained 1 living planted tree species. It should be noted that the trees protected by tree guards were alive and growing, although they appeared to have been planted in a denser cluster than those planted throughout the rest of the project. Further, of the shrub and tree stems found alive, most had been browsed. Planted trees were not considered successful. Extrapolation from the

two plots in the resulted in an overall average of approximately 120 planted trees per acre for this restoration site, with an average of 3 trees per plot.

Natural regeneration was quite prevalent in plot 2. This was probably due to an abundant seed source. Fraxinus spp. and Platanus occidentalis (sycamore) were the dominant trees within the area. Extrapolation from the two plots in the resulted in an overall average of approximately 1550 naturally regenerated trees per acre for this restoration site, with an average of 41 trees per plot. Overall, the area appeared to be in an early successional state.

Throughout both reaches of Austin and Smith Creeks, Microstegium vimineum (Japanese stiltgrass) occur along the stream banks and in areas of the buffer. Sorghum halepense (Johnson grass) is sporadic throughout the more open areas of the project.

Vegetation overall within this project has mixed success. Herbaceous vegetation, both planted and naturally regenerating, is doing well in some areas and poor in others. Live stakes are marginal to non-existent in most areas. Surviving planted tree species were low in density in buffers of both creeks.

Recommendations include replanting trees to obtain mitigation requirements and stake only in areas where erosion is problematic. Although invasive vegetation is not a major issue on this project site, Microstegium vimineum and Sorghum halepense should be monitored. Deer are an issue on this site, however, as housing development continues, browsing may decrease.

2.2 Geomorphology

Restored channel dimension, pattern, profile and substrate were examined during the 2004 monitoring.

2.2.1 Results and Discussion

Smith Reach 1 (Station 0+00 to 20+00)

The Smith Creek is sand bed channel with a percentage of gravel and therefore the dune and anti-dune characteristics of sand-bed sediment transport should be considered. The restoration construction created a C5 channel from an existing G5 / F5 channel from STA: 7+00 to STA: 20+00. From STA: 0+00 to STA: 7+00 the channel was stabilized in-place with no significant change in pattern or profile. The valley slope for this reach is 0.45%, this reach has entrenchment ratio greater than 3.0 and the ratio of the top of bank height to the bankfull height is approximately 1.0. Constructed riffles and rock cross vanes are used to hold grade on this reach. The channel profile along Smith Creek Reach 1 has shown signs of deposition but has not significantly changed from the as-build profile and this year's monitoring. The stream is moving toward a run dominated system pools are filling in and riffles are flattening. Rock cross vanes are holding the grade of the stream. In general for this reach, stream features are still located in the correct plan form locations. There are no major failures with the rock cross vanes. The as-built stream profile shows that riffles were constructed but are transitioning into runs. The design was most likely intended to build a riffle/pool sequence plan form C5 type channel for the majority of the project, this intent has been achieved over the monitoring period thus far. The location of riffles has not changed significantly from construction to the present, but riffles have transitioned in to other bed features and have flattened. The number of riffles has decreased and only the longer and or steeper riffles remain. Unless the substrate becomes coarser, the system will stay embedded with sand and will likely continue to migrate toward a run dominated system. During the 2004 monitoring period there was some backwater influence on the lower portion of Smith Creek Reach 1 from Beaver Dams located downstream in Reach 2.

Cross section results were calculated using the most obvious bench or bankfull indicator as a datum. This elevation will be used in future monitoring 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 was not evaluated in this reach because it was located upstream of the project. Cross-sections 2 is located on a riffle and has a current cross sectional area of 55.9 square feet, a decrease of 8% from 2003. Cross-sections 3 is located on a riffle and has a current cross sectional area of 36.6 square feet, a decrease of 22% from 2003. Cross-sections 4 is located on a pool and has a current cross sectional area of 43.8 square feet, a decrease of 37% from 2003. Cross-sections 5 is located on a pool and has a current cross sectional area of 78.9 square feet, a decrease of 36% from 2003. All Cross sections in this reach have a fair amount of deposition, low near bank stress and low bank erosion potential. This reach classifies as a C5 channel with an ER of > 3.0.

The channel substrate in the riffle sections are sand and have a D50 of 0.69 mm with a D84 of 2.3 mm. The channel substrate in the pool sections are sand and have a D50 of 0.69 mm with a D84 of 2.3 mm. Future monitoring should better evaluate channel substrate and sediment loading patterns.

Channel pattern appears to have been maintained Smith Reach 1 since construction. There is no excessive migration evident and no shoot cut-offs are apparent. The pattern aligns closely with the as-build pattern. The channel banks throughout the Smith Creek Reach-1 remain fairly stable, with the exception of localized areas of scour near mid channel bars and structures.

While loosing bedform diversity, this project has fairly stable banks but does not appear able to transport the sediment supplied through the reach without forming mid-channel bars. There were no areas of concern noted. Results of near bank stress and the bank erosion hazard index was used to rank the stream banks as having a moderate low erodibility rating. Bed scour is primarily limited to meander beds below structures where energy is being dissipated in a stream. Vegetation is growing well and there is significant of volunteer growth on this project but does not meet the minimum vegetation requirements for mitigation yet. This reach of Smith Creek appears to be aggrading and trying to form a stable dimension. This will be monitored closely over the next three years.

Smith Reach 2 (Station 20+00 to 45+50)

The Smith Creek is sand bed channel with a percentage of gravel and therefore the dune and anti-dune characteristics of sand-bed sediment transport should be considered. The restoration construction created a C5 channel from an existing G5 / F5 channel from STA: 20+00 to STA: 45+50. The valley slope for this reach is 0.45%, this reach has entrenchment ratio greater than 3.0 and the ratio of the top of bank height to the bankfull height is approximately 1.0.

There are six beaver dams located on Smith Reach-2 at stations 26+50, 28+00, 38+60, 41+50, 43+50 and 45+50. At station 26+50 the beaver dam has a head of 13 inches and has produced a backwater effect greater than 400 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream. At station 28+00 the beaver dam has a head of 4 inches and has produced a backwater effect greater than 130 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream. At station 38+60 the beaver dam has a head of 30 inches and has produced a backwater effect greater than 1000 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream. At station 41+50 the beaver dam has a head of 7 inches and has produced a backwater effect greater than 250 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream. At station 43+50 the beaver dam has a head of 9 inches and has produced a backwater effect greater than 200 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream. At station 45+50 the beaver dam has a head of 14 inches and has produced a backwater effect greater than 200 ft along the long-profile of Smith Creek and greater than 500ft along the long-profile of

Austin Creek. The backwater has changed the dimension and profile of both streams. Constructed riffles and rock cross vanes are used hold grade on this reach. The channel profile along Smith Creek Reach 2 has shown signs of deposition and has produced significant changes between the as-build profile and this year's monitoring. The stream is moving toward a run dominated system pools are filling in and riffles are flattening. Rock cross vanes are holding the grade of the stream. There are no major failures with the rock cross vanes. The as-built stream profile indicates that riffles were constructed but have transitioned into runs and filling in due to the significant back water this reach receives. The design was most likely intended to build a riffle/pool sequence plan form C5 type channel for the majority of the project, this intent has not been achieved over the monitoring period thus far. The location of riffles has changed significantly from construction to the present; the back water has transitioned bed features upstream into meander bends. There are no riffles remaining in this reach. Unless the beaver dams are removed, the system will stay embedded with sand and will continue to migrate toward a run dominated system. During the 2004 monitoring period, there was significant backwater influence on Smith Creek Reach 2 from Beaver Dams.

Cross section results were calculated using the most obvious bench or bankfull indicator as a datum. This elevation will be used in future monitoring 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 plan form, BEHI, and the longitudinal profile. Cross-Section 5 was not evaluated in this reach because the backwater from one of the beaver dam inhibited surveying. Cross-sections 1 is located on a riffle and has a current cross sectional area of 44.9 square feet a decrease of 2% from 2003. Cross-sections 2 is located on a pool and has a current cross sectional area of 60.8 square. Cross-sections 3 is located on a pool and has a current cross sectional area of 52.4 square feet a decrease of 12% from 2003. Cross-sections 4 is located on a riffle and has a current cross sectional area of 38.4 square feet a decrease of 10% from 2003. All Cross sections in this reach have a fair amount of deposition, low near bank stress and low bank erosion potential. This reach classifies as a C5 channel with an ER of > 3.0.

The channel substrate in the riffle sections are sand and have a D50 of 0.28 mm with a D84 of 2.27 mm. The channel substrate in the pool sections are sand and have a D50 of 0.10 mm with a D84 of 0.73 mm. Future monitoring should better evaluate channel substrate and sediment loading patterns.

Channel pattern appears to have been maintained in Smith Reach 2 since construction considering the influence of the beaver dams. There is no excessive migration evident. There is one side channel forming near the beaver dam at station 45+50 and no shoot cut-offs are apparent. The pattern aligns closely with the as-build pattern. The channel banks throughout the Smith Creek Reach-2 remain fairly unstable because they are saturated.

While loosing bedform diversity, this project has fairly stable banks. The reach does not appear able to transport the sediment supplied through the reach without forming mid-channel bars. There were no areas of concern noted. Results of near bank stress and the bank erosion hazard index was used to rank the stream banks as having a moderate low

erodibility rating. Vegetation is growing well and there is significant of volunteer growth on this project but does not meet the minimum vegetation requirements for mitigation yet. This reach of Smith Creek appears to be aggrading and trying to form a stable dimension. This will be monitored closely over the next three years. The beaver dams located on this reach should be removed if the channel is to be stable.

Smith Reach 3 (Station 45+50 to 53+70 – confluence)
The Smith Creek is sand bed channel with a percentage of gravel and therefore the dune and anti-dune characteristics of sand-bed sediment transport should be considered. The restoration construction stabilized this reach by installing grade control structures root wads for bank protection and cutting a bench without removing existing large vegetation. The existing G5 / F5 channel was stabilized and given a larger floodplain. The valley slope for this reach is 0.24%, this reach has entrenchment ratio greater than ~2.0 and the ratio of the top of bank height to the bankfull height is approximately 1.8. The structures on this section are holding grade. The banks have a low to moderate erodability rating. At this time point this reach seems to be moving toward a stable state.

Austin Reach 1 (Station 0+00 to 26+20)
The Austin Creek is sand bed channel with a percentage of gravel and therefore the dune and anti-dune characteristics of sand-bed sediment transport should be considered. The restoration approach was to stabilize this reach without changing the existing pattern due to the constraints. The left bank was re-graded to a stable slope in some locations and a bankfull bench was built on the right bank along the entire reach. This construction created a C5 channel with a low sinuosity from an existing G5 / F5 channel. The valley slope for this reach is 0.32%, this reach has entrenchment ratio greater than 3.0 and the ratio of the top of bank height to the bankfull height is approximately 1.0. There are rock cross vanes that hold grade on this reach and direct flow. The channel profile along Austin Creek Reach 1 has shown signs of deposition but without any significant changes between the as-build profile and this year's monitoring. Rock cross vanes are holding the grade of the stream effectively. There are no major failures with the rock cross vanes. The design was most likely intended to build a riffle/pool sequence plan form C5 type channel for the majority of the project, this intent has been achieved over the monitoring period thus far. The location of riffles has not changed significantly from construction to the present. The number of riffles is consistent with as-built conditions.

Cross section results were calculated using the most obvious bench or bankfull indicator as a datum. This elevation will be used in future monitoring 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 was not evaluated in this reach because it was above the project beginning. Cross-sections 2 is located on a riffle and has a current cross sectional area of 62.4 square feet, an increase of 18% from 2003. Cross-sections 3 is located on a riffle and has a current cross sectional area of 52.7 square feet, consistent with as-built conditions. Cross-sections 4 is located on a pool and has a current cross sectional area of 38.3 square feet, consistent with as-built conditions. All Cross sections

in this reach have a low near bank stress and a low bank erosion potential. This reach classifies as a C5 channel with a low sinuosity and an ER of > 3.0.

The channel substrate in the riffle sections are sand and have a D50 of 0.07 mm with a D84 of 2.3 mm. The channel substrate in the pool sections are sand and have a D50 of 0.22 mm with a D84 of 2.5 mm. Future monitoring should better evaluate channel substrate and sediment loading patterns.

Channel pattern appears to have been maintained in Austin Reach 1 since construction. There is no excessive migration evident and no shoot cut-offs are apparent. The pattern aligns closely with the as-build pattern. The channel banks throughout the Austin Creek Reach-1 remain fairly stable, with the exception of localized areas of scour near mid channel bars and structures.

There were no areas of concern noted. Results of near bank stress and the bank erosion hazard index was used to rank the stream banks as having a moderate low erodibility rating. Bed scour is primarily limited to meander beds below structures where energy show be dissipated in a stream. Vegetation is growing well and there is significant number of volunteer seedlings sprouting on this project but does not meet the minimum vegetation requirements for mitigation yet. This reach of Austin Creek appears to be aggrading and trying to form a stable dimension. This will be monitored closely over the next three years.

Austin Reach 2 (Station 26+30 to 31+00)

The Austin Creek is sand bed channel with a percentage of gravel and therefore the dune and anti-dune characteristics of sand-bed sediment transport should be considered. The restoration approach was to stabilize this reach without changing the pattern. The left bank was re-graded to a stable slope and a bankfull bench was built on the right bank along the entire reach. This construction created a C5 channel with a low sinuosity from an existing G5 / F5 channel. The valley slope for this reach is 0.32%, this reach has entrenchment ratio greater than 3.0 and the ratio of the top of bank height to the bankfull height is approximately 1.0. There are rock cross vanes that hold grade on this reach and direct flow. The channel profile along Austin Creek Reach 2 has shown signs of deposition but without any significant changes between the as-build profile and this year's monitoring. Rock cross vanes are holding the grade of the stream. There are no major failures with the rock cross vanes. The design was most likely intended to build a riffle/pool sequence plan form C5 type channel for the majority of the project, this intent has been achieved over the monitoring period thus far. The location of riffles has not changed significantly from construction to the present. The number of riffles has not decreased significantly.

Cross section results were calculated using the most obvious bench or bankfull indicator as a datum. This elevation will be used in future monitoring 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-sections 1 is located on a riffle and has a current cross sectional area of 62.1 square feet an increase of 27% from 2003 which is due to a mid-

channel bar. Cross-sections 2 is located on a pool and has a current cross sectional area of 43.9 square feet an increase of 19% from 2003 which is due to a mid-channel bar. Cross-sections 3 is located on a riffle and has a current cross sectional area of 53.9 square feet, similar to as-built conditions. This reach classifies as a C5 channel with a low sinuosity and an ER of > 3.0.

The channel substrate in the riffle sections are sand and have a D50 of 0.64 mm with a D84 of 1.9 mm. The channel substrate in the pool sections are sand and have a D50 of 0.70 mm with a D84 of 2.0 mm. Future monitoring should better evaluate channel substrate and sediment loading patterns.

Channel pattern appears to have been maintained in Austin Reach 2 since construction. There is no excessive migration evident and no shoot cut-offs are apparent. The pattern aligns closely with the as-build pattern. The channel banks throughout the Austin Creek Reach-2 remain stable, with the exception of localized areas of scour near mid channel bars and structures.

There were no areas of concern noted. Results of near bank stress and the bank erosion hazard index was used to rank the stream banks as having a moderate low erodibility rating. Bed scour is primarily limited to meander beds below structures where energy is dissipated in a stream and mid-channel bars. Vegetation is growing well and there is significant volunteer growth on this project but does not meet the minimum vegetation requirements for mitigation yet. This reach of Austin Creek appears to be aggrading and trying to form a stable dimension. This will be monitored closely over the next three years.

Austin Reach 3 (Station 31+00 to 55+50 – end of project)

The Austin Creek is sand bed channel with a percentage of gravel and therefore the dune and anti-dune characteristics of sand-bed sediment transport should be considered. The restoration construction created a C5 channel from an existing G5 / F5 channel from STA: 31+00 to STA: 55+50. The valley slope for this reach is 0.32% and the reach bankfull slope is 0.17%, this reach has entrenchment ratio greater than 3.0 and the ratio of the top of bank height to the bankfull height is approximately 1.0.

A beaver dam located on Smith Reach-2 at stations 45+50 and a very flat bankfull slope produce a reach that appears unable to transport the sediment load. At station 45+50 on Smith Creek the beaver dam has a head of 14 inches and has produced a backwater effect greater than 200 ft along the long-profile of Smith Creek and greater than 500ft along the long-profile of Austin Creek. The backwater has changed the dimension and profile of both streams. There are constructed riffles and rock cross vanes that hold grade on this reach. The channel profile along Austin Creek Reach 3 has shown signs of deposition and has produced significant changes between the as-build profile and this year's monitoring. The stream is moving toward a run dominated system pools are filling in and riffles are flattening. Rock cross vanes are holding the grade of the stream. There are no major failures with the rock cross vanes. The stream profile of the as-build shows that riffles were constructed but are transitioning into runs and filling in due to the significant back water these reach receives. The design was most likely intended to build a riffle/pool

sequence plan form C5 type channel for the majority of the project, this intent has not been achieved over the monitoring period thus far. The location of riffles have changed significantly from construction to the present; the back water has transitioned bed features into transitional bed features upstream. There are no riffles remaining in this reach. Unless the beaver dams are removed the system will stay embedded with sand and will continue to migrate toward a run dominated system. During the 2004 monitoring period there was significant backwater influence on Austin Creek Reach 3 from a Beaver Dam.

Cross section results were calculated using the most obvious bench or bankfull indicator as a datum. This elevation will be used in future monitoring 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 plan form, BEHI, and the longitudinal profile. Cross-sections 1 is located on a pool and has a current cross sectional area of 72.7 square feet a decrease of 17% from 2003. Cross-sections 2 is located on a riffle and has a current cross sectional area of 97.1 square feet a decrease of 22% from 2003. Cross-sections 3 is located on a pool and has a current cross sectional area of 93.0 square feet a decrease of 38% from 2003. Cross-sections 4 is located on a riffle and has a current cross sectional area of 63.7 square feet a decrease of 18% from 2003. Cross-sections 5 is located on a riffle and has a current cross sectional area of 88.9 square feet a decrease of 23% from 2003. Cross-sections 6 is located on a pool and has a current cross sectional area of 70.0 square feet a decrease of 36% from 2003. All Cross sections in this reach have a significant amount of deposition, have a low near bank stress and a low bank erosion potential. This reach classifies as a C5 channel with an ER of > 3.0.

The channel substrate in the riffle sections are sand and have a D50 of 0.65 mm with a D84 of 2.6 mm. The channel substrate in the pool sections are sand and have a D50 of 0.78 mm with a D84 of 2.4 mm. Future monitoring should better evaluate channel substrate and sediment loading patterns.

Channel pattern appears to have been maintained in Austin Reach 3 since construction considering the influence of the beaver dams. There is no excessive migration evident and no shoot cut-offs are apparent. The pattern aligns closely with the as-build pattern. The channel banks throughout the Austin Creek Reach-3 remain fairly unstable because they are saturated.

While loosing bedform diversity, this project has fairly unstable banks and is not able to transport the sediment supplied through the reach without forming mid-channel bars. There were no areas of concern noted. Results of near bank stress and the bank erosion hazard index was used to rank the stream banks as having a moderate low erodibility rating. Vegetation is growing well and there is significant of volunteer growth on this project but does not meet the minimum vegetation requirements for mitigation yet. This reach of Austin Creek appears to be aggrading and trying to form a stable dimension. This will be monitored closely over the next three years. The beaver dams located downstream on this reach should be removed if the channel is to stabilize.

2.3 Biological and Ecological

Benthic macroinvertebrate samples have been collected from four locations during two post-construction surveys at this project. A recovery site was located below the confluence of Smith and Austin Creeks and all data were compared to a reference site on Austin Creek. Data from both streams indicate an initial improvement in biological integrity following construction compared to pre-construction conditions. Increases in taxa richness, Dominants in Common and keystone species were found during this survey (2003). However, data from the second post-construction investigation noted declines at both restoration reaches. Lower EPT taxa richness and abundance values and lower Dominant in Common percentages were noted within these two features.

2.3.1 Results and Discussion

Biological samples were collected from four locations to assess this restoration project. Because of the relatively large size of these streams, full scale samples were collected prior to construction (2001) and during surveys one and two years following construction (2003 and 2004). Two stations were established on Austin Creek: station 1 at Jones Dairy Road was used as the upstream reference reach for this project and station 2 was within the restoration reach. The stream at station 1 appears to be relatively stable. Triaenodes and Serratella were collected at this site, which probably is related to the microhabitat requirements for these two taxa (stable banks and moss on rocks) during the pre-construction survey and this was the only site with any stoneflies. Station 2 on Austin Creek is within the restoration reach of this feature. Prior to construction it had a relatively wide riparian zone with some instream habitat, although much of the substrate was shifting sand. EPT taxa richness and abundance values were much lower at this site than all others during the pre-construction survey. Many of the structures that were constructed during this project were completely covered by sediment during the 2004 investigation.

Two stations were also established on Smith Creek. Smith Creek #1, which is within the restoration reach, is very unstable and had a substrate composed primarily of shifting sand. Macrophytes along the bank were very common. Smith Creek #2 is below the confluence with Austin Creek. Smith Creek at this point also was channelized in the past and had excessive amounts of sediment. Table 2 summarizes the data from all three surveys.

Table 2. Summary statistics from the stream restoration project at Smith/Austin Creeks, Wake Forest.

	Austin Creek 1 (Reference Site)			**Austin Creek 2**			**Smith Creek 1**			**Smith Creek 2**		
Year of Collection	Aug 01	Aug 03	July 04	Aug 01	Aug 03	July 04	Aug 01	Aug 03	July 04	Aug 01	Aug 03	July 04
Total Taxa Richness	35	49	45	26	54	38	34	48	52	42	41	42
EPT Taxa Richness	11	15	**6**	7	14	**10**	11	13	**10**	12	12	**9**
EPT Abundance	55	70	35	29	83	41	68	64	34	43	52	47
Dominant in Common Index (%)	-	-		33%	63%	**27%**	48%	60%	**46%**	48%[1]	37%	54%
#Keystone Species	5	8	6	1	4	5	2	4	3	5	4	4

[1] A comparison of dominants in common for this site may be inappropriate because of the size difference between this location and the reference reach at Austin #1.

The data summarized in table 10 suggest that water quality conditions improved at all of the locations in 2003, including data from the reference reach (much less so at the Smith Creek 2 location); but that water quality conditions declined during the 2004 surveys at all locations. Note the increase in the 2003 DIC index values and the number of keystone species at the two restoration reaches (Austin Creek 2 and Smith Creek 1). However also note the decrease in DIC values and much lower EPT taxa richness value at the reference reach at Austin Creek 1 in 2004 to near similar pre-construction conditions (in bold in table 10). It is difficult to say how much of the improvement in 2003 are due to low flow conditions during the pre-construction survey (2001) compared to high flow conditions following construction. Typically we would expect to see greater nonpoint source impacts during high flow years. Substrate composition within the restoration reaches appears to be unchanged following construction (primarily shifting sand), although prolific growths of filamentous algae were noted at the Smith Creek location suggesting the potential enrichment from upstream landuse activities. Much lower taxa richness and EPT abundance values were noted at the both Austin Creek locations during the 2004 investigations and taxa richness values also declined at both Smith Creek sites. DIC numbers declined at all locations compared to the data collected in 2003 and were very similar to those values recorded during the 2001 preconstruction survey. The fauna at both restoration sites were dominated by grazing organism (primarily Baetidae) and predators (Odonata) but note the elimination of Isonychia and Stenonema modestum at the Smith Creek 1 location in 2004. These very common taxa were abundant during all previous investigations at this location. Data will continue to be collected from this project.

Table 1a. Summary of Channel Conditions Smith Reach-1

DIMENSION	Smith Reach 1 Cross-section #2 Riffle			Smith Reach 1 Cross-section #3 Riffle			Smith Reach 1 Cross-section #4 Pool			Smith Reach 1 Cross-section #5 Pool		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	55.9	60.8	59.6	36.6	47.5	44.9	43.8	69.3	57.9	78.9	123.2	109.2
Bankfull Width	25.1	23.6	23.5	25.9	25.6	31.3	45.1	47.4	46.5	43.2	44.2	41.8
Bankfull Mean Depth	2.2	2.6	2.5	1.4	1.9	1.4	1.0	1.5	1.2	1.8	2.8	2.6
Bankfull Max Depth	3.1	3.7	3.7	2.4	2.7	2.8	3.7	4.1	3.8	3.1	5.1	4.8

PATTERN	Smith Reach 1 AS-BUILT			Smith Reach 1 2003			Smith Reach 1 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			90	248	172
Radius of Curvature	Not Reported			Not Reported			20	64	36
Beltwidth	Not Reported			Not Reported			38	139	89

PROFILE	Smith Reach 1 Design			Smith Reach 1 As-built 2003			Smith Reach 1 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			15	39	18
Riffle Slope	Not Reported			Not Reported			0.7%	3.9%	1.3%
Pool Length	Not Reported			Not Reported			6	76	33
Pool to Pool Spacing	Not Reported			Not Reported			16	149	60
Valley (TOB) Slope	Not Reported			Not Reported			0.30%	0.60%	0.45%
Bankfull Slope	Not Reported			Not Reported			0.20%	0.51%	0.26%

SUBSTRATE	Smith Reach 1 Cross-section #2 Riffle		Smith Reach 1 Cross-section #3 Riffle		Smith Reach 1 Cross-section #4 Pool		Smith Reach 1 Cross-section #5 Pool	
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004
d50	N/A	0.56	N/A	0.82	N/A	1.07	N/A	0.32
d84	N/A	2.04	N/A	2.65	N/A	2.72	N/A	1.83

VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

Table 1b. Summary of Channel Conditions Smith Reach-2

DIMENSION	Smith Reach 2 Cross-section #1 Riffle			Smith Reach 2 Cross-section #2 Pool			Smith Reach 2 Cross-section #3 Pool			Smith Reach 2 Cross-section #4 Riffle		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	44.9	45.9	46.5	60.8	59.2	48.5	52.4	59.6	64.0	38.4	42.7	38.9
Bankfull Width	20.0	20.2	33.2	25.7	26.2	26.9	36.3	37.7	39.1	18.4	18.9	18.7
Bankfull Mean Depth	2.2	2.3	1.4	2.4	2.3	1.8	1.4	1.6	1.6	2.1	2.3	2.1
Bankfull Max Depth	3.9	3.3	3.1	4.6	3.8	3.8	3.4	4.2	4.1	3.2	3.3	3.1

PATTERN	Smith Reach 2 AS-BUILT			Smith Reach 2 2003			Smith Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			204	398	309
Radius of Curvature	Not Reported			Not Reported			42	97	62
Beltwidth	Not Reported			Not Reported			67	140	95

PROFILE	Smith Reach 2 Design			Smith Reach 2 As-built 2003			Smith Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			N/A	N/A	N/A
Riffle Slope	Not Reported			Not Reported			N/A	N/A	N/A
Pool Length	Not Reported			Not Reported			23	83	43
Pool to Pool Spacing	Not Reported			Not Reported			40	120	89
Valley (TOB) Slope	Not Reported			Not Reported			0.25%		
Bankfull Slope	Not Reported			Not Reported			0.27%	0.36%	0.32%

SUBSTRATE	Smith Reach 2 Cross-section #1 Riffle		Smith Reach 2 Cross-section #2 Pool		Smith Reach 2 Cross-section #3 Pool		Smith Reach 2 Cross-section #4 Riffle	
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004
d50	N/A	0.28	N/A	0.10	N/A	Beaver Dam	N/A	Beaver Dam
d84	N/A	2.27	N/A	0.73	N/A	Beaver Dam	N/A	Beaver Dam

VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

Table 1c. Summary of Channel Conditions Austin Reach-1

DIMENSION	Austin Reach 1 Cross-section #2 Riffle			Austin Reach 1 Cross-section #3 Riffle			Austin Reach 1 Cross-section #4 Pool		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	62.4	51.2	49.0	52.7	51.2	49.8	38.3	38.5	38.2
Bankfull Width	29.5	31.1	32.4	22.8	23.8	24.4	22.7	22.5	23.3
Bankfull Mean Depth	2.1	1.6	1.5	2.3	2.2	2.0	1.7	1.7	1.6
Bankfull Max Depth	4.0	3.8	3.9	3.9	3.2	3.2	2.8	2.5	2.5

PATTERN	Austin Reach 1 AS-BUILT			Austin Reach 1 2003			Austin Reach 1 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			N/A	N/A	N/A
Radius of Curvature	Not Reported			Not Reported			N/A	N/A	N/A
Beltwidth	Not Reported			Not Reported			N/A	N/A	N/A

PROFILE	Austin Reach 1 Design			Austin Reach 1 As-built 2003			Austin Reach 1 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			10	55	15
Riffle Slope	Not Reported			Not Reported			1.1%	6.4%	4.2%
Pool Length	Not Reported			Not Reported			13	72	31
Pool to Pool Spacing	Not Reported			Not Reported			23	287	64
Valley (TOB) Slope	Not Reported			Not Reported			0.32%		
Bankfull Slope	Not Reported			Not Reported			0.32%		

SUBSTRATE	Austin Reach 1 Cross-section #2		Austin Reach 1 Cross-section #3		Austin Reach 1 Cross-section #4	
	Riffle		Riffle		Pool	
Monitoring Year	2003	2004	2003	2004	2003	2004
d50	N/A	N/A	N/A	0.07	N/A	0.22
d84	N/A	N/A	N/A	2.31	N/A	2.54

VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

Table 1d. Summary of Channel Conditions Austin Reach-2

DIMENSION	Austin Reach 2 Cross-section #1 Riffle			Austin Reach 2 Cross-section #2 Pool			Austin Reach 2 Cross-section #3 Riffle		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	62.1	45.4	48.1	43.9	36.9	37.1	53.9	56.4	54.4
Bankfull Width	20.8	18.8	19.3	17.3	19.7	21.3	24.1	24.0	24.9
Bankfull Mean Depth	3.0	2.4	2.5	2.5	1.9	1.7	2.2	2.4	2.2
Bankfull Max Depth	4.0	3.6	3.6	3.4	3.5	3.6	3.2	3.2	3.1

PATTERN	Austin Reach 2 AS-BUILT			Austin Reach 2 2003			Austin Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			N/A	N/A	N/A
Radius of Curvature	Not Reported			Not Reported			N/A	N/A	N/A
Beltwidth	Not Reported			Not Reported			N/A	N/A	N/A

PROFILE	Austin Reach 2 Design			Austin Reach 2 As-built 2003			Austin Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			8	10	9
Riffle Slope	Not Reported			Not Reported			5.4%	7.3%	6.3%
Pool Length	Not Reported			Not Reported			21	48	22
Pool to Pool Spacing	Not Reported			Not Reported			59	157	102
Valley (TOB) Slope	Not Reported			Not Reported			0.32%		
Bankfull Slope	Not Reported			Not Reported			0.26%		

SUBSTRATE	Austin Reach 2 Cross-section #1		Austin Reach 2 Cross-section #2		Austin Reach 2 Cross-section #3	
	Riffle		Pool		Riffle	
Monitoring Year	2003	2004	2003	2004	2003	2004
d50	N/A	N/A	N/A	0.70	N/A	0.64
d84	N/A	N/A	N/A	2.02	N/A	1.90

VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

Table 1e. Summary of Channel Conditions Austin Reach-3

DIMENSION	Austin Reach 3 Cross-section #1 Pool			Austin Reach 3 Cross-section #2 Riffle			Austin Reach 3 Cross-section #3 Pool		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	72.7	87.5	97.1	97.1	125.1	126.5	93.0	151.2	153.8
Bankfull Width	39.6	41.2	37.3	35.5	37.2	38.4	39.1	39.4	38.5
Bankfull Mean Depth	1.8	2.1	2.6	2.7	3.4	3.3	2.4	3.8	4.0
Bankfull Max Depth	3.8	4.8	4.8	3.8	5.3	5.3	3.8	7.1	7.1

DIMENSION	Austin Reach 3 Cross-section #4 Riffle			Austin Reach 3 Cross-section #5 Riffle			Austin Reach 3 Cross-section #6 Pool		
Monitoring Year	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**	**2004**	**2003**	**AS-BUILT**
Bankfull Cross-sectional Area	63.7	77.4	78.8	88.9	116.0	99.9	70.0	108.9	135.7
Bankfull Width	35.1	34.1	31.6	35.6	39.1	34.3	56.9	58.4	58.3
Bankfull Mean Depth	1.8	2.3	2.5	2.5	3.0	2.9	1.2	1.9	2.3
Bankfull Max Depth	3.3	4.0	4.0	3.9	4.7	4.2	3.4	6.7	6.9

PATTERN	Austin Reach 3 AS-BUILT			Austin Reach 3 2003			Austin Reach 3 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			321	507	346
Radius of Curvature	Not Reported			Not Reported			87	178	99
Beltwidth	Not Reported			Not Reported			77	239	95

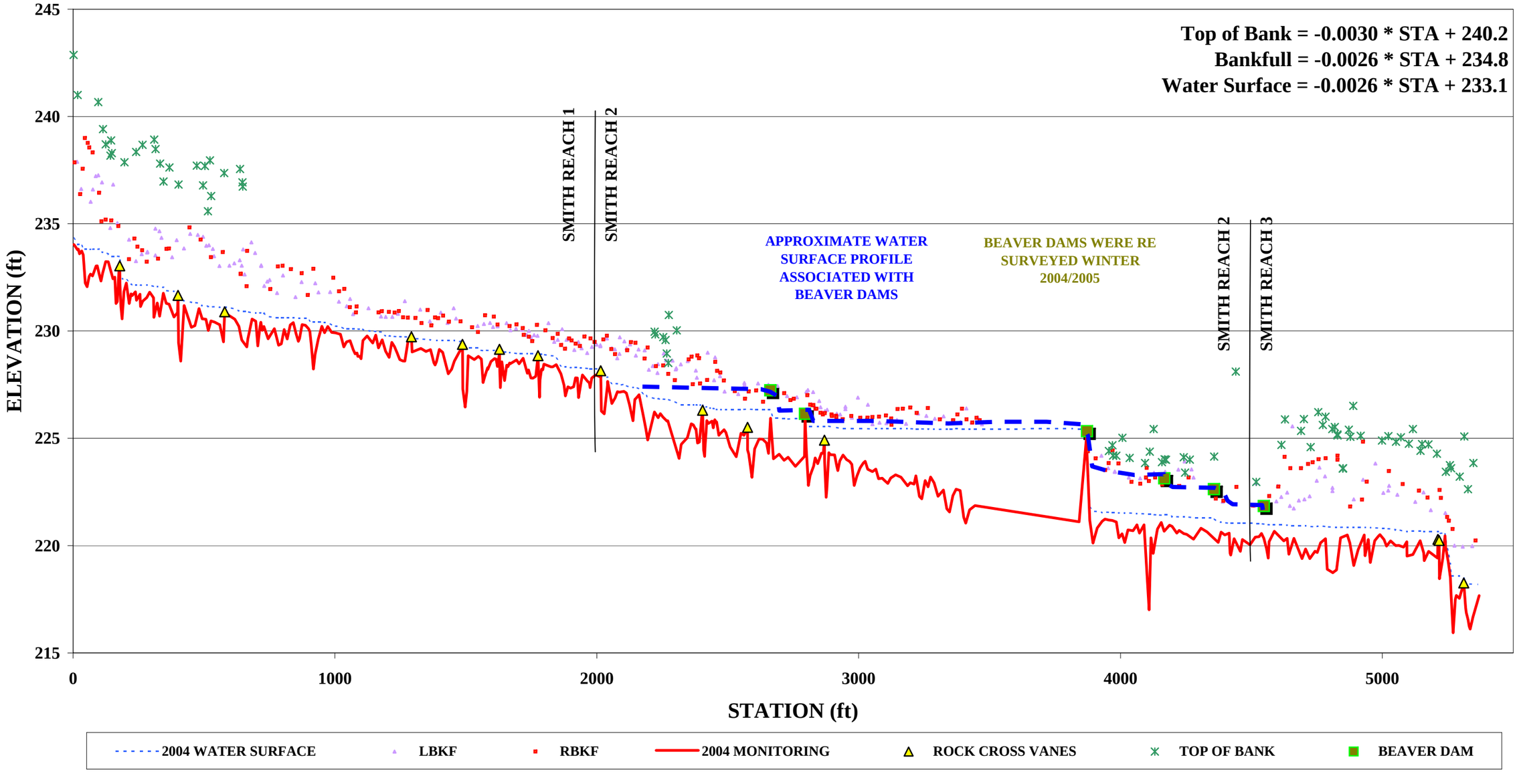
PROFILE	Austin Reach 3 Design			Austin Reach 3 As-built 2003			Austin Reach 3 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			21	36	28
Riffle Slope	Not Reported			Not Reported			1.2%	1.7%	1.4%
Pool Length	Not Reported			Not Reported			14	89	26
Pool to Pool Spacing	Not Reported			Not Reported			32	492	113
Valley (TOB) Slope	Not Reported			Not Reported			0.32%		
Bankfull Slope	Not Reported			Not Reported			0.17%		

SUBSTRATE	Austin Reach 3 Cross-section #1 Pool		Austin Reach 3 Cross-section #2 Riffle		Austin Reach 3 Cross-section #3 Pool		Austin Reach 3 Cross-section Riffle		Austin Reach 3 Cross-section Riffle		Austin Reach 3 Cross-section Pool	
Monitoring Year	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
d50	N/A	N/A	N/A	0.56	N/A	1.10	N/A	N/A	N/A	0.75	N/A	0.47
d84	N/A	N/A	N/A	3.00	N/A	2.89	N/A	N/A	N/A	2.28	N/A	1.95

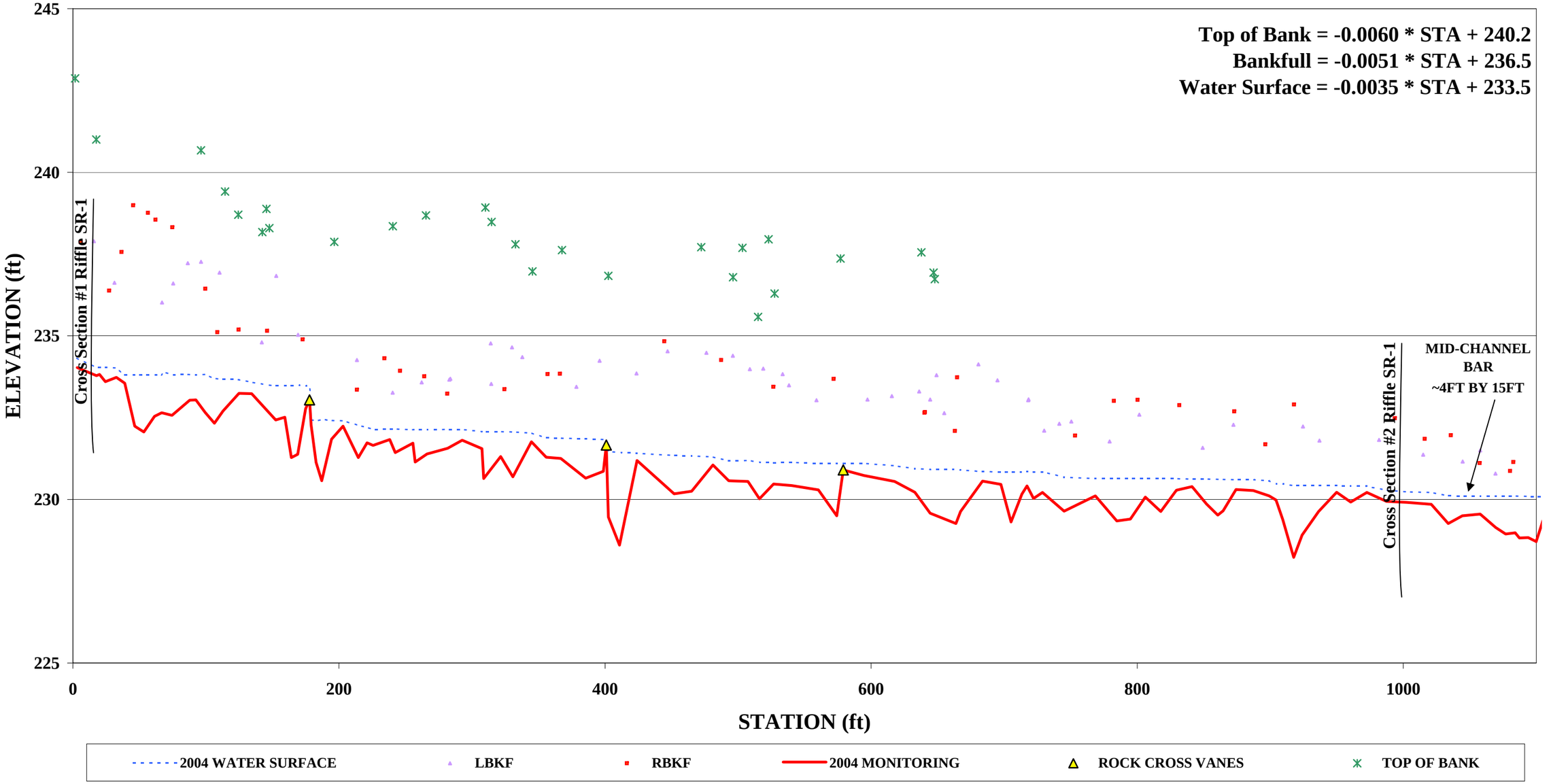
VEGETATION 2004 Monitoring	Quad 1 - AUSTIN		Quad 2 - AUSTIN		Quad 3 - SMITH		Quad 4 - SMITH	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	800	80	1440	80	400	200	3120	40
Shrub Stratum (% cover)	6	n/a	0	n/a	1	n/a	0	n/a
Herb Stratum (%cover)	117	n/a	50	n/a	77	n/a	39	n/a

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

SMITH AND AUSTIN
LONG PROFILE
SMITH REACH
STA: 0+00 THRU STA: 53+70
2004 MONITORING

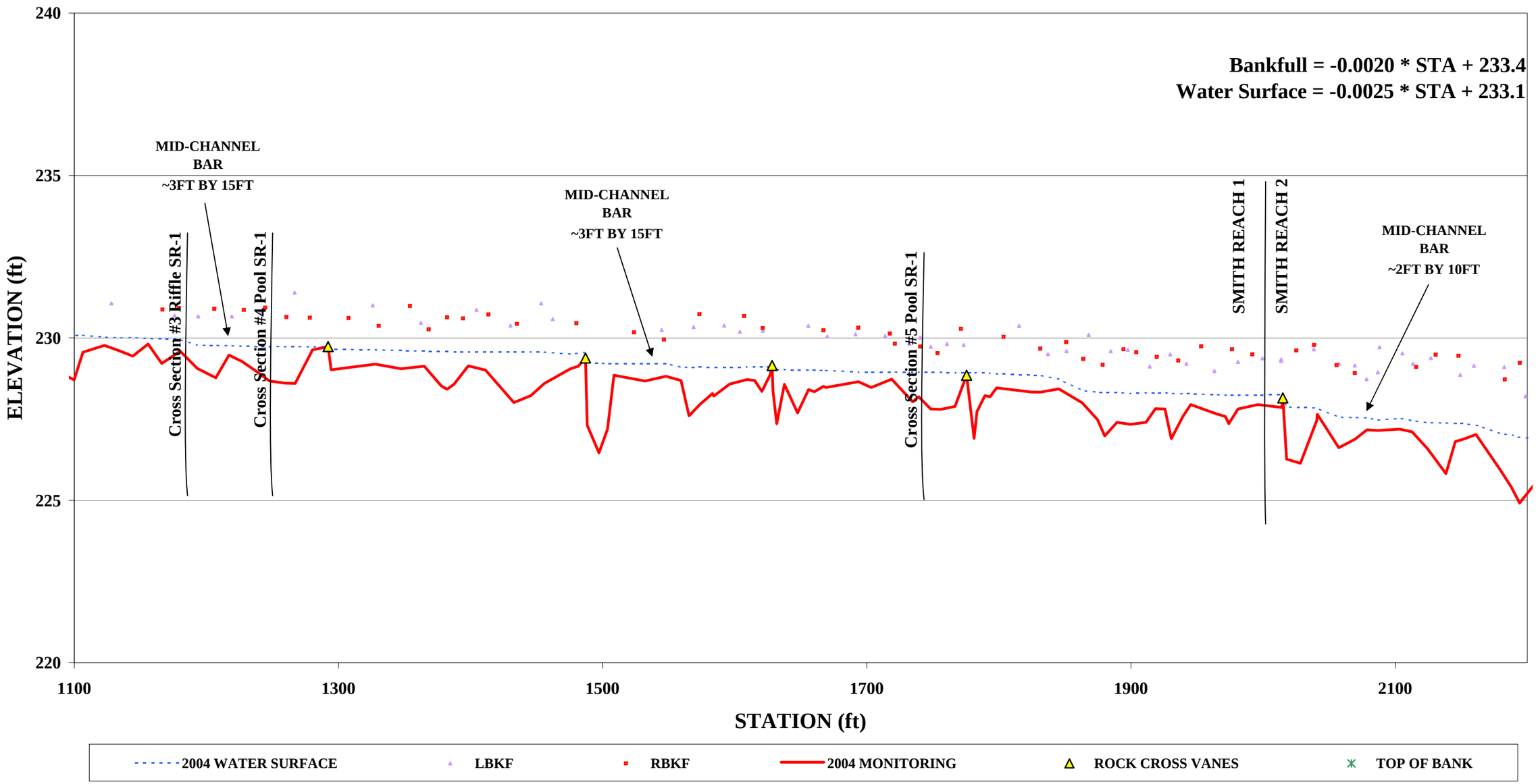


SMITH AND AUSTIN
LONG PROFILE
SMITH REACH-1
STA: 0+00 THRU STA: 11+00
2004 MONITORING

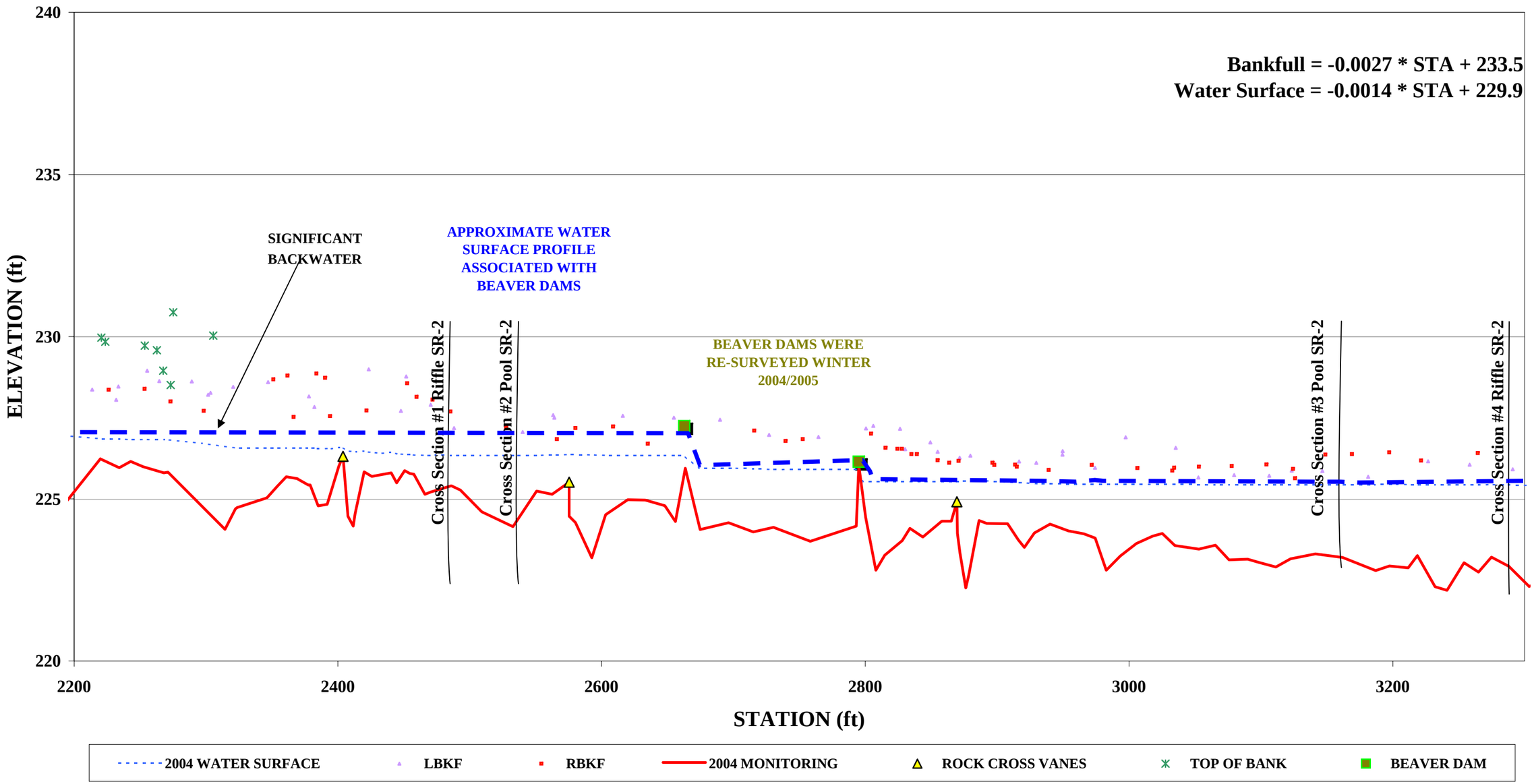


SMITH AND AUSTIN
LONG PROFILE
SMITH REACH-1
STA: 11+00 THRU STA: 22+00
2004 MONITORING

Bankfull = -0.0020 * STA + 233.4
Water Surface = -0.0025 * STA + 233.1



SMITH AND AUSTIN
LONG PROFILE
SMITH REACH-2
STA: 22+00 THRU STA: 33+00
2004 MONITORING



SMITH AND AUSTIN
LONG PROFILE
SMITH REACH-2
STA: 33+00 THRU STA: 44+00
2004 MONITORING

Top of Bank = -0.0025 * STA + 234.9
Bankfull = -0.0036 * STA + 237.9

APPROXIMATE WATER SURFACE PROFILE ASSOCIATED WITH BEAVER DAMS

BEAVER DAMS WERE RE-SURVEYED WINTER 2004/2005

Cross Section #5 Riffle SR-2

Un-Reliable Thalweg Data Due to Depth

ELEVATION (ft)

235
230
225
220
215

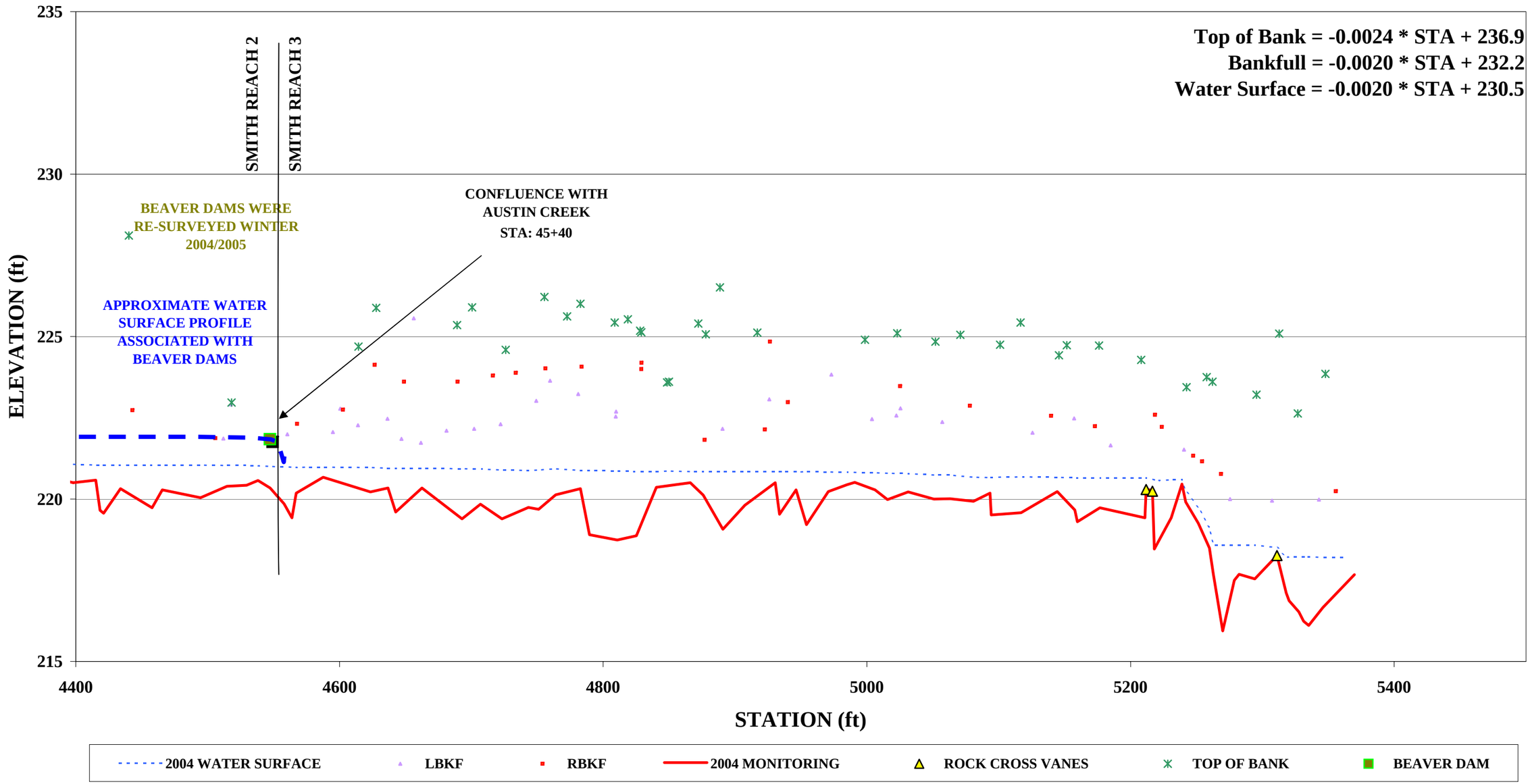
3300
3500
3700
3900
4100
4300

STATION (ft)

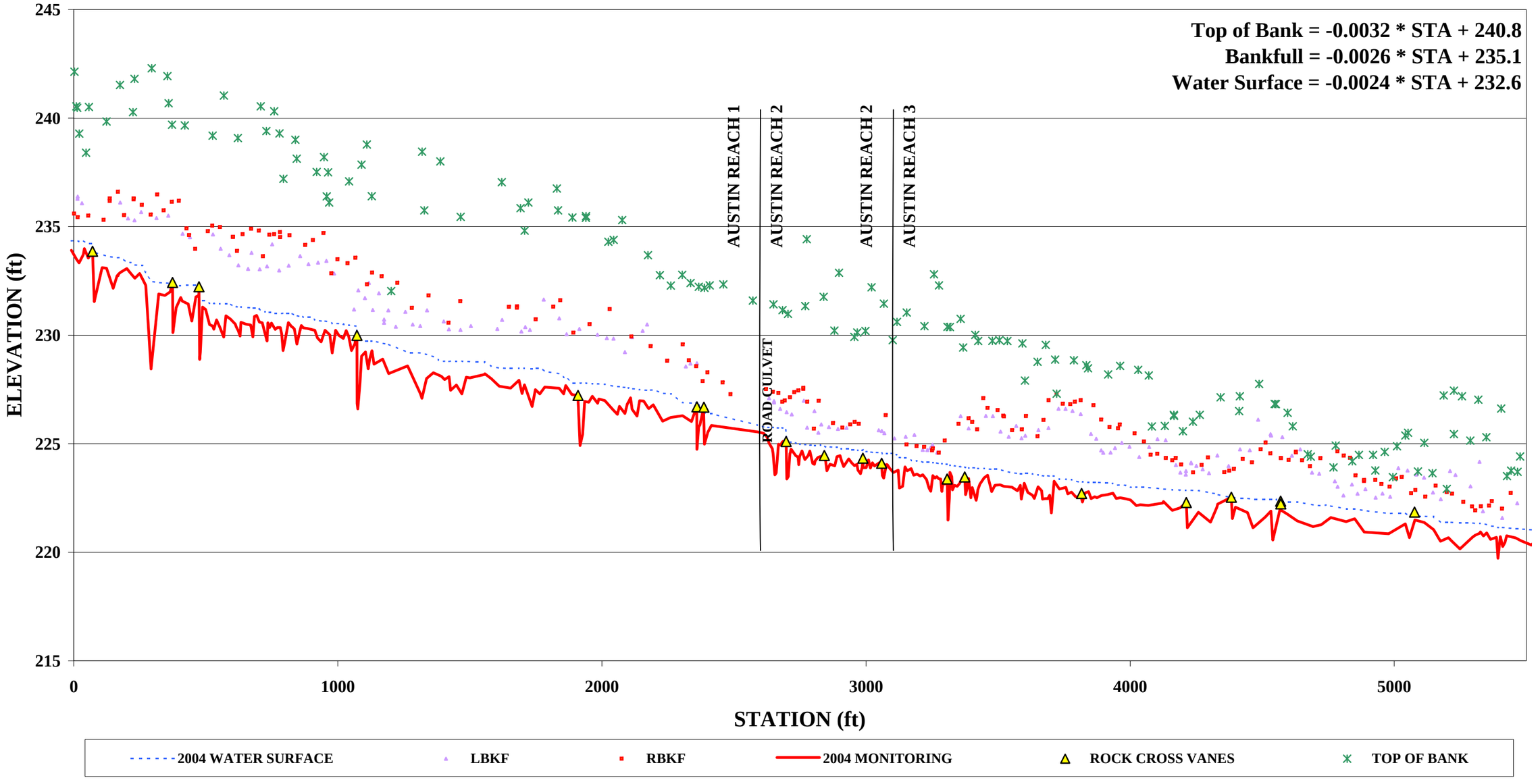
2004 WATER SURFACE | LBKF | RBKF | 2004 MONITORING | ROCK CROSS VANES | TOP OF BANK | BEAVER DAM

SMITH AND AUSTIN
LONG PROFILE
SMITH REACH-3
STA: 44+00 THRU STA: 55+00
2004 MONITORING

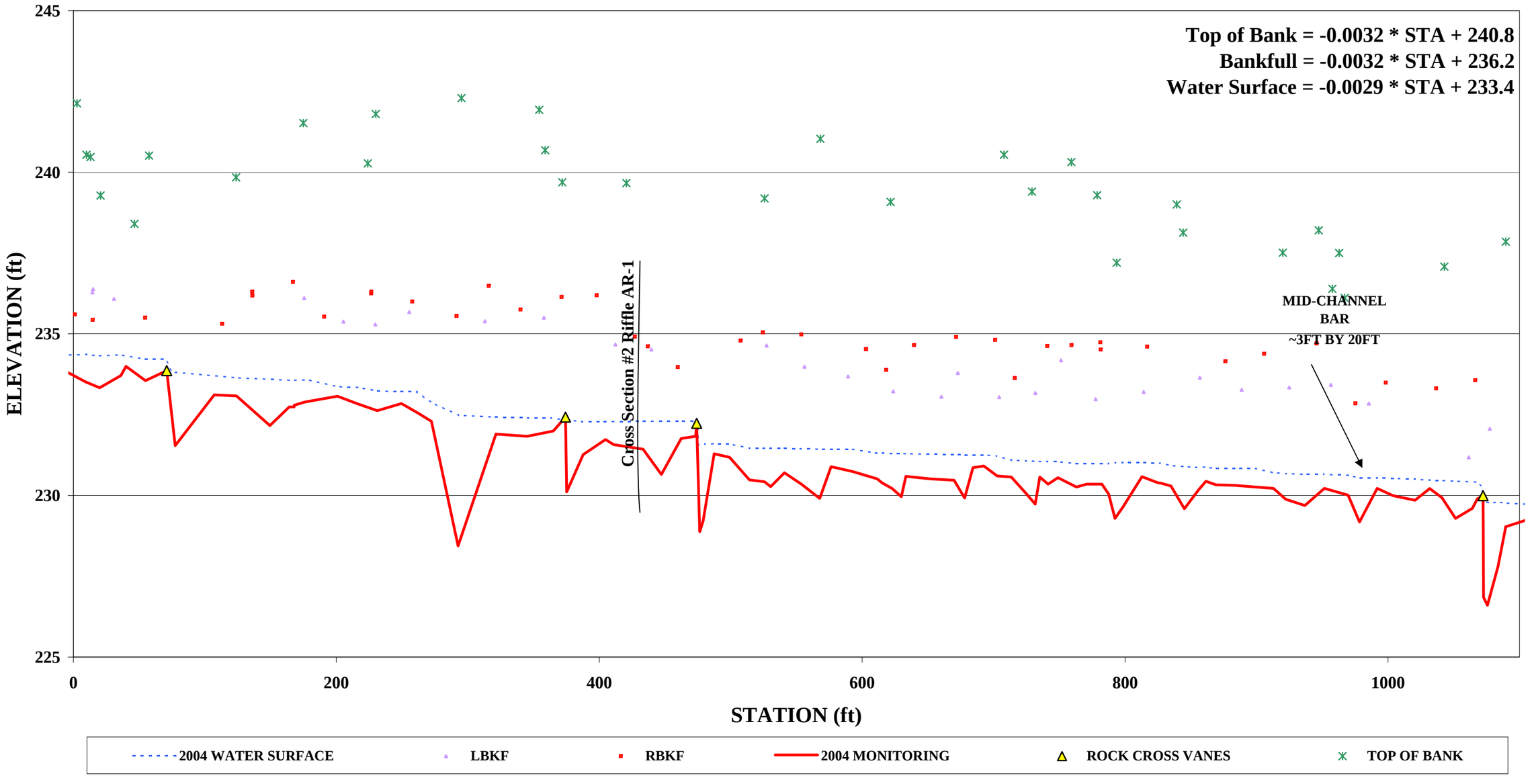
Top of Bank = -0.0024 * STA + 236.9
Bankfull = -0.0020 * STA + 232.2
Water Surface = -0.0020 * STA + 230.5



SMITH AND AUSTIN
LONG PROFILE
AUSTIN REACH
STA: 0+00 THRU STA: 55+00
2004 MONITORING

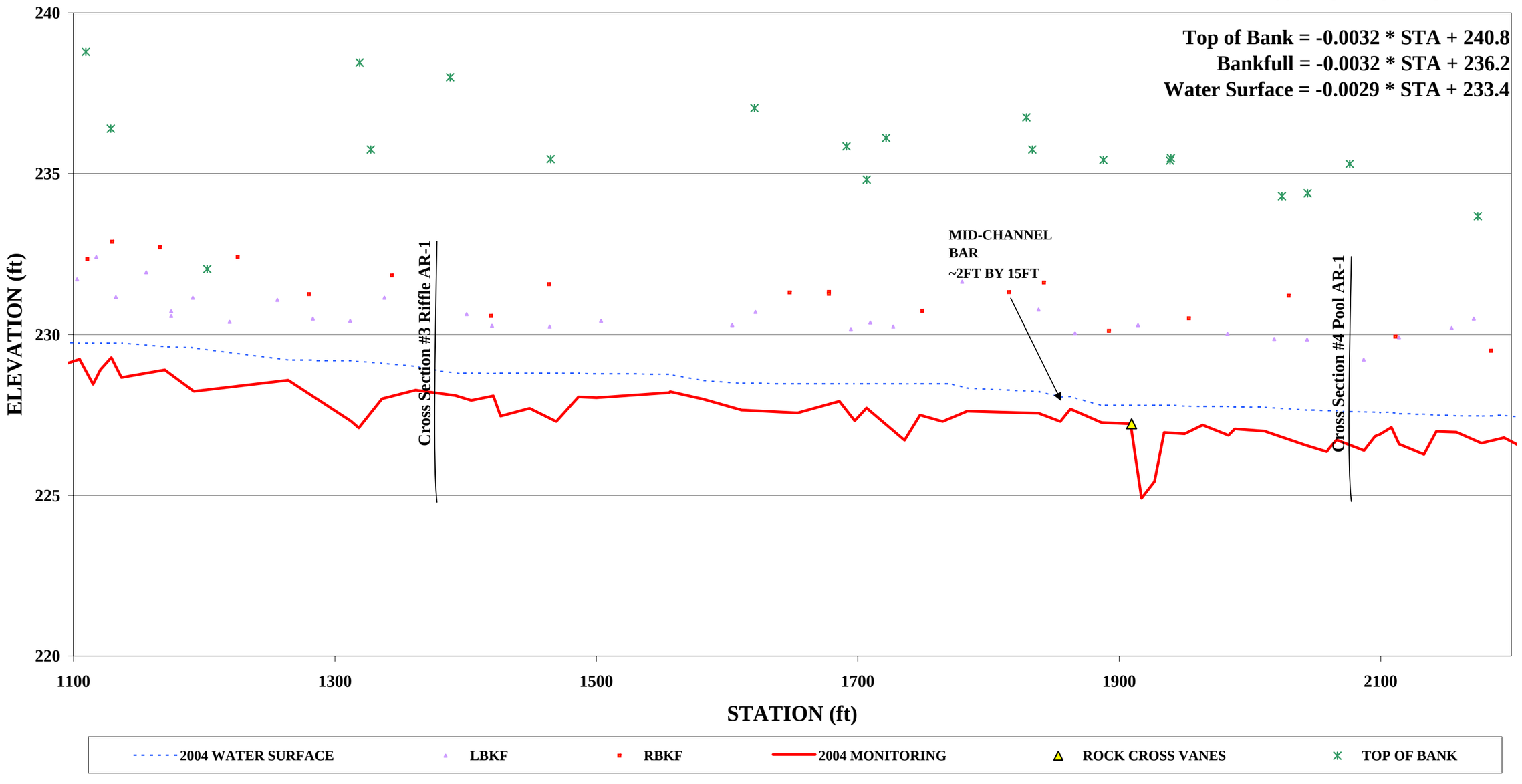


SMITH AND AUSTIN
LONG PROFILE
AUSTIN REACH-1
STA: 0+00 THRU STA: 11+00
2004 MONITORING



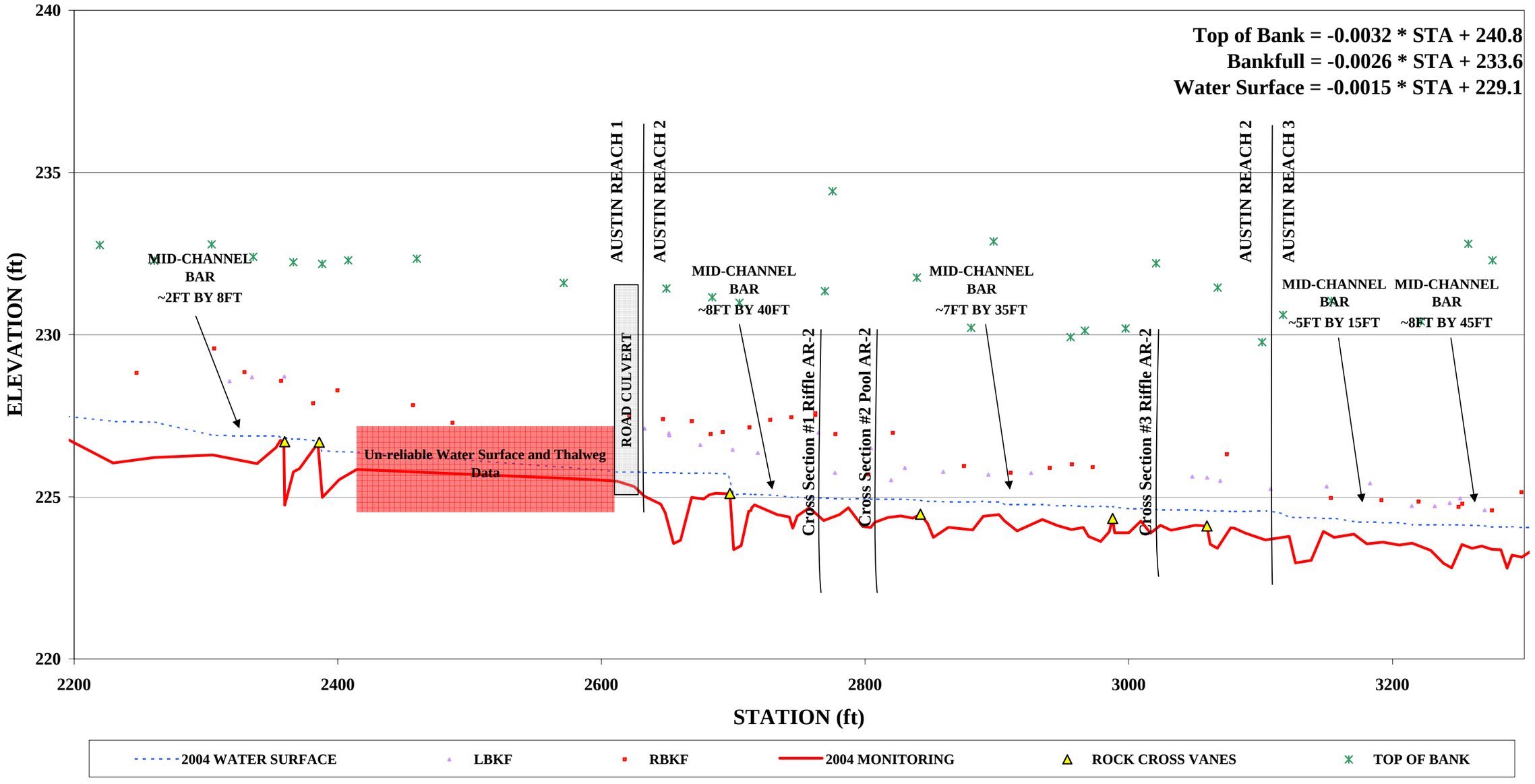
SMITH AND AUSTIN
LONG PROFILE
AUSTIN REACH-1
STA: 11+00 THRU STA: 22+00
2004 MONITORING

Top of Bank = -0.0032 * STA + 240.8
Bankfull = -0.0032 * STA + 236.2
Water Surface = -0.0029 * STA + 233.4



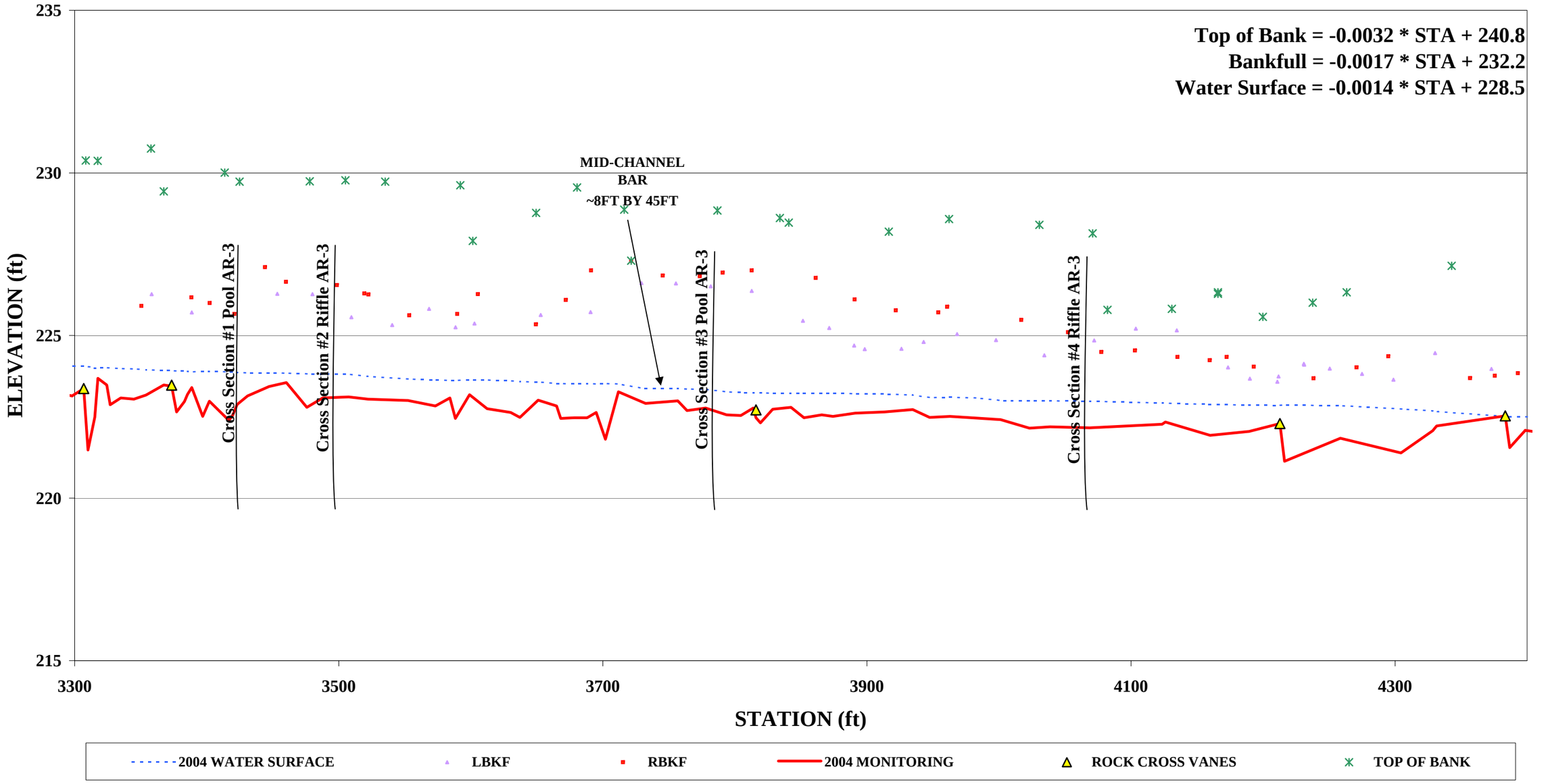
SMITH AND AUSTIN
LONG PROFILE
AUSTIN REACH-2
STA: 22+00 THRU STA: 33+00
2004 MONITORING

Top of Bank = -0.0032 * STA + 240.8
Bankfull = -0.0026 * STA + 233.6
Water Surface = -0.0015 * STA + 229.1

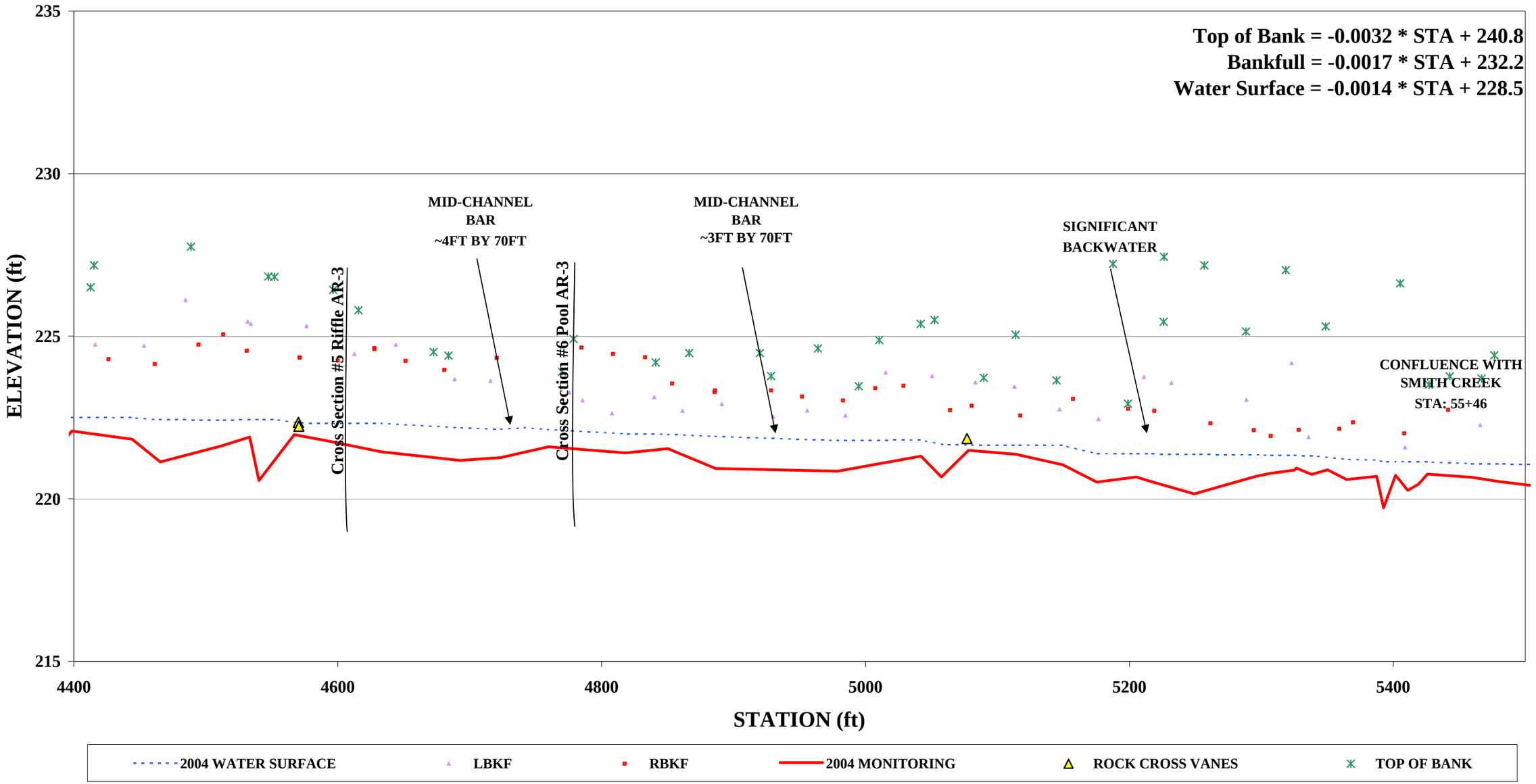


SMITH AND AUSTIN
LONG PROFILE
AUSTIN REACH-3
STA: 33+00 THRU STA: 44+00
2004 MONITORING

Top of Bank = -0.0032 * STA + 240.8
Bankfull = -0.0017 * STA + 232.2
Water Surface = -0.0014 * STA + 228.5



SMITH AND AUSTIN
LONG PROFILE
AUSTIN REACH-3
STA: 44+00 THRU STA: 55+00
2004 MONITORING



3.0 AREAS OF CONCERN

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

Smith and Austin Creek

- Beaver Dams
    - There are six beaver dams located on Smith Reach-2 at stations 26+50, 28+00, 38+60, 41+50, 43+50 and 45+50
        - At station 26+50 the beaver dam has a head of 13 inches and has produced a backwater effect greater than 400 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
        - At station 28+00 the beaver dam has a head of 4 inches and has produced a backwater effect greater than 130 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
        - At station 38+60 the beaver dam has a head of 30 inches and has produced a backwater effect greater than 1000 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
        - At station 41+50 the beaver dam has a head of 7 inches and has produced a backwater effect greater than 250 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
        - At station 43+50 the beaver dam has a head of 9 inches and has produced a backwater effect greater than 200 ft along the long-profile of the stream. The backwater has changed the dimension and profile of the stream.
        - At station 45+50 the beaver dam has a head of 14 inches and has produced a backwater effect greater than 200 ft along the long-profile of Smith Creek and greater than 500ft along the long-profile of Austin Creek. The backwater has changed the dimension and profile of both streams.
- Bank Erosion and Mid Channel Bars
    - Bank erosion has been noted at four locations on the reaches of Smith Creek due to the formation of mid-channel bars
        - At Station 10+50 there is a mid-channel bar forming that has dimensions of 4ft wide by 15ft along the profile of the stream
        - At Station 12+20 there is a mid-channel bar forming that has dimensions of 3ft wide by 15ft along the profile of the stream
        - At Station 15+50 there is a mid-channel bar forming that has dimensions of 3ft wide by 15ft along the profile of the stream
        - At Station 20+80 there is a mid-channel bar forming that has dimensions of 2ft wide by 10ft along the profile of the stream
    - Bank erosion has been noted at six locations on the reaches of Austin Creek due to the formation of mid-channel bars

        - At Station 9+75 there is a mid-channel bar forming that has dimensions of 3ft wide by 20ft along the profile of the stream
        - At Station 18+30 there is a mid-channel bar forming that has dimensions of 2ft wide by 15ft along the profile of the stream
        - At Station 27+40 there is a mid-channel bar forming that has dimensions of 8ft wide by 40ft along the profile of the stream
        - At Station 29+10 there is a mid-channel bar forming that has dimensions of 7ft wide by 35ft along the profile of the stream
        - At Station 31+80 there is a mid-channel bar forming that has dimensions of 5ft wide by 15ft along the profile of the stream
        - At Station 32+60 there is a mid-channel bar forming that has dimensions of 8ft wide by 40ft along the profile of the stream
    - There were three additional locations of significant mid-channel bars forming on Austin Creek that are currently not producing significant bank erosion
        - At Station 37+40 there is a mid-channel bar forming that has dimensions of 8ft wide by 45ft along the profile of the stream
        - At Station 47+00 there is a mid-channel bar forming that has dimensions of 4ft wide by 70ft along the profile of the stream
        - At Station 49+30 there is a mid-channel bar forming that has dimensions of 3ft wide by 70ft along the profile of the stream
- 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 an issue on this project site. A maintenance plan is recommended for control of these exotic invasive species.

APP1 AR1 XSEC1 RIFFLE

APP2 AR1 PROJECT START

APP3 AR1 STA 3+34

APP4 AR1 XSEC2 RIFFLE

APP5 AR1 VEGETATION PLOT

APP5A AR1 VEGETATION PLOT AT TOP

APP6 AR1 STA 5+92

APP7 AR1 STA 7+21

APP8 AR1 STA 9+13

APP8A AR1 STA 10+00

APP9 AR1 STA 11+42

APP10 AR1 XSEC3 RIFFLE

APP11 AR1 STA 18+55

APP12 AR1 XSEC4 POOL

APP13 AR1 STA 22+51

APP14 AR1 STA 23+19 FROM GOLF CART BRIDGE

APP15 AR2 BEGIN REACH FROM CULVERT

APP16 AR2 XSEC1 RIFFLE

APP17 AR2 XSEC2 POOL

APP19 AR2 XSEC3 RIFFLE

APP20 AR3 BEGIN REACH BEDROCK NICKPOINT

APP21 AR3 STA 32+60

APP21 AR3 STA 32+60

APP22 AR3 XSEC1 POOL

APP22A AR3 LIVE STAKE PLOT

APP23 AR3 XSEC2 RIFFLE

APP24 AR3 STA 36+00

APP25 AR3 XSEC3 POOL

APP26 AR3 XSEC3 POOL

APP27 AR3 XSEC4 RIFFLE

APP28 AR3 STA 41+80

APP29 AR3 STA 44+00

APP30 AR3 XSEC5 RIFFLE

APP30A AR3 VEGETATION PLOT

APP31 AR3 XSEC6 POOL

APP31A AR3 XSEC6 POOL RTOB

APP31B AR3 XSEC6 POOL

APP32 AR3 STA 50+40

APP33 AR3 STA 50+75

APP34 AR3 STA 54+20

SPP35 SR1 XSEC1 RIFFLE_JFR

SPP36 SR1 STA 0+00_JFR

SPP37 SR1 STA 0+50_JFR

SPP38 SR1 STA 1+25_JFR

SPP39 SR1 STA 2+00_JFR

SPP40 SR1 STA 2+55_JFR

SPP41 SR1 STA 3+25 AT TRIBUTARY_JFR

SPP42 SR1 STA 3+90_JFR

SPP43 SR1 STA 4+90_JFR

SPP44 SR1 STA 5+25_JFR

SPP45 SR1 STA 6+50_JFR

SPP46 SR1 STA 7+25_JFR

SPP47 SR1 XSEC2 RIFFLE_JFR

SPP47A SR1 VEGETATION PLOT RIGHT_JFR

SPP47B SR1 VEGETATION PLOT LEFT_JFR

SPP48 SR1 XSEC3 RIFFLE_JFR

SPP49 SR1 XSEC4 POOL_JFR

SPP50 SR1 STA 12+10_JFR

SPP51 SR1 STA 13+35_JFR

SPP51A SR1 LIVE STAKE PLOT_JFR

SPP51B SR1 LIVE STAKE PLOT_JFR

SPP52 SR1 STA 14+10_JFR

SPP53 SR1 STA 15+00_JFR

SPP54 SR1 STA 15+35_JFR

SPP55 SR1 XSEC5 POOL_JFR

SPP56 SR1 STA 17+05_JFR

SPP57 SR1 STA 18+40_JFR

SPP58 SR2 STA 20+60_JFR

SPP59 SR2 STA 21+95_RJ

SPP60 SR2 STA 22+75_RJ

SPP61 SR2 XSEC1 RIFFLE_JFR

SPP62 SR2 XSEC2 POOL_JFR

SPP63 SR2 STA 25+05_JFR

SPP64 SR2 STA 26+55_JFR

SPP65 SR2 STA 27+75_JFR

SPP66 SR2 STA 29+00_JFR

SPP67 SR2 XSEC3 POOL_JFR

SPP68 SR2 XSEC4 RIFFLE_JFR

SPP69 SR2 STA 32+75N_JFR

SPP70 SR2 STA 34+50_JFR

SPP71 SR2 STA 35+10_JFR

SPP74 SR2 STA 39+90_JFR

SPP75 SR2 STA 41+00_JFR

SPP77 SR2 STA 42+55_JFR

SPP78 SR2 STA 44+00_JFR

SPP79 SR2 AR3 CONFLUENCE UPSTREAM_JFR

SPP79 SR2 AR3 CONFLUENCE_JFR

SPP80 SR3 STA 47+90_JFR

SPP81 SR3 STA 50+00_JFR

SPP82 SR3 STA 51+50_JFR

SPP83 SR3 STA 52+00 PROJECT END_JFR

Project Name	Smith and Austin
Cross Section	SR1-2
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
22.475	234.9	LP
28.455	234.55	
33.665	233.37	
43.765	232.97	BKF
45.555	232.43	
46.615	232.2	
48.935	230.27	
49.295	230.03	
50.925	230.17	
53.305	230.21	
55.035	230.21	
57.525	230.18	
59.3	230.3	
61.7	230.3	
66.4	230.8	
66.8	231.9	
66.9	231.9	
68.8	233.3	BKF
78.6	233.4	
99.92	233.14	
115.33	232.60	RP

2003
2003 Survey

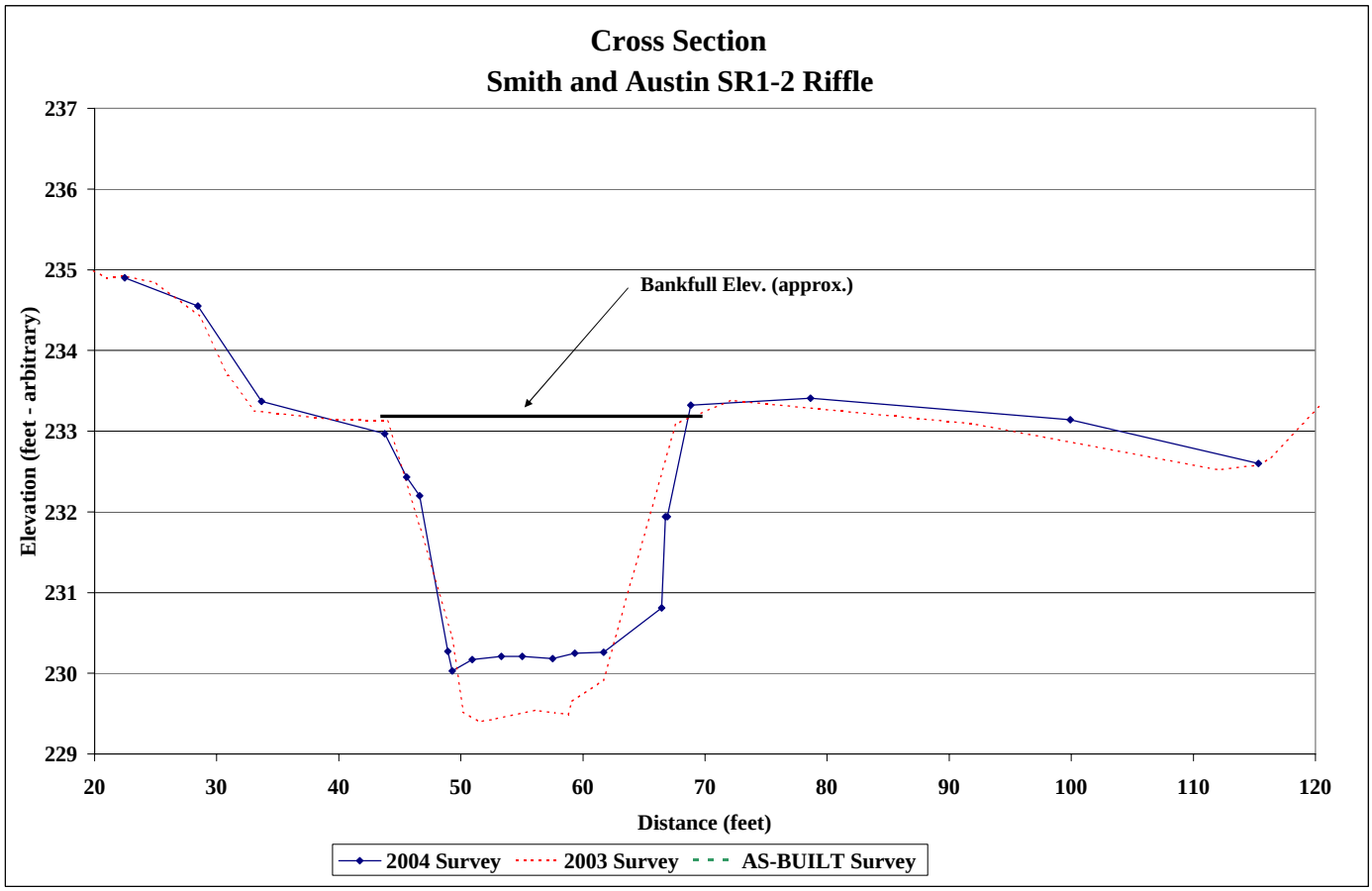
Station	Elevation	Notes
1.0	235.7	
12.0	235.6	
21.0	234.9	
22.5	234.920	LP
25.0	234.8	
28.6	234.4	
30.9	233.7	
33.1	233.3	
39.7	233.1	
44.0	233.1	
46.6	231.8	
49.3	230.5	
50.2	229.5	
51.5	229.4	
52.8	229.4	
56.1	229.5	
57.7	229.5	
58.8	229.5	
59.1	229.7	
61.7	229.9	
64.0	231.2	
67.6	233.09	BKF
72.1	233.38	
92	233.09	
112	232.52	
115.3	232.58	RP
116.2	232.66	
122	233.57	
130	234.8	
136	235.39	
140	235.42	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section SR1-2 - Looking Downstream @ STA 9+35

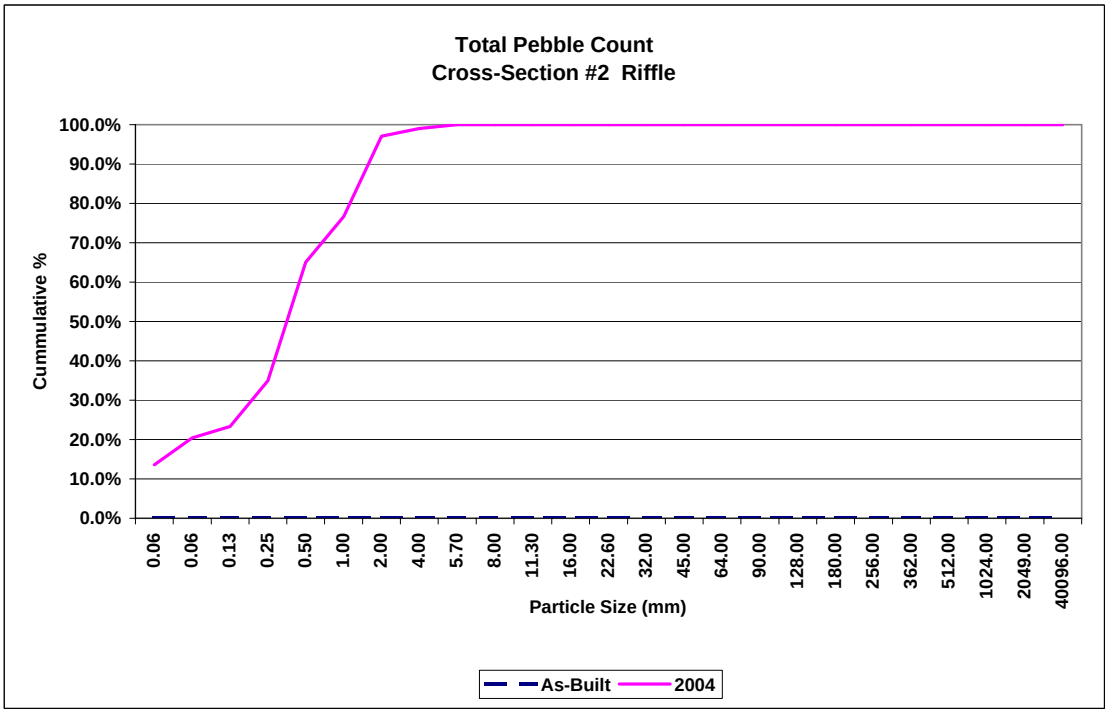
	2004	2003	AS-BUILT
Area	55.9	60.8	59.6
Width	25.1	23.6	23.5
Mean Depth	2.2	2.6	2.5
Max Depth	3.1	3.7	3.7
W/D	11.3	9.2	9.3



Project Name	Smith Reach 1
Cross Section	#2
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	10	4	13.6%	13.6%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	7	0	6.8%	20.4%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	2	1	2.9%	23.3%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	8	4	11.7%	35.0%
	course sand	0.50	0	#DIV/0!	#DIV/0!	20	11	30.1%	65.0%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	3	9	11.7%	76.7%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	2	19	20.4%	97.1%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	2	1.9%	99.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	1	1.0%	100.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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!		52	51	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.07	0.38	0.56	2.04	2.85



Project Name	Smith and Austin
Cross Section	SR1-3
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
27.045	232.225	LP
40.025	232.335	
51.085	232.705	
67.765	232.805	
74.985	232.565	
81.245	231.325	
84.205	230.475	
85.135	229.815	
90.695	229.695	
93.025	229.465	
96.505	229.845	
97.155	230.755	
103.8	231.9	BKF
126.0	232.2	
147.4	232.6	
172.9	232.7	RP

2003
2003 Survey

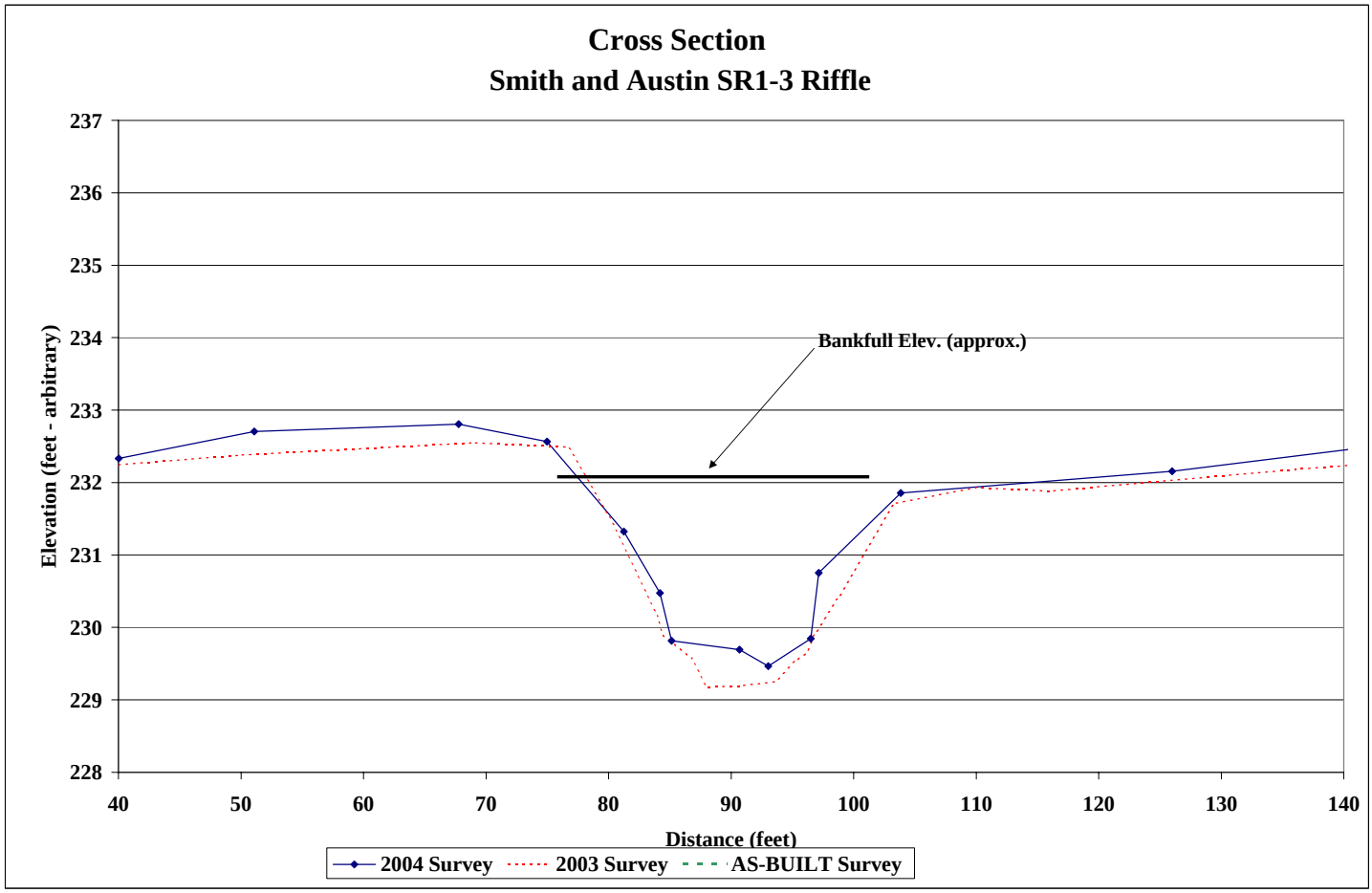
Station	Elevation	Notes
2.8	236.6	
7.0	236.3	
13.0	235.1	
18.0	233.7	
24.0	232.5	
27.4	232.260	LP
33.0	232.2	
50.0	232.4	
69.0	232.6	
76.7	232.5	
80.0	231.6	
84.0	230.2	
84.4	229.9	
86.8	229.6	
88.0	229.2	
90.6	229.2	
93.6	229.3	
95.2	229.5	
96.2	229.7	
96.8	229.9	
98.7	230.4	
103.3	231.71	
110	231.93	BKF
116	231.88	
136	232.18	
169	232.59	
172.5	232.67	RP
174.5	232.71	
179	233.58	
185	234.38	
191	234.99	
194	235.43	
204.8	235.4	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section SR1-3 - Looking Downstream @ STA 11+30

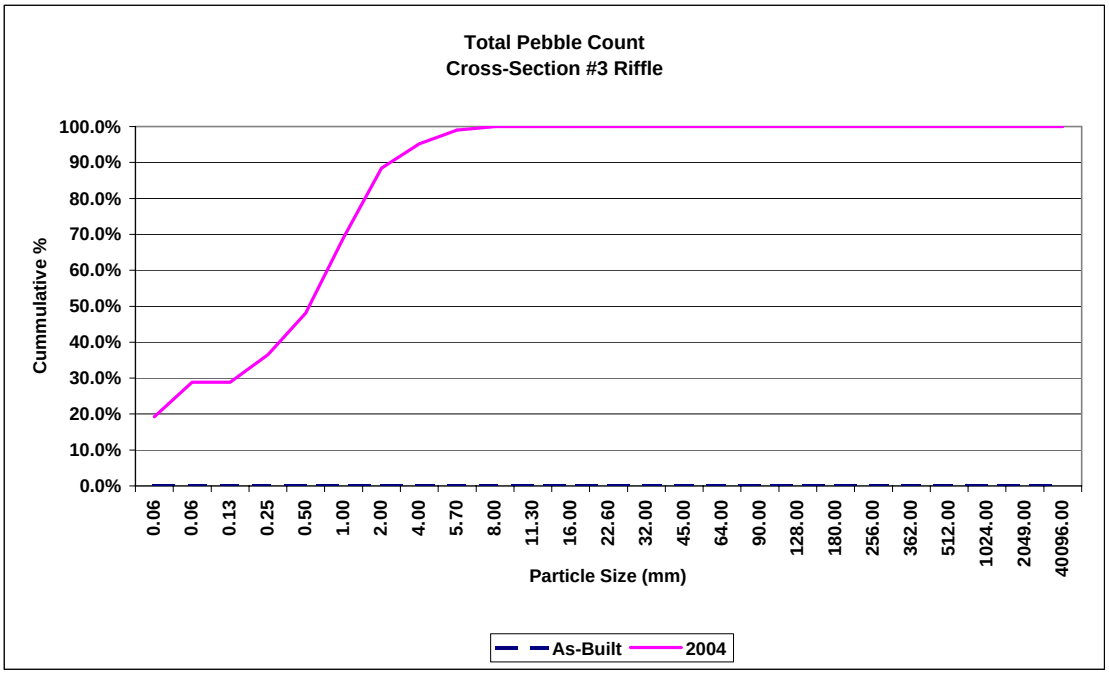
	2004	2003	AS-BUILT
Area	36.6	47.5	44.9
Width	25.9	25.6	31.3
Mean Depth	1.4	1.9	1.4
Max Depth	2.4	2.7	2.8
W/D	18.3	13.8	21.8



Project Name	Smith Reach 1
Cross Section	#3
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	20	0	19.2%	19.2%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	10	0	9.6%	28.8%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	0	0.0%	28.8%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	8	7.7%	36.5%
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	12	11.5%	48.1%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	22	21.2%	69.2%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	20	19.2%	88.5%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	7	6.7%	95.2%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	4	3.8%	99.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	1	1.0%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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!		30	74	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.00	0.34	0.82	2.65	4.80



Project Name	Smith and Austin
Cross Section	SR1-4
Feature	Pool
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
30.11	232.52	LP
47.96	232.62	
63.35	232.65	
81.63	232.45	BKF
98.89	231.98	
104.61	231.08	
107.93	231.09	
111.2	230.28	
116.02	229.82	
119.04	229.83	
120.96	228.82	
122.51	229.67	
123.4	230.93	
123.5	231.07	
124.5	231.10	
125.6	231.74	
126.7	232.50	BKF
128.5	233.38	
129.6	233.38	
129.94	233.30	
132.82	233.60	
137.19	233.84	RP

2003
2003 Survey

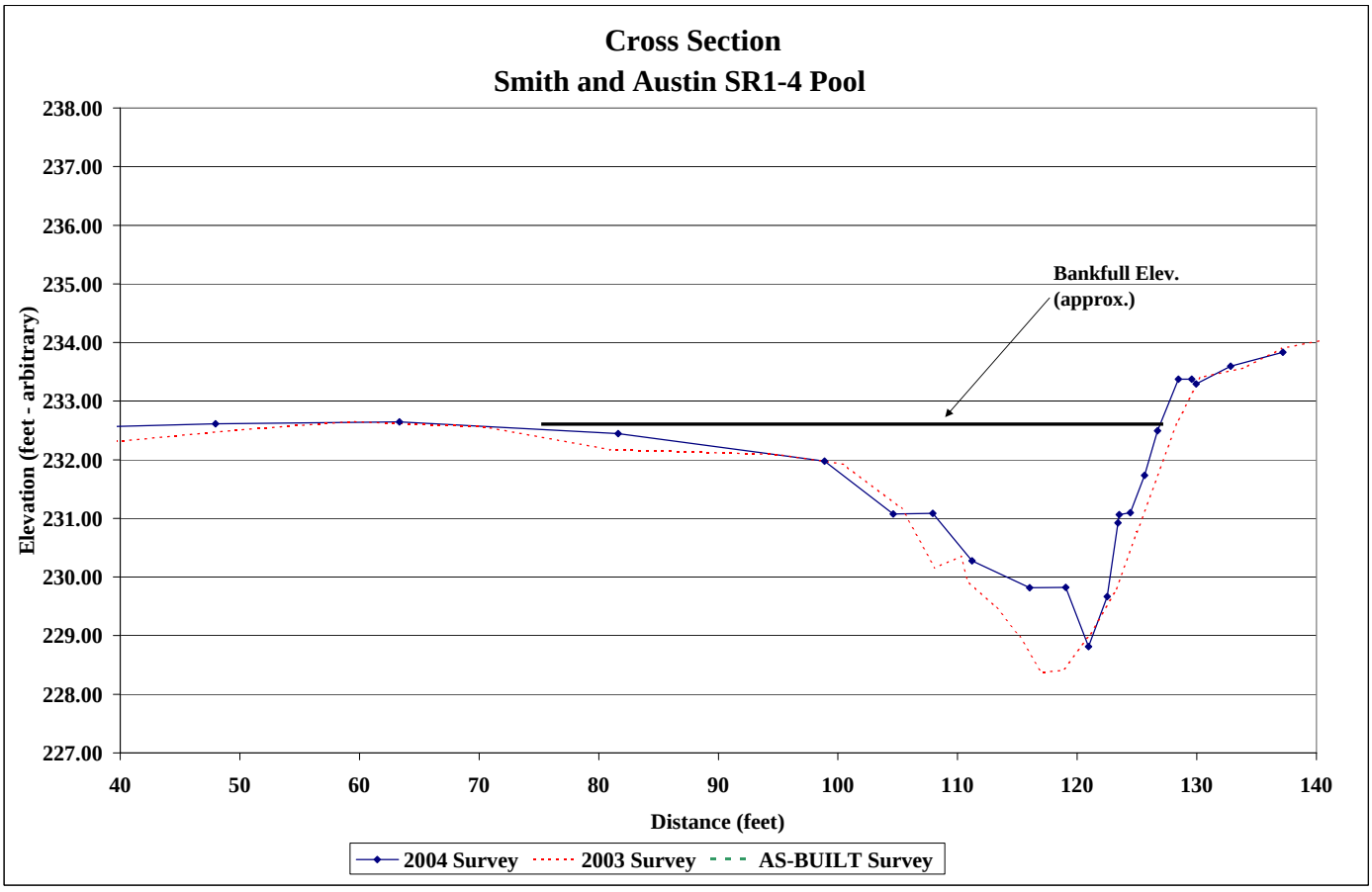
Station	Elevation	Notes
11.2	236.8	
13.7	236.6	
17.7	235.4	
22.3	233.7	
26.2	232.6	
30.2	232.5	LP
39.7	232.3	
49.4	232.5	
59.4	232.7	
70.5	232.6	BKF
81.0	232.2	
95.0	232.1	
100.5	231.9	
105.3	231.2	
108.1	230.2	
110.3	230.4	
110.8	229.9	
113.2	229.5	
115.2	229.0	
117.0	228.4	
118.8	228.4	
121	228.99	
123.2	229.75	
125	230.76	
128.4	232.66	
130.3	233.4	
134	233.57	
137.1	233.9	RP
155	234.62	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section SR1-4 - Looking Downstream @ STA 12+00

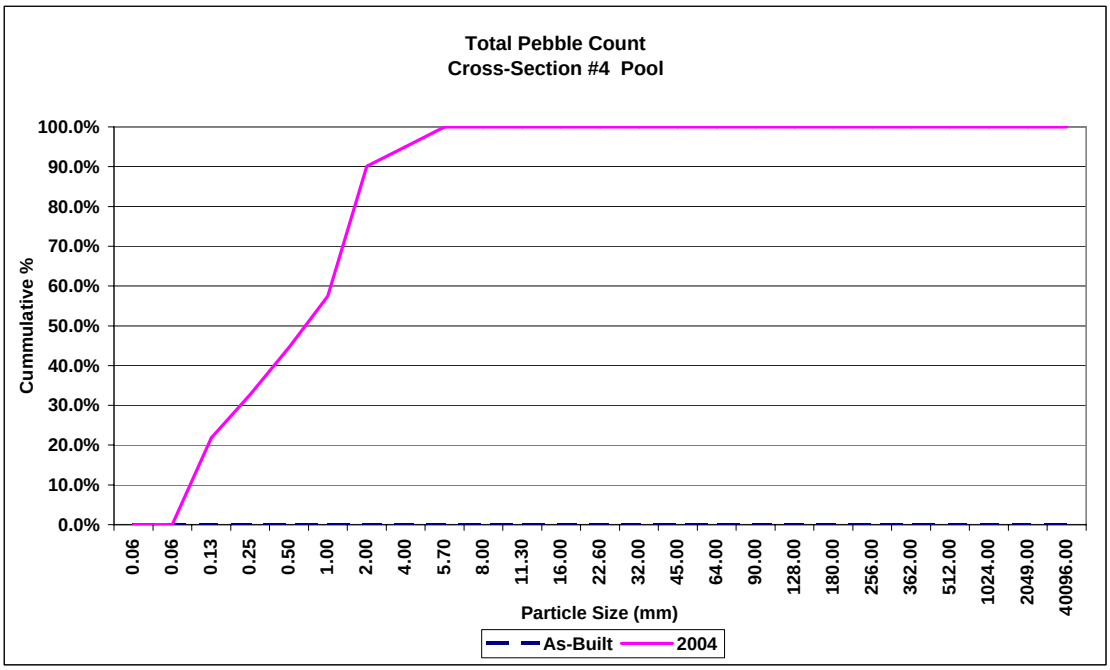
	2004	2003	AS-BUILT
Area	43.8	69.3	57.9
Width	45.1	47.4	46.5
Mean Depth	1.0	1.5	1.2
Max Depth	3.7	4.1	3.8
W/D	46.4	32.4	37.3



Project Name	Smith Reach 1
Cross Section	#4
Feature	Pool
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Pool - Bed**	**%**	**Cum %**	**Pool - Bank**	**Pool - Bed**	**%**	**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	0	0.0%	0.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	22	0	21.8%	21.8%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	10	1	10.9%	32.7%
	course sand	0.50	0	#DIV/0!	#DIV/0!	6	6	11.9%	44.6%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	4	9	12.9%	57.4%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	8	25	32.7%	90.1%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	5	5.0%	95.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	5	5.0%	100.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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!		50	51	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.16	0.45	1.07	2.72	4.83



Project Name	Smith and Austin
Cross Section	SR1-5
Feature	Pool
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
8.245	231.84	LP
17.545	231.86	BKF
20.005	230.76	
23.515	230.17	
25.285	229.38	
26.125	228.61	
28.395	228.62	
31.935	228.64	
35.725	229.13	
41.655	229.84	
47.505	231.17	
60.715	232.07	
87.7	231.5	
117.1	231.9	
139.2	231.4	RP

2003
2003 Survey

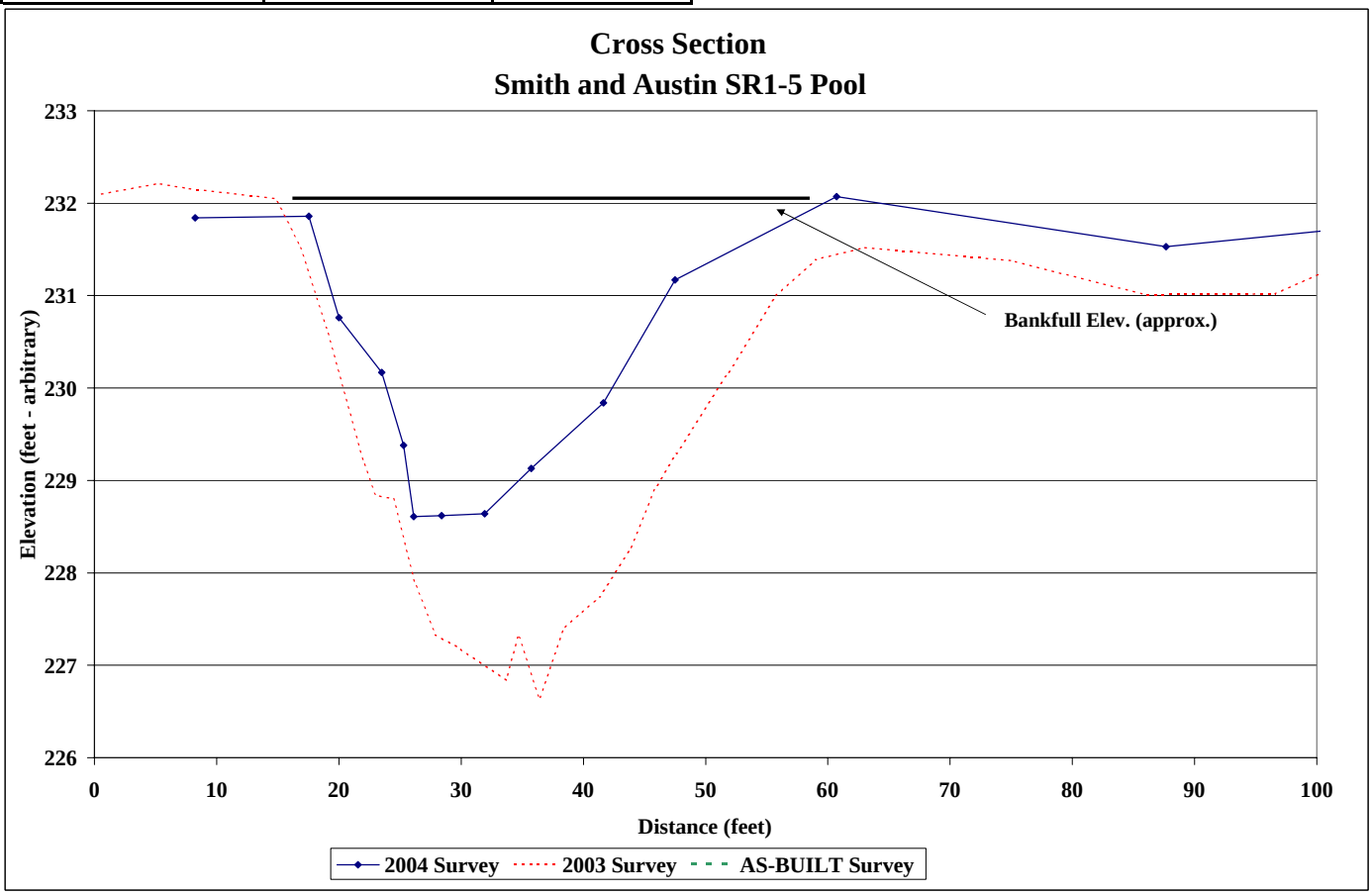
Station	Elevation	Notes
0.6	232.1	
5.2	232.2	
7.6	232.2	LP
14.8	232.1	
16.8	231.6	
19.0	230.7	
22.0	229.2	
23.0	228.8	
24.5	228.8	
26.2	227.9	
27.9	227.3	
29.8	227.2	
33.7	226.8	
34.7	227.3	
36.4	226.6	
38.4	227.4	
41.3	227.7	
43.8	228.2	
45.9	228.9	
47.6	229.3	
51.7	230.1	
55.8	231.00	
59	231.39	
63	231.52	BKF
75	231.38	
86	231.01	
96.6	231.02	
101.5	231.31	
113	231.68	
122	231.54	
135	231.15	
139.8	231.12	RP
153.5	231.38	
166	231.87	
172	231.98	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section SR1-5 - Looking Downstream @ STA 16+90

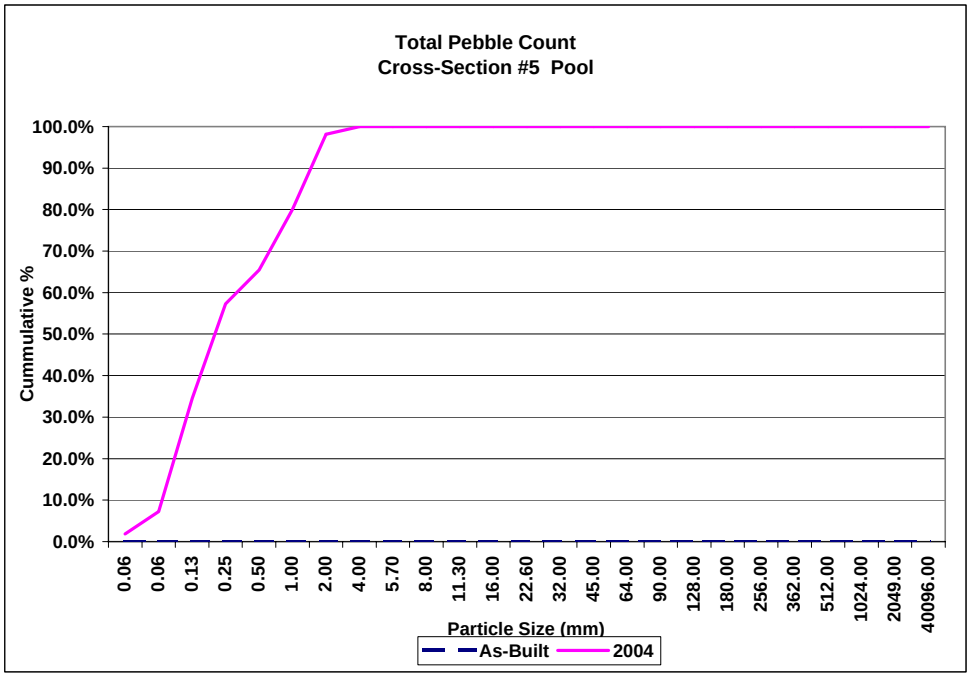
	2004	2003	AS-BUILT
Area	78.9	123.2	109.2
Width	43.2	44.2	41.8
Mean Depth	1.8	2.8	2.6
Max Depth	3.1	5.1	4.8
W/D	23.6	15.9	16.0



Project Name	Smith Reach 1
Cross Section	#5
Feature	Pool
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Pool - Bed**	**%**	**Cum %**	**Pool - Bank**	**Pool - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	2	0	1.8%	1.8%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	6	0	5.5%	7.3%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	30	0	27.3%	34.5%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	21	4	22.7%	57.3%
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	9	8.2%	65.5%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	16	14.5%	80.0%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	1	19	18.2%	98.2%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	2	1.8%	100.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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	50	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.12	0.19	0.32	1.83	2.74



Project Name	Smith and Austin
Cross Section	SR2-1
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004 Survey

Station	Elevation	Notes
100.0	229.9	LP
115.5	229.7	
125.5	229.7	
138.4	229.4	
146.5	229.1	
148.9	227.7	
150.8	226.1	
152.1	225.8	
153.6	225.3	
155.0	225.6	
155.7	225.9	
156.6	225.8	
157.6	226.1	
158.8	226.2	
159.2	226.4	
160.8	226.7	
164.1	228.0	
166.5	228.5	BKF
169.7	228.6	
185.5	228.9	RP

2003 Survey

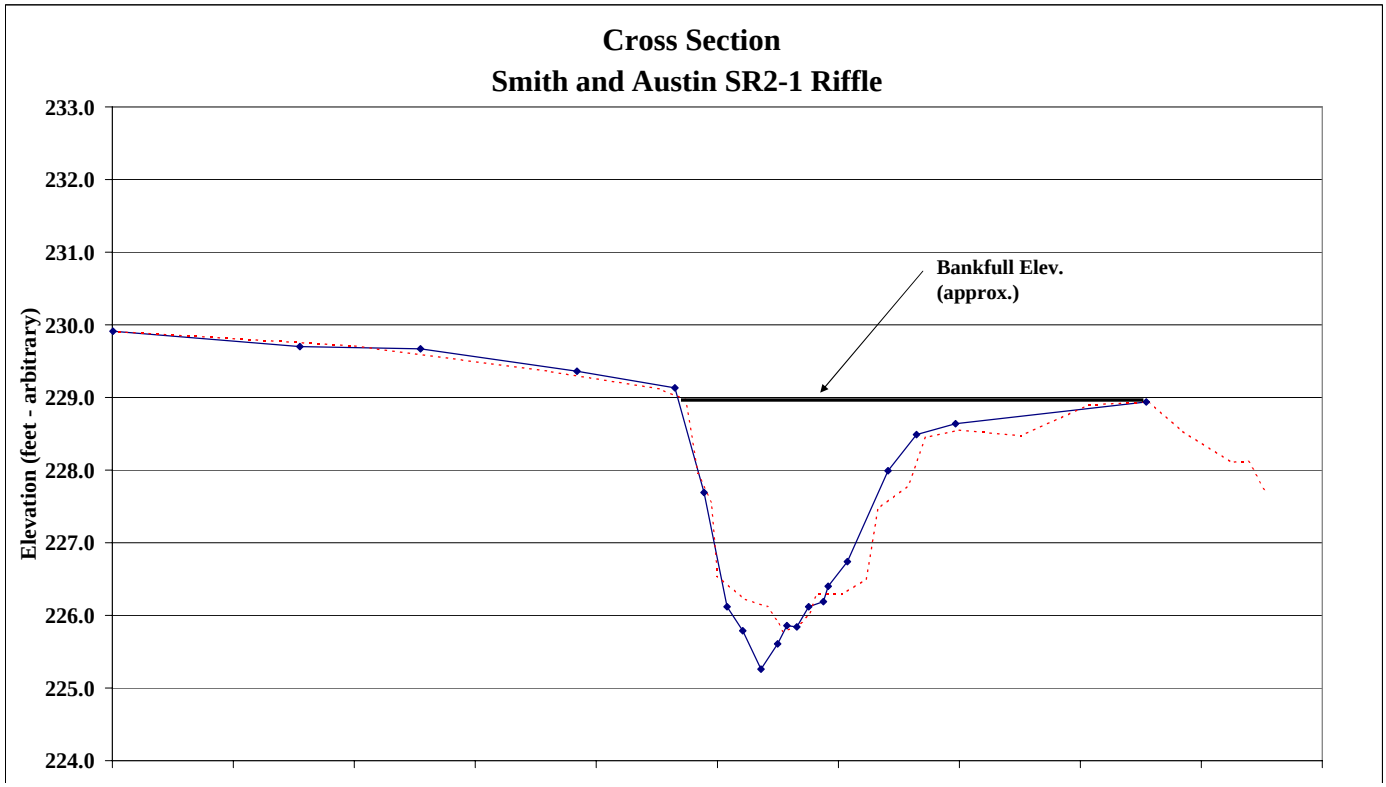
Station	Elevation	Notes
0.0	232.3	
11.0	232.0	
20.0	231.2	
22.8	231.1	
39.0	231.4	
50.0	231.2	
60.4	231.2	
69.0	231.2	
79.0	230.8	
89.0	230.4	
97.0	230.1	
99.8	229.9	LP
120.0	229.7	
136.0	229.4	
145.2	229.1	
147.4	229.0	
148.4	228.0	
149.5	227.6	
150.0	226.5	
152.2	226.2	
154.1	226.1	
155.0	225.9	
155.4	225.8	
156.6	225.8	
157.6	226.0	
158.2	226.3	
160.3	226.3	
162.3	226.5	
163.3	227.5	
165.8	227.8	
167.2	228.5	
170.0	228.6	
175.1	228.5	
180.7	228.9	
185.7	228.9	RP
188.3	228.6	
192.5	228.1	
193.9	228.1	
195.3	227.7	
198.3	227.9	
204.8	228.3	
212.8	227.9	
215.5	227.8	
217.4	226.5	
219.5	225.9	
224.0	226.1	
226.7	226.0	
227.5	228.2	
230.9	229.1	
233.5	229.9	

AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section SR2-1 - Looking Downstream @ STA 24+30

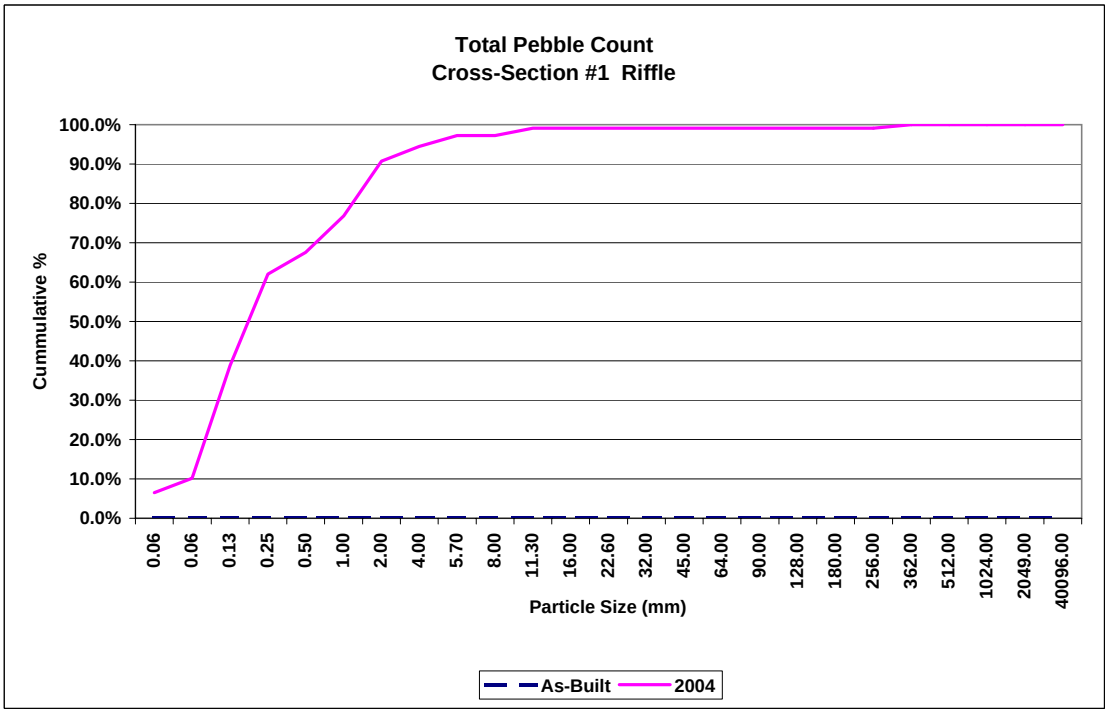
	2004	2003	AS-BUILT
Area	44.9	45.9	46.5
Width	20.0	20.2	33.2
Mean Depth	2.2	2.3	1.4
Max Depth	3.9	3.3	3.1
W/D	8.9	8.9	23.7



Project Name	Smith Reach 2
Cross Section	#1
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	7	0	6.5%	6.5%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	4	0	3.7%	10.2%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	27	4	28.7%	38.9%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	11	14	23.1%	62.0%
	course sand	0.50	0	#DIV/0!	#DIV/0!	2	4	5.6%	67.6%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	10	9.3%	76.9%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	15	13.9%	90.7%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	4	3.7%	94.4%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	3	2.8%	97.2%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	97.2%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	2	1.9%	99.1%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	1	0.9%	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!		51	57	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.11	0.17	0.28	2.27	5.25



Project Name	Smith and Austin
Cross Section	SR2-2
Feature	Pool
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
4.0	229.7	LP
4.5	229.7	
4.7	229.3	
13.7	229.7	
18.1	228.0	
18.5	227.3	
22.2	225.9	
23.0	224.8	
23.9	224.0	
26.5	224.3	
29.2	224.7	
31.0	226.2	
31.3	226.6	
35.7	227.8	
43.8	228.7	BKF
51.4	228.6	RP

2003
2003 Survey

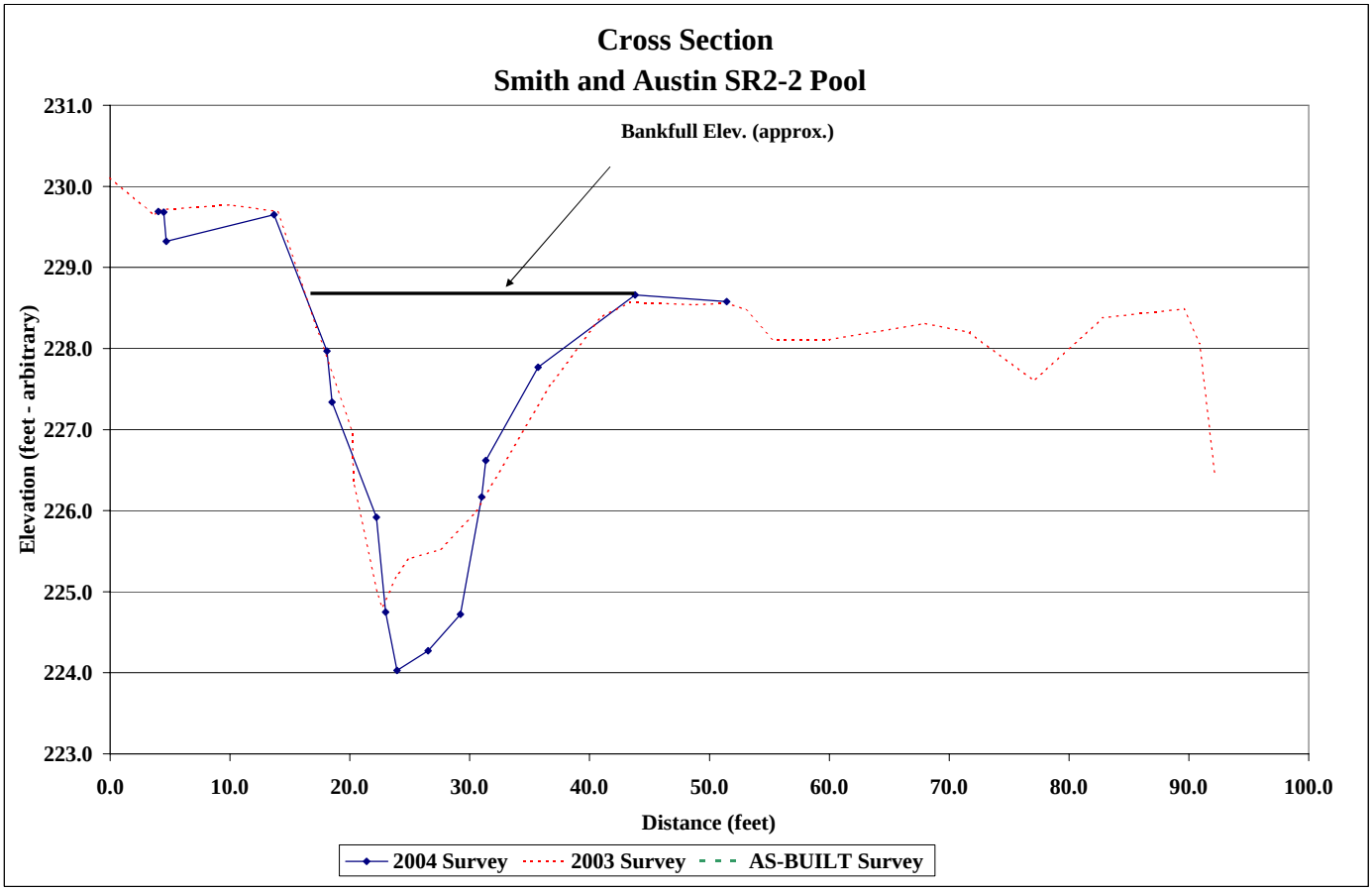
Station	Elevation	Notes
0.0	230.1	
3.7	229.6	
4.0	229.7	LP
10.0	229.8	
14.0	229.7	
17.2	228.3	
20.2	227.0	
20.3	226.4	
22.3	225.0	
22.7	224.8	
24.0	225.2	
24.9	225.4	
27.5	225.5	
30.3	225.9	
36.9	227.6	
41.0	228.4	
43.4	228.6	
48.8	228.5	
51.5	228.6	RP
53.0	228.5	
55.3	228.1	
60.0	228.1	
68.0	228.3	
71.7	228.2	
77.1	227.6	
82.8	228.4	
89.6	228.5	
90.9	228.1	
92.2	226.4	
99.4	226.2	
101.8	226.1	
103.1	228.1	
104.4	228.4	
107.4	228.9	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section SR2-2 - Looking Downstream @ STA 24+87

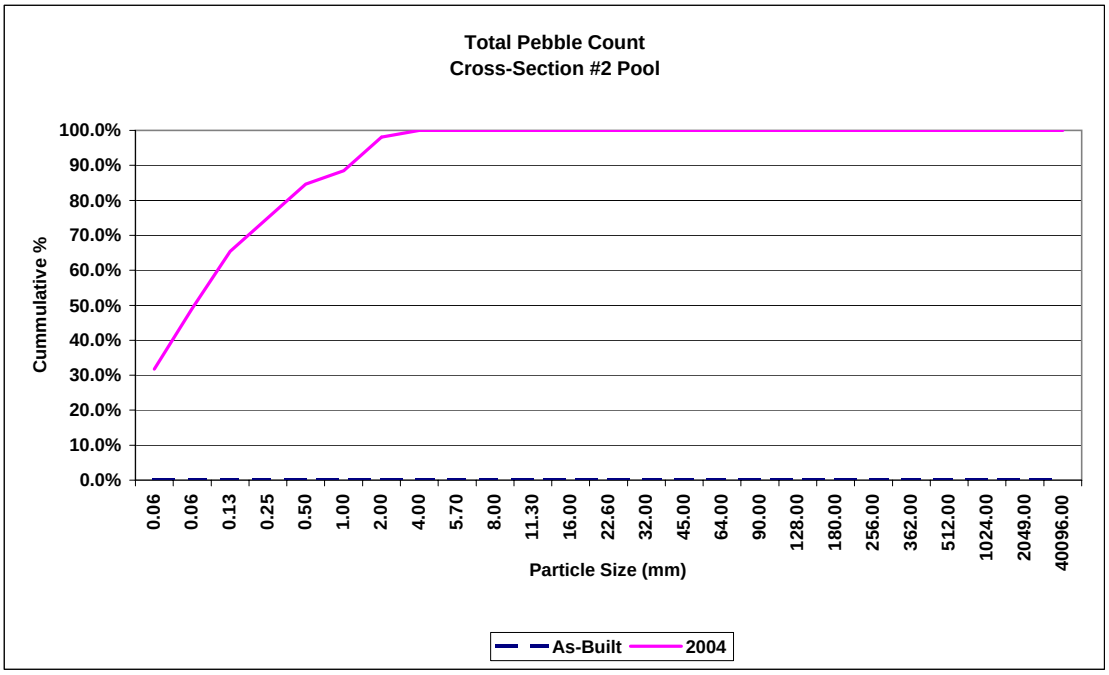
	2004	2003	AS-BUILT
Area	60.8	59.2	48.5
Width	25.7	26.2	26.9
Mean Depth	2.4	2.3	1.8
Max Depth	4.6	3.8	3.8
W/D	10.9	11.6	14.9



Project Name	Smith Reach 2
Cross Section	#2
Feature	Pool
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Pool - Bed**	**%**	**Cum %**	**Pool - Bank**	**Pool - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	33	0	31.7%	31.7%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	18	0	17.3%	49.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	4	13	16.3%	65.4%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	10	9.6%	75.0%
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	10	9.6%	84.6%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	4	3.8%	88.5%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	10	9.6%	98.1%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	2	1.9%	100.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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!		55	49	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.00	0.07	0.10	0.73	2.52



Project Name	Smith and Austin
Cross Section	SR2-3
Feature	Pool
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
7.4	226.6	LP
8.1	226.7	
22.2	226.5	
42.4	226.7	
59.9	226.4	BKF
75.0	226.1	
78.8	225.8	
87.2	225.3	
90.2	224.7	
92.9	224.4	
95.2	223.6	
100.5	223.1	
101.8	223.1	
104.1	223.7	
105.8	225.1	
108.3	226.6	BKF
114.7	229.4	
123.7	229.4	RP

2003
2003 Survey

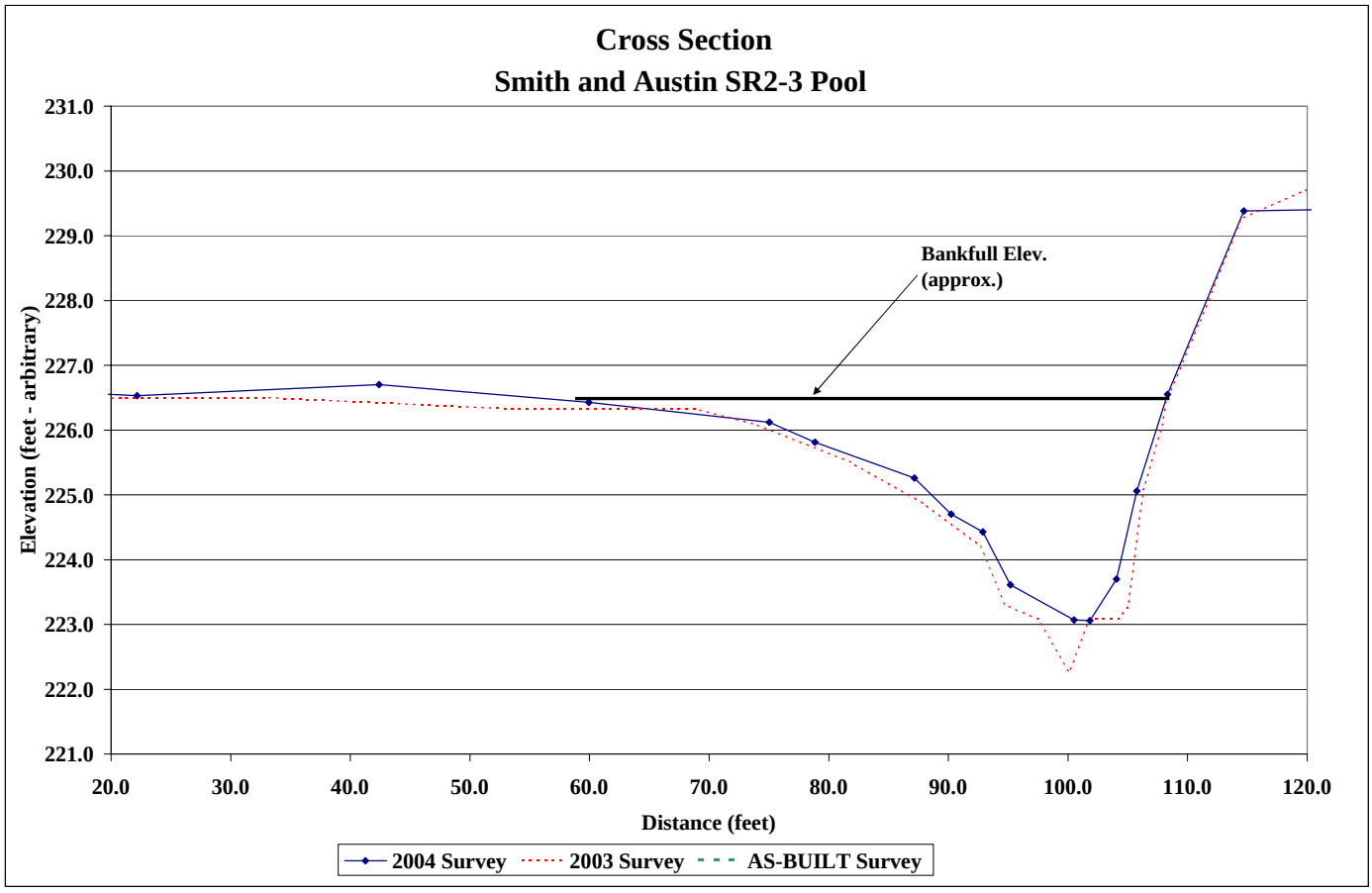
Station	Elevation	Notes
2.0	226.7	
7.0	226.6	
7.6	226.5	LP
21.0	226.5	
33.0	226.5	BKF
53.0	226.3	
69.0	226.3	
74.0	226.1	
81.9	225.5	
88.0	224.9	
92.7	224.2	
94.7	223.3	
97.5	223.1	
100.1	222.3	
101.8	223.1	
104.2	223.1	
105.0	223.3	
106.3	225.1	
107.9	226.1	
108.2	226.4	
110.9	227.6	
114.5	229.3	
119.9	229.7	
122.1	229.5	
123.5	229.4	RP

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section SR2-3 - Looking Downstream @ STA 31+25

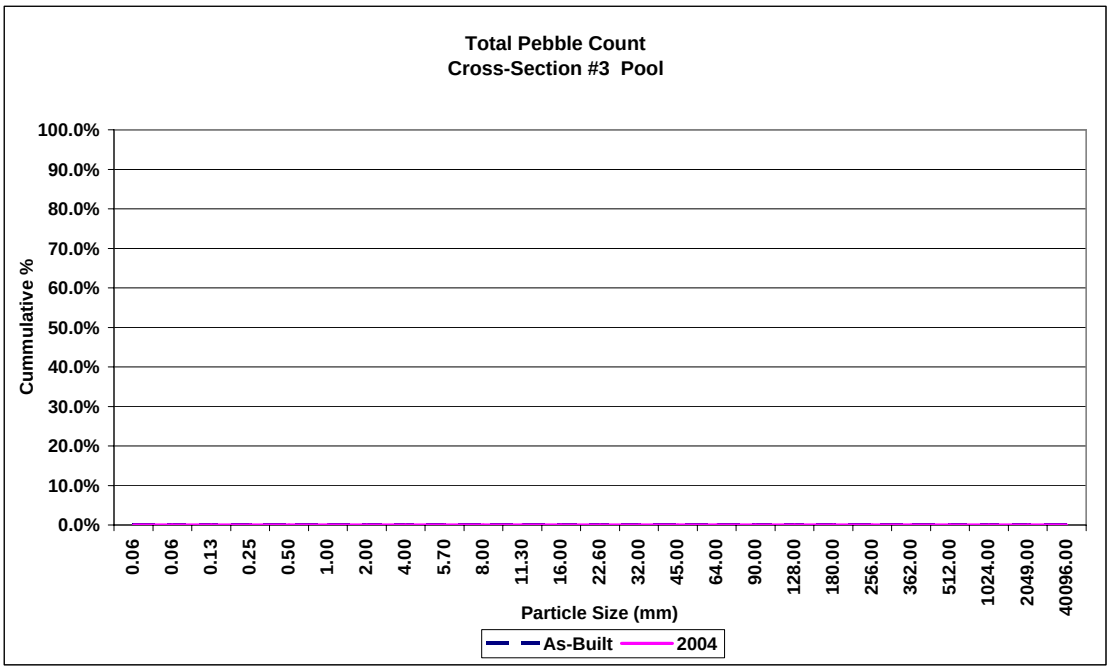
	2004	2003	AS-BUILT
Area	52.4	59.6	64.0
Width	36.3	37.7	39.1
Mean Depth	1.4	1.6	1.6
Max Depth	3.4	4.2	4.1
W/D	25.1	23.8	23.9



Project Name	Smith Reach 2
Cross Section	#3
Feature	Pool
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Pool - Bed**	**%**	**Cum %**	**Pool - Bank**	**Pool - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
TOTAL / %of whole count			0	#DIV/0!		0	0	#DIV/0!	

	d16	**d35**	**d50**	**d85**	**d95**
2004	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!



Project Name	Smith and Austin
Cross Section	SR2-4
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
4.9	226.9	LP
18.6	226.2	
30.8	226.0	
35.8	225.8	BKF
36.5	225.5	
38.1	223.8	
40.8	223.2	
43.7	222.7	
44.6	222.9	
47.3	223.1	
50.2	224.1	
52.1	225.2	
54.2	226.1	
60.4	225.8	
67.0	226.2	
69.8	226.4	
71.0	226.0	
81.5	225.9	
91.1	225.8	RP

2003
2003 Survey

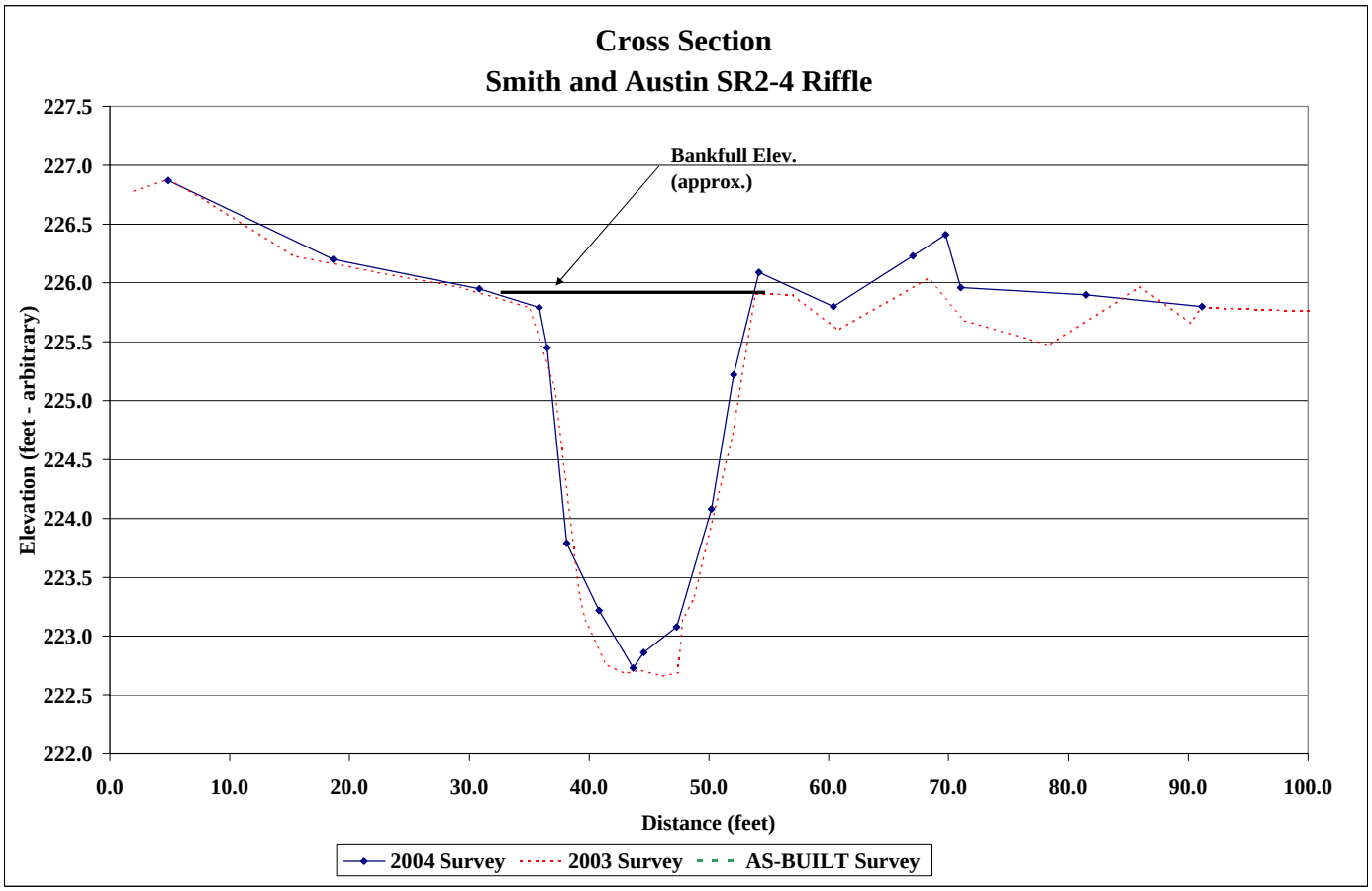
Station	Elevation	Notes
2.0	226.8	
4.9	226.9	LP
8.0	226.7	
15.3	226.2	
22.3	226.1	
29.3	226.0	
35.0	225.8	BKF
37.1	225.1	
39.2	223.3	
39.7	223.1	
41.4	222.8	
43.0	222.7	
44.3	222.7	
46.1	222.7	
47.4	222.7	
47.8	223.1	
48.7	223.3	
51.9	224.7	
53.9	225.9	
57.0	225.9	
60.8	225.6	
68.3	226.0	
71.3	225.7	
78.4	225.5	
86.0	226.0	
90.2	225.7	
91.1	225.8	RP
100.1	225.8	
108.0	226.0	
113.6	226.3	
117.0	226.5	
118.6	228.2	
121.3	228.5	
124.6	228.1	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section SR2-4 - Looking Downstream @ STA 32+45

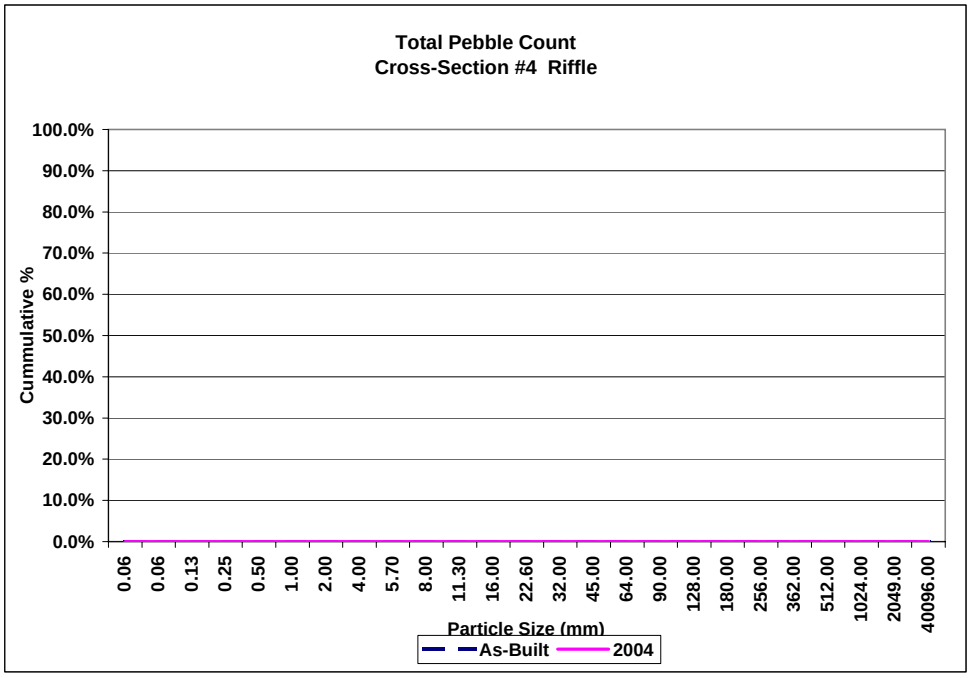
	2004	2003	AS-BUILT
Area	38.4	42.7	38.9
Width	18.4	18.9	18.7
Mean Depth	2.1	2.3	2.1
Max Depth	3.2	3.3	3.1
W/D	8.8	8.4	9.0



Project Name	Smith Reach 2
Cross Section	#4
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
TOTAL / %of whole count			0	#DIV/0!		0	0	#DIV/0!	

	d16	**d35**	**d50**	**d85**	**d95**
2004	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

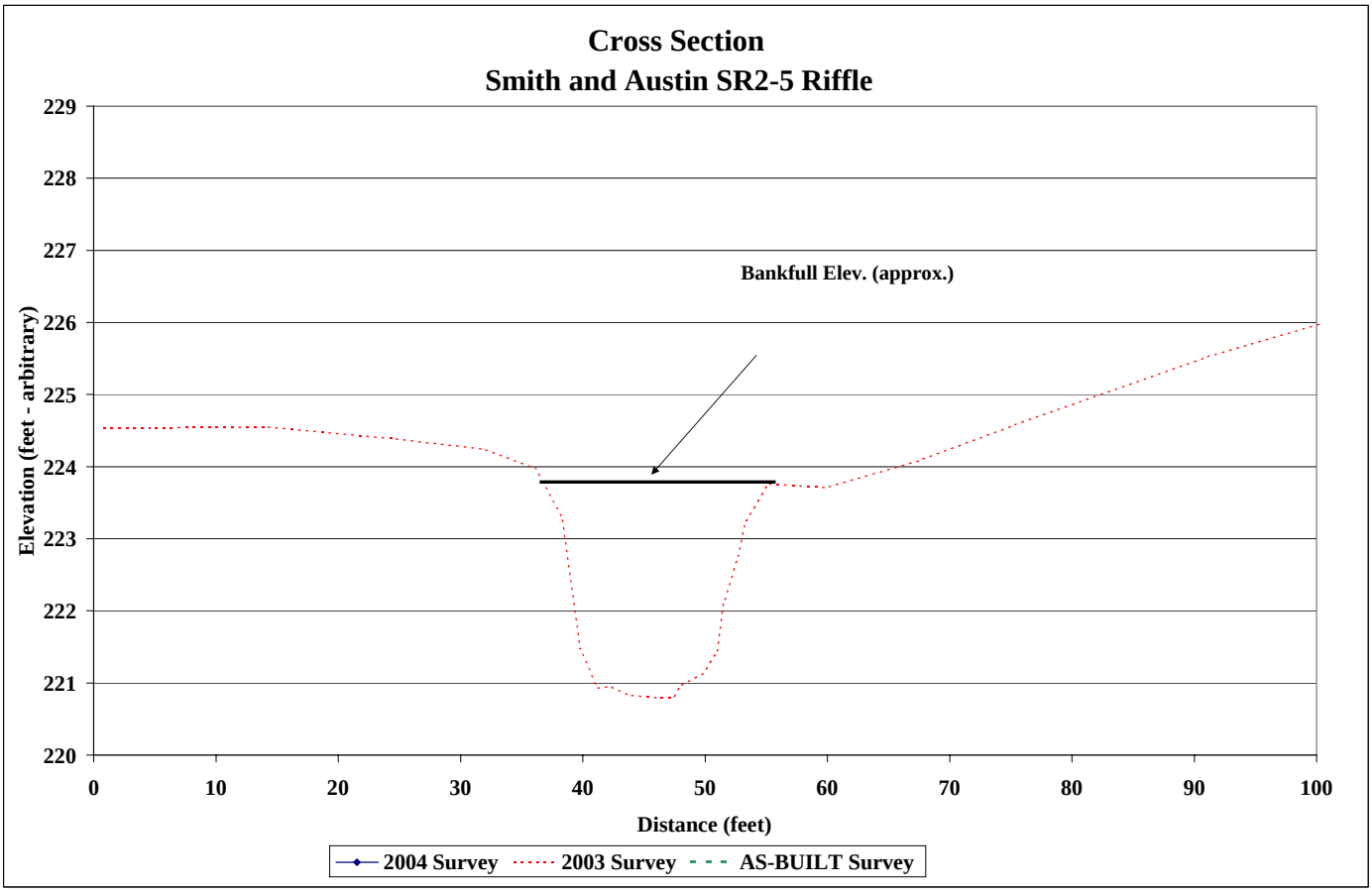


Project Name	Smith and Austin
Cross Section	SR2-5
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004 Survey			2003 Survey			AS-BUILT Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
			0.8	224.5	LP			
			4.6	224.5				
			14.3	224.6				
			24.8	224.4				
			32.0	224.2				
			36.1	224.0				
			38.3	223.3				
			39.8	221.5				
			41.2	220.9				
			42.3	221.0				
			43.7	220.8				
			46.1	220.8				
			47.4	220.8				
			48.0	221.0				
			49.8	221.1				
			51.0	221.4				
			51.5	222.1				
			52.7	222.8				
			53.3	223.2				
			55.2	223.8	BKF			
			59.9	223.7				
			67.5	224.1				
			75.2	224.6				
			90.9	225.5				
			102.5	226.1				
			111.6	227.3				
			121.0	228.1				
			125.9	228.3	RP			
			131.0	228.2				

Photo of Cross-Section SR2-5 - Looking Downstream @ STA 39+20

	2004	2003	AS-BUILT
Area		35.8	37.2
Width		16.9	18.4
Mean Depth		2.1	2.0
Max Depth		3.0	3.0
W/D		8.0	9.1



Project Name	Smith and Austin
Cross Section	AR1-2
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
2.6	239.7	LP
13.2	241.4	
17.2	239.5	
22.1	235.5	BKF
23.4	233.6	
25.7	232.3	
30.6	231.9	
33.0	231.5	
34.4	231.5	
38.1	232.0	
38.8	233.1	
41.2	234.8	
45.5	235.1	
52.9	235.8	
73.9	235.8	
83.5	236.2	RP

2003
2003 Survey

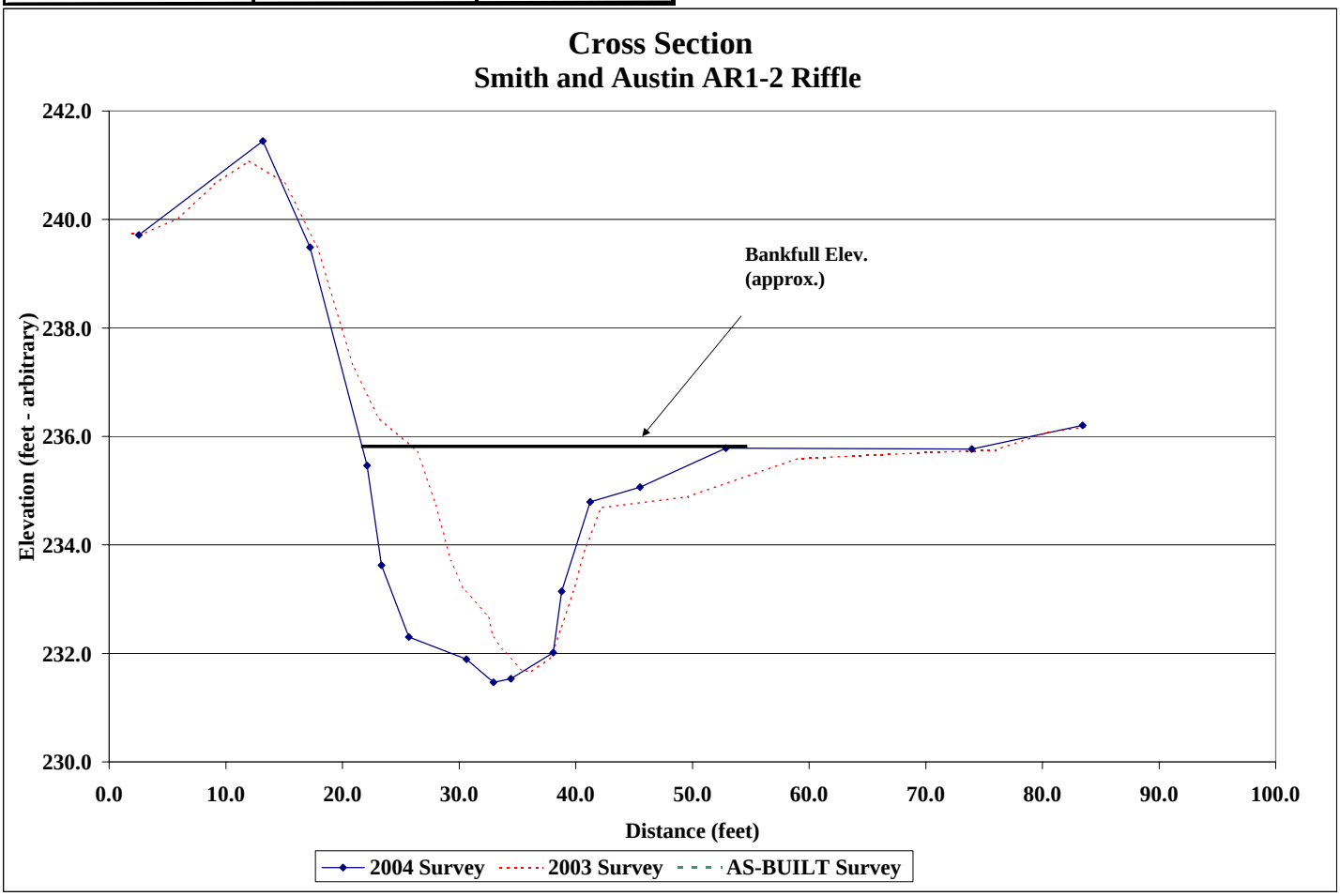
Station	Elevation	Notes
2.0	239.7	LP
3.0	239.7	
6.0	240.0	
9.0	240.7	
12.0	241.1	
15.0	240.7	
17.8	239.5	
21.0	237.2	
23.1	236.4	
26.4	235.7	BKF
27.9	234.8	
29.3	233.7	
30.4	233.2	
32.5	232.7	
32.9	232.3	
33.7	232.1	
35.4	231.7	
36.2	231.7	
37.9	231.9	
38.7	232.4	
39.8	233.1	
40.8	233.9	
42.2	234.7	
49.6	234.9	
59.0	235.6	BKF
70.0	235.7	
76.0	235.8	
80.5	236.1	
84.0	236.2	RP
84.7	236.2	
89.5	237.3	
97.9	239.6	
102.0	239.5	
110.0	239.3	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section AR1-2 - Looking Downstream @ STA 4+42

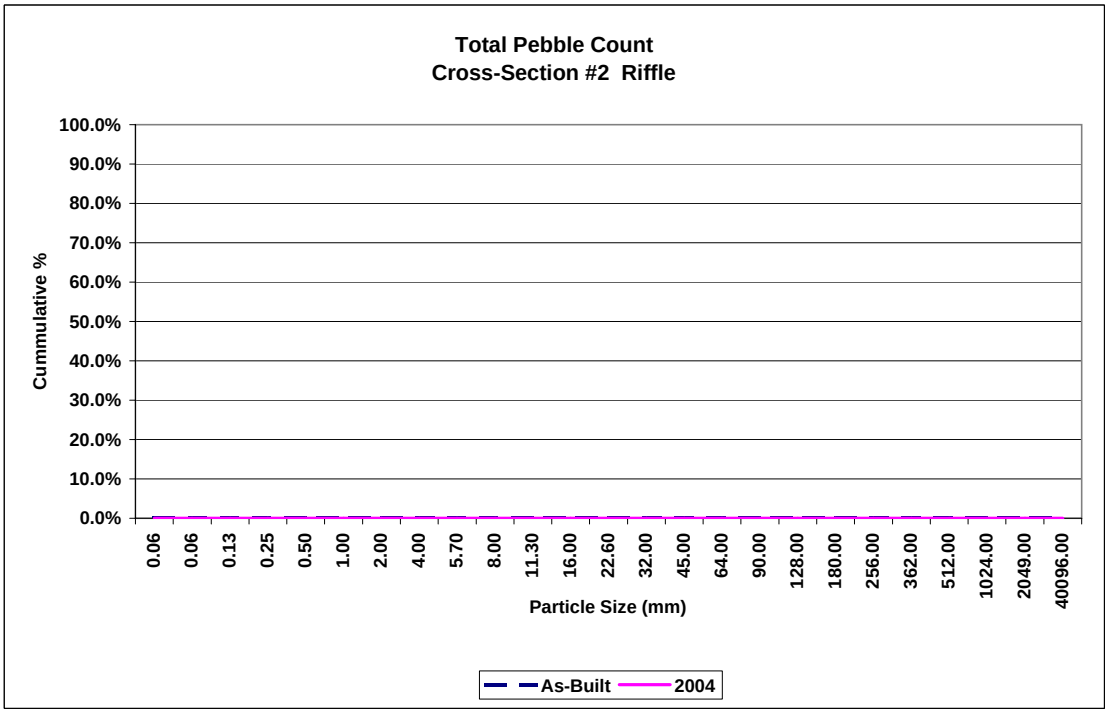
	2004	2003	AS-BUILT
Area	62.4	51.2	49.0
Width	29.5	31.1	32.4
Mean Depth	2.1	1.6	1.5
Max Depth	4.0	3.8	3.9
W/D	14.0	18.9	21.4



Project Name	Austin Reach 1
Cross Section	#2
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
TOTAL / %of whole count			0	#DIV/0!		0	0	#DIV/0!	

	d16	**d35**	**d50**	**d85**	**d95**
2004	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

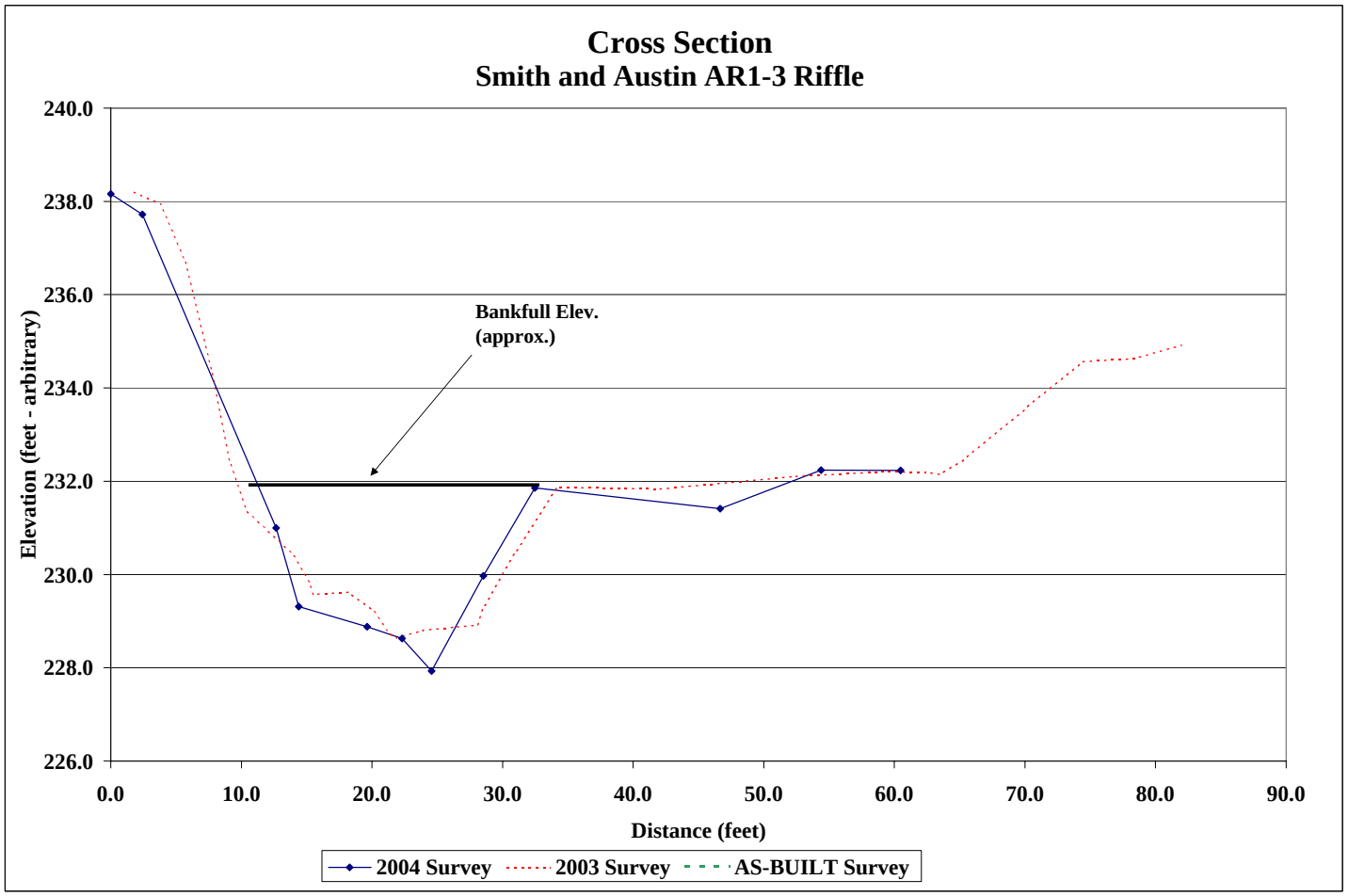


Project Name	Smith and Austin
Cross Section	AR1-3
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004 Survey			2003 Survey			AS-BUILT Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0.0	238.2	LP	1.8	238.2	LP			
2.4	237.7		3.8	237.9				
12.7	231.0		5.7	236.7				
14.4	229.3		7.7	234.4				
19.6	228.9		9.1	232.4				
22.3	228.6		10.4	231.4				
24.6	227.9		13.9	230.4				
28.5	230.0		15.2	229.8				
32.5	231.9	BKF	15.5	229.6				
46.7	231.4		18.2	229.6				
54.4	232.2		20.1	229.2				
60.5	232.2	RP	21.3	228.8				
			21.9	228.6				
			23.9	228.8				
			26.3	228.9				
			28.1	228.9				
			28.5	229.3				
			31.0	230.5				
			34.2	231.9	BKF			
			42.0	231.8				
			52.4	232.1				
			59.0	232.2				
			62.4	232.2	RP			
			63.5	232.2				
			65.4	232.5				
			70.0	233.6				
			74.4	234.6				
			78.4	234.6				
			82.0	234.9				
			86.0	235.9				
			89.0	236.5				

Photo of Cross-Section AR1-3 - Looking Downstream @ STA 13+95

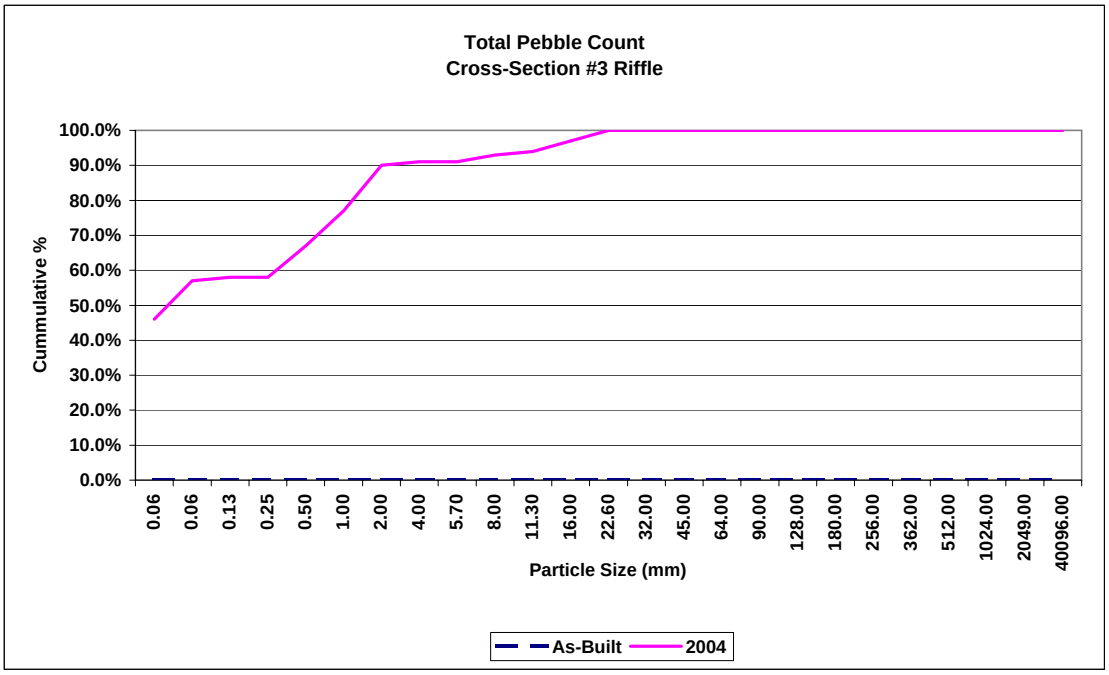
	2004	2003	AS-BUILT
Area	52.7	51.2	49.8
Width	22.8	23.8	24.4
Mean Depth	2.3	2.2	2.0
Max Depth	3.9	3.2	3.2
W/D	9.9	11.1	12.0



Project Name	Austin Reach 1
Cross Section	#3
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	41	5	46.0%	46.0%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	9	2	11.0%	57.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	1	1.0%	58.0%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	0	0.0%	58.0%
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	9	9.0%	67.0%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	10	10.0%	77.0%
G r a v e l	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	13	13.0%	90.0%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	1	1.0%	91.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	0.0%	91.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	2	2.0%	93.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	1	1.0%	94.0%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	3	3.0%	97.0%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	3	3.0%	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!		50	50	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.00	0.00	0.07	2.31	15.53

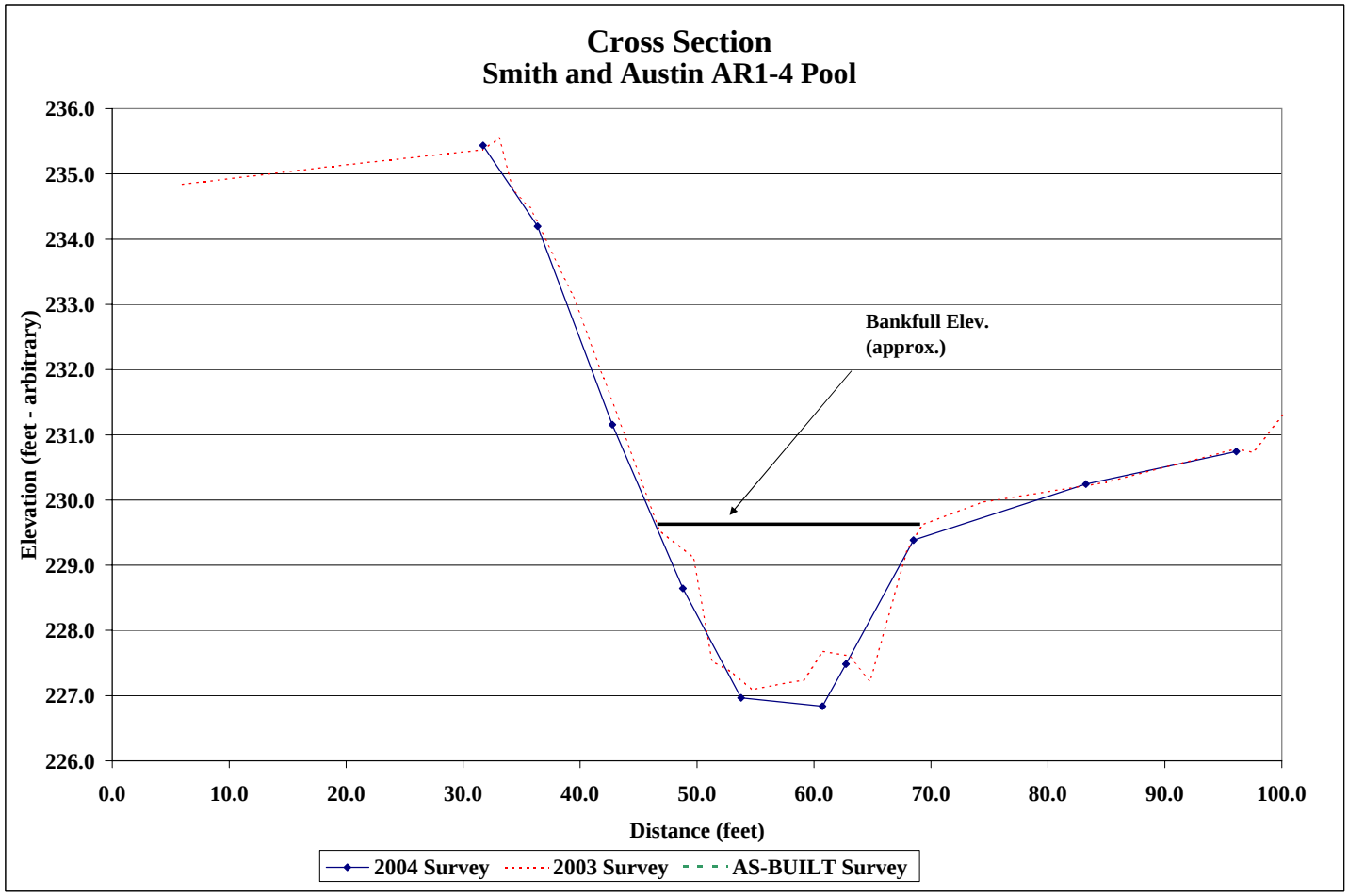


Project Name	Smith and Austin
Cross Section	AR1-4
Feature	Pool
Date	6/25/05
Crew	Bidelspach, Clinton

2004 Survey			2003 Survey			AS-BUILT Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
31.7	235.4	LP	6.0	234.8				
36.4	234.2		18.0	235.1				
42.7	231.2		31.7	235.4	LP			
48.8	228.6		33.1	235.6				
53.8	227.0		34.3	234.7				
60.7	226.8		35.7	234.5				
62.7	227.5		39.4	233.1				
68.5	229.4	BKF	42.0	231.9				
83.2	230.2		46.8	229.5				
96.1	230.7	RP	49.7	229.1				
			51.3	227.5				
			53.1	227.4				
			54.7	227.1				
			56.4	227.2				
			59.1	227.2				
			60.8	227.7				
			63.0	227.6				
			64.8	227.2				
			68.0	229.2				
			69.3	229.6	BKF			
			74.3	230.0				
			85.0	230.3				
			94.6	230.7				
			96.1	230.8	RP			
			97.5	230.7				
			103.0	232.0				
			108.6	233.4				

Photo of Cross-Section AR1-4 - Looking Downstream @ STA 20+90

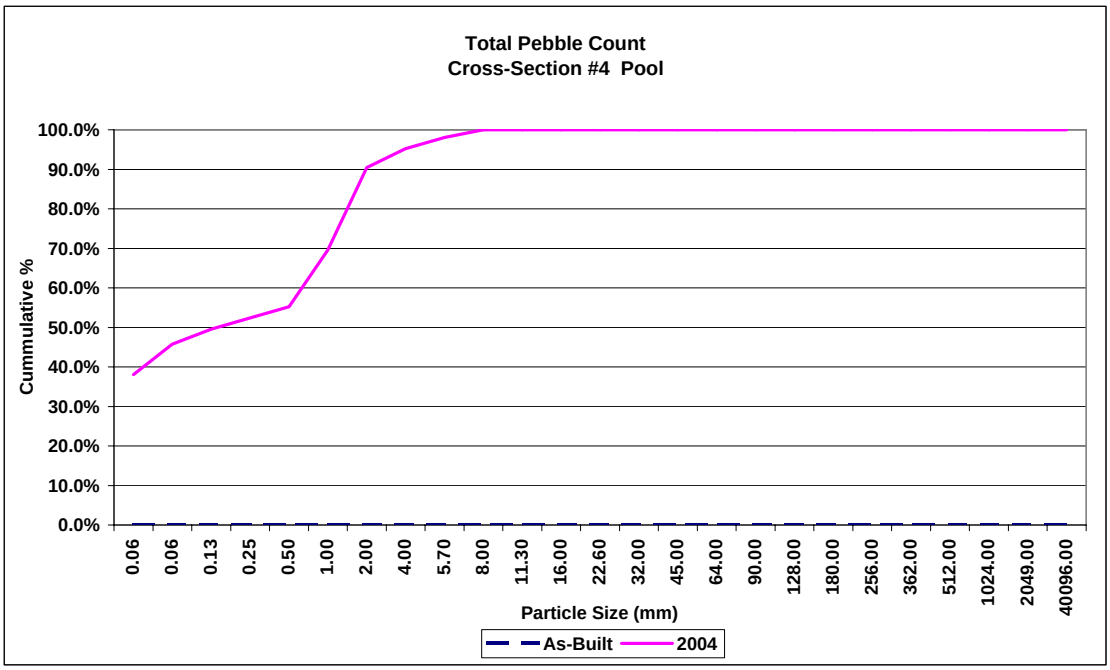
	2004	2003	AS-BUILT
Area	38.3	38.5	38.2
Width	22.7	22.5	23.3
Mean Depth	1.7	1.7	1.6
Max Depth	2.8	2.5	2.5
W/D	13.5	13.1	14.2



Project Name	Austin Reach 1
Cross Section	#4
Feature	Pool
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	40	0	38.1%	38.1%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	8	0	7.6%	45.7%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	4	0	3.8%	49.5%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	3	2.9%	52.4%
	course sand	0.50	0	#DIV/0!	#DIV/0!	2	1	2.9%	55.2%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	5	10	14.3%	69.5%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	1	21	21.0%	90.5%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	5	4.8%	95.2%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	1	2	2.9%	98.1%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	2	1.9%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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!		61	44	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.00	0.00	0.22	2.54	4.76



Project Name	Smith and Austin
Cross Section	AR2-1
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
10.5	234.4	LP
15.1	234.5	
22.4	232.3	
26.3	228.2	
29.2	225.1	
30.4	225.1	
30.9	224.8	
34.4	224.5	
36.4	224.2	
36.7	224.3	
38.0	224.6	
41.8	224.4	
42.7	224.9	
47.2	228.2	BKF
59.5	228.6	
68.6	228.3	
79.6	228.2	
96.2	227.9	
109.3	228.1	
120.6	228.7	RP

2003
2003 Survey

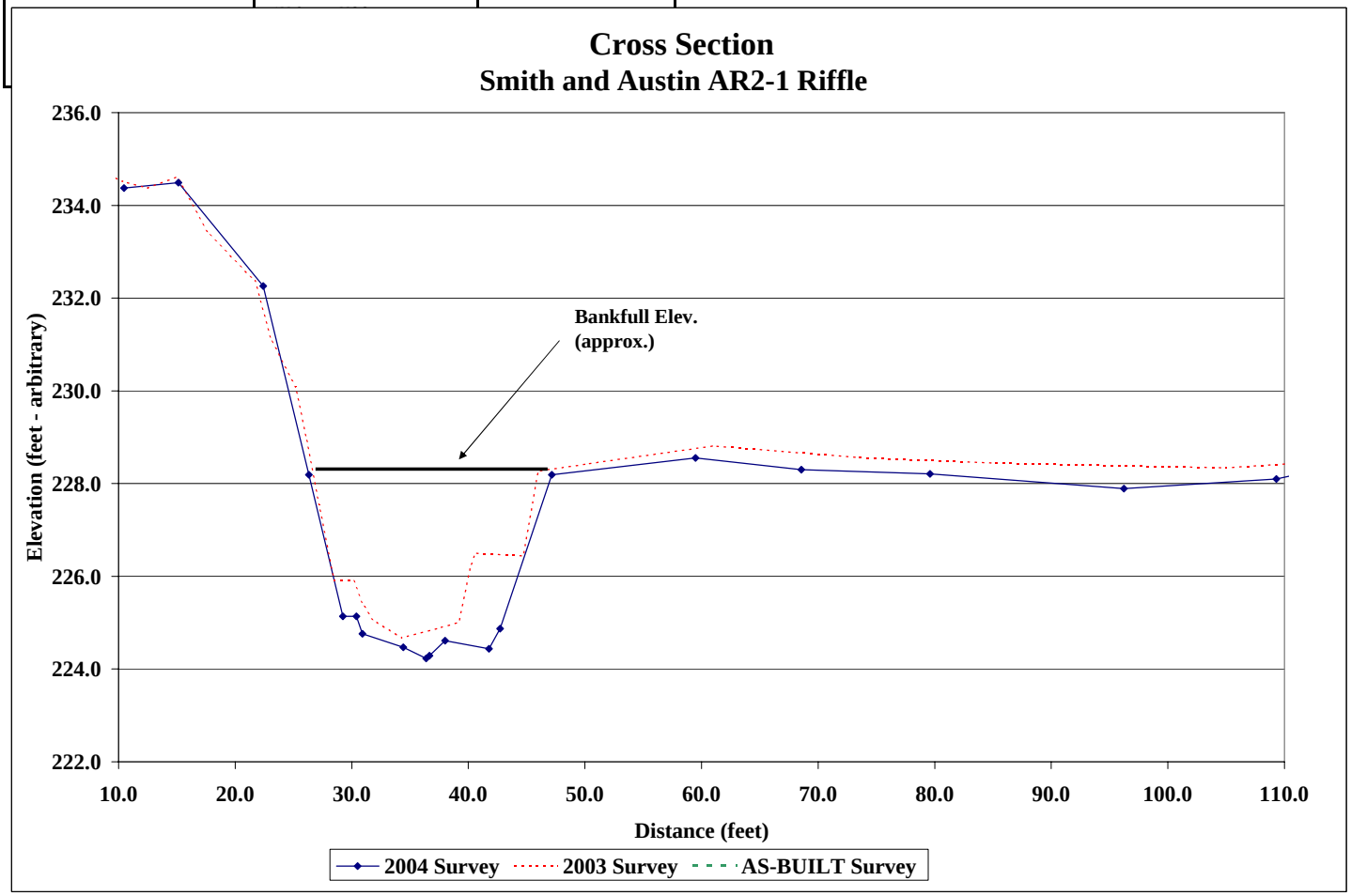
Station	Elevation	Notes
7.5	234.8	
10.3	234.5	
10.6	234.5	LP
12.5	234.4	
15.0	234.6	
17.8	233.4	
21.7	232.4	
23.1	231.1	
25.2	230.1	
26.1	229.0	
27.2	227.5	
28.5	225.9	
30.2	225.9	
30.9	225.4	
31.8	225.1	
34.3	224.7	
37.3	224.9	
39.2	225.0	
40.2	226.2	
40.6	226.5	
44.7	226.4	
46.0	228.3	BKF
50.2	228.4	
61.0	228.8	
73.6	228.6	
85.0	228.4	
105.0	228.3	
118.0	228.6	
120.5	228.6	RP

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section AR2-1 - Looking Downstream @ STA 27+90

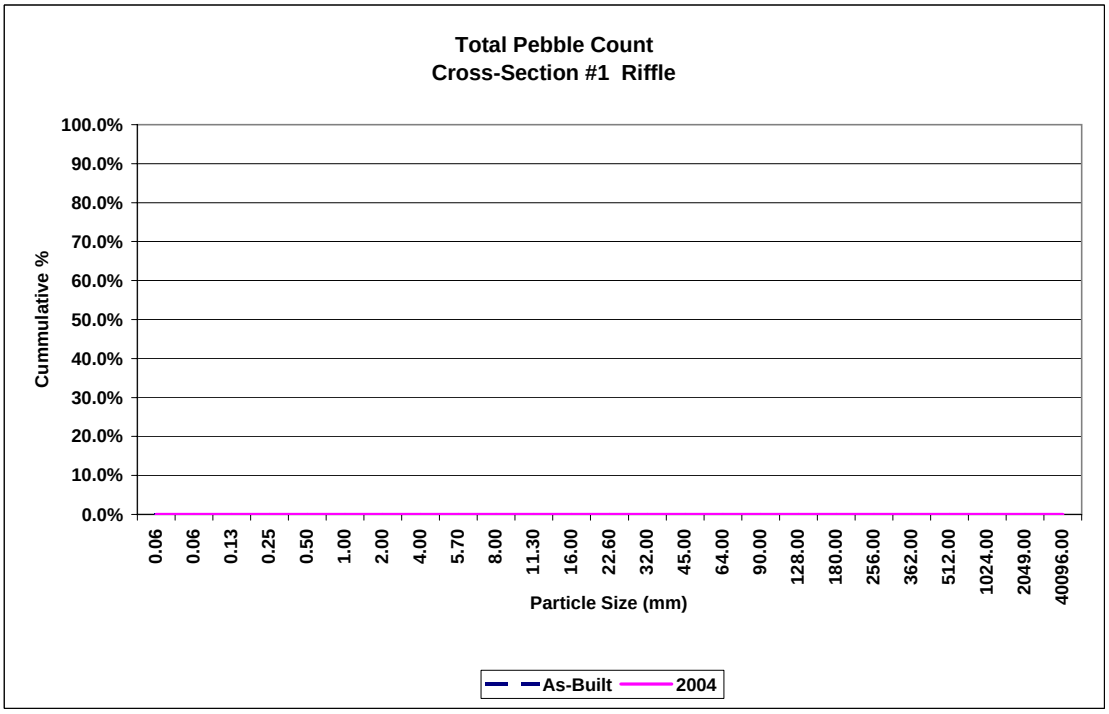
	2004	2003	AS-BUILT
Area	62.1	45.4	48.1
Width	20.8	18.8	19.3
Mean Depth	3.0	2.4	2.5
Max Depth	4.0	3.6	3.6
W/D	7.0	7.8	7.7



Project Name	Austin Reach 2
Cross Section	#1
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
TOTAL / %of whole count			0	#DIV/0!		0	0	#DIV/0!	

	d16	**d35**	**d50**	**d85**	**d95**
2004	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

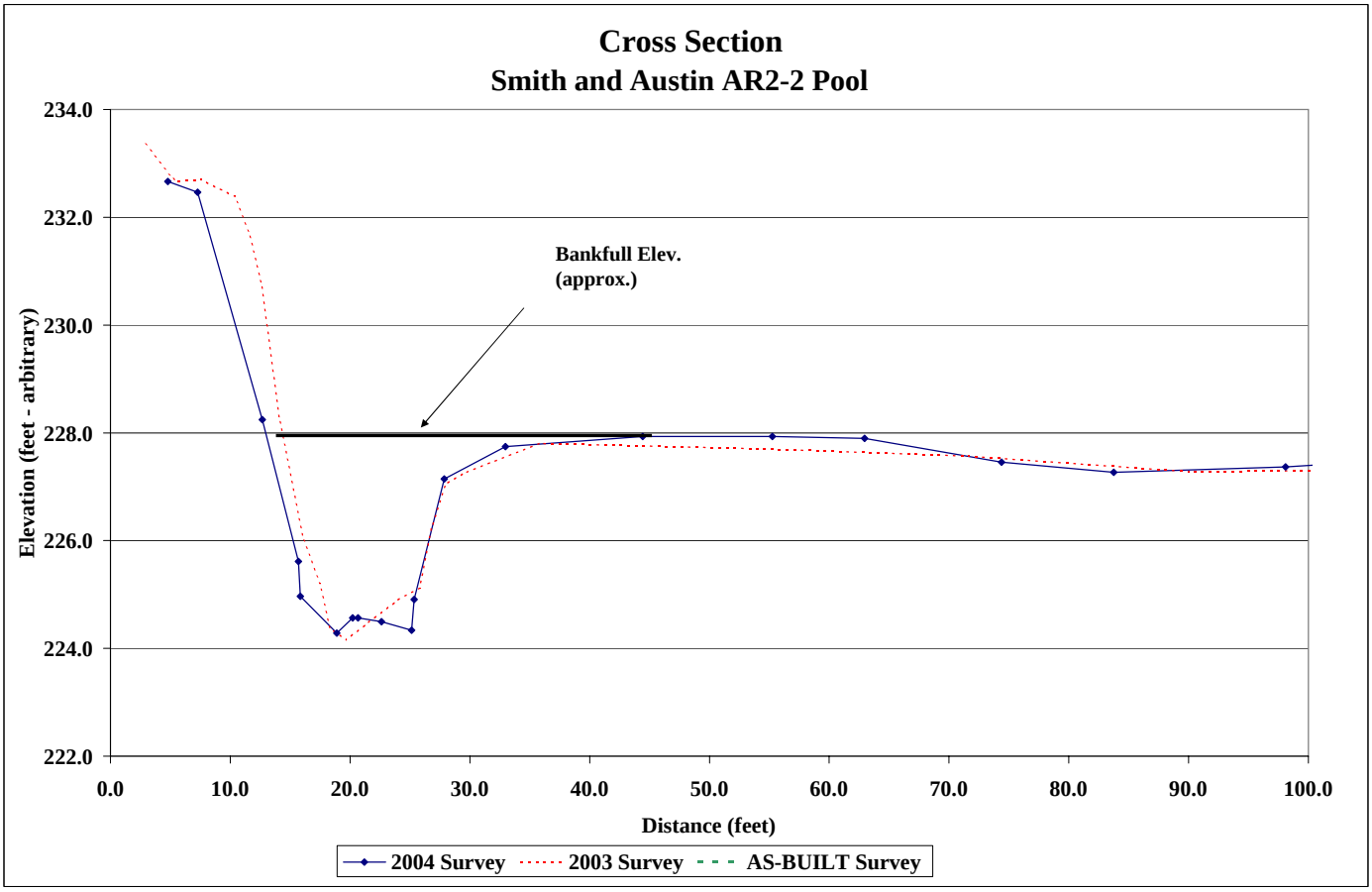


Project Name	Smith and Austin
Cross Section	AR2-2
Feature	Pool
Date	6/25/05
Crew	Bidelspach, Clinton

2004			2003			AS-BUILT		
2004 Survey			2003 Survey			AS-BUILT Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
4.8	232.7	LP	2.9	233.4				
7.3	232.5		5.0	232.8				
12.7	228.2		5.5	232.7	LP			
15.7	225.6		7.6	232.7				
15.9	225.0		10.4	232.4				
18.9	224.3		11.6	231.7				
20.2	224.6		12.6	230.8				
20.7	224.6		14.1	228.3	BKF			
22.6	224.5		16.1	226.1				
25.1	224.3		17.5	225.2				
25.3	224.9		18.3	224.4				
27.9	227.1		19.7	224.2				
33.0	227.7	BKF	21.3	224.4				
44.4	227.9		24.0	224.9				
55.3	227.9		25.8	225.1				
62.9	227.9		26.8	226.2				
74.4	227.5		28.0	227.1				
83.8	227.3		29.4	227.2				
98.1	227.4		35.8	227.8	BKF			
108.5	227.5	RP	54.4	227.7				
			71.6	227.6				
			90.0	227.3				
			103.0	227.3				
			107.0	227.4				
			107.8	227.5	RP			
			109.0	227.6				
			114.0	228.8				
			119.0	230.0				
			121.2	230.6				
			130.0	230.9				
			136.0	231.1				

Photo of Cross-Section AR2-2 - Looking Downstream @ STA 28+35

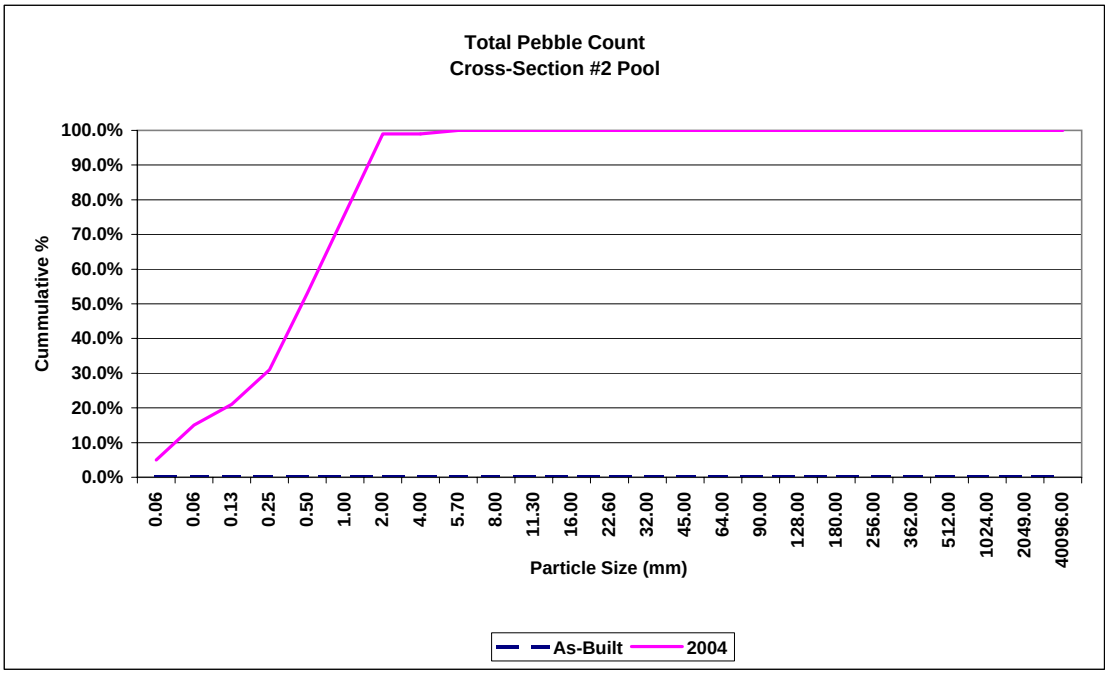
	2004	2003	AS-BUILT
Area	43.9	36.9	37.1
Width	17.3	19.7	21.3
Mean Depth	2.5	1.9	1.7
Max Depth	3.4	3.5	3.6
W/D	6.8	10.5	12.2



Project Name	Austin Reach 2
Cross Section	#2
Feature	Pool
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Pool - Bank**	**Pool - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	5	0	5.0%	5.0%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	10	0	10.0%	15.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	5	1	6.0%	21.0%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	10	10.0%	31.0%
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	22	22.0%	53.0%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	23	23.0%	76.0%
G r a v e l	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	23	23.0%	99.0%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	1	1.0%	100.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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!		20	80	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.11	0.44	0.70	2.02	2.74



Project Name	Smith and Austin
Cross Section	AR2-3
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
1.4	232.3	LP
5.5	229.2	
8.7	227.0	
12.0	224.9	
12.0	224.5	
16.3	224.1	
18.1	224.3	
20.0	224.5	
21.8	224.6	
23.5	224.5	
26.6	223.9	
28.1	224.5	
28.9	225.2	
32.8	227.0	BKF
43.0	227.2	
50.2	227.6	
64.6	227.8	
81.6	228.2	RP

2003
2003 Survey

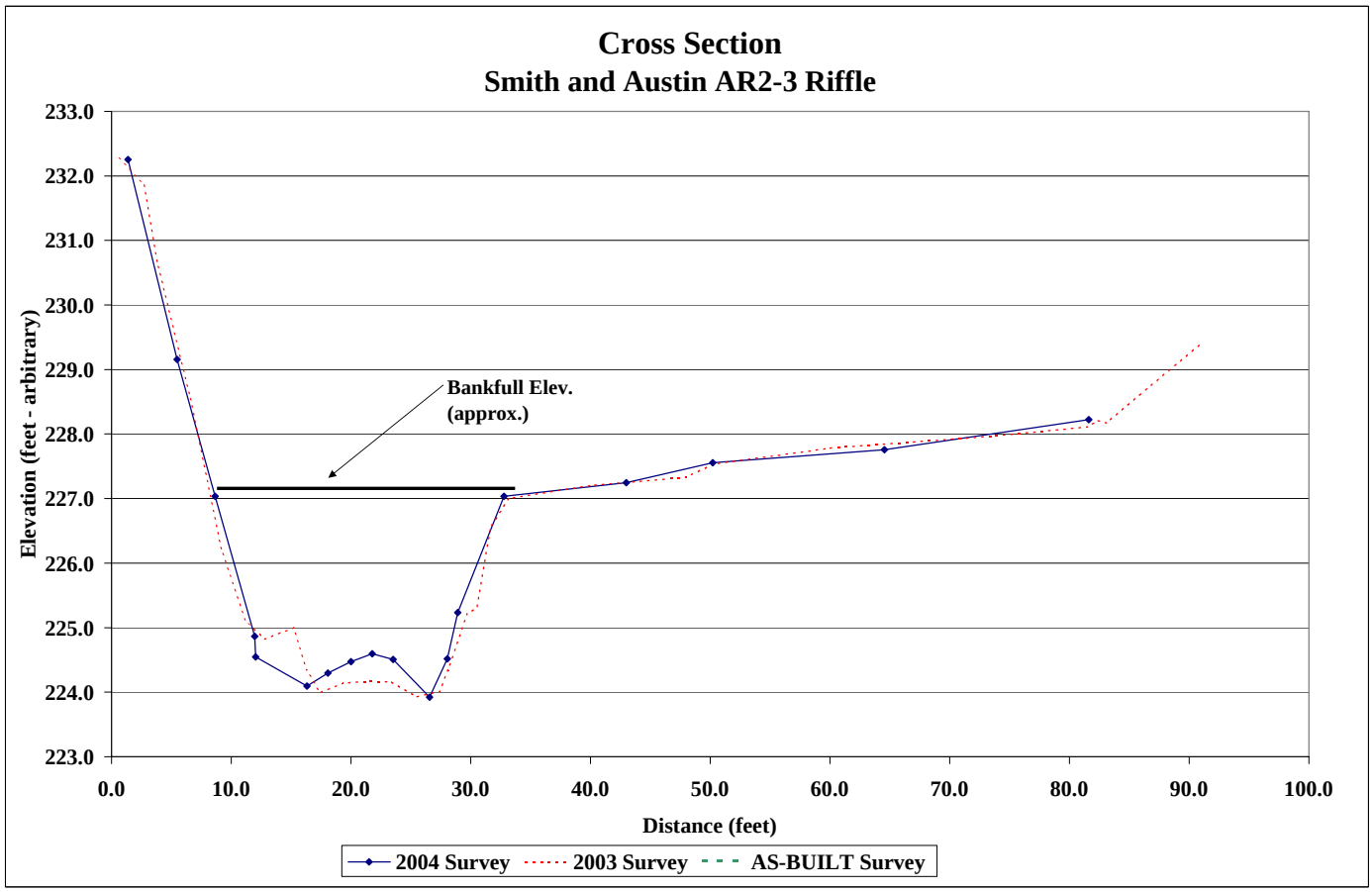
Station	Elevation	Notes
0.6	232.3	LP
2.7	231.9	
3.9	230.6	
6.5	228.6	
9.2	226.2	
11.2	225.1	
12.8	224.8	
15.2	225.0	
16.3	224.3	
17.4	224.0	
19.3	224.1	
21.4	224.2	
23.4	224.2	
25.5	223.9	
27.4	224.0	
28.1	224.3	
29.7	225.2	
30.5	225.3	
31.7	226.6	
33.2	227.0	BKF
40.0	227.2	
48.0	227.3	
50.2	227.5	
60.0	227.8	
73.7	228.0	
81.5	228.1	
82.4	228.2	RP
83.1	228.2	
91.0	229.4	
96.5	230.0	
103.3	230.5	
112.0	231.1	
121.0	231.6	
140.0	231.9	
145.0	232.0	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section AR2-3 - Looking Downstream @ STA 30+45

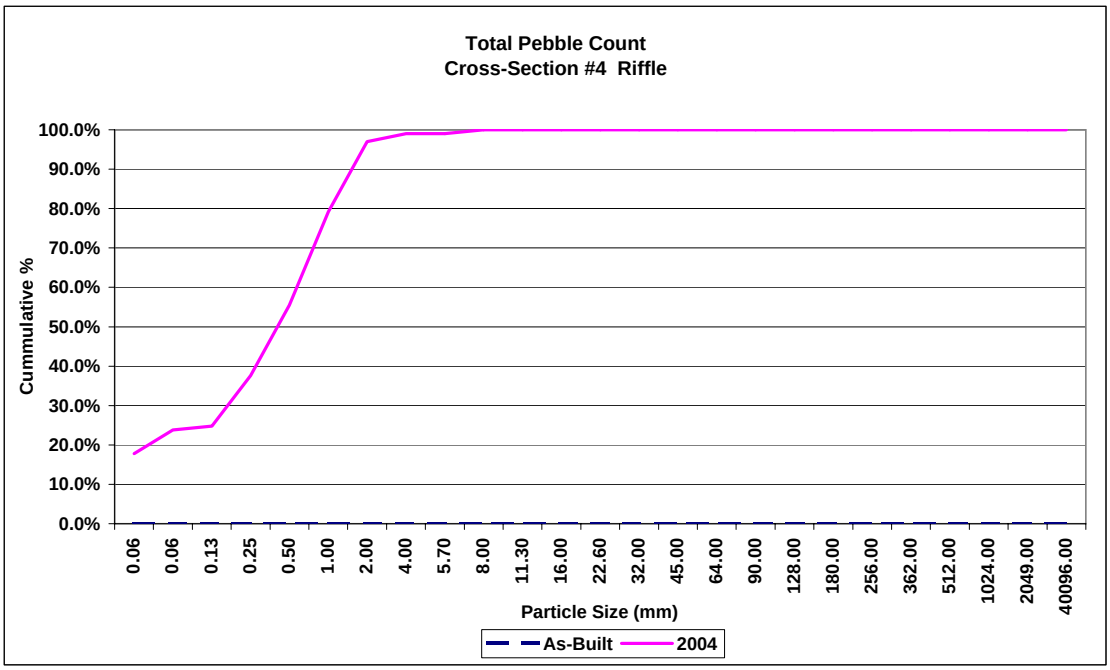
	2004	2003	AS-BUILT
Area	53.9	56.4	54.4
Width	24.1	24.0	24.9
Mean Depth	2.2	2.4	2.2
Max Depth	3.2	3.2	3.1
W/D	10.8	10.2	11.4



Project Name	Austin Reach 2
Cross Section	#3
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	15	3	17.8%	17.8%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	6	0	5.9%	23.8%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	1	0	1.0%	24.8%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	13	12.9%	37.6%
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	18	17.8%	55.4%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	24	23.8%	79.2%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	18	17.8%	97.0%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	2	2.0%	99.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	1	1.0%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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!		22	79	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.00	0.34	0.64	1.90	2.83



Project Name	Smith and Austin
Cross Section	AR3-1
Feature	Pool
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
16.9	227.0	LP
31.6	227.2	
45.1	227.4	
60.0	227.0	
70.6	226.7	
75.1	225.7	
77.9	224.7	
83.5	223.9	
87.0	223.6	
88.9	223.3	
93.3	222.9	
95.0	223.1	
96.7	223.2	
97.5	225.2	
101.3	225.4	
105.8	226.6	BKF
110.3	227.2	
113.9	227.4	RP

2003
2003 Survey

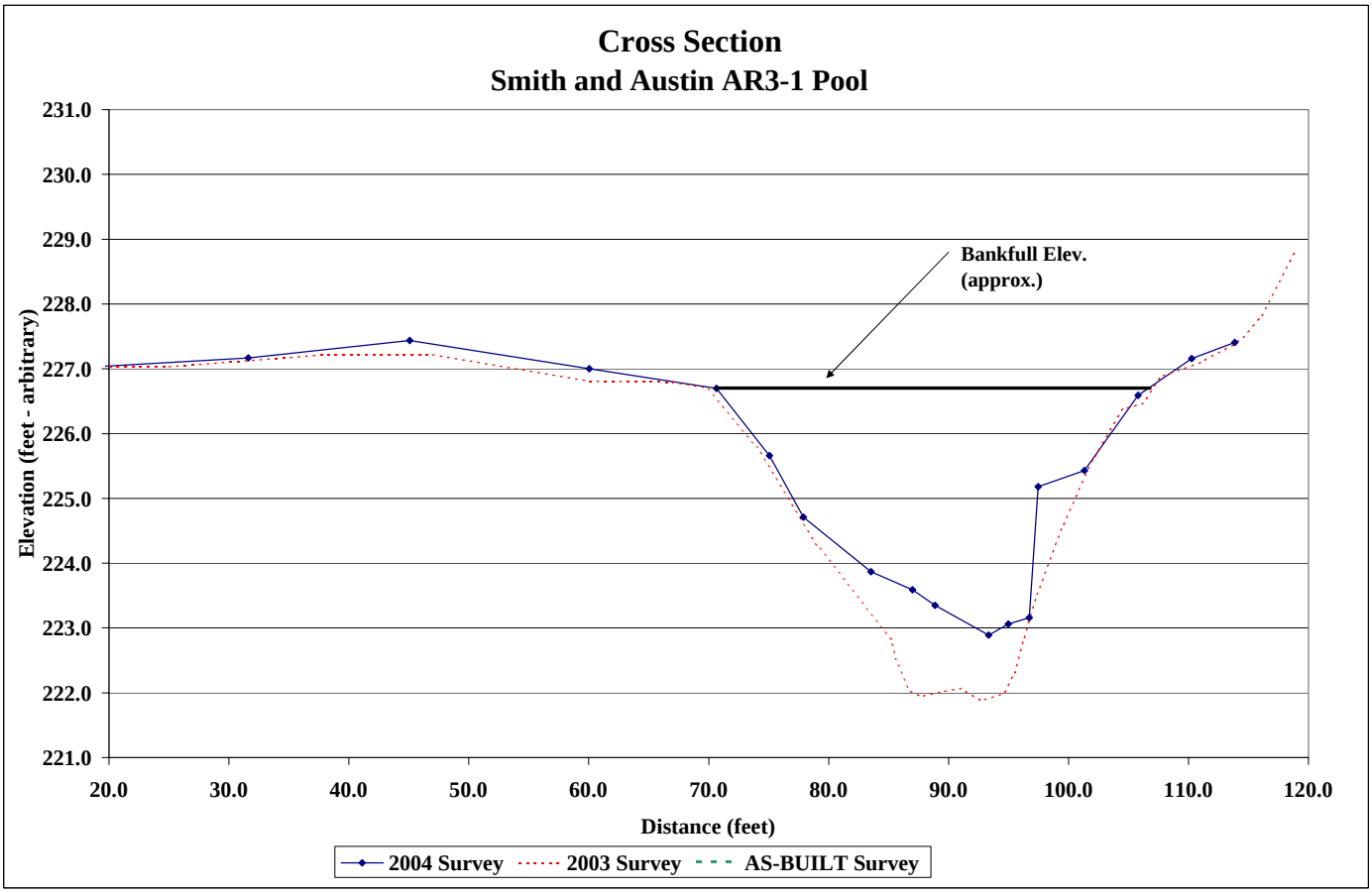
Station	Elevation	Notes
2.0	230.0	
4.4	230.1	
6.0	230.3	
7.9	230.2	
10.0	229.7	
11.3	229.3	
12.2	228.5	
13.0	227.4	
14.0	226.9	
16.9	227.0	LP
25.0	227.0	
38.0	227.2	
47.0	227.2	
60.0	226.8	
67.0	226.8	
69.8	226.7	BKF
74.0	225.8	
79.0	224.3	
85.2	222.8	
85.6	222.5	
86.7	222.0	
87.7	221.9	
89.5	222.0	
91.0	222.1	
92.7	221.9	
94.6	222.0	
95.5	222.3	
96.2	222.8	
97.4	223.5	
99.5	224.6	
102.1	225.6	
104.5	226.4	
106.2	226.5	
107.7	226.9	BKF
111.0	227.1	
113.9	227.4	RP
114.6	227.5	
116.0	227.8	
119.0	228.8	
122.0	229.9	
132.0	230.2	
145.0	230.5	
155.0	230.7	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section AR3-1 - Looking Downstream @ STA 34+55

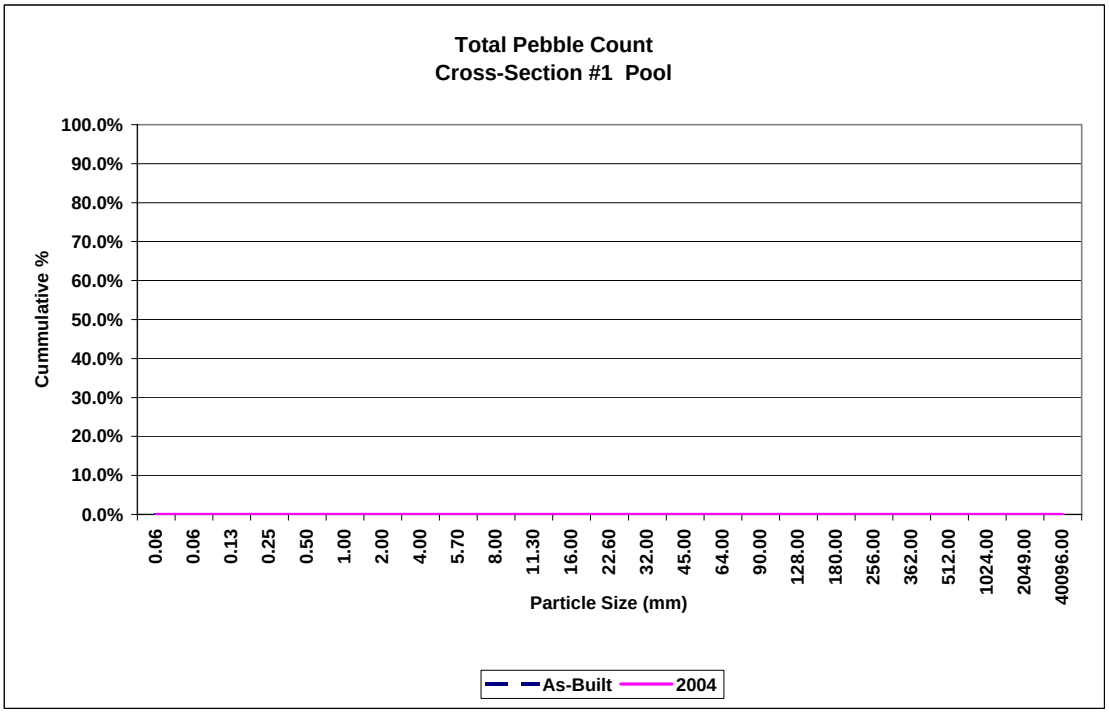
	2004	2003	AS-BUILT
Area	72.7	87.5	97.1
Width	39.6	41.2	37.3
Mean Depth	1.8	2.1	2.6
Max Depth	3.8	4.8	4.8
W/D	21.6	19.4	14.3



Project Name	Austin Reach 3
Cross Section	#1
Feature	Pool
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Pool - Bank**	**Pool - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
G r a v e l	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
TOTAL / %of whole count			0	#DIV/0!		0	0	#DIV/0!	

	d16	**d35**	**d50**	**d85**	**d95**
2004	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!



Project Name	Smith and Austin
Cross Section	AR3-2
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
12.3	227.6	LP
28.5	227.2	
41.8	226.3	
44.7	224.9	
47.3	223.6	
50.6	222.9	
53.4	223.2	
56.3	223.8	
69.1	223.9	
77.4	226.7	BKF
92.1	227.1	
104.9	227.4	
122.7	227.4	RP

2003
2003 Survey

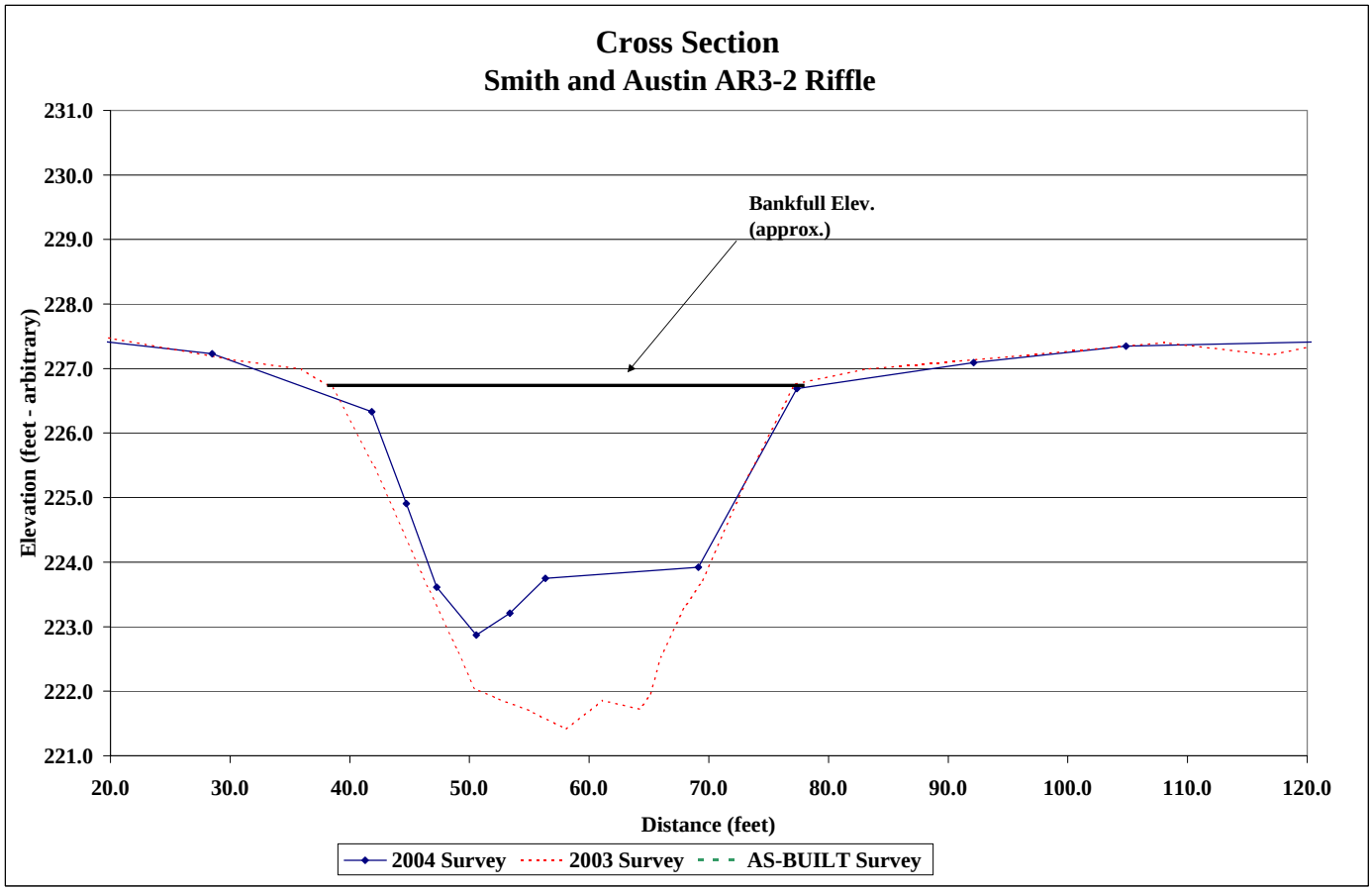
Station	Elevation	Notes
3.0	229.6	
4.0	226.8	
6.0	227.0	
9.4	227.3	
12.6	227.6	LP
20.0	227.5	
30.0	227.1	
36.0	227.0	
38.6	226.7	BKF
42.0	225.5	
46.5	223.6	
48.9	222.7	
50.4	222.0	
52.3	221.9	
55.0	221.7	
58.1	221.4	
61.1	221.9	
64.2	221.7	
65.1	221.9	
66.0	222.5	
68.0	223.3	
69.4	223.7	
73.4	225.4	
77.2	226.8	BKF
83.0	227.0	
95.0	227.2	
108.0	227.4	
117.0	227.2	
122.4	227.4	RP
124.0	227.5	
128.0	228.1	
132.0	228.9	
136.0	229.6	
145.0	230.1	
161.0	230.6	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section AR3-2 - Looking Downstream @ STA 35+15

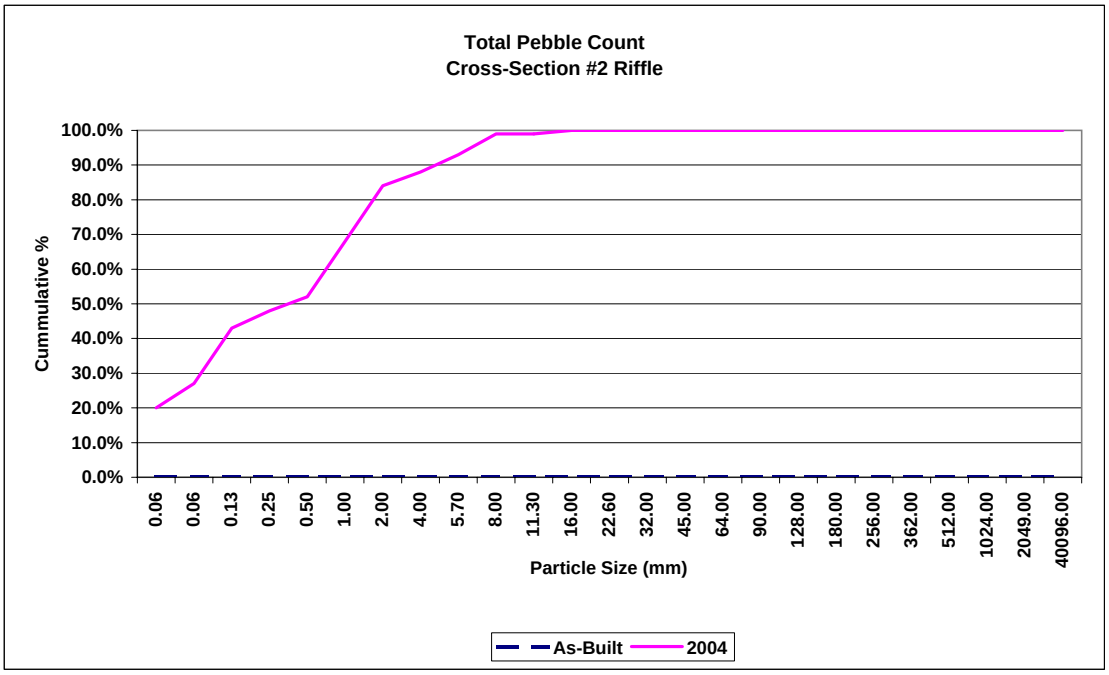
	2004	2003	AS-BUILT
Area	97.1	125.1	126.5
Width	35.5	37.2	38.4
Mean Depth	2.7	3.4	3.3
Max Depth	3.8	5.3	5.3
W/D	13.0	11.1	11.7



Project Name	Austin Reach 3
Cross Section	#2
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	8	12	20.0%	20.0%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	7	0	7.0%	27.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	15	1	16.0%	43.0%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	5	5.0%	48.0%
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	4	4.0%	52.0%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	16	16.0%	68.0%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	16	16.0%	84.0%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	4	4.0%	88.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	5	5.0%	93.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	6	6.0%	99.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.0%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	1	1.0%	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!		30	70	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.00	0.14	0.56	3.00	7.78



Project Name	Smith and Austin
Cross Section	AR3-3
Feature	Pool
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
44.3	226.5	LP
67.7	226.5	
77.5	226.6	
93.8	226.6	
102.2	226.5	BKF
108.5	224.8	
115.1	223.7	
115.5	223.2	
118.6	222.7	
120.9	222.7	
124.8	223.1	
127.9	223.3	
131.7	223.2	
135.3	223.5	
141.3	226.8	
148.2	226.7	
148.8	226.7	RP

2003
2003 Survey

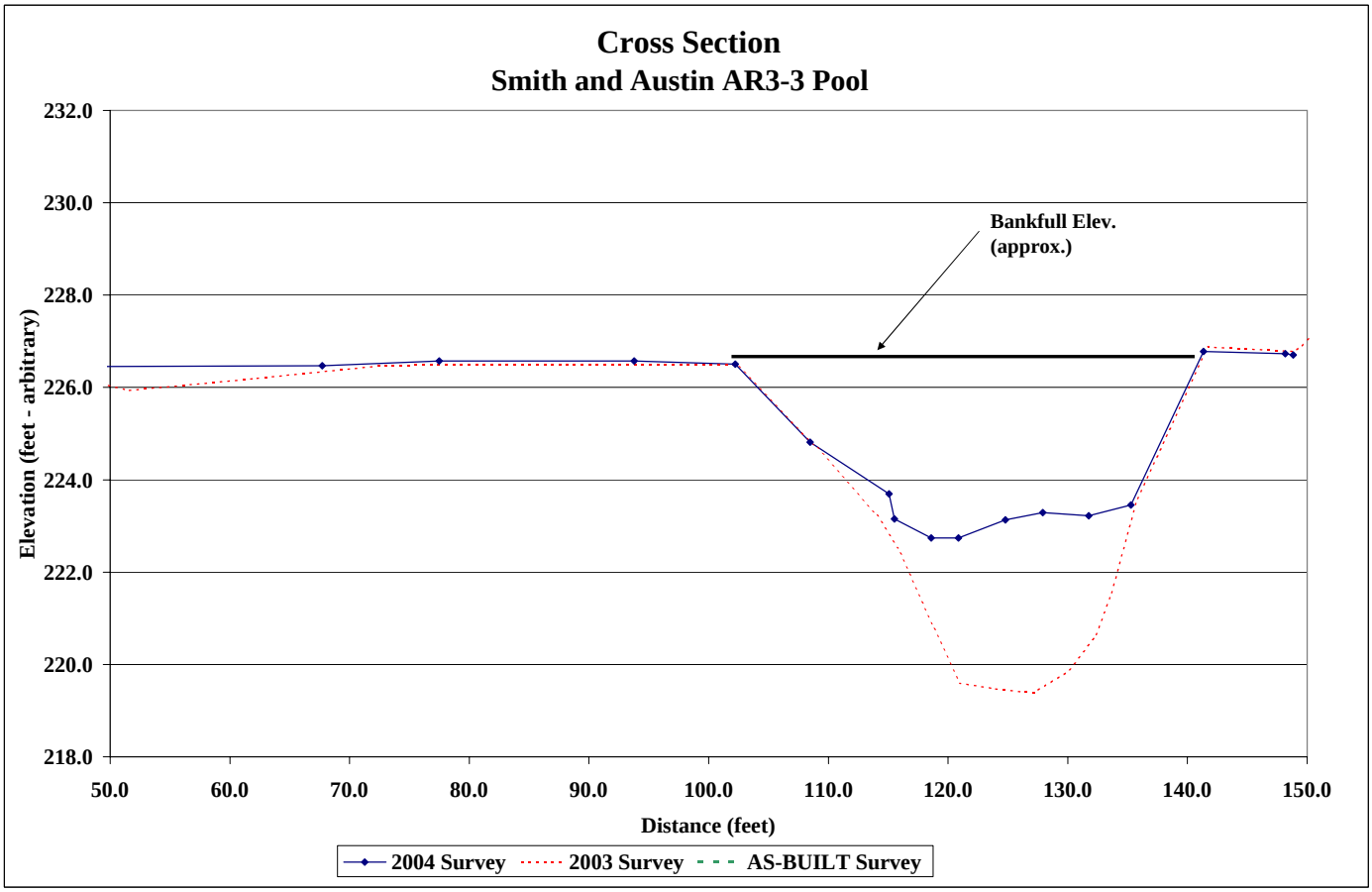
Station	Elevation	Notes
4.0	230.2	
15.0	229.4	
25.0	228.8	
35.7	228.5	
39.3	227.8	
43.7	226.4	
44.2	226.4	LP
51.6	225.9	
62.0	226.2	
72.9	226.5	
88.0	226.5	
102.3	226.5	BKF
109.0	224.7	
114.0	223.2	
115.8	222.5	
118.7	220.9	
121.0	219.6	
123.8	219.5	
126.0	219.4	
127.2	219.4	
130.0	219.8	
132.3	220.6	
133.6	221.5	
135.8	223.6	
141.7	226.9	BKF
148.9	226.8	RP
149.4	226.9	
153.0	227.8	
156.9	228.7	
164.0	228.9	
180.0	228.8	
201.0	228.8	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section AR3-3 - Looking Downstream @ STA 38+15

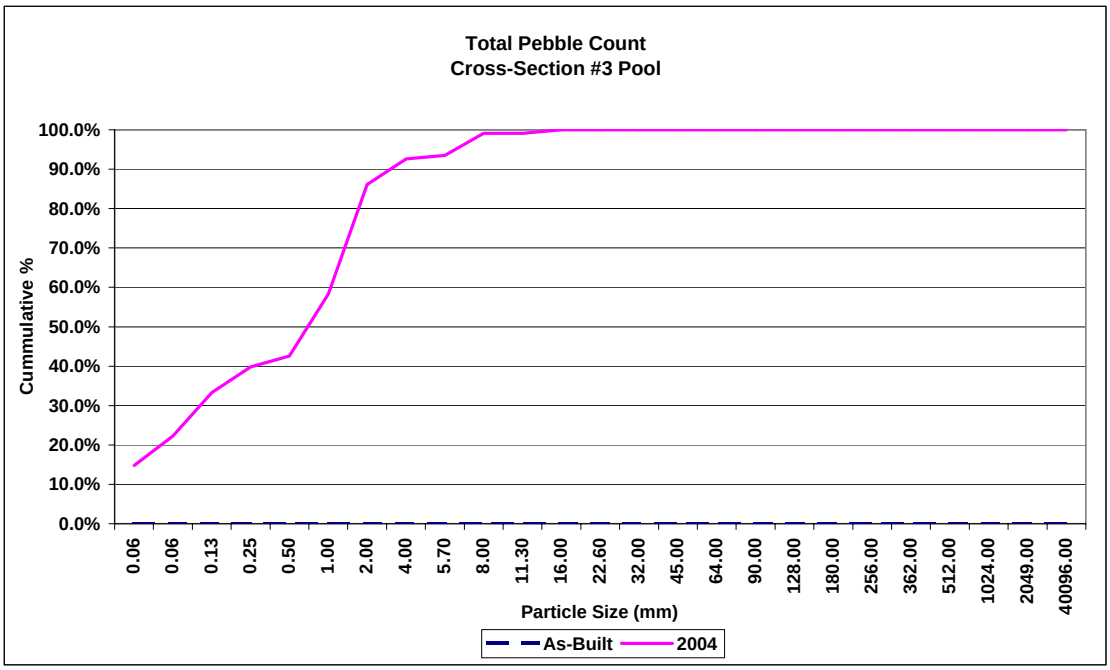
	2004	2003	AS-BUILT
Area	93.0	151.2	153.8
Width	39.1	39.4	38.5
Mean Depth	2.4	3.8	4.0
Max Depth	3.8	7.1	7.1
W/D	16.4	10.3	9.6



Project Name	Austin Reach 3
Cross Section	#3
Feature	Pool
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Pool - Bank**	**Pool - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	13	3	14.8%	14.8%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	8	0	7.4%	22.2%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	12	0	11.1%	33.3%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	7	0	6.5%	39.8%
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	3	2.8%	42.6%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	17	15.7%	58.3%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	30	27.8%	86.1%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	7	6.5%	92.6%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	1	0.9%	93.5%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	6	5.6%	99.1%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.1%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	1	0.9%	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!		40	68	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.07	0.24	1.10	2.89	7.60



Project Name	Smith and Austin
Cross Section	AR3-4
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
18.5	225.3	LP
22.1	225.3	
30.8	225.6	
41.2	225.5	BKF
48.7	223.0	
51.8	222.7	
54.5	223.1	
56.2	222.9	
61.3	222.2	
64.8	222.9	
66.5	223.2	
69.9	224.0	
76.3	226.4	
80.2	226.2	
90.4	226.4	
99.0	226.4	
99.9	226.5	RP

2003
2003 Survey

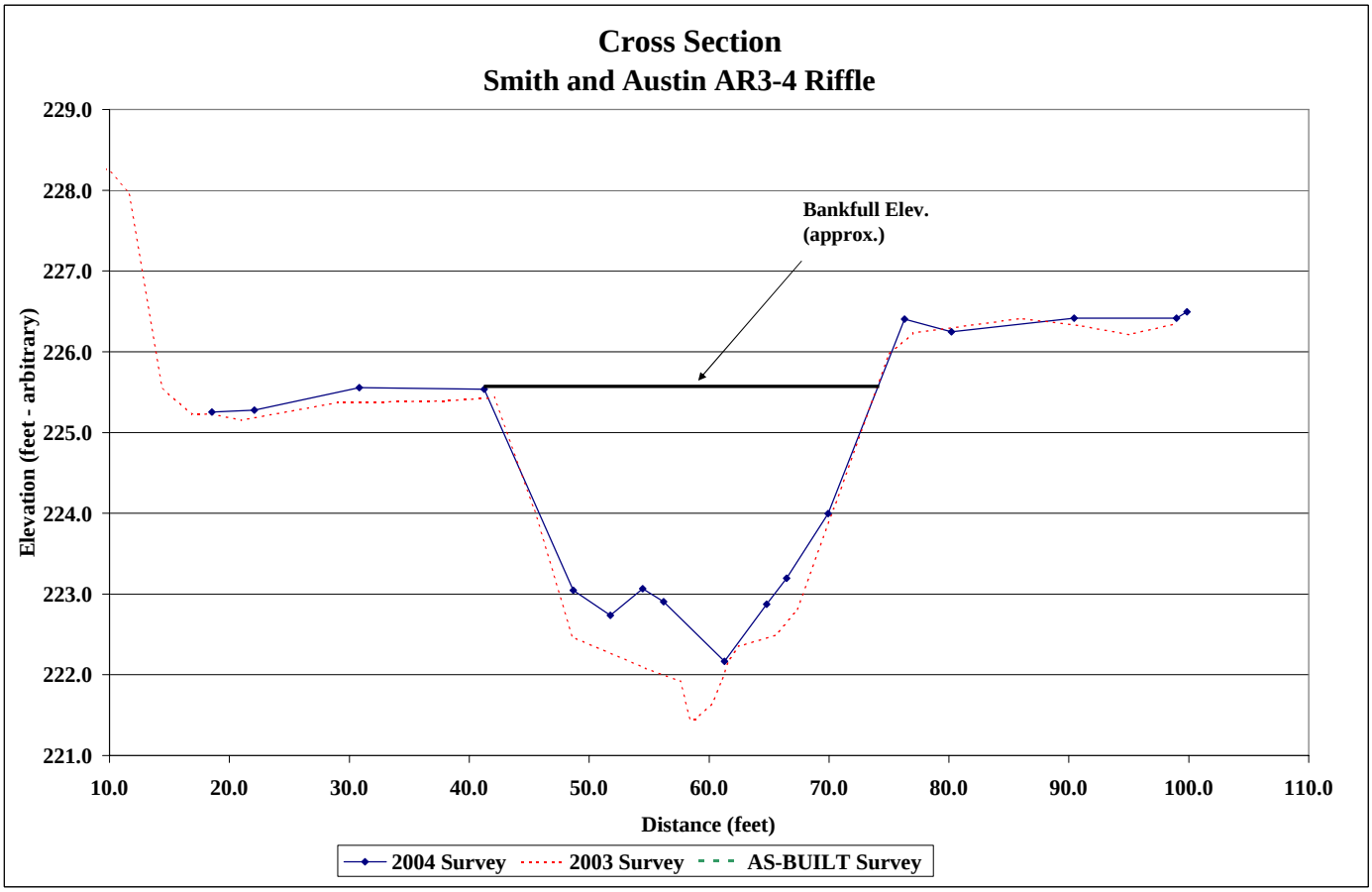
Station	Elevation	Notes
6.5	228.6	
10.0	228.2	
11.6	228.0	
14.4	225.6	
16.9	225.2	
18.5	225.2	LP
21.0	225.2	
29.0	225.4	
38.0	225.4	
42.1	225.4	BKF
45.4	224.1	
48.6	222.5	
54.7	222.1	
57.6	221.9	
58.4	221.5	
58.9	221.5	
60.3	221.7	
61.0	221.9	
61.7	222.2	
62.5	222.4	
65.5	222.5	
67.3	222.8	
70.4	224.1	
75.0	226.0	
77.0	226.2	
86.0	226.4	
91.0	226.3	
95.0	226.2	
99.0	226.4	
99.9	226.5	RP
100.6	226.5	
103.6	227.5	
106.3	228.2	
112.0	228.2	
128.0	228.2	
133.0	228.5	
147.2	228.3	
150.0	228.6	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section AR3-4 - Looking Downstream @ STA 41+00

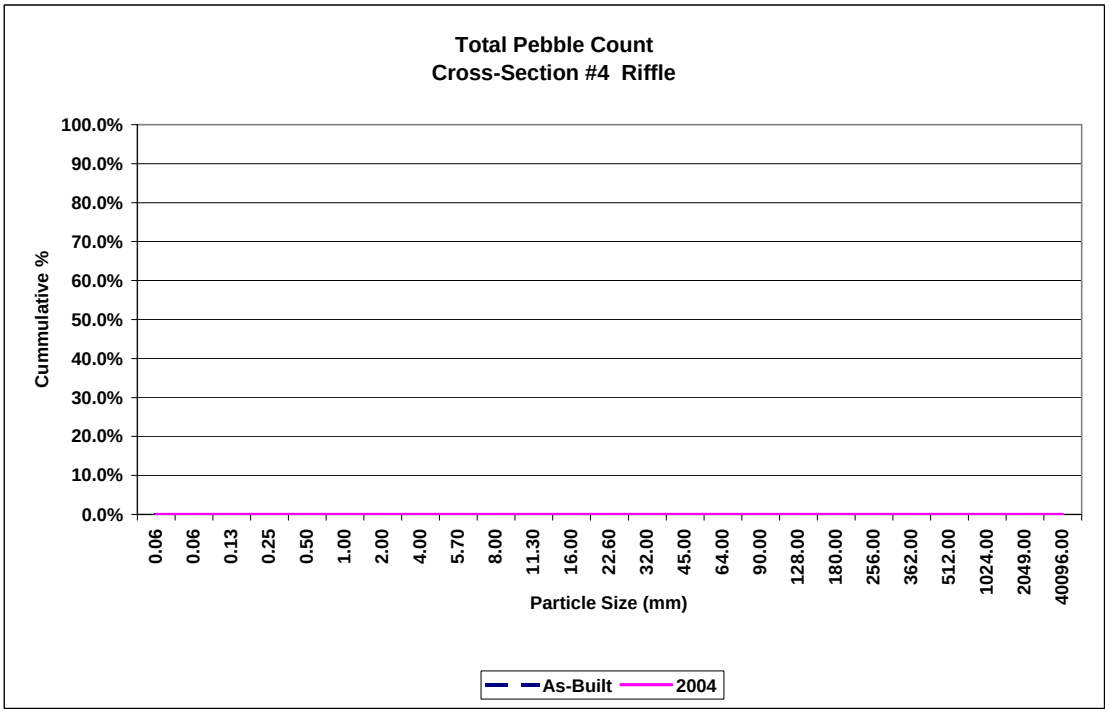
	2004	2003	AS-BUILT
Area	63.7	77.4	78.8
Width	35.1	34.1	31.6
Mean Depth	1.8	2.3	2.5
Max Depth	3.3	4.0	4.0
W/D	19.3	15.0	12.7



Project Name	Austin Reach 3
Cross Section	#4
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	#DIV/0!
TOTAL / %of whole count			0	#DIV/0!		0	0	#DIV/0!	

	d16	**d35**	**d50**	**d85**	**d95**
2004	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

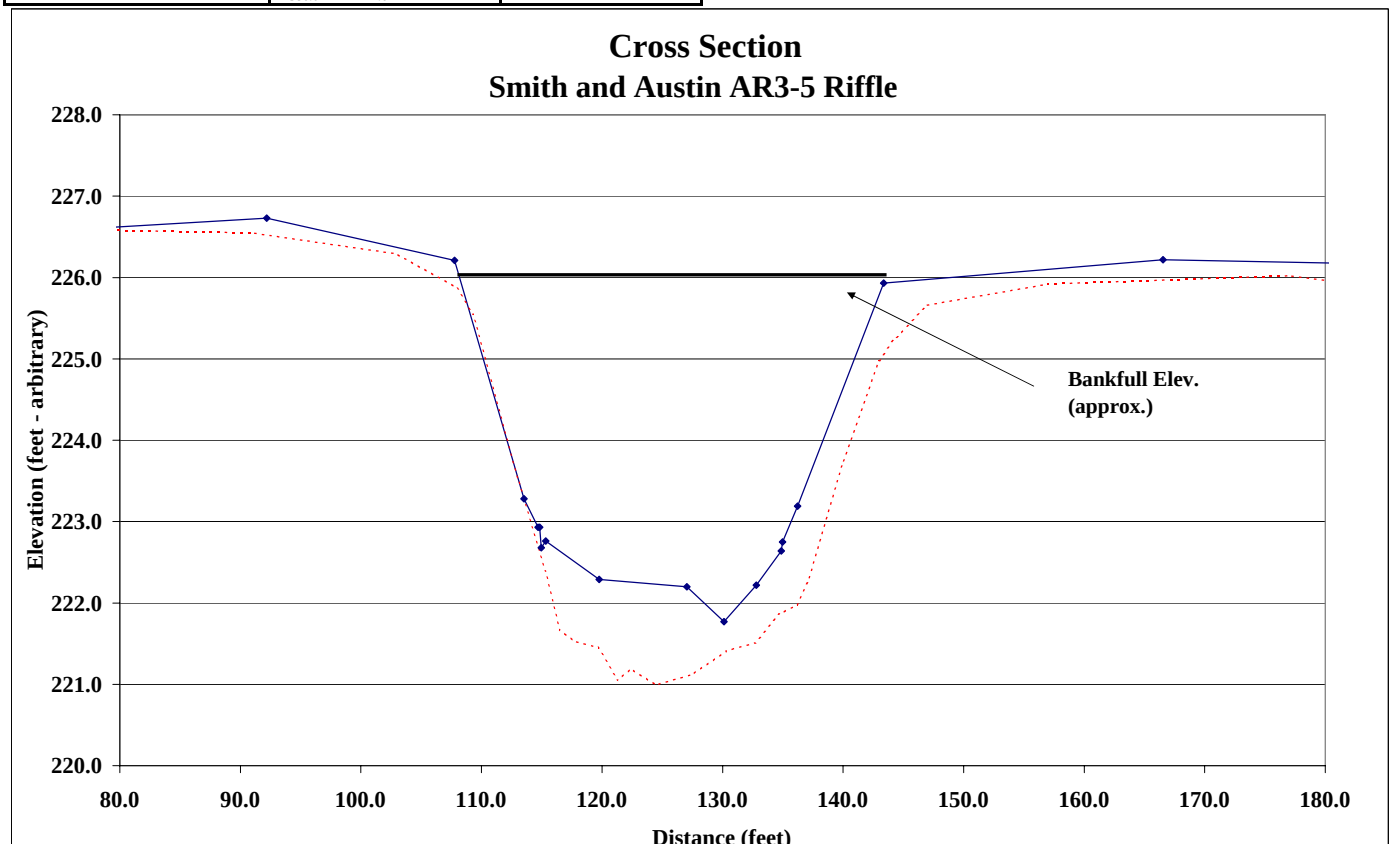


Project Name	Smith and Austin
Cross Section	AR3-5
Feature	Riffle
Date	6/25/05
Crew	Bidelspach, Clinton

2004 Survey			2003 Survey			AS-BUILT Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
16.6	226.8	LP	2.0	226.9				
33.0	226.3		7.0	226.7				
60.3	226.5		15.6	226.7	LP			
92.2	226.7		31.0	226.4				
107.8	226.2		44.0	226.1				
113.5	223.3		58.0	226.4				
114.7	222.9		75.0	226.6				
114.8	222.9		91.0	226.6				
115.0	222.7		103.0	226.3				
115.3	222.8		107.9	225.9	BKF			
119.8	222.3		109.3	225.6				
127.0	222.2		113.0	223.5				
130.1	221.8		115.3	222.4				
132.8	222.2		116.5	221.7				
134.9	222.6		117.7	221.5				
135.0	222.8		119.7	221.5				
136.2	223.2		121.3	221.1				
143.4	225.9	BKF	122.4	221.2				
166.5	226.2		124.5	221.0				
186.9	226.2		127.5	221.1				
201.5	225.8		130.3	221.4				
229.0	225.6		132.7	221.5				
257.8	225.6		134.7	221.9				
282.8	225.8		136.2	222.0				
299.7	225.9		137.1	222.3				
310.9	225.8		140.0	223.7				
334.7	225.7		143.0	225.0				
358.6	224.8	RP	144.2	225.2				
			147.0	225.7	BKF			
			157.0	225.9				
			177.0	226.0				
			200.0	225.6				
			208.0	225.4				
			219.0	225.5				
			247.0	225.4				
			274.0	225.5				
			293.0	225.8				
			300.0	225.7				
			306.0	225.7				
			320.0	225.4				
			337.0	225.4				
			356.0	225.6				
			359.6	225.6	RP			
			363.5	225.6				
			368.0	226.2				
			376.0	226.7				
			386.0	227.6				

Photo of Cross-Section AR3-5 - Looking Downstream @ STA 46+40

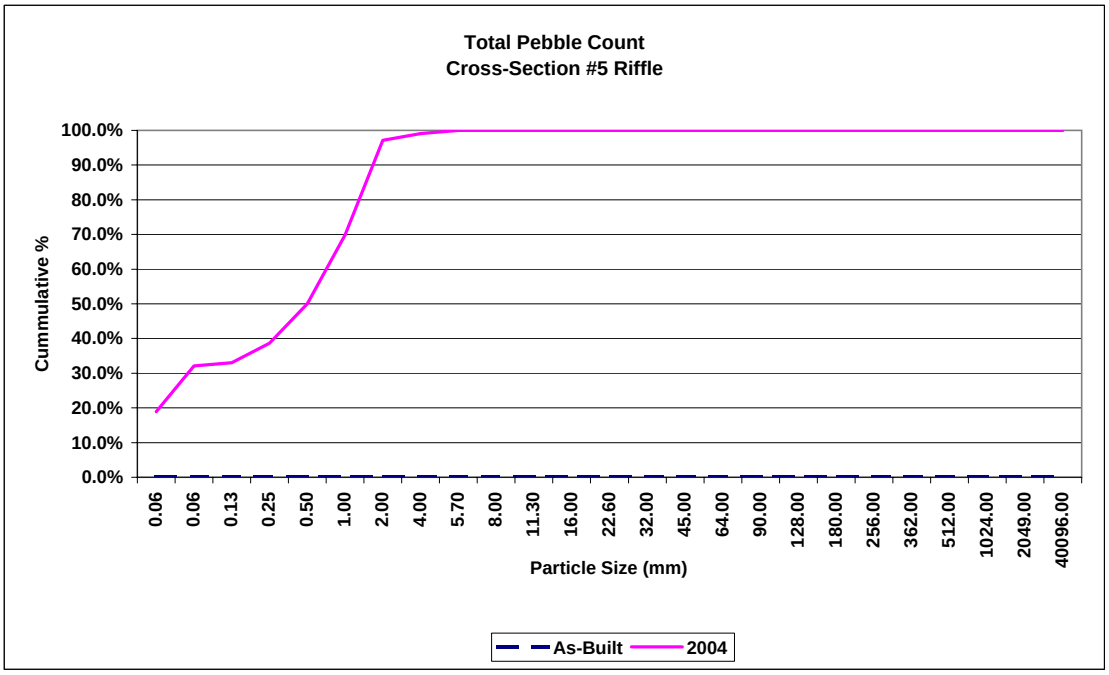
	2004	2003	AS-BUILT
Area	88.9	116.0	99.9
Width	35.6	39.1	34.3
Mean Depth	2.5	3.0	2.9
Max Depth	3.9	4.7	4.2
W/D	14.2	13.2	11.8



Project Name	Austin Reach 3
Cross Section	#5
Feature	Riffle
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bank**	**Riffle - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	20	0	18.9%	18.9%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	14	0	13.2%	32.1%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	1	0.9%	33.0%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	6	5.7%	38.7%
	course sand	0.50	0	#DIV/0!	#DIV/0!	4	8	11.3%	50.0%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	2	19	19.8%	69.8%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	29	27.4%	97.2%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	2	1.9%	99.1%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	1	0.9%	100.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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!		40	66	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.00	0.25	0.75	2.28	2.88



Project Name	Smith and Austin
Cross Section	AR3-6
Feature	Pool
Date	6/25/05
Crew	Bidelspach, Clinton

2004
2004 Survey

Station	Elevation	Notes
79.9	225.1	LP
94.7	224.8	
126.9	224.7	
157.7	224.1	BKF
167.2	223.1	
171.0	222.4	
174.8	222.1	
179.8	222.0	
182.2	221.8	
187.0	221.6	
189.3	221.1	
192.6	222.1	
197.8	224.5	
206.6	225.3	
227.4	226.2	RP

2003
2003 Survey

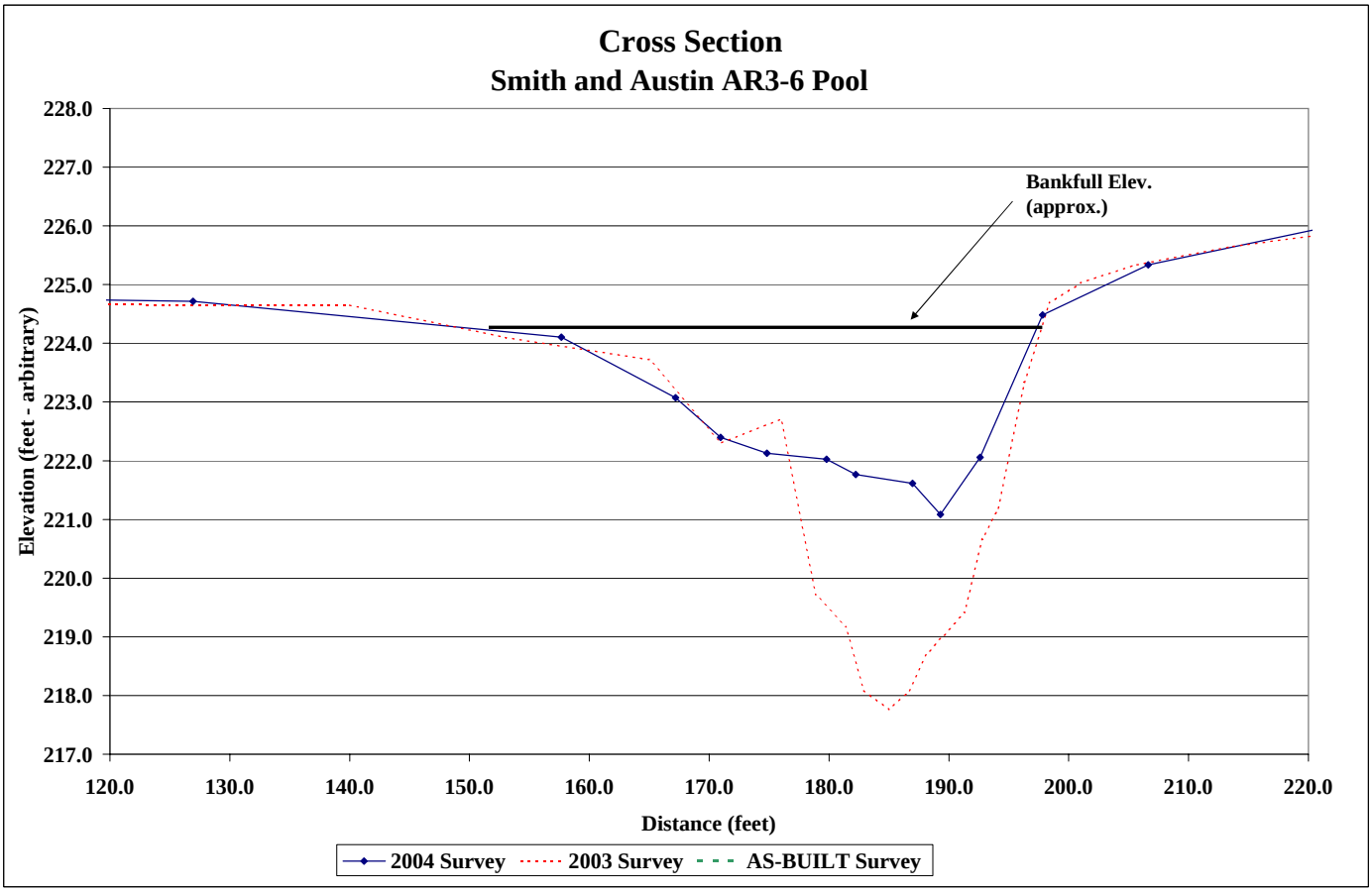
Station	Elevation	Notes
2.0	226.6	
20.0	226.2	
37.0	225.9	
61.0	225.4	
79.9	225.2	LP
101.0	224.7	
125.0	224.7	
140.0	224.7	BKF
153.0	224.1	
165.0	223.7	
171.0	222.3	
176.0	222.7	
178.9	219.7	
181.4	219.2	
182.9	218.1	
185.0	217.8	
186.7	218.1	
188.1	218.7	
189.4	219.0	
191.3	219.4	
192.8	220.7	
194.1	221.2	
196.3	223.3	
198.4	224.7	BKF
201.0	225.0	
205.3	225.3	
213.3	225.6	
223.0	225.9	
227.4	226.2	RP
229.0	226.2	

AS-BUILT
AS-BUILT Survey

Station	Elevation	Notes

Photo of Cross-Section AR3-6 - Looking Downstream @ STA 48+20

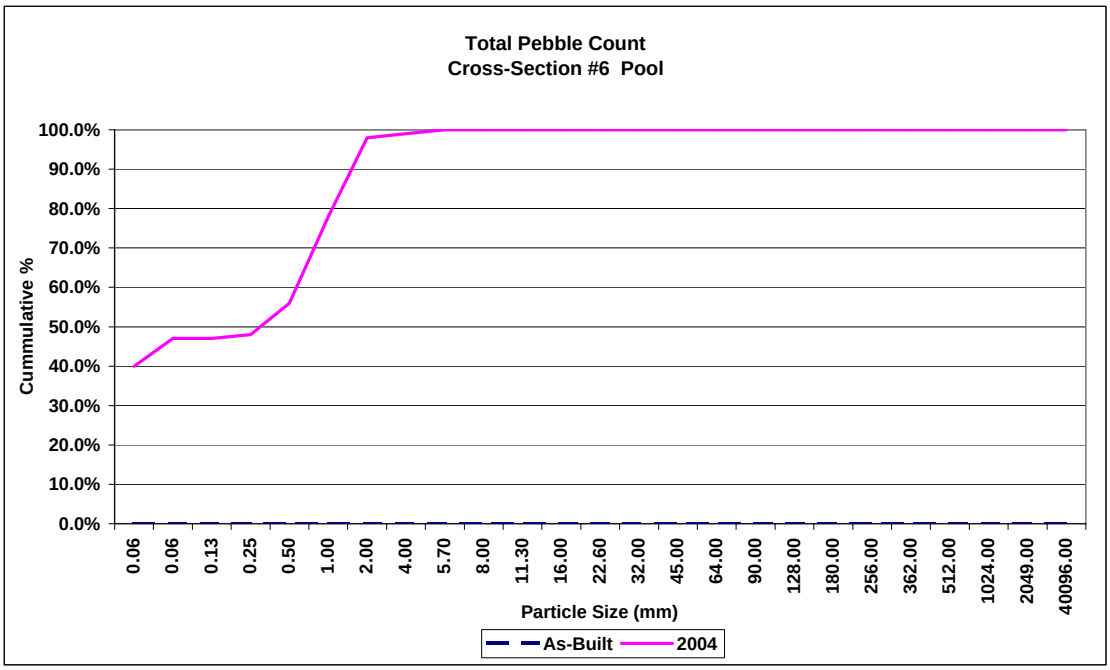
	2004	2003	AS-BUILT
Area	70.0	108.9	135.7
Width	56.9	58.4	58.3
Mean Depth	1.2	1.9	2.3
Max Depth	3.4	6.7	6.9
W/D	46.2	31.3	25.0



Project Name	Austin Reach 3
Cross Section	#6
Feature	Pool
Date	6/25/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Pool - Bank**	**Pool - Bed**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	40	0	40.0%	40.0%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	7	0	7.0%	47.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	0	0.0%	47.0%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	0	1	1.0%	48.0%
	course sand	0.50	0	#DIV/0!	#DIV/0!	1	7	8.0%	56.0%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	9	13	22.0%	78.0%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	3	17	20.0%	98.0%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	1	1.0%	99.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	1	1.0%	100.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	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	40	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.00	0.00	0.47	1.95	2.78



Smith Stream Restoration
Wake Forest, NC

Quad 1

Tree Stratum

Species	Height (cm)	Diameter (mm)	Radius (mm)	Σ X-sec. (mm²)	Rel. x-sec (%)	Density	Rel. Density (%)	Rank (Importance)	Average
Quercus phellos	87	11	5.5						
	31	8	4						
	31	7	3.5						
Total			**13**	**530.9**	**42.6**	**3**	**30**	**1**	**36.3**
Fraxinus sp.	62	12	6						
	15	3	1.5						
Total			**7.5**	**176.7**	**14.2**	**2**	**20**	**3**	**17.1**
Quercus falcata	33	14	7						
	42	8	4						
Total			**11**	**380.1**	**30.5**	**2**	**20**	**2**	**25.2**
Platanus occidentalis	42	9	4.5						
Total			**4.5**	**63.6**	**5.1**	**1**	**10**	**5**	**7.6**
Pinus taeda	23	5	2.5						
	20	6	3						
Total			**5.5**	**95.0**	**7.6**	**2**	**20**	**4**	**13.8**
Overall Total				**1246.4**	**100.0**	**10**	**100**		

Total Trees per acre	400
Planted trees per acre	200
Natural regen. trees per acre	200

Shrub Stratum

Species	Cover (%)	Rel. cover (%)	Density	Rel. Density (%)	Rank (Importance)
Diospyros virginiana	1	100	1	100	1

Herb Stratum

Species	Cover (%)	Rel. cover (%)	Rank (Importance)
Eupatorium capifolium	30	39.0	2
Lespedeza cuneata	40	51.9	1
Solidago sp.	5	6.5	3
Festuca sp.	2	2.6	4
Total	**77**	**100**	

Smith Stream Restoration
Wake Forest, NC

Quad 2

Tree Stratum

Species	Height (cm)	Diameter (mm)	Radius (mm)	Σ X-sec. (mm²)	Rel. x-sec (%)	Density	Rel. Density (%)	Rank (Importance)	Average
Fraxinus sp.	11	4	2						
	5.5	1	0.5						
	5.8	1	0.5						
	10	1	0.5						
	5.5	1	0.5						
	11	1	0.5						
	22.5	5	2.5						
	19	2	1						
	20	3	1.5						
	20	2	1						
	19	2	1						
	19	2	1						
	18	2	1						
	18	2	1						
	17	2	1						
	17	2	1						
	15	2	1						
	18	2	1						
	14	2	1						
	12	1	0.5						
	12	1	0.5						
	10	1	0.5						
	9	1	0.5						
	14	2	1						
	15	3	1.5						
	18	2	1						
	17	2	1						
	19	3	1.5						
	20	3	1.5						
	18	2	1						
	10	1	0.5						
	19	2	1						
	10	1	0.5						
	15	1	0.5						
	18	2	1						
	10	1	0.5						
	7.1	1	0.5						
Total			**34.5**	**3739.3**	**4.8**	**37**	**47.4**	**2**	**26.1**
Platanus occidentalis	18	2	1						
	8	1	0.5						
	26	2	1						
	15.5	3	1.5						
	26	2	1						
	42	2	1						
	30	2	1						
	25	2	1						
	23	2	1						
	24	3	1.5						
	24	3	1.5						
	28	2	1						
	27	3	1.5						
	22	2	1						
	14	2	1						
	13	2	1						
	14	2	1						
	20	3	1.5						
	20	3	1.5						
	18	3	1.5						
	17	3	1.5						
	16	2	1						
	11	1	0.5						
	12	1	0.5						
	14	2	1						
	14	2	1						
	18	2	1						
	23	5	2.5						
Total			**32**	**3217.0**	**4.1**	**28**	**35.9**	**3**	**20.0**
Liquidambar styracifula	12.5	1	0.5						
	26	1	0.5						
	11	1	0.5						
	22	2	1						
Total			**2.5**	**19.6**	**0.0**	**4**	**5.1**	**4**	**2.6**
Liriodendron tulipifera	11	2	1						
Total			**1**	**3.1**	**0.0**	**1**	**1.3**	**7**	**0.6**
Betula nigra	27	3	1.5						
Total			**1.5**	**7.1**	**0.0**	**1**	**1.3**	**7**	**0.6**
Cercis canadensis	15	2	1						
Total			**1**	**3.1**	**0.0**	**1**	**1.3**	**7**	**0.6**

Acer rubrum	18	2	1						
	13	0.5	0.25						
	12	1	0.5						
Total			**1.75**	**9.6**	**0.0**	**3**	**3.8**	**5**	**1.9**
Acer negundo	14	2	1						
	30	3	1.5						
Total			**2.5**	**19.6**	**0.0**	**2**	**2.6**	**6**	**1.3**
Pinus taeda	1000	300	150						
Total			**150**	**70685.8**	**91.0**	**1**	**1.3**	**1**	**46.1**
Overall Total				**77704.3**	**100.0**	**78**	**100**		**100.0**
Total Trees per acre						3120			
Planted trees per acre						40			
Natural regen. trees per acre						3080			

Shrub stratum
No shrubs found

Herb Stratum

Species	**Cover (%)**	**Rel. cover (%)**	**Rank (Importance)**
Rudbeckia hirta	2	5.1	4
Lezpedeza cuneata	1	2.6	5
Eupatorium cappilifolium	10	25.6	2
Solidago sp.	5	12.8	3
Panicum caldestinum	1	2.6	5
Festuca sp.	20	51.3	1

Austin Stream Restoration
Wake Forest, NC

Quad 1

Tree Stratum

Species	Height (cm)	Diameter (mm	Radius (mm)	Σ X-sec. (mm²)	Rel. x-sec (%)	Density	Rel. Density (%)	Rank (Importance)	Average
Fraxinus sp.	42	6	3	28.3					
	43	7	3.5	38.5					
	35	5	2.5	19.6					
	22	3	1.5	7.1					
	32	5	2.5	19.6					
	30	7	3.5	38.5					
	44	6	3	28.3					
	33	7	3.5	38.5					
	36	6	3	28.3					
	43	5	2.5	19.6					
	36	5	2.5	19.6					
	36	6	3	28.3					
Total			**34**	**314.2**	**39.9**	**12**	**60**	**1**	**49.9**
Betula nigra	30	4	2	12.6					
	33	5	2.5	19.6					
	25	5	2.5	19.6					
	46	5	2.5	19.6					
Total			**9.5**	**283.5**	**36.0**	**4**	**20**	**2**	**28.0**
Platanus occidentalis	31	5	2.5	19.6					
	74	12	6	113.1					
Total			**8.5**	**132.7**	**16.8**	**2**	**10**	**3**	**13.4**
Liriodendron tulipifera	20	3	1.5	7.1					
Total			**1.5**	**7.1**	**0.9**	**1**	**5**	**5**	**2.9**
Acer negundo	58	8	4	50.3					
Total			**4**	**50.3**	**6.4**	**1**	**5**	**4**	**5.7**
Overall Total			**57.5**	**787.8**	**100**	**20**	**100**		
Total Trees per acre						800			
Planted trees per acre						80			
Natural regen. trees per acre						720			

Shrub Stratum

Species	Cover (%)	Rel. cover (%)	Density	Rel. Density (%)	Rank (Importance)
Salix nigra	5	83.3	4	80	1
Unk. Shrub	1	16.7	1	20	2
Total	**6**	**100.0**	**5**	**100**	

Herb Stratum

Species	Cover (%)	Rel. cover (%)	Rank (Importance)
Solidago sp.	5	4.3	4
Geranium sp.	10	8.5	3
Festuca sp.	40	34.2	1
Erichtites hieracifolia	40	34.2	1
Eupatorium cappifolium	10	8.5	3
Aster sp.	12	10.3	2
Total	**117**	**100**	

Austin Stream Restoration
Wake Forest, NC

Quad 2

Tree Stratum

Species	Height (cm)	Diameter (mm)	Radius (mm)	Σ X-sec. (mm²)	Rel. x-sec (%)	Density	Rel. Density (%)	Rank (Importance)	Average
Platanus occidentalis	20	18	9						
	20	3	1.5						
	56	7	3.5						
	30	4	2						
Total			**16**	**804.2**	**16.7**	**4**	**11.1**		**13.9**
Liriodendron tulipifera	13	3	1.5						
	4	1	0.5						
Total			**2**	**12.6**	**0.3**	**2**	**5.6**		**2.9**
Fraxinus sp.	25	3	1.5						
	23	3	1.5						
	23	3	1.5						
	30	4	2						
	34	9	4.5						
	35	4	2						
	39	5	2.5						
	10	1	0.5						
	10	1	0.5						
	10	1	0.5						
	10	1	0.5						
	10	1	0.5						
	11	1	0.5						
	11	1	0.5						
	11	1	0.5						
	11	1	0.5						
	11	1	0.5						
	15	2	1						
	20	2	1						
	19	2	1						
	18	2	1						
	28	2	1						
	49	7	3.5						
	26	3	1.5						
	26	2	1						
Total			**31.5**	**3117.2**	**64.9**	**25**	**69.4**		**67.2**
Acer negundo	140	20	10						
	138	12	6						
Total			**16**	**804.2**	**16.7**	**2**	**5.6**	**1**	**11.1**
Betula nigra	23	3	1.5						
Total			**1.5**	**7.1**	**0.1**	**1**	**2.8**	**4**	**1.5**
Quercus phellos	17	5	2.5						
Total			**2.5**	**19.6**	**0.4**	**1**	**2.8**	**3**	**1.6**
Quercus sp.	44	7	3.5						
Total			**3.5**	**38.5**	**0.8**	**1**	**2.8**	**2**	**1.8**
Overall Total			**73**	**4803.5**	**100.0**	**36**	**100**		
Total Trees per acre						1440			
Planted trees per acre						80			
Natural regen. trees per acre						1360			

Shrub Stratum
No shrubs found

Herb Stratum

Species	Cover (%)	Rel. cover (%)	Rank (Importance)
Festuca sp.	30	60	1
Unknown 1	2	4	3
Unknown 2	1	2	4
Panicum clandestinum	15	30	2
Geranium sp.	2	4	3
Total	**50**	**100**	

Point	Station	Elevation	Description	Point	Station	Elevation	Description	Point	Station	Elevation	Description	Point	Station	Elevation	Description
1340	3.28	234.03	Thalweg	1341	3.1	234.32	Water	1339	15.69	237.89	LBKF	1342	5.98	237.86	RBKF
1343	17.7	233.78	Thalweg	1344	17.66	234.03	Water	1375	31.28	236.62	LBKF	1374	27.18	236.38	RBKF
1335	20	233.82	Head of Riffle	1346	24.62	234.03	Water	1376	67	236.02	LBKF	1372	36.57	237.56	RBKF
1345	24.43	233.6	Max Pool	1348	32.64	234.02	Water	1377	75.38	236.6	LBKF	1371	45.27	238.99	RBKF
1347	32.64	233.73	Head of Riffle	1350	38.67	233.81	Water	1378	86.35	237.22	LBKF	1370	56.45	238.76	RBKF
1349	39.02	233.55	Thalweg	1352	46.32	233.81	Water	1379	96.26	237.26	LBKF	1369	62.13	238.55	RBKF
1351	46.43	232.24	Thalweg	1354	52.4	233.81	Water	1380	110.28	236.93	LBKF	1368	74.68	238.32	RBKF
1353	53.34	232.06	Thalweg	1356	62.65	233.8	Water	1304	142.03	234.8	LBKF	1367	99.53	236.44	RBKF
1355	61.33	232.54	Thalweg	1358	66.47	233.81	Water	1381	152.78	236.83	LBKF	1317	108.6	235.11	RBKF
1357	66.7	232.65	Thalweg	1336	68.14	233.89	Water	1382	169.18	235.03	LBKF	1308	124.56	235.19	RBKF
1359	74.45	232.57	Thalweg	1360	75.66	233.81	Water	1384	213.52	234.26	LBKF	1390	146.04	235.15	RBKF
1361	87.75	233.03	Thalweg	1362	86.22	233.82	Water	1385	240.36	233.26	LBKF	1392	172.68	234.89	RBKF
1363	92.46	233.04	Thalweg	1364	92.52	233.81	Water	1386	262.1	233.58	LBKF	1395	213.45	233.35	RBKF
1365	99.41	232.66	Thalweg	1366	99.17	233.82	Water	1301	282.88	233.66	LBKF	1396	234.17	234.31	RBKF
1314	106.31	232.33	Max Pool	1315	105.73	233.7	Water	1387	283.68	233.69	LBKF	1398	245.92	233.93	RBKF
1312	112.79	232.7	Thalweg	1313	112.63	233.67	Water	1293	313.99	234.77	LBKF	1399	264.1	233.76	RBKF
1307	124.83	233.24	Head of Riffle	1309	124.44	233.66	Water	1292	314.49	233.53	LBKF	1401	281.33	233.23	RBKF
1305	134.37	233.23	Thalweg	1306	135.01	233.58	Water	1285	330.09	234.65	LBKF	1290	324.36	233.37	RBKF
1439	152.44	232.43	Thalweg	1440	149.37	233.48	Water	1282	337.81	234.35	LBKF	1278	356.81	233.83	RBKF
1437	159.28	232.51	Thalweg	1438	159.83	233.48	Water	1272	378.51	233.44	LBKF	1275	366.03	233.84	RBKF
1436	164.15	231.28	Thalweg	1435	170.26	233.49	Water	1271	395.86	234.24	LBKF	1255	444.54	234.83	RBKF
1434	169.01	231.38	Thalweg	1433	175.26	233.47	Water	1256	423.6	233.85	LBKF	1252	487.33	234.26	RBKF
1432	174.91	232.77	Thalweg	1431	178.12	233.44	Water	1248	447.01	234.53	LBKF	1231	526.49	233.44	RBKF
1430	177.84	233.04	Rock Vane	1429	179.06	232.43	Water	1242	476.17	234.48	LBKF	1211	571.84	233.68	RBKF
1428	178.98	232.28	Thalweg	1427	183.77	232.4	Water	1238	496.02	234.39	LBKF	1202	640.15	232.65	RBKF
1426	182.82	231.13	Thalweg	1425	188.14	232.45	Water	1235	508.84	233.98	LBKF	1199	640.51	232.67	RBKF
1424	187.01	230.57	Max Pool	1423	192.57	232.41	Water	1232	518.84	234	LBKF	1194	662.92	232.09	RBKF
1422	194.39	231.84	Thalweg	1421	203.27	232.4	Water	1230	533.45	233.83	LBKF	1136	664.67	233.73	RBKF
1420	203.08	232.24	Head of Riffle	1419	214.81	232.26	Water	1229	538.24	233.49	LBKF	1106	753.3	231.95	RBKF
1418	214.56	231.28	Max Pool	1417	221.71	232.19	Water	1224	558.87	233.03	LBKF	1105	782.44	233.01	RBKF
1416	221.16	231.73	Thalweg	1415	226.48	232.14	Water	1217	597.2	233.05	LBKF	1096	800.28	233.04	RBKF
1414	225.57	231.65	Thalweg	1413	238.12	232.15	Water	1210	615.6	233.16	LBKF	1086	831.65	232.88	RBKF
1412	238.2	231.83	Thalweg	1411	242.81	232.15	Water	1208	636.08	233.3	LBKF	1079	872.93	232.69	RBKF
1410	242.26	231.43	Thalweg	1409	255.45	232.13	Water	1203	644.42	233.05	LBKF	1074	896.28	231.68	RBKF
1408	255.55	231.72	Thalweg	1407	257.19	232.14	Water	1198	649.11	233.8	LBKF	1065	917.88	232.9	RBKF
1406	257.19	231.14	Head of Pool	1405	266.5	232.13	Water	1197	654.92	232.64	LBKF	1043	993.62	232.48	RBKF
1404	266.1	231.39	Thalweg	1403	281.47	232.14	Water	1130	680.6	234.13	LBKF	1037	1016.07	231.85	RBKF
1402	281.59	231.56	Thalweg	1300	292.54	232.14	Water	1127	694.94	233.64	LBKF	1033	1035.67	231.96	RBKF
1299	292.6	231.81	Head of Riffle	1298	307.57	232.07	Water	1119	718.06	233.03	LBKF	1025	1057.4	231.11	RBKF
1297	307.41	231.55	Head of Pool	1296	308.37	232.07	Water	1118	718.28	233.06	LBKF	983	1080.25	230.87	RBKF
1295	308.78	230.64	Max Pool	1289	321.15	232.07	Water	1115	730	232.1	LBKF	1013	1082.71	231.14	RBKF
1288	321.47	231.31	Head of Pool	1287	330.64	232.06	Water	1112	741.47	232.31	LBKF	964	1166.79	230.87	RBKF
1286	330.67	230.69	Max Pool	1281	344.76	232.03	Water	1107	750.4	232.38	LBKF	941	1179.03	230.92	RBKF
1280	344.58	231.76	Head of Riffle	1277	355.67	231.88	Water	1104	779.19	231.77	LBKF	940	1206.04	230.89	RBKF
1276	355.77	231.29	Thalweg	1274	366.85	231.87	Water	1097	801.63	232.59	LBKF	931	1228.32	230.86	RBKF
1273	366.66	231.25	Thalweg	1270	385.24	231.85	Water	1087	849.26	231.58	LBKF	904	1244.53	230.93	RBKF
1269	385.37	230.65	Thalweg	1268	399.2	231.83	Water	1077	872.34	232.28	LBKF	897	1260.59	230.64	RBKF
1267	398.7	230.86	Thalweg	1266	400.7	231.81	Water	1064	924.54	232.23	LBKF	893	1278.34	230.62	RBKF
1265	400.92	231.66	Rock Vane	1264	402.54	231.46	Water	1061	936.97	231.8	LBKF	887	1307.65	230.61	RBKF
1263	402.41	229.46	Thalweg	1260	412.58	231.43	Water	1046	981.79	231.82	LBKF	879	1330.51	230.37	RBKF
1259	410.79	228.6	Max Pool	1258	423.84	231.41	Water	1040	1014.89	231.37	LBKF	875	1354.16	230.98	RBKF
1257	424	231.19	Thalweg	1254	452.13	231.34	Water	1034	1044.61	231.16	LBKF	870	1368.4	230.26	RBKF
1253	451.93	230.17	Thalweg	1250	464.92	231.33	Water	1024	1057.73	231.5	LBKF	865	1382.31	230.63	RBKF
1249	465.05	230.25	Head of Pool	1247	480.9	231.3	Water	1020	1069.31	230.79	LBKF	860	1394.29	230.6	RBKF
1246	481.13	231.05	Thalweg	1244	492.74	231.18	Water	975	1128.2	231.06	LBKF	856	1413.51	230.72	RBKF
1243	492.95	230.57	Thalweg	1240	508.12	231.19	Water	944	1175.91	230.68	LBKF	852	1435.14	230.43	RBKF
1239	507.44	230.55	Thalweg	1237	516.71	231.13	Water	934	1193.82	230.66	LBKF	823	1480.16	230.45	RBKF
1236	516.05	230.02	Thalweg	1228	526.63	231.12	Water	928	1219.26	230.66	LBKF	812	1523.77	230.17	RBKF
1227	526.62	230.47	Thalweg	1226	540.51	231.13	Water	896	1240.5	230.8	LBKF	807	1546.48	229.95	RBKF
1225	540.4	230.42	Thalweg	1222	560.76	231.1	Water	892	1266.8	231.39	LBKF	801	1573.23	230.73	RBKF
1221	560.29	230.29	Thalweg	1219	574.34	231.1	Water	886	1325.93	231	LBKF	788	1607.14	230.67	RBKF
1218	574.16	229.5	Thalweg	1216	594.45	231.1	Water	876	1362.44	230.46	LBKF	784	1621.25	230.3	RBKF
1209	579.03	230.9	Rock Vane	1213	616.94	231.03	Water	855	1404.49	230.86	LBKF	759	1667.17	230.23	RBKF
1215	594.34	230.73	Head of Riffle	1206	632.94	230.94	Water	851	1430.26	230.38	LBKF	752	1693.52	230.31	RBKF
1212	617.61	230.55	Thalweg	1201	644.79	230.91	Water	826	1453.4	231.06	LBKF	749	1717.43	230.13	RBKF
1205	632.87	230.22	Thalweg	1196	661.5	230.91	Water	848	1462.18	230.58	LBKF	744	1721.29	229.82	RBKF
1200	644.32	229.58	Thalweg	1134	667	230.9	Water	802	1544.81	230.24	LBKF	736	1740.41	229.73	RBKF
1195	663.67	229.26	Max Pool	1132	683.64	230.85	Water	800	1568.91	230.33	LBKF	733	1753.55	229.53	RBKF
1133	667.19	229.63	Thalweg	1129	697.1	230.84	Water	791	1592.04	230.38	LBKF	729	1771.27	230.28	RBKF
1131	683.7	230.56	Thalweg	1124	704.88	230.84	Water	787	1603.96	230.19	LBKF	713	1803.59	230.03	RBKF
1128	697.59	230.46	Thalweg	1117	712.87	230.84	Water	783	1621.35	230.22	LBKF	706	1831.37	229.67	RBKF
1123	705.12	229.31	Max Pool	1122	717.24	230.85	Water	766	1655.68	230.37	LBKF	702	1850.97	229.87	RBKF
1116	713.26	230.16	Thalweg	1114	722.09	230.84	Water	758	1669.99	230.04	LBKF	699	1863.83	229.35	RBKF
1121	717.1	230.41	Thalweg	1111	728.75	230.84	Water	753	1691.47	230.11	LBKF	698	1878.54	229.17	RBKF
1113	722.1	230.03	Max Pool	1109	745.19	230.68	Water	748	1713.97	230.06	LBKF	687	1894.33	229.65	RBKF
1110	728.76	230.21	Thalweg	1103	768.43	230.63	Water	745	1732.21	229.82	LBKF	681	1904.05	229.56	RBKF
1108	745.06	229.64	Thalweg	1099	785.23	230.63	Water	740	1740.45	230.01	LBKF	675	1919.47	229.41	RBKF
1102	768.55	230.11	Head of Pool	1101	794.18	230.63	Water	737	1748.44	229.72	LBKF	670	1935.8	229.3	RBKF
1098	784.63	229.34	Max Pool	1093	805.74	230.63	Water	730	1760.69	229.81	LBKF	664	1953.03	229.74	RBKF
1100	794.89	229.4	Head of Pool	1095	818.6	230.63	Water	726	1773.31	229.78	LBKF	656	1976.41	229.65	RBKF
1092	806.1	230.07	Thalweg	1089	829.44	230.63	Water	712	1815.35	230.37	LBKF	653	1991.82	229.49	RBKF
1094	817.72	229.63	Max Pool	1083	840.78	230.62	Water	707	1837.1	229.5	LBKF	647	2025.21	229.61	RBKF
1088	829.5	230.28	Thalweg	1085	851.75	230.62	Water	703	1851.23	229.59	LBKF	635	2038.6	229.78	RBKF
1082	841.14	230.39	Thalweg	1081	862.33	230.61	Water	693	1868.01	230.09	LBKF	595	2055.64	229.16	RBKF
1084	852.04	229.86	Thalweg	1076	874.29	230.6	Water	688	1884.61	229.59	LBKF	602	2069.47	228.92	RBKF
1080	860.58	229.52	Max Pool	1073	887.81	230.6	Water	686	1897.62	229.63	LBKF	619	2115.93	229.1	RBKF
1078	864.53	229.65	Thalweg	1071	899.06	230.57	Water	683	1914.17	229.12	LBKF	618	2130.64	229.48	RBKF
1075	874.22	230.3	Thalweg	1069	904.77	230.47	Water	682	1929.74	229.49	LBKF	626	2148	229.45	RBKF
1072	887.3	230.27	Head of Riffle	1067	909.73	230.47	Water	673	1941.97	229.2	LBKF	1146	2182.97	228.72	RBKF
1070	899.17	230.11	Head of Pool	1063	917.29	230.42	Water	665	1963.19	228.98	LBKF	1155	2194.38	229.23	RBKF
1066	904.3	229.98	Head of Pool	1060	924.11	230.42	Water	657	1981.02	229.26	LBKF	1169	2226.22	228.36	RBKF
1068	909.4	229.39	Max Pool	1057	936.8	230.42	Water	650	1999.54	229.37	LBKF	1159	2253.48	228.39	RBKF
1062	917.55	228.23	Max Pool	1054	949.87	230.42	Water	642	2013.47	229.29	LBKF	1187	2273.15	228	RBKF
1059	923.98	228.91	Thalweg	1051	960.35	230.41	Water	648	2013.66	229.34	LBKF	1168	2298.32	227.71	RBKF
1056	936.38	229.63	Thalweg	1048	972.35	230.4	Water	634	2038.5	229.65	LBKF	582	2351.15	228.68	RBKF
1053	949.84	230.22	Thalweg	1045	987.29	230.28	Water	598	2057.58	229.2	LBKF	579	2361.83	228.8	RBKF
1050	960.43	229.92	Thalweg	1042	1002.79	230.23	Water	601	2069.39	229.15	LBKF	10050	2366.47	227.52	RBKF
1047	972.57	230.21	Thalweg	1039	1020.99	230.21	Water	603	2078.36	228.73	LBKF	576	2383.75	228.86	RBKF
1044	987.35	229.94	Thalweg	1036	1033.88	230.11	Water	609	2086.85	228.94	LBKF	573	2390.3	228.73	RBKF
1041	1002.85	229.91	Thalweg	1032	1044.28	230.1	Water	606	2088.13	229.71	LBKF	10057	2394.1	227.55	RBKF
1038	1020.94	229.85	Head of Riffle	1023	1058.04	230.1	Water	610	2105.44	229.52	LBKF	561	2421.75	227.72	RBKF
1035	1033.76	229.26	Thalweg	1018	1069.25	230.1	Water	615	2113.46	229.2	LBKF	553	2452.58	228.56	RBKF
1031	1044.43	229.5	Thalweg	1015	1077.5	230.1	Water	620	2127.09	229.38	LBKF	10077	2459.64	228.14	RBKF
1022	1057.77	229.55	Thalweg	1012	1084.46	230.1	Water	625	2149.2	228.86	LBKF	545	2471.9	228.06	RBKF

1017	1069.42	229.14	Thalweg
1014	1076.9	228.94	Thalweg
1010	1084.16	228.98	Head of Pool
1011	1087.17	228.82	Max Pool
979	1093.9	228.83	Max Pool
1027	1099.92	228.71	Max Pool
981	1106.62	229.56	Thalweg
976	1122.89	229.77	Thalweg
973	1134.21	229.6	Thalweg
971	1144.27	229.44	Thalweg
969	1155.93	229.81	Thalweg
965	1166.31	229.21	Thalweg
945	1180.23	229.59	Head of Riffle
942	1193.14	229.06	Thalweg
936	1207.14	228.77	Max Pool
932	1217.09	229.47	Thalweg
929	1227.21	229.27	Thalweg
902	1237.73	228.97	Head of Pool
898	1247.84	228.67	Max Pool
900	1259.23	228.61	Thalweg
894	1267.19	228.6	Thalweg
890	1280.39	229.63	Thalweg
884	1292.14	229.73	Rock Vane
888	1294.54	229.02	Thalweg
881	1327.91	229.19	Thalweg
877	1347.35	229.05	Thalweg
871	1365.02	229.13	Thalweg
866	1377.89	228.52	Thalweg
873	1382.11	228.42	Head of Pool
868	1387.51	228.57	Max Pool
863	1398.28	229.14	Thalweg
858	1411.41	229.01	Thalweg
853	1432.82	228.01	Thalweg
849	1445.52	228.22	Thalweg
846	1455.93	228.6	Thalweg
827	1475.71	229.05	Thalweg
829	1481.6	229.13	Thalweg
824	1487.02	229.38	Rock Vane
821	1488.36	227.31	Thalweg
817	1497.24	226.46	Max Pool
815	1503.69	227.19	Thalweg
813	1508.6	228.85	Thalweg
808	1532.04	228.67	Thalweg
803	1547.79	228.82	Thalweg
810	1559.4	228.69	Thalweg
805	1565.42	227.6	Max Pool
797	1573.48	227.94	Thalweg
799	1583.11	228.29	Rock Vane
794	1584.1	228.21	Thalweg
792	1596.09	228.58	Thalweg
785	1609.43	228.72	Head of Riffle
789	1615.18	228.69	Thalweg
781	1620.62	228.35	Max Pool
779	1626.9	228.87	Thalweg
775	1628.26	229.15	Rock Vane
769	1629.01	228.37	Thalweg
777	1631.83	227.36	Max Pool
771	1637.61	228.57	Thalweg
773	1647.61	227.69	Max Pool
762	1655.98	228.41	Thalweg
764	1660.34	228.34	Thalweg
760	1667.22	228.51	Thalweg
756	1668.95	228.47	Thalweg
754	1693.63	228.65	Thalweg
750	1703.33	228.47	Thalweg
746	1718.8	228.73	Thalweg
742	1734.72	228.03	Thalweg
738	1739.17	228.19	Thalweg
734	1748.45	227.81	Thalweg
731	1756.07	227.8	Thalweg
727	1766.79	227.89	Max Pool
724	1775.54	228.85	Rock Vane
722	1781.2	226.91	Max Pool
720	1783.4	227.73	Thalweg
718	1789.28	228.22	Thalweg
716	1793.29	228.19	Max Pool
710	1798.31	228.46	Head of Riffle
708	1824.96	228.33	Thalweg
704	1831.67	228.33	Thalweg
700	1845.34	228.43	Head of Riffle
696	1863.06	228	Thalweg
694	1874.7	227.48	Head of Pool
691	1880.07	226.98	Max Pool
689	1889.43	227.4	Thalweg
684	1899.44	227.34	Thalweg
679	1911.4	227.4	Max Pool
677	1918.53	227.82	Thalweg
674	1925.73	227.81	Head of Pool
671	1930.5	226.9	Max Pool
668	1939.33	227.58	Thalweg
666	1945.23	227.95	Head of Riffle
662	1964.02	227.67	Thalweg
660	1971.47	227.58	Head of Pool
658	1974	227.36	Max Pool
654	1981.01	227.81	Thalweg
651	1996.15	227.95	Head of Riffle
645	2014.17	227.86	Thalweg
643	2014.94	228.15	Rock Vane
640	2017.75	226.27	Head of Pool
638	2028.2	226.14	Max Pool
632	2040.62	227.46	Head of Riffle
637	2041.09	227.65	Max Pool
596	2057.35	226.62	Thalweg
599	2069.52	226.88	Thalweg
604	2078.64	227.17	Thalweg
607	2086.85	227.15	Thalweg
611	2103.38	227.19	Thalweg
1030	1093.52	230.09	Water
1028	1101.34	230.08	Water
982	1106.26	230.08	Water
977	1122.68	230.02	Water
974	1134.14	230	Water
972	1143.87	230.01	Water
970	1155.83	229.98	Water
966	1165.88	229.97	Water
946	1180.32	229.95	Water
943	1192.95	229.78	Water
939	1200.94	229.77	Water
937	1207.29	229.77	Water
933	1217.3	229.76	Water
930	1226.2	229.75	Water
903	1238.73	229.74	Water
899	1247.87	229.74	Water
901	1259.52	229.73	Water
895	1267.55	229.73	Water
891	1280.06	229.72	Water
885	1291.52	229.73	Water
889	1294.82	229.65	Water
882	1328.15	229.63	Water
878	1347.34	229.61	Water
872	1365.17	229.59	Water
869	1388.46	229.57	Water
864	1398.64	229.57	Water
859	1411.5	229.56	Water
854	1431.98	229.56	Water
850	1445.56	229.56	Water
847	1455.93	229.56	Water
828	1475.56	229.5	Water
830	1485.86	229.55	Water
825	1487.61	229.47	Water
822	1487.7	229.24	Water
818	1497.24	229.22	Water
816	1504.3	229.21	Water
814	1508.15	229.21	Water
809	1532.21	229.21	Water
804	1547.87	229.21	Water
811	1558.56	229.1	Water
806	1563.83	229.09	Water
798	1573.06	229.1	Water
793	1596.21	229.09	Water
786	1609.11	229.1	Water
790	1615.09	229.1	Water
782	1620.58	229.11	Water
780	1626.71	229.11	Water
776	1627.74	229.11	Water
770	1628.96	229.03	Water
778	1631.76	229.02	Water
772	1637.63	229.02	Water
774	1648.19	229.01	Water
763	1655.19	229.01	Water
765	1660.66	229.01	Water
761	1667.78	229	Water
757	1668.15	229	Water
755	1693.76	228.95	Water
751	1703.07	228.95	Water
747	1719.05	228.95	Water
743	1734.32	228.94	Water
739	1739.14	228.94	Water
735	1748.57	228.94	Water
732	1756.26	228.94	Water
728	1767.14	228.92	Water
725	1775.47	228.92	Water
723	1781.44	228.92	Water
721	1782.23	228.92	Water
719	1788.67	228.92	Water
717	1793.04	228.91	Water
711	1798.63	228.9	Water
709	1824.85	228.85	Water
705	1832.09	228.84	Water
701	1845.33	228.73	Water
697	1863.34	228.38	Water
695	1874.58	228.33	Water
692	1880.19	228.32	Water
690	1889.38	228.32	Water
685	1899.4	228.29	Water
680	1911.66	228.31	Water
678	1918.07	228.31	Water
676	1926.56	228.31	Water
672	1930.73	228.29	Water
669	1939.58	228.28	Water
667	1945.47	228.28	Water
663	1964.43	228.25	Water
661	1971.53	228.24	Water
659	1974.45	228.24	Water
655	1981.21	228.24	Water
652	1996.26	228.24	Water
646	2014.01	228.25	Water
644	2014.75	228.24	Water
641	2018.04	227.87	Water
639	2027.18	227.86	Water
633	2040.25	227.84	Water
597	2057.37	227.56	Water
600	2069.83	227.55	Water
605	2079.09	227.54	Water
608	2086.81	227.47	Water
612	2104.15	227.52	Water
614	2113.42	227.45	Water
617	2123.79	227.39	Water
622	2138.16	227.38	Water
624	2147.26	227.36	Water
630	2152.37	227.36	Water
628	2162.87	227.3	Water
1145	2179.76	227.05	Water
1150	2189.15	227.01	Water
631	2159.56	229.14	LBKF
1147	2182.62	229.1	LBKF
1149	2198.59	228.2	LBKF
1151	2213.65	228.37	LBKF
1167	2231.93	228.05	LBKF
1152	2233.59	228.46	LBKF
1156	2255.4	228.95	LBKF
1178	2264.62	228.63	LBKF
592	2289.22	228.62	LBKF
1177	2301.61	228.21	LBKF
1180	2303.39	228.27	LBKF
591	2320.64	228.45	LBKF
585	2347.13	228.6	LBKF
588	2378.07	228.16	LBKF
10053	2382.19	227.83	LBKF
564	2423.41	228.99	LBKF
10074	2447.82	227.71	LBKF
556	2451.84	228.77	LBKF
550	2470.41	227.9	LBKF
10085	2488.17	227.18	LBKF
10093	2540.13	227.06	LBKF
10098	2563.31	227.58	LBKF
10173	2564.22	227.5	LBKF
10171	2616.08	227.56	LBKF
10170	2654.86	227.5	LBKF
10169	2689.84	227.44	LBKF
10168	2726.98	226.97	LBKF
10167	2764.47	226.91	LBKF
10166	2800.47	227.17	LBKF
291	2806.01	227.25	LBKF
294	2826.31	227.16	LBKF
10165	2830.22	226.53	LBKF
299	2849.34	226.74	LBKF
10164	2854.81	226.45	LBKF
308	2871.55	226.27	LBKF
10163	2879.6	226.33	LBKF
324	2916.57	226.15	LBKF
10162	2929.66	226.11	LBKF
338	2949.58	226.36	LBKF
341	2949.68	226.47	LBKF
344	2974.19	225.96	LBKF
358	2997.46	226.9	LBKF
362	3035.45	226.57	LBKF
369	3052.56	225.66	LBKF
375	3079.7	225.73	LBKF
379	3106.32	225.71	LBKF
417	3123.4	225.87	LBKF
418	3146.55	225.86	LBKF
420	3181.32	225.68	LBKF
422	3226.81	226.16	LBKF
424	3258.27	226.05	LBKF
426	3291.02	225.91	LBKF
429	3324.69	226.02	LBKF
436	3389.17	225.76	LBKF
451	3411.83	226.39	LBKF
454	3431.71	225.73	LBKF
458	3455.09	225.97	LBKF
462	3470.71	225.65	LBKF
473	3903.69	223.65	LBKF
469	3927.28	224.19	LBKF
2824	3952.87	223.61	LBKF
2846	3978.37	223.46	LBKF
2843	3978.41	223.43	LBKF
2860	4032.05	223.17	LBKF
2797	4074.76	223.13	LBKF
2868	4097.56	223.14	LBKF
2790	4127.94	223.39	LBKF
2782	4170.82	223.44	LBKF
2780	4220.8	223.54	LBKF
2798	4245.03	223.92	LBKF
2768	4271.47	223.55	LBKF
2794	4279.15	223.17	LBKF
2767	4323.44	222.71	LBKF
2754	4390.82	222.05	LBKF
2750	4511.94	221.86	LBKF
2672	4517.64	222.91	LBKF
2731	4560.44	221.99	LBKF
2736	4594.98	222.06	LBKF
2745	4600.51	222.78	LBKF
2920	4614.03	222.27	LBKF
2922	4636.46	222.47	LBKF
2926	4646.96	221.85	LBKF
2932	4656.36	225.56	LBKF
2937	4661.81	221.73	LBKF
2940	4681.22	222.1	LBKF
2944	4702.09	222.16	LBKF
2948	4722.16	222.3	LBKF
2955	4749.26	223.02	LBKF
2957	4759.68	223.64	LBKF
2962	4781.07	223.23	LBKF
2973	4809.58	222.54	LBKF
2970	4809.74	222.69	LBKF
2993	4890.54	222.16	LBKF
2998	4926.01	223.07	LBKF
3010	4973.09	223.83	LBKF
3016	5003.93	222.46	LBKF
3019	5022.36	222.57	LBKF
3039	5025.56	222.79	LBKF
3049	5057.25	222.37	LBKF
3060	5125.63	222.04	LBKF
3070	5157.21	222.48	LBKF
3074	5184.97	221.65	LBKF
3105	5240.6	221.52	LBKF
3112	5275.44	220	LBKF
3116	5307.35	219.95	LBKF
3128	5342.87	219.98	LBKF
10084	2485.36	227.69	RBKF
10090	2527.56	227.2	RBKF
10099	2566.05	226.84	RBKF
10103	2580.15	227.18	RBKF
10110	2608.74	227.23	RBKF
10114	2635.11	226.7	RBKF
10121	2664.83	227.15	RBKF
10128	2715.77	227.1	RBKF
10131	2739.53	226.78	RBKF
10132	2752.63	226.84	RBKF
10141	2804.4	227.01	RBKF
10143	2815.39	226.57	RBKF
298	2824.34	226.54	RBKF
10144	2827.73	226.54	RBKF
302	2834.93	226.38	RBKF
10145	2839.12	226.38	RBKF
307	2854.84	226.19	RBKF
10148	2863.62	226.11	RBKF
311	2870.77	226.17	RBKF
323	2896.44	226.11	RBKF
10157	2897.9	226.04	RBKF
325	2913.6	226.05	RBKF
328	2914.91	225.99	RBKF
337	2939.04	225.89	RBKF
345	2971.75	226.04	RBKF
359	3006.34	225.95	RBKF
366	3032.83	225.87	RBKF
363	3034.19	225.96	RBKF
370	3052.92	225.99	RBKF
376	3077.94	226.01	RBKF
380	3104.22	226.06	RBKF
385	3124.38	225.92	RBKF
419	3125.87	225.63	RBKF
421	3148.95	226.36	RBKF
423	3169.07	226.38	RBKF
425	3197.29	226.43	RBKF
427	3221.49	226.18	RBKF
428	3264.53	226.41	RBKF
432	3309.92	225.88	RBKF
435	3360.87	225.83	RBKF
439	3360.95	225.84	RBKF
440	3377.27	226.11	RBKF
452	3394.95	226.38	RBKF
455	3412.24	225.88	RBKF
456	3433.81	225.73	RBKF
457	3449.99	225.95	RBKF
461	3462.45	225.84	RBKF
477	3871.23	225.39	RBKF
474	3875.82	224.39	RBKF
470	3905.34	224.06	RBKF
2835	3941.59	223.52	RBKF
2839	3954.88	223.84	RBKF
2850	3970.03	224.43	RBKF
2856	3992.14	223.83	RBKF
2864	4041.85	222.97	RBKF
2867	4075.38	222.88	RBKF
2875	4097.73	223.17	RBKF
2793	4100.04	223.62	RBKF
2878	4108.36	223.01	RBKF
2887	4132.12	223.17	RBKF
2785	4159.64	222.84	RBKF
2775	4223.98	222.77	RBKF
2773	4260.46	223.17	RBKF
2781	4363.89	222.19	RBKF
2774	4393.24	222.09	RBKF
2760	4442.93	222.73	RBKF
2751	4505.81	221.87	RBKF
2738	4567.84	222.31	RBKF
2744	4602.65	222.75	RBKF
2923	4626.67	224.13	RBKF
2929	4648.99	223.61	RBKF
2933	4689.61	223.61	RBKF
2941	4716.41	223.8	RBKF
2952	4733.73	223.88	RBKF
2958	4756.29	224.02	RBKF
2966	4783.66	224.07	RBKF
2987	4828.97	224	RBKF
2971	4829.04	224.19	RBKF
2995	4876.99	221.82	RBKF
3008	4922.61	222.14	RBKF
3012	4926.49	224.84	RBKF
3015	4940.14	222.98	RBKF
3038	5025.22	223.47	RBKF
3050	5078.14	222.87	RBKF
3063	5139.71	222.56	RBKF
3071	5173.01	222.24	RBKF
3079	5218.61	222.59	RBKF
3082	5223.75	222.22	RBKF
3091	5247.54	221.33	RBKF
3096	5254.33	221.16	RBKF
3108	5268.62	220.77	RBKF
3129	5355.76	220.24	RBKF

613	2112.82	227.11	Thalweg	1154	2191.65	226.95	Water

Point	Station	Elevation	Description
5006	2662.7	227.24	Beaver Dam
5089	2795.13	226.14	Beaver Dam
5016	3872.5	225.33	Beaver Dam
5021	4167.4	223.13	Beaver Dam
5026	4357.1	222.63	Beaver Dam
5031	4547.3	221.84	Beaver Dam

Point	Station	Elevation	Description
1430	177.84	233.04	Rock Vane
1265	400.92	231.66	Rock Vane
1209	579.03	230.9	Rock Vane
884	1292.14	229.73	Rock Vane
824	1487.02	229.38	Rock Vane
775	1628.26	229.15	Rock Vane
724	1775.54	228.85	Rock Vane
643	2014.94	228.15	Rock Vane
568	2403.94	226.31	Rock Vane
10100	2575.45	225.51	Rock Vane
315	2869.4	224.91	Rock Vane
3099	5211.84	220.29	Rock Vane
3080	5216.62	220.24	Rock Vane
3122	5311.05	218.26	Rock Vane

1337	1.73	242.87	Top of Bank
1338	17.6	241	Top of Bank
1316	96.23	240.67	Top of Bank
1318	114.39	239.41	Top of Bank
1311	124.3	238.7	Top of Bank
1303	142.34	238.17	Top of Bank
1389	145.53	238.88	Top of Bank
1391	147.65	238.29	Top of Bank
1394	196.49	237.87	Top of Bank
1397	240.52	238.35	Top of Bank
1400	265.41	238.68	Top of Bank
1388	309.99	238.92	Top of Bank
1294	314.71	238.48	Top of Bank
1284	332.59	237.8	Top of Bank
1291	345.43	236.97	Top of Bank
1283	367.6	237.62	Top of Bank
1279	402.48	236.83	Top of Bank
1245	472.35	237.71	Top of Bank
1241	496.2	236.79	Top of Bank
1251	503.3	237.69	Top of Bank
1233	515.07	235.58	Top of Bank
1220	522.88	237.95	Top of Bank
1234	527.4	236.29	Top of Bank
1214	576.99	237.36	Top of Bank
1204	637.72	237.55	Top of Bank
1223	646.91	236.93	Top of Bank
1135	647.9	236.73	Top of Bank
1160	2220.67	229.97	Top of Bank
1190	2223.57	229.84	Top of Bank
1161	2253.62	229.72	Top of Bank
1181	2262.7	229.58	Top of Bank
1189	2267.49	228.95	Top of Bank
1188	2273.28	228.51	Top of Bank
1166	2275.11	230.75	Top of Bank
1179	2305.5	230.03	Top of Bank
2842	3955.39	224.41	Top of Bank
2838	3968.83	224.68	Top of Bank
2847	3971.49	224.2	Top of Bank
2859	3983.8	224.19	Top of Bank
2853	4007.02	225.02	Top of Bank
2861	4035.17	224.09	Top of Bank
2871	4093.94	223.85	Top of Bank
2880	4111.87	224.38	Top of Bank
2891	4126.69	225.43	Top of Bank
2894	4158.37	223.89	Top of Bank
2895	4168.67	224.02	Top of Bank
2872	4173.79	224	Top of Bank
2879	4241.64	224.12	Top of Bank
2896	4246.95	223.4	Top of Bank
2883	4264.95	224.01	Top of Bank
2886	4357.94	224.15	Top of Bank
2716	4440.28	228.11	Top of Bank
2728	4518.15	222.97	Top of Bank
2918	4614.4	224.69	Top of Bank
2919	4627.9	225.88	Top of Bank
2936	4689.14	225.35	Top of Bank
2945	4700.61	225.9	Top of Bank
2949	4726.1	224.59	Top of Bank
2959	4755.39	226.22	Top of Bank
2965	4772.69	225.62	Top of Bank
2967	4782.81	226.01	Top of Bank
2976	4808.71	225.43	Top of Bank
2979	4818.75	225.53	Top of Bank
2986	4828.06	225.18	Top of Bank
2972	4828.9	225.13	Top of Bank
2985	4848.53	223.59	Top of Bank
2977	4849.91	223.61	Top of Bank
2990	4872.2	225.4	Top of Bank
2994	4877.91	225.07	Top of Bank
2999	4888.57	226.51	Top of Bank
3005	4917	225.12	Top of Bank
3034	4998.65	224.9	Top of Bank
3037	5023.09	225.1	Top of Bank
3046	5052.09	224.84	Top of Bank
3053	5070.95	225.05	Top of Bank

3056	5101.07	224.75	Top of Bank
3059	5116.59	225.43	Top of Bank
3064	5145.74	224.42	Top of Bank
3067	5151.69	224.73	Top of Bank
3075	5176.06	224.72	Top of Bank
3078	5208.12	224.28	Top of Bank
3086	5242.52	223.44	Top of Bank
3101	5257.78	223.75	Top of Bank
3109	5262.18	223.61	Top of Bank
3113	5295.61	223.21	Top of Bank
3120	5312.76	225.09	Top of Bank
3124	5326.85	222.63	Top of Bank
3125	5347.87	223.85	Top of Bank

Point	Station	Elevation	Description
1774	-9.01	233.91	Thalweg
1770	9.47	233.51	Thalweg
1766	20.06	233.33	Thalweg
1762	36.16	233.71	Thalweg
1778	40	233.99	Thalweg
1760	54.84	233.55	Thalweg
1757	71.01	233.86	Rock Vane
1755	77.41	231.54	Max Pool
1724	107.13	233.11	Thalweg
1722	124.02	233.08	Thalweg
1720	149.44	232.16	Thalweg
1719	164.2	232.74	Thalweg
1718	167.9	232.74	Thalweg
1716	167.9	232.79	Thalweg
1714	176.1	232.89	Thalweg
1712	200.88	233.07	Head of Riffle
1710	216.37	232.83	Thalweg
1706	231.13	232.62	Thalweg
1708	249.53	232.84	Thalweg
1704	262.53	232.54	Thalweg
1701	272.4	232.29	Head of Riffle
1700	292.57	228.44	Max Pool
1698	321.38	231.9	Thalweg
1696	345.19	231.83	Thalweg
1694	365.04	231.99	Thalweg
1691	374.3	232.42	Rock Vane
1689	375.2	230.11	Max Pool
1687	387.71	231.26	Thalweg
1685	404.85	231.73	Head of Riffle
1683	410.79	231.57	Thalweg
1681	433.28	231.43	Thalweg
1625	447.27	230.65	Thalweg
1623	462.33	231.76	Thalweg
1621	473.3	231.83	Thalweg
1618	474.15	232.23	Rock Vane
1615	476.46	228.88	Thalweg
1611	479.04	229.21	Thalweg
1613	487.46	231.29	Thalweg
1609	499.09	231.18	Thalweg
1607	514.31	230.48	Thalweg
1603	525.67	230.42	Thalweg
1605	530.44	230.27	Thalweg
1601	540.86	230.7	Thalweg
1599	553.75	230.35	Thalweg
1597	567.62	229.91	Max Pool
1595	576.31	230.89	Thalweg
1593	592.91	230.74	Thalweg
1589	611.41	230.51	Thalweg
1591	615.07	230.39	Thalweg
1587	622.76	230.21	Thalweg
1585	629.71	229.96	Max Pool
1583	633.22	230.59	Thalweg
1582	651.86	230.51	Thalweg
1578	669.92	230.47	Thalweg
1574	677.94	229.92	Max Pool
1576	684.21	230.86	Thalweg
1572	692.52	230.91	Thalweg
1570	702.64	230.6	Thalweg
1568	713.45	230.57	Thalweg
1564	724.93	230.05	Thalweg
1566	731.56	229.73	Thalweg
1562	735.11	230.57	Thalweg
1560	741.36	230.35	Thalweg
1558	748.88	230.55	Thalweg
1554	762.94	230.26	Thalweg
1556	770.66	230.35	Thalweg
1444	782.34	230.35	Thalweg
1446	787.53	230.04	Thalweg
1448	792.33	229.29	Thalweg
1450	798.35	229.64	Thalweg
1452	812.75	230.58	Thalweg
1454	824.97	230.39	Thalweg
1456	826.98	230.38	Thalweg
1459	834.9	230.29	Thalweg
1461	845.13	229.59	Thalweg
1463	856.04	230.18	Thalweg
1465	861.46	230.44	Thalweg
1467	869.11	230.33	Thalweg
1469	883.2	230.31	Thalweg
1471	899.19	230.26	Thalweg
1473	912.85	230.22	Thalweg
1475	922.17	229.88	Thalweg
1477	936.68	229.69	Thalweg
1479	951.59	230.22	Thalweg
1481	969.57	230.01	Thalweg
1483	978.27	229.18	Max Pool
1485	991.71	230.22	Thalweg
1487	1003.88	229.99	Thalweg
1489	1020.52	229.85	Thalweg
1491	1031.72	230.21	Thalweg
1493	1040.97	229.93	Thalweg
1495	1051.39	229.29	Thalweg
1497	1064.18	229.6	Thalweg
1499	1067.96	229.9	Thalweg
1501	1072.21	229.99	Rock Vane
1503	1072.62	226.85	Thalweg
1507	1075.64	226.6	Max Pool
1509	1083.57	227.8	Thalweg
1511	1089.52	229.03	Thalweg
1513	1104.64	229.23	Thalweg
1515	1115.02	228.45	Thalweg
1517	1120.65	228.91	Thalweg
1519	1128.89	229.28	Thalweg
231	1136.62	228.66	Thalweg
1771	-9.09	234.34	Water
1775	9.99	234.36	Water
1767	19.47	234.32	Water
1763	35.91	234.35	Water
1761	54.77	234.21	Water
1758	70.3	234.21	Water
1756	74.88	233.82	Water
1723	123.72	233.64	Water
1717	164.82	233.56	Water
1715	178.9	233.57	Water
1713	200.98	233.36	Water
1711	216.47	233.34	Water
1707	231.64	233.23	Water
1709	249.21	233.21	Water
1705	261.14	233.21	Water
1702	271.73	232.89	Water
1703	293.07	232.48	Water
1699	320.24	232.42	Water
1697	345.68	232.4	Water
1695	363.52	232.39	Water
1688	386.67	232.28	Water
1686	403.69	232.28	Water
1682	432.72	232.29	Water
1624	462.34	232.3	Water
1622	472.44	232.3	Water
1619	474.84	232.3	Water
1616	475.41	231.58	Water
1612	480.25	231.59	Water
1614	487.25	231.6	Water
1610	498.47	231.6	Water
1608	514.21	231.46	Water
1604	524.84	231.46	Water
1606	530	231.46	Water
1602	539.69	231.45	Water
1600	553.09	231.44	Water
1598	568.26	231.43	Water
1596	577.99	231.43	Water
1594	592.38	231.43	Water
1590	610.35	231.31	Water
1592	615.72	231.31	Water
1588	622.19	231.3	Water
1586	628.96	231.3	Water
1584	633.56	231.29	Water
1579	670.1	231.26	Water
1575	677.63	231.25	Water
1573	692.91	231.25	Water
1571	702.31	231.22	Water
1569	713.73	231.09	Water
1565	724.91	231.07	Water
1567	731.6	231.06	Water
1561	740.69	231.04	Water
1559	748.57	231.04	Water
1555	761.88	230.99	Water
1447	787.39	230.99	Water
1449	792.74	231.01	Water
1451	798.19	231.01	Water
1453	812.94	231.01	Water
1455	826.37	231	Water
1460	835.27	230.92	Water
1462	844.9	230.89	Water
1464	854.07	230.87	Water
1466	861.27	230.88	Water
1468	868.76	230.83	Water
1470	883.52	230.83	Water
1472	899.33	230.83	Water
1474	912.75	230.7	Water
1476	922.29	230.68	Water
1478	936.66	230.65	Water
1480	951.27	230.65	Water
1482	970.02	230.62	Water
1484	978.27	230.54	Water
1486	991.56	230.54	Water
1488	1004.06	230.53	Water
1490	1020.45	230.5	Water
1492	1031.31	230.47	Water
1494	1041.19	230.46	Water
1496	1052.13	230.44	Water
1500	1068.25	230.41	Water
1502	1071.47	230.27	Water
1504	1072.51	229.8	Water
1508	1078.07	229.77	Water
1510	1084.26	229.79	Water
1512	1090.33	229.76	Water
1514	1104.14	229.73	Water
1516	1114.85	229.73	Water
1518	1121.04	229.73	Water
1520	1129.11	229.73	Water
232	1137.22	229.73	Water
223	1169.73	229.62	Water
218	1190.26	229.59	Water
220	1191.94	229.58	Water
209	1264.59	229.2	Water
211	1312.04	229.18	Water
203	1335.64	229.11	Water
197	1361.68	229.01	Water
182	1380.74	228.86	Water
192	1394.92	228.79	Water
187	1404.25	228.8	Water
184	1421.25	228.79	Water
177	1426.82	228.8	Water
173	1448.9	228.8	Water
167	1470.11	228.8	Water
164	1486.94	228.79	Water
157	1555.18	228.76	Water
1773	14.51	236.28	LBKF
1780	14.95	236.38	LBKF
1765	30.86	236.08	LBKF
1733	175.49	236.11	LBKF
1736	205.39	235.38	LBKF
1739	229.66	235.29	LBKF
1742	255.46	235.67	LBKF
1745	312.99	235.39	LBKF
1749	357.98	235.5	LBKF
1753	412.31	234.67	LBKF
1645	439.6	234.51	LBKF
1648	527.23	234.64	LBKF
1651	556.03	233.98	LBKF
1656	589.28	233.68	LBKF
1658	623.52	233.22	LBKF
1660	660.21	233.05	LBKF
1662	672.73	233.79	LBKF
1664	704.27	233.04	LBKF
1665	731.77	233.17	LBKF
1670	751.24	234.18	LBKF
1532	777.58	232.98	LBKF
1533	814.15	233.2	LBKF
1534	856.83	233.64	LBKF
1535	888.7	233.27	LBKF
1536	924.81	233.34	LBKF
1537	956.53	233.42	LBKF
1538	985.41	232.84	LBKF
1539	1061.39	231.18	LBKF
1540	1077.35	232.06	LBKF
1541	1102.66	231.71	LBKF
1542	1117.4	232.41	LBKF
233	1132.46	231.16	LBKF
230	1155.68	231.93	LBKF
228	1174.72	230.57	LBKF
229	1174.77	230.72	LBKF
227	1191.33	231.14	LBKF
226	1219.42	230.39	LBKF
224	1255.94	231.07	LBKF
221	1283.13	230.49	LBKF
213	1311.69	230.42	LBKF
200	1337.89	231.14	LBKF
189	1400.81	230.63	LBKF
180	1420.14	230.27	LBKF
169	1464.28	230.24	LBKF
161	1503.55	230.42	LBKF
150	1603.91	230.29	LBKF
149	1621.71	230.7	LBKF
140	1694.73	230.17	LBKF
137	1709.48	230.37	LBKF
132	1727.05	230.24	LBKF
123	1779.75	231.64	LBKF
116	1838.31	230.77	LBKF
108	1866.2	230.04	LBKF
98	1914.33	230.29	LBKF
85	1982.81	230.02	LBKF
76	2018.57	229.86	LBKF
71	2043.74	229.84	LBKF
64	2087	229.22	LBKF
50	2113.93	229.91	LBKF
37	2154.28	230.2	LBKF
29	2171.18	230.49	LBKF
271	2317.84	228.56	LBKF
268	2334.95	228.69	LBKF
263	2359.51	228.71	LBKF
1809	2632.68	227.1	LBKF
1812	2651.26	226.96	LBKF
1814	2651.46	226.9	LBKF
1821	2674.97	226.6	LBKF
1827	2699.56	226.45	LBKF
1831	2718.6	226.35	LBKF
1866	2764.7	226.98	LBKF
1889	2777.11	225.74	LBKF
1895	2804.42	226.5	LBKF
1924	2819.74	225.51	LBKF
1930	2830.19	225.89	LBKF
1935	2859.26	225.77	LBKF
1949	2893.52	225.68	LBKF
1957	2925.86	225.73	LBKF
2007	3048.18	225.62	LBKF
2010	3059.44	225.59	LBKF
2013	3069.42	225.49	LBKF
2028	3107.55	225.24	LBKF
2044	3150.05	225.32	LBKF
2051	3183.05	225.41	LBKF
2056	3214.7	224.72	LBKF
2064	3232.08	224.71	LBKF
2067	3243.5	224.81	LBKF
2073	3251.28	224.95	LBKF
2077	3269.85	224.59	LBKF
2105	3358.33	226.27	LBKF
2119	3388.64	225.71	LBKF
2200	3453.43	226.28	LBKF
2205	3480.13	226.27	LBKF
2208	3509.56	225.56	LBKF
2237	3540.49	225.32	LBKF
2243	3568.46	225.82	LBKF
2246	3588.46	225.25	LBKF
2250	3602.84	225.37	LBKF
2270	3652.96	225.63	LBKF
2264	3690.68	225.72	LBKF
2287	3729.18	226.61	LBKF
2291	3755.35	226.6	LBKF
2295	3781.78	226.51	LBKF
2318	3812.8	226.37	LBKF
1776	1.18	235.6	RBKF
1772	14.7	235.43	RBKF
1764	54.59	235.5	RBKF
1726	113.22	235.31	RBKF
1730	136.08	236.3	RBKF
1728	136.19	236.18	RBKF
1731	167.09	236.6	RBKF
1732	190.84	235.53	RBKF
1735	226.55	236.25	RBKF
1737	226.66	236.3	RBKF
1738	257.76	236	RBKF
1741	291.44	235.55	RBKF
1744	315.97	236.48	RBKF
1746	340.15	235.75	RBKF
1748	371.32	236.14	RBKF
1747	398.07	236.19	RBKF
1750	427.14	234.91	RBKF
1644	436.9	234.61	RBKF
1646	459.81	233.97	RBKF
1647	507.5	234.79	RBKF
1649	524.4	235.04	RBKF
1650	553.69	234.98	RBKF
1653	602.88	234.52	RBKF
1652	603.07	234.53	RBKF
1655	618.27	233.88	RBKF
1657	639.42	234.65	RBKF
1659	671.5	234.9	RBKF
1661	701.12	234.81	RBKF
1663	716.06	233.63	RBKF
1666	740.72	234.62	RBKF
1668	759.21	234.65	RBKF
1531	781.18	234.74	RBKF
1669	781.41	234.51	RBKF
1530	816.86	234.6	RBKF
1529	876.27	234.15	RBKF
1528	905.76	234.38	RBKF
1527	945.58	234.7	RBKF
1526	975.13	232.85	RBKF
1525	998.29	233.49	RBKF
1524	1036.57	233.31	RBKF
1523	1066.32	233.56	RBKF
1522	1110.61	232.34	RBKF
1521	1129.65	232.88	RBKF
225	1166.13	232.71	RBKF
214	1225.62	232.41	RBKF
206	1280.14	231.25	RBKF
199	1343.6	231.83	RBKF
165	1419.31	230.57	RBKF
160	1463.82	231.56	RBKF
145	1647.9	231.3	RBKF
136	1677.9	231.32	RBKF
133	1677.95	231.26	RBKF
124	1749.44	230.73	RBKF
115	1815.7	231.31	RBKF
104	1842.37	231.61	RBKF
95	1892.1	230.11	RBKF
75	1953.36	230.5	RBKF
67	2029.7	231.2	RBKF
28	2111.25	229.93	RBKF
22	2184.32	229.49	RBKF
20	2247.41	228.82	RBKF
253	2306.25	229.57	RBKF
257	2329.3	228.84	RBKF
260	2357.04	228.57	RBKF
252	2381.37	227.88	RBKF
250	2399.81	228.28	RBKF
239	2457.12	227.82	RBKF
237	2487.04	227.28	RBKF
1808	2620.95	227.51	RBKF
1813	2646.69	227.39	RBKF
1817	2668.51	227.33	RBKF
1820	2682.83	226.93	RBKF
1824	2692.02	226.99	RBKF
1830	2712.35	227.14	RBKF
1844	2728.1	227.37	RBKF
1851	2744.07	227.45	RBKF
1863	2762.28	227.52	RBKF
1856	2762.33	227.57	RBKF
1892	2777.54	226.93	RBKF
1898	2802.48	225.69	RBKF
1927	2820.98	226.97	RBKF
1944	2875	225.95	RBKF
1954	2910.45	225.74	RBKF
1960	2940.13	225.89	RBKF
1963	2956.9	226	RBKF
1964	2972.6	225.91	RBKF
2019	3074.44	226.31	RBKF
2047	3153.29	224.96	RBKF
2053	3191.62	224.89	RBKF
2059	3219.75	224.85	RBKF
2070	3250.15	224.69	RBKF
2076	3253.03	224.78	RBKF
2080	3275.41	224.58	RBKF
2083	3297.99	225.14	RBKF
2108	3350.51	225.91	RBKF
2110	3388.39	226.17	RBKF
2113	3402.22	226	RBKF
2116	3421.03	225.66	RBKF
2197	3444.15	227.1	RBKF
2216	3460.03	226.65	RBKF
2215	3498.61	226.55	RBKF
2234	3519.42	226.29	RBKF
2214	3522.48	226.26	RBKF
2231	3553.46	225.62	RBKF

222	1169.9	228.9	Thalweg
219	1192.08	228.23	Thalweg
208	1264.26	228.58	Thalweg
210	1312.28	227.3	Thalweg
204	1318.21	227.09	Thalweg
202	1336.07	228	Thalweg
196	1361.72	228.27	Thalweg
191	1392.14	228.1	Thalweg
186	1404.21	227.95	Thalweg
183	1421.14	228.09	Thalweg
176	1426.75	227.46	Thalweg
172	1448.98	227.7	Thalweg
166	1469.28	227.29	Max Pool
163	1486.32	228.06	Thalweg
158	1500.08	228.03	Thalweg
154	1555.79	228.19	Thalweg
156	1556.49	228.22	Thalweg
151	1581.5	227.99	Thalweg
146	1611.02	227.65	Thalweg
141	1654.04	227.56	Thalweg
143	1685.95	227.92	Thalweg
138	1697.61	227.31	Thalweg
134	1706.75	227.71	Thalweg
128	1735.78	226.71	Max Pool
125	1747.68	227.49	Thalweg
121	1764.9	227.29	Thalweg
118	1783.69	227.61	Thalweg
113	1838.34	227.55	Thalweg
110	1854.99	227.29	Thalweg
105	1862.67	227.68	Thalweg
102	1886.34	227.26	Thalweg
83	1908.7	227.22	Rock Vane
99	1917	224.91	Thalweg
89	1927.01	225.43	Max Pool
93	1934.3	226.95	Thalweg
91	1950.04	226.91	Thalweg
87	1963.78	227.18	Thalweg
72	1983.61	226.86	Thalweg
81	1988.39	227.06	Thalweg
78	2011.05	226.99	Thalweg
62	2042.85	226.55	Thalweg
69	2058.73	226.35	Thalweg
68	2060.56	226.45	Thalweg
65	2066.21	226.72	Thalweg
60	2087.25	226.39	Max Pool
55	2095.72	226.83	Thalweg
30	2099.7	226.9	Thalweg
52	2108.14	227.11	Thalweg
47	2114.12	226.59	Thalweg
43	2133.06	226.27	Thalweg
39	2142.57	226.98	Thalweg
34	2157.92	226.96	Thalweg
32	2176.34	226.63	Thalweg
23	2177.12	226.62	Thalweg
26	2194.29	226.79	Thalweg
18	2229.6	226.04	Thalweg
16	2260.53	226.21	Head of Pool
282	2305.27	226.29	Thalweg
279	2338.92	226.02	Thalweg
280	2339.39	226.04	Thalweg
277	2353.2	226.52	Thalweg
276	2356.5	226.74	Head of Riffle
269	2359.1	226.7	Rock Vane
272	2359.8	224.74	Max Pool
274	2365.5	225.64	Thalweg
266	2366.28	225.77	Thalweg
264	2370.94	225.87	Thalweg
254	2384.95	226.65	Thalweg
258	2388.25	224.98	Thalweg
248	2401.01	225.53	Thalweg
245	2414.39	225.84	Thalweg
1796	2589.21	225.54	TCUL
1798	2612	225.48	TCUL
1800	2625.02	225.31	Thalweg
1802	2632.46	225.02	Thalweg
1804	2645.05	224.77	Thalweg
1806	2648.38	224.51	Thalweg
1810	2654.64	223.56	Thalweg
1815	2660.04	223.66	Thalweg
1818	2668.33	224.98	Thalweg
1822	2677.41	224.93	Thalweg
1825	2681.87	225.06	Thalweg
1828	2686.5	225.11	Thalweg
1832	2696.11	225.09	Thalweg
1834	2697.42	225.1	Rock Vane
1836	2700.26	223.37	Thalweg
1839	2705.95	223.49	Max Pool
1842	2711.7	224.55	Thalweg
1845	2713.45	224.58	Thalweg
1847	2714	224.66	Thalweg
1849	2716.17	224.75	Thalweg
1852	2718.53	224.71	Thalweg
1854	2733.23	224.45	Thalweg
1857	2742.53	224.38	Thalweg
1859	2745.07	224.03	Max Pool
1864	2748.63	224.41	Thalweg
1861	2757.61	224.66	Thalweg
1887	2768.61	224.27	Thalweg
1890	2780.55	224.45	Thalweg
1893	2787.32	224.66	Thalweg
1896	2797.99	224.09	Thalweg
1899	2804.26	224.05	Thalweg
1922	2807.24	224.21	Thalweg
1925	2817.27	224.36	Thalweg
1928	2826.97	224.41	Thalweg
1931	2836.24	224.34	Thalweg
1933	2841.99	224.46	Rock Vane
152	1580.76	228.57	Water
147	1610.93	228.48	Water
142	1653.65	228.47	Water
144	1685.26	228.47	Water
139	1697.11	228.47	Water
135	1706.63	228.47	Water
129	1735.26	228.46	Water
126	1747.48	228.47	Water
122	1770.34	228.47	Water
119	1783.72	228.33	Water
114	1838.81	228.22	Water
111	1855.49	228.05	Water
106	1863.01	228.07	Water
103	1886.24	227.79	Water
84	1917.6	227.79	Water
90	1927.12	227.8	Water
94	1939.47	227.8	Water
92	1950.32	227.77	Water
88	1964.77	227.76	Water
73	1981.17	227.76	Water
82	1988.13	227.75	Water
79	2011.81	227.73	Water
63	2043.05	227.65	Water
66	2066.32	227.62	Water
46	2071.66	227.6	Water
61	2087.06	227.59	Water
56	2095.65	227.58	Water
31	2099.96	227.57	Water
53	2107.52	227.58	Water
48	2114.69	227.53	Water
44	2132.19	227.52	Water
40	2141.6	227.49	Water
35	2158.36	227.47	Water
33	2176.74	227.46	Water
24	2177.06	227.46	Water
27	2194.6	227.48	Water
19	2231.72	227.32	Water
17	2261.02	227.3	Water
15	2262.54	227.29	Water
283	2305.28	226.89	Water
281	2341.7	226.87	Water
278	2355.34	226.87	Water
275	2357.5	226.81	Water
273	2361.23	226.81	Water
270	2365.17	226.78	Water
267	2365.99	226.78	Water
265	2370.99	226.78	Water
255	2385.09	226.72	Water
259	2387.93	226.42	Water
249	2400.37	226.39	Water
246	2414.67	226.38	Water
1797	2588.58	225.86	Water
1795	2599.77	225.83	Water
1799	2612.16	225.76	Water
1801	2625.09	225.76	Water
1803	2632.38	225.75	Water
1805	2644.42	225.74	Water
1807	2648.06	225.74	Water
1811	2654.6	225.74	Water
1816	2660.08	225.73	Water
1819	2668.38	225.72	Water
1823	2677.27	225.72	Water
1826	2681.62	225.73	Water
1829	2686.52	225.72	Water
1833	2696.09	225.7	Water
1835	2697.53	225.46	Water
1837	2700.27	225.06	Water
1840	2705.95	225.08	Water
1843	2711.54	225.08	Water
1846	2713.64	225.07	Water
1848	2715.05	225.08	Water
1850	2716.36	225.07	Water
1853	2718.48	225.07	Water
1855	2733.04	225.04	Water
1858	2742.33	224.99	Water
1860	2744.92	224.98	Water
1865	2749.11	224.98	Water
1862	2757.81	224.97	Water
1888	2768.09	224.96	Water
1891	2780.69	224.94	Water
1894	2787.94	224.93	Water
1897	2797.6	224.94	Water
1900	2804.3	224.92	Water
1923	2806.79	224.92	Water
1926	2816.93	224.92	Water
1929	2827.54	224.93	Water
1932	2835.95	224.91	Water
1934	2841.98	224.89	Water
1937	2847.4	224.85	Water
1940	2852.48	224.85	Water
1946	2881.63	224.84	Water
1948	2888.96	224.85	Water
1951	2901.42	224.84	Water
1953	2905.97	224.76	Water
1956	2914.97	224.76	Water
1959	2934.73	224.76	Water
1962	2946.28	224.72	Water
1966	2956.66	224.72	Water
1968	2965.52	224.71	Water
1970	2969.3	224.69	Water
1974	2978.91	224.71	Water
1978	2985.06	224.69	Water
1976	2987.89	224.7	Water
1980	2989.68	224.68	Water
1982	3000.31	224.63	Water
1984	3009.24	224.64	Water
1986	3016.49	224.62	Water
2328	3851.5	225.45	LBKF
2330	3871.45	225.23	LBKF
2334	3890.39	224.69	LBKF
2348	3898.34	224.58	LBKF
2351	3926.09	224.59	LBKF
2347	3943.01	224.8	LBKF
2361	3968.36	225.04	LBKF
2367	3997.82	224.86	LBKF
2372	4034.43	224.39	LBKF
2412	4072.1	224.85	LBKF
2415	4103.62	225.21	LBKF
2421	4134.66	225.16	LBKF
2426	4173.53	224.02	LBKF
2429	4190.07	223.67	LBKF
2434	4210.9	223.58	LBKF
2432	4211.7	223.74	LBKF
2438	4230.92	224.13	LBKF
2437	4231.13	224.1	LBKF
2442	4250.51	223.98	LBKF
2444	4275.01	223.82	LBKF
2448	4298.72	223.64	LBKF
2453	4330.25	224.46	LBKF
2457	4372.92	223.97	LBKF
2465	4416.15	224.74	LBKF
2467	4453.2	224.7	LBKF
2471	4484.64	226.11	LBKF
2476	4513.02	225.08	LBKF
2480	4531.74	225.44	LBKF
2481	4534.02	225.38	LBKF
2492	4576.34	225.31	LBKF
2497	4612.56	224.45	LBKF
2501	4644.04	224.74	LBKF
2539	4688.6	223.67	LBKF
2540	4715.89	223.62	LBKF
2546	4775.56	223.27	LBKF
2565	4785.6	223.02	LBKF
2568	4807.86	222.62	LBKF
2571	4839.85	223.12	LBKF
2575	4861.36	222.7	LBKF
2578	4891.03	222.91	LBKF
2582	4929.83	222.52	LBKF
2584	4955.79	222.71	LBKF
2587	4984.74	222.56	LBKF
2590	5015.24	223.88	LBKF
2593	5050.54	223.77	LBKF
2597	5083.23	223.58	LBKF
2601	5112.9	223.44	LBKF
2608	5146.96	222.75	LBKF
2611	5176.6	222.45	LBKF
2615	5211.05	223.74	LBKF
2628	5231.94	223.56	LBKF
2631	5288.73	223.04	LBKF
2635	5322.86	224.17	LBKF
2642	5335.85	221.89	LBKF
2657	5408.87	221.58	LBKF
2668	5465.87	222.26	LBKF
2679	5533.62	222.17	LBKF
2240	3589.77	225.66	RBKF
2251	3605.37	226.27	RBKF
2254	3649.31	225.34	RBKF
2257	3671.96	226.09	RBKF
2258	3691.13	227	RBKF
2274	3721.51	227.29	RBKF
2282	3745.36	226.84	RBKF
2288	3773.47	226.82	RBKF
2292	3790.74	226.93	RBKF
2322	3812.8	227	RBKF
2329	3861.25	226.77	RBKF
2333	3890.67	226.11	RBKF
2337	3921.84	225.77	RBKF
2358	3954.08	225.71	RBKF
2342	3960.86	225.88	RBKF
2364	4016.9	225.48	RBKF
2368	4052.37	225.1	RBKF
2411	4077.5	224.49	RBKF
2414	4102.96	224.54	RBKF
2418	4135.24	224.34	RBKF
2422	4159.64	224.24	RBKF
2425	4172.51	224.34	RBKF
2430	4193.07	224.04	RBKF
2439	4238.24	223.68	RBKF
2443	4270.78	224.02	RBKF
2445	4294.85	224.36	RBKF
2456	4356.83	223.69	RBKF
2458	4375.61	223.76	RBKF
2462	4393.01	223.84	RBKF
2466	4426.26	224.29	RBKF
2468	4461.28	224.14	RBKF
2472	4494.45	224.74	RBKF
2475	4513.26	225.05	RBKF
2479	4531.1	224.55	RBKF
2493	4571.13	224.34	RBKF
2491	4571.22	224.34	RBKF
2496	4600.06	224.25	RBKF
2500	4627.77	224.63	RBKF
2502	4627.93	224.6	RBKF
2505	4651.37	224.24	RBKF
2541	4680.82	223.96	RBKF
2545	4720.46	224.33	RBKF
2569	4784.71	224.65	RBKF
2570	4808.66	224.45	RBKF
2572	4832.96	224.35	RBKF
2576	4853.46	223.54	RBKF
2579	4885.68	223.28	RBKF
2577	4886	223.33	RBKF
2583	4928.52	223.33	RBKF
2588	4951.88	223.14	RBKF
2589	4982.9	223.02	RBKF
2591	5007.36	223.4	RBKF
2592	5028.78	223.47	RBKF
2596	5064.06	222.72	RBKF
2598	5080.46	222.86	RBKF
2602	5117.3	222.56	RBKF
2614	5157.27	223.07	RBKF
2618	5199.05	222.77	RBKF
2620	5218.79	222.7	RBKF
2629	5261.37	222.32	RBKF
2630	5294.31	222.11	RBKF
2634	5307.04	221.93	RBKF
2641	5328.32	222.12	RBKF
2646	5359.03	222.15	RBKF
2652	5369.47	222.35	RBKF
2658	5408.22	222.01	RBKF
2664	5441.49	222.73	RBKF
2669	5503.18	222.44	RBKF
2672	5531	222.91	RBKF

1936	2847.36	224.18	Thalweg		2006	3024.16	224.6	Water

Point	Station	Elevation	Description
1757	71.01	233.86	Rock Vane
1691	374.3	232.42	Rock Vane
1618	474.15	232.23	Rock Vane
1501	1072.21	229.99	Rock Vane
83	1909.4	227.22	Rock Vane
269	2359.8	226.7	Rock Vane
256	2385.95	226.68	Rock Vane
1834	2697.42	225.1	Rock Vane
1933	2841.99	224.46	Rock Vane
1975	2987.8	224.33	Rock Vane
2014	3059.25	224.1	Rock Vane
2096	3306.85	223.37	Rock Vane
2124	3373.41	223.47	Rock Vane
2323	3815.97	222.71	Rock Vane
2431	4212.84	222.29	Rock Vane
2459	4383.47	222.53	Rock Vane
2490	4570.19	222.35	Rock Vane
2494	4570.52	222.23	Rock Vane
2603	5076.9	221.85	Rock Vane

Point	Station	Elevation	Description
1781	2.71	242.13	Top of Bank
1777	9.98	240.54	Top of Bank
1768	13.04	240.47	Top of Bank
1769	20.68	239.28	Top of Bank
1680	46.46	238.4	Top of Bank
1679	57.53	240.51	Top of Bank
1727	123.74	239.84	Top of Bank
1734	174.92	241.52	Top of Bank
1678	223.98	240.27	Top of Bank
1740	230.07	241.8	Top of Bank
1743	295.23	242.29	Top of Bank
1752	354.34	241.93	Top of Bank
1677	358.88	240.68	Top of Bank
1751	371.93	239.69	Top of Bank
1676	420.72	239.66	Top of Bank
1675	525.67	239.19	Top of Bank
1654	568.24	241.03	Top of Bank
1674	621.65	239.08	Top of Bank
1667	707.9	240.54	Top of Bank
1673	729.11	239.4	Top of Bank
1671	759.07	240.31	Top of Bank
1672	778.68	239.29	Top of Bank
1548	793.52	237.2	Top of Bank
1549	839.2	239	Top of Bank
1547	844.21	238.13	Top of Bank
1546	919.97	237.51	Top of Bank
1553	947.35	238.2	Top of Bank
1550	957.68	236.39	Top of Bank
1552	962.79	237.5	Top of Bank
1545	967.11	236.11	Top of Bank
1551	1042.77	237.08	Top of Bank
1543	1089.53	237.85	Top of Bank
1544	1109.46	238.78	Top of Bank
234	1128.49	236.4	Top of Bank
215	1202.26	232.03	Top of Bank
216	1318.84	238.45	Top of Bank
201	1327.44	235.75	Top of Bank
195	1388.17	238	Top of Bank
162	1465.07	235.45	Top of Bank
148	1620.92	237.04	Top of Bank
131	1691.35	235.85	Top of Bank
130	1706.86	234.81	Top of Bank
127	1721.61	236.11	Top of Bank
117	1829.04	236.75	Top of Bank
107	1833.51	235.75	Top of Bank
97	1887.89	235.42	Top of Bank
96	1938.92	235.4	Top of Bank
77	1939.55	235.48	Top of Bank
70	2024.55	234.3	Top of Bank
74	2044.12	234.39	Top of Bank
59	2076.33	235.3	Top of Bank
25	2174.33	233.68	Top of Bank
21	2219.44	232.76	Top of Bank
13	2260.88	232.28	Top of Bank
251	2304.31	232.78	Top of Bank
247	2335.88	232.4	Top of Bank
244	2366.35	232.23	Top of Bank
242	2388.17	232.18	Top of Bank
240	2407.94	232.29	Top of Bank
238	2459.91	232.34	Top of Bank
2155	2571.38	231.59	Top of Bank
2154	2649.28	231.42	Top of Bank
2152	2683.97	231.15	Top of Bank
2153	2704.67	230.98	Top of Bank
2151	2769.52	231.34	Top of Bank
2158	2775.31	234.42	Top of Bank
2159	2839.21	231.76	Top of Bank
2150	2880.42	230.21	Top of Bank
2160	2897.45	232.87	Top of Bank
2149	2955.9	229.92	Top of Bank
2161	2966.71	230.12	Top of Bank
2148	2997.55	230.19	Top of Bank
2162	3020.73	232.2	Top of Bank
2163	3067.46	231.45	Top of Bank
2147	3101.14	229.77	Top of Bank

2146	3117	230.61	Top of Bank
2164	3153.73	231.04	Top of Bank
2165	3221.44	230.41	Top of Bank
2166	3257.57	232.8	Top of Bank
2167	3275.87	232.29	Top of Bank
2168	3308.41	230.38	Top of Bank
2169	3317.41	230.37	Top of Bank
2170	3357.81	230.75	Top of Bank
2145	3367.55	229.43	Top of Bank
2144	3413.7	230.01	Top of Bank
2403	3424.83	229.73	Top of Bank
2171	3478.01	229.74	Top of Bank
2402	3505	229.77	Top of Bank
2405	3535.22	229.73	Top of Bank
2249	3592.02	229.62	Top of Bank
2404	3601.44	227.91	Top of Bank
2273	3649.48	228.77	Top of Bank
2267	3680.5	229.55	Top of Bank
2401	3716.24	228.87	Top of Bank
2279	3721.53	227.3	Top of Bank
2399	3786.8	228.84	Top of Bank
2400	3834.06	228.61	Top of Bank
2397	3840.82	228.47	Top of Bank
2398	3916.64	228.19	Top of Bank
2396	3962.17	228.58	Top of Bank
2394	4030.68	228.4	Top of Bank
2395	4070.9	228.14	Top of Bank
2680	4082.25	225.79	Top of Bank
2682	4131.01	225.82	Top of Bank
2681	4165.83	226.33	Top of Bank
2683	4165.89	226.28	Top of Bank
2684	4199.81	225.57	Top of Bank
2685	4237.66	226.01	Top of Bank
2686	4263.4	226.33	Top of Bank
2687	4342.79	227.14	Top of Bank
2689	4412.72	226.5	Top of Bank
2690	4415.24	227.18	Top of Bank
2692	4488.79	227.75	Top of Bank
2691	4547.42	226.83	Top of Bank
2693	4552.07	226.82	Top of Bank
2694	4596.55	226.42	Top of Bank
2695	4615.68	225.8	Top of Bank
2696	4672.65	224.51	Top of Bank
2698	4683.95	224.4	Top of Bank
2697	4769.89	223.91	Top of Bank
2699	4778.7	224.91	Top of Bank
2701	4840.98	224.19	Top of Bank
2700	4866.31	224.48	Top of Bank
2702	4919.87	224.48	Top of Bank
2703	4928.42	223.77	Top of Bank
2705	4963.88	224.62	Top of Bank
2704	4994.9	223.46	Top of Bank
2706	5010.42	224.88	Top of Bank
2707	5041.84	225.38	Top of Bank
2709	5052.26	225.5	Top of Bank
2708	5089.54	223.72	Top of Bank
2711	5113.75	225.04	Top of Bank
2710	5144.77	223.64	Top of Bank
2714	5187.46	227.22	Top of Bank
2712	5198.85	222.92	Top of Bank
2721	5225.99	225.44	Top of Bank
2717	5226.19	227.44	Top of Bank
2715	5256.71	227.18	Top of Bank
2720	5288.36	225.14	Top of Bank
2713	5318.46	227.03	Top of Bank
2724	5348.72	225.3	Top of Bank
2716	5405.12	226.62	Top of Bank
2722	5427	223.51	Top of Bank
2725	5442.75	223.76	Top of Bank
2890	5466.91	223.7	Top of Bank
2723	5476.61	224.41	Top of Bank
2727	5501.25	222.9	Top of Bank
2726	5520.95	225.51	Top of Bank
2728	5529.6	222.97	Top of Bank