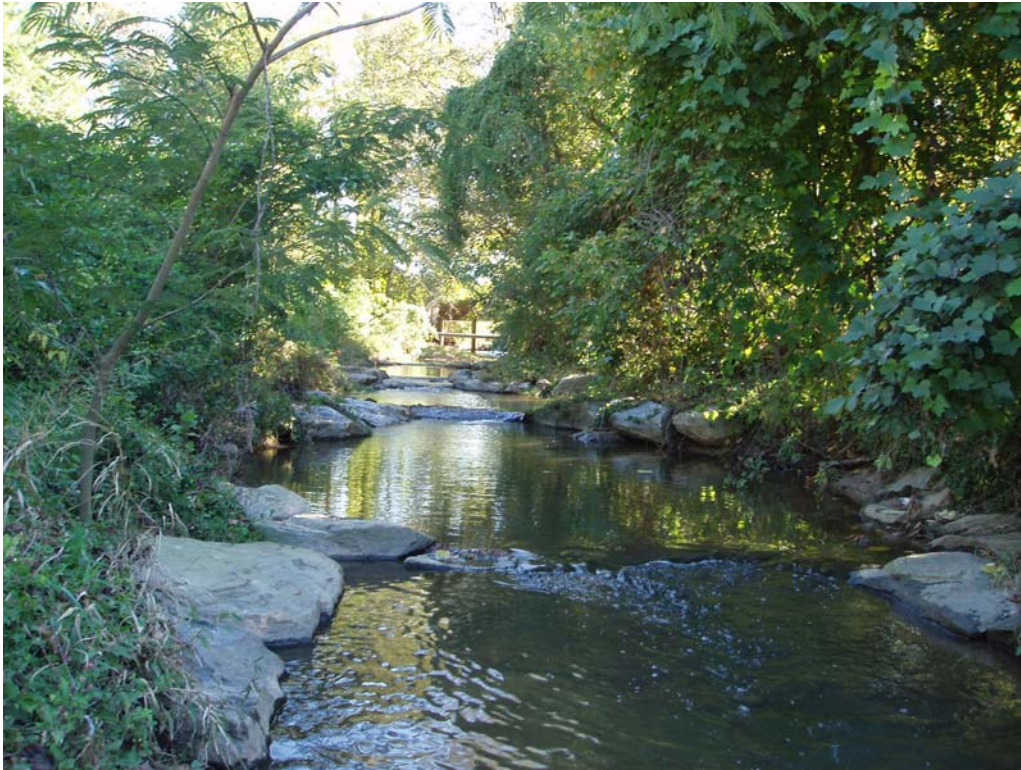


**Silas Creek Stream Restoration
2006 Monitoring Report
Monitoring Year Three**

Ecosystem Enhancement Program Project Number 00335



Submitted to: NCDENR-Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

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Submitted: January 19, 2007



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- I. Stream Problem Areas Plan View
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1.0 EXECUTIVE SUMMARY/PROJECT ABSTRACT

URS Corporation (URS) was retained by the North Carolina Ecosystem Enhancement Program (EEP) to conduct stream monitoring at the Silas Creek stream restoration project, located in Winston-Salem, Forsyth County, North Carolina. The stream monitoring effort conducted by URS in September 2006 represents Monitoring Year 3 for this project. Prior to the monitoring effort, URS received a digital As-Built drawing for the project site from EEP. In addition, URS received a Mitigation Plan prepared by Buck Engineering (Buck 2004), a Year 1 Monitoring Report produced by Buck Engineering (Buck 2005), and a Year 2 Monitoring Report prepared by EcoLogic Associates, P.C (EcoLogic 2006).

The Silas Creek project is located within the city limits of Winston-Salem in a heavily developed, urban watershed. The project reach is situated within Shaffner Park, where Silas Creek crosses Silas Creek Parkway, near the intersection of Silas Creek Parkway and Yorkshire Road. The project reach crosses under two major roads and is confined by water, sewer and other underground utilities, overhead power lines, and a well used urban greenway.

In 2003, EEP restored 4,449 linear feet of stream along three reaches of Silas Creek (Reaches 1, 2, and 3) and one reach of Buena Vista Branch. According to the Mitigation Plan, prior to the restoration activities the project reach had low sinuosity with varying levels of incision due to historic channelization. The Priority 2 and 3 restoration involved converting the impaired channels into sinuous channels, where possible (mostly on the tributary). Rock and log crossvanes, single arm vanes, channel width restrictors, and rock toe protection root wads (tributary only) were incorporated for aquatic habitat enhancement and bed and bank stability. A riparian buffer was planted using native vegetation. The buffer ranged from 15 to 25 feet in width, dependent upon space and easement limitations.

Data collected during Monitoring Year 3 indicated that the vegetation planted during the restoration effort has generally become well established. Seventeen vegetation problem areas were noted along the project reach. No vegetation problem areas were identified along Buena Vista Branch. Mimosa (*Albizia julibrissin*), Japanese honeysuckle (*Lonicera japonica*), porcelain berry (*Ampelopsis brevipedunculata*), Chinese privet (*Ligustrum sinense*), multiflora rose (*Rosa multiflora*), bamboo (*Phyllostachys aurea*), tree of heaven (*Ailanthus altissima*), and kudzu (*Pueraria montana*) were present in varying densities throughout the site. Populations of these non-native, invasive floral species should be monitored due to their propensity to outcompete and overwhelm the more desirable native vegetation planted during restoration.

While it has some problems, the Silas Creek restoration project is overall functioning fairly well, especially considering the highly urbanized watershed and flashy hydrology. Reach 1 is exhibiting an inability to transport sediment. As a result, the reach shows signs of aggradation and bar formation. In addition, several cross vanes are not functioning correctly, possibly due to improper construction. Reach 2 has undergone significant downcutting in the lower part of the reach, leaving all of the cross vanes in this section underwater during normal daily flows. Where Reach 2 ends at Silas Creek Parkway, the bed elevation is 2.7 feet below the invert of the culvert. Reach 3 is exhibiting bank erosion and scour in several areas along the reach. Buena Vista Branch is exhibiting significant aggradation and bar formation. Several pools within the reach are shallow and are continuing to fill in. In addition, several areas display bank erosion.

2.0 PROJECT BACKGROUND

2.1 PROJECT OBJECTIVES

The restoration of Silas Creek was conducted as a Priority 3 Restoration by changing the channel dimension to allow for the construction of a bankfull bench and the addition of rock structures to stabilize the channel and increase the in-stream channel diversity of riffles and pools. The Buena Vista Branch restoration was a Priority 2 and 3 and included building a bankfull bench in the upper reach, changing the channel pattern and profile, and installing stone structures and root wads. Prior to restoration, Silas Creek had failing banks, unstable plan form and cross sectional geometry, little or no riparian buffer, and poor bed morphology, diversity, and aquatic habitat. The goals of the Silas Creek restoration project were listed in the 2004 Year 1 monitoring Report as:

1. Restore 4,449 linear feet of channel dimension, pattern, and profile to the extent possible considering project constraints, watershed characteristics and data from reference reaches in similar watersheds.
2. Improve floodplain functionality by matching floodplain elevations with bankfull stage, therefore increasing watershed attenuation and reducing peak flows.
3. Stabilize native floodplain vegetation to allow treatment of diffuse storm flow and nutrient uptake while establishing part of a wildlife corridor in the watershed.
4. Improve the natural aesthetics of the stream corridor.
5. Improve the water quality of the Silas Creek watershed by reducing bank erosion, increasing nutrient storage and uptake, and increasing dissolved oxygen in the system.

2.2 PROJECT STRUCTURE, MITIGATION TYPE, AND APPROACH

The Priority 2 and 3 restoration involved converting the impaired channels into sinuous channels, where possible (mostly on the tributary). Rock and log crossvanes, single arm vanes, channel width restrictors, and rock toe protection root wads (tributary only) were installed for aquatic habitat enhancement and bed and bank stability. A riparian buffer was planted using native vegetation.

**Table I. Project Restoration Components
Silas Creek
EEP Project Number 00335**

Project Segment or Reach ID	Existing Feet*	Mitigation Type	Approach	Linear Footage	Mitigation Ratio*	Mitigation Units*	Stationing	Comment
Silas Creek – Reach 1	999	EI	PIII	450			0+00 to 4+50	Cut new floodplain, restoration of incised channel
Silas Creek – Reach 2	897	EI	PIII	6,735			4+50 to 70+00	Cut new floodplain, restoration of incised channel
Silas Creek – Reach 3	1,771	EI	PIII	2,352			0+00 to 25+00	Cut new floodplain, restoration of incised channel
Buena Vista Branch	782	R	PII & III	1,409			0+00 to 15+00	Change dimension, pattern, and profile

* Mitigation Ratios and Units were not provided in previous reports.

R= Restoration

P1= Priority I

EI= Enhancement I

PII= Priority II

EII= Enhancement II

PIII= Priority III

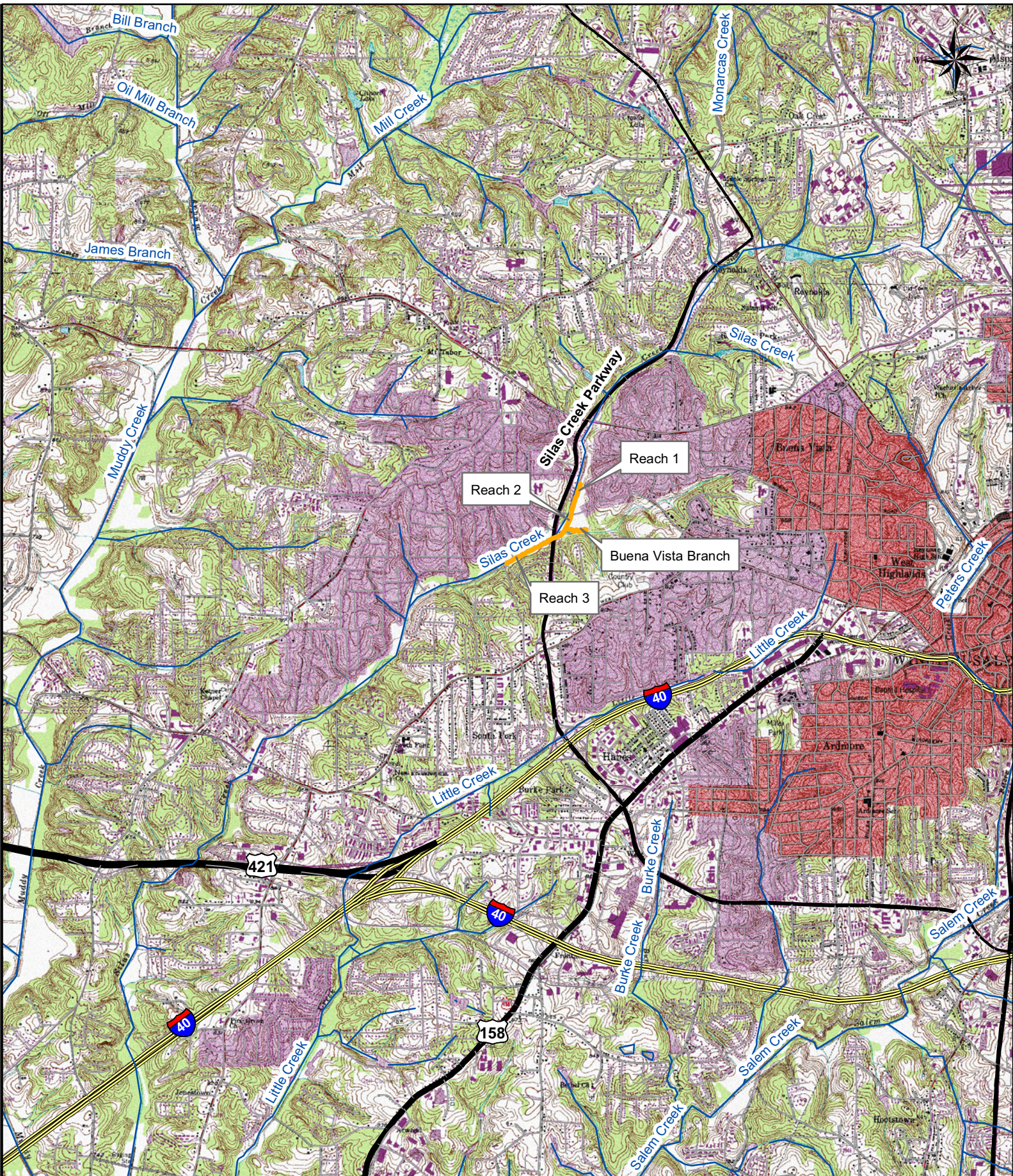
S= Stabilization

SS= Stream Bank Stabilization

2.3 LOCATION AND SETTING

The Silas Creek project is located within the city limits of Winston-Salem in a heavily developed urban watershed. The project reach is within Shaffner Park, located where Silas Creek crosses Silas Creek Parkway, near the intersection of Silas Creek Parkway and Yorkshire Road (Figure 1). The project crosses under two major roads and is confined by water, sewer and other underground utilities, overhead power lines, and a well used urban greenway. The project restored three reaches of Silas Creek and one reach of Buena Vista Branch. The reaches are divided as follows: Reach 1 of Silas Creek begins at a pedestrian bridge upstream/north of Yorkshire Road, and ends at the Yorkshire Road crossing. Reach 1 is 970 feet in length. Reach 2 of Silas Creek begins at Yorkshire Road and ends at the Silas Creek Parkway crossing. Reach 2 is 915 feet in length. Reach 3 of Silas Creek begins at Silas Creek Parkway and ends at a pedestrian bridge southwest of Silas Creek Parkway. Reach 3 is 1,807 feet in length. Buena Vista Branch is a tributary to Silas Creek. It is approximately 799 feet in length and joins Silas Creek between Yorkshire Road and Silas Creek Parkway (within Reach 2). Lengths are derived from the Year 3 longitudinal profiles.

To travel to the site from the Raleigh-area, take I-40 West towards Winston-Salem. Take Exit 188 onto I-40/US-421 South towards Winston-Salem. Take the Silas Creek Parkway/NC-67 East exit. The project reach is located in Shaffer Park, just north of Country Club Road. Reaches 1 and 2 and Buena Vista Branch are located east of Silas Creek Parkway. Reach 3 is west of Silas Creek Parkway.



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Prepared For:
 NC Ecosystem
 Enhancement Program



Project:
 Silas Creek
 Stream Restoration
 Forsyth County, NC

Project Number:
 00335

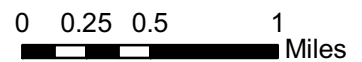
Monitoring Year:
 3 (2006)

Date:
 January 2007

Legend

Project Reach

Figure 1
 Project Vicinity



2.3 PROJECT HISTORY AND BACKGROUND

The Silas Creek restoration project was constructed during the spring and summer of 2003. The As-built survey was conducted in October of 2003.

The pre-restoration stream channels had low sinuosity and varying levels of incision due to historic channelization. The stream restoration design was based on natural channel design principals and considered differences in drainage area, adjacent land uses, upstream impoundments, and future development potential. The design addressed the channel dimension, pattern, and profile based on reference reach parameters and hydraulic geometry relationships. When considering design alternatives, every effort was made to create a stable meandering channel with bankfull stage located at the existing floodplain elevation. Where valley or development restrictions did not allow for channel pattern to be established, the existing incised channels were enhanced by excavating new floodplain benches and installing structures to improve bed features and control channel grade.

Activity or Report	Scheduled Completion	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	Unknown	Unknown	Unknown
Design 90%	Unknown	Unknown	Unknown
Construction	2003	Fall 2003	Fall 2003
Planting	2003	January 2004	January 2004
As-Built/Mitigation Report	2003	Fall 2003	Fall 2003
Year 1 Monitoring	2005	October 2004	February 2005
Year 2 Monitoring	2005	September 2005	April 2006
Year 3 Monitoring	2006	October 2006	December 2006
Year 4 Monitoring	2007	--	--
Year 5 Monitoring	2008	--	--
Year + Monitoring	Not scheduled	--	--

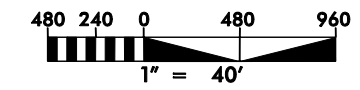
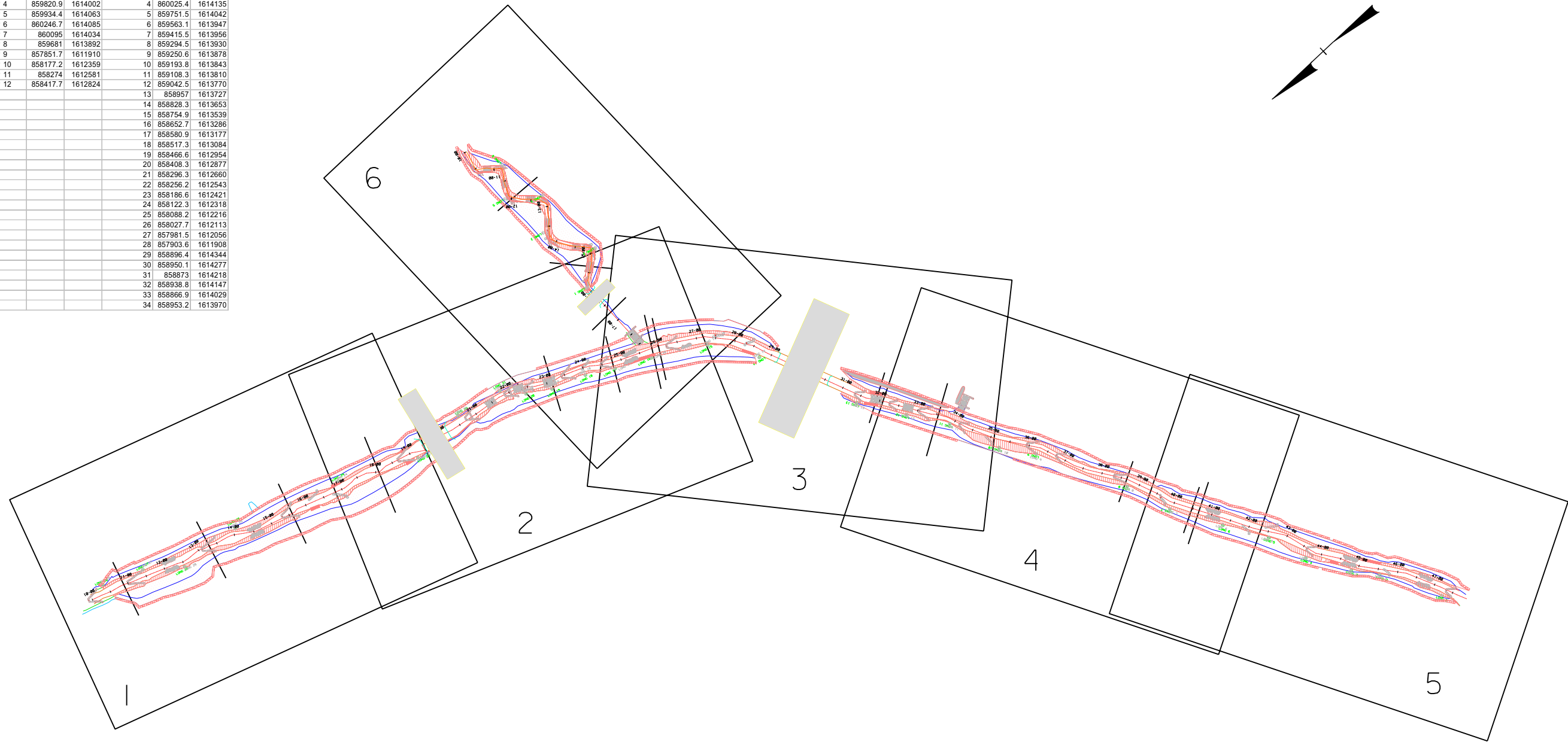
Designer	Buck Engineering 1152 Executive Circle, Suite 100 Cary, NC 27511 Will Harmon 919-463-5488
Primary project design POC	
Construction Contractor	North State Environmental 2889 Lowery Street Winston-Salem, NC 27101 Darryl Westmoreland 336-725-2010
Construction contractor POC	
Planting Contractor	North State Environmental 2889 Lowery Street Winston-Salem, NC 27101 Darryl Westmoreland 336-725-2010
Planting contractor POC	

Seeding Contractor Seeding contractor POC	Unknown
2004 Monitoring Performers	Buck Engineering 1152 Executive Circle, Suite 100 Cary, NC 27511 Will Harmon 919-463-5488
2005 Monitoring Performers Stream Monitoring POC Vegetation Monitoring POC	EcoLogic Associates, P.C. 4321-A S. Elm-Eugene St. Greensboro, NC 27406 Kyle Hoover 336-335-1108 Moni Bates 336-335-1108
2006 Monitoring Performers Monitoring POC	URS Corporation – North Carolina 1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560 Kathleen McKeithan 919-461-1597

Table IV. Project Background Table		
Silas Creek		
EEP Project Number 00335		
Project County		Forsyth County
Drainage Area	Silas Creek	7.2 square miles
	Buena Vista Branch	1.4 square miles
Drainage impervious cover estimate (%)		Estimated at >25%
Stream Order	Silas Creek	3 rd
	Buena Vista Branch	1 st
Physiographic Region		Piedmont/Foothills
Ecoregion		Northern Inner Piedmont (45b)
Rosgen Classification of As-Built	Silas Creek	B4c
	Buena Vista Branch	E4
Dominant soil types		Wehadkee, Chewacla, Urban land
Reference site ID		Unknown
USGS HUC for Project		03040103
NCDWQ Sub-basin for Project		03-07-06
NCDWQ classification for Project		C
Any portion of any project segment 303d listed?		No
Any portion of any project segment upstream of a 303d listed segment?		No
Reasons for 303d listing or stressor		NA
% of project easement fenced		0% - no cattle in reach

2.5 MONITORING PLAN VIEW

Veg Plots			Photo Points		
ID	Northing	Easting	ID	Northing	Easting
VP 1	858899.7	1613989	1	860369.8	1614261
VP 2	858894.3	1614253	2	860268.4	1614219
VP 3	859086.7	1613723	3	860185.1	1614151
VP 4	859820.9	1614002	4	860025.4	1614135
VP 5	859934.4	1614063	5	859751.5	1614042
VP 6	860246.7	1614085	6	859563.1	1613947
VP 7	860095	1614034	7	859415.5	1613956
VP 8	859681	1613892	8	859294.5	1613930
VP 9	857851.7	1611910	9	859250.6	1613878
VP 10	858177.2	1612359	10	859193.8	1613843
VP 11	858274	1612581	11	859108.3	1613810
VP 12	858417.7	1612824	12	859042.5	1613770
			13	858957	1613727
			14	858828.3	1613653
			15	858754.9	1613539
			16	858652.7	1613286
			17	858580.9	1613177
			18	858517.3	1613084
			19	858466.6	1612954
			20	858408.3	1612877
			21	858296.3	1612660
			22	858256.2	1612543
			23	858186.6	1612421
			24	858122.3	1612318
			25	858088.2	1612216
			26	858027.7	1612113
			27	857981.5	1612056
			28	857903.6	1611908
			29	858896.4	1614344
			30	858950.1	1614277
			31	858873	1614218
			32	858938.8	1614147
			33	858866.9	1614029
			34	858953.2	1613970



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PROJECT: SILAS CREEK
 STREAM RESTORATION
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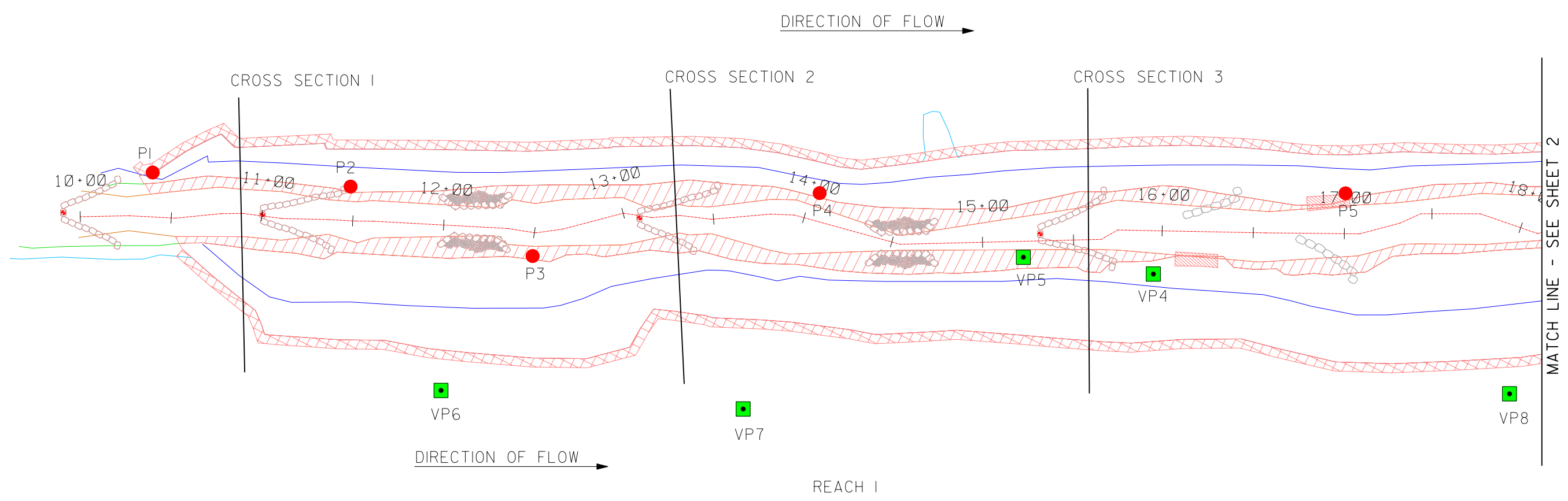
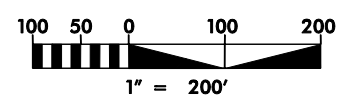
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LEGEND

- CHANNEL (10/03)
- TOP OF TERRACE (10/03)
- TOE OF TERRACE (10/03)
- THALWEG (10/03)
- BANKFULL (10/03)
- PHOTO POINT
- VEGETATION PLOT
- CROSS VANE
- JHOOK
- VANE
- STEP POOL
- MODIFIED CROSS VANE
- CONSTRUCTED RIFFLE
- DOUBLE WING DEFLECTOR
- ROOTWAD



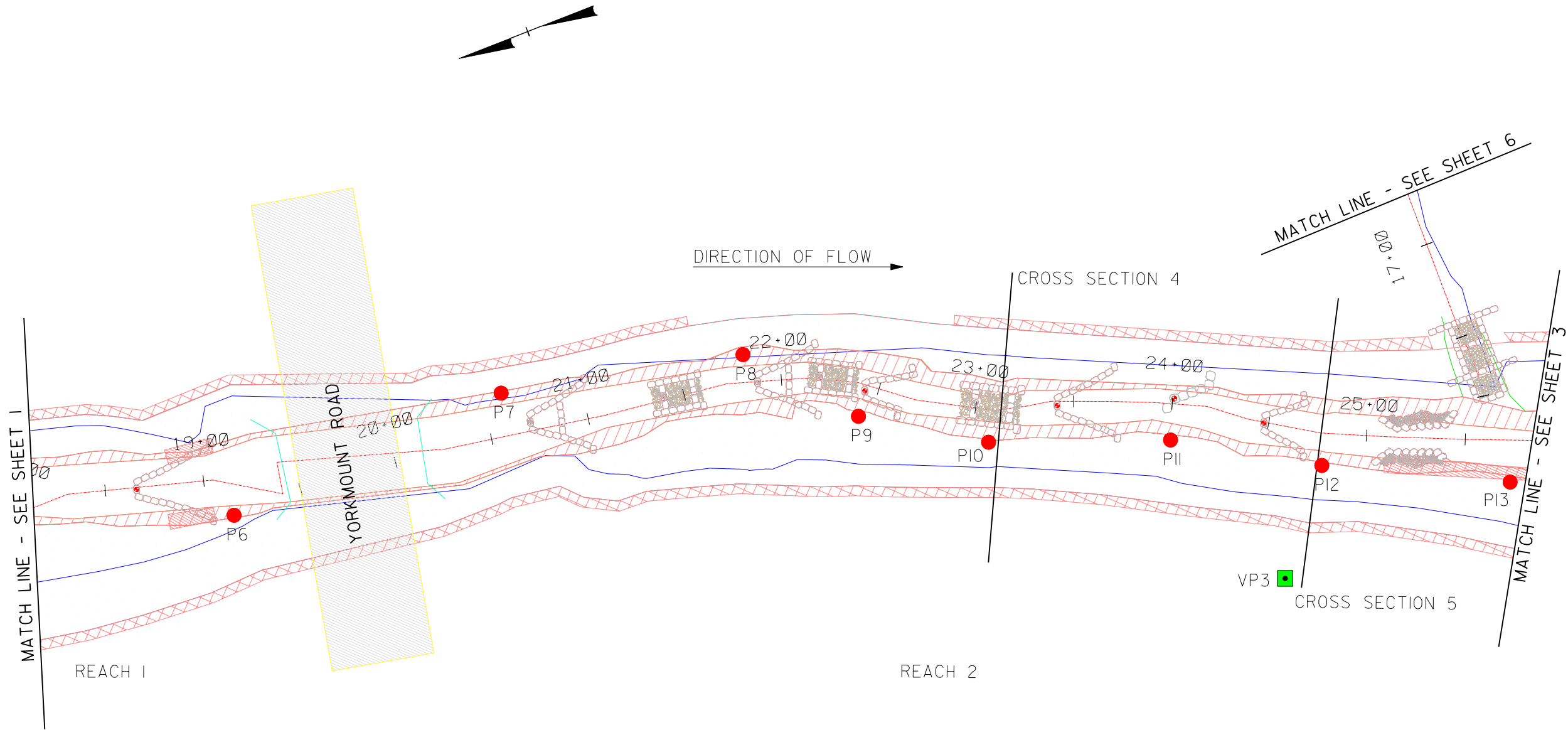
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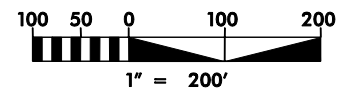
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PROJECT: SILAS CREEK
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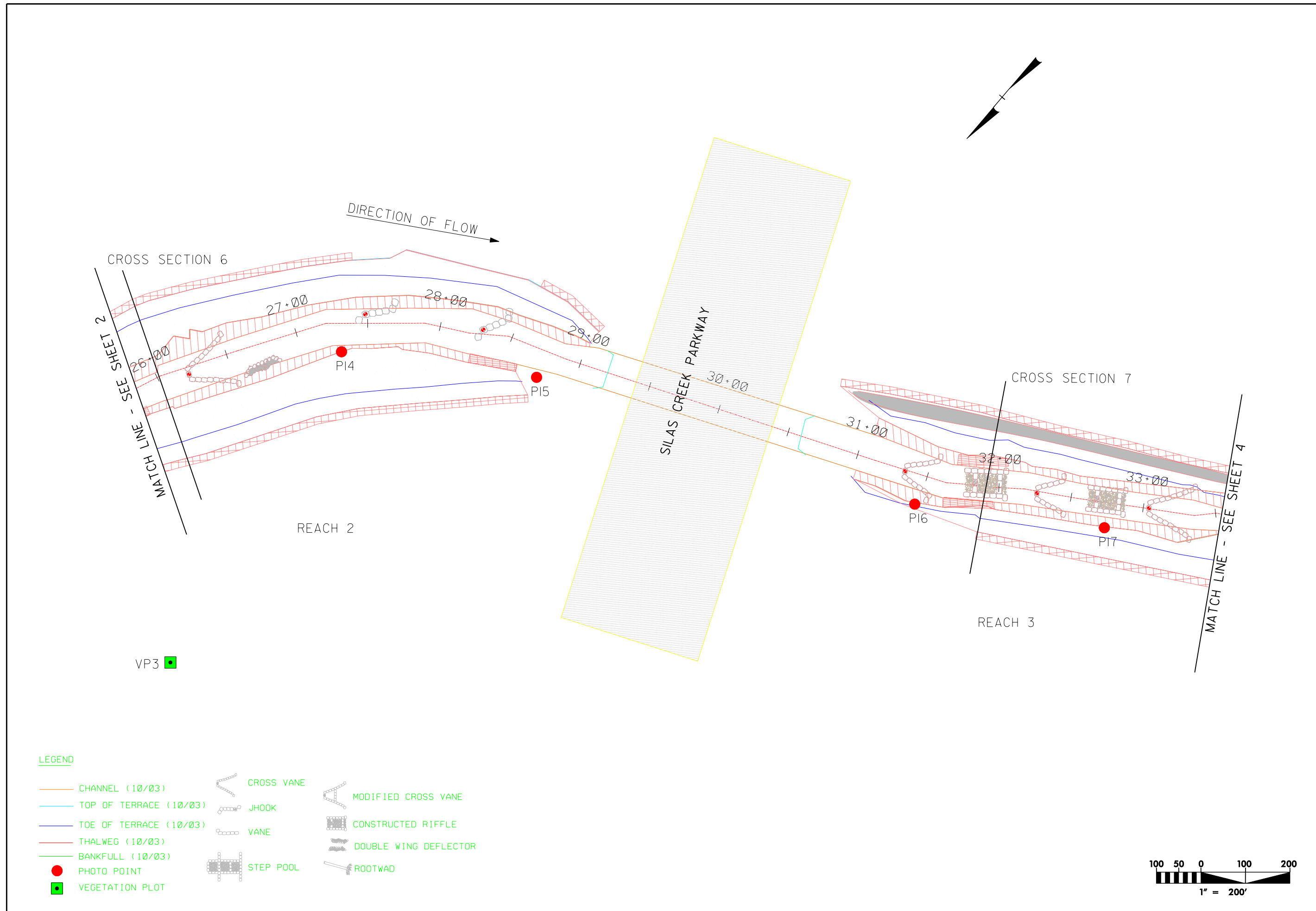
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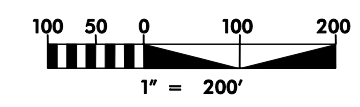
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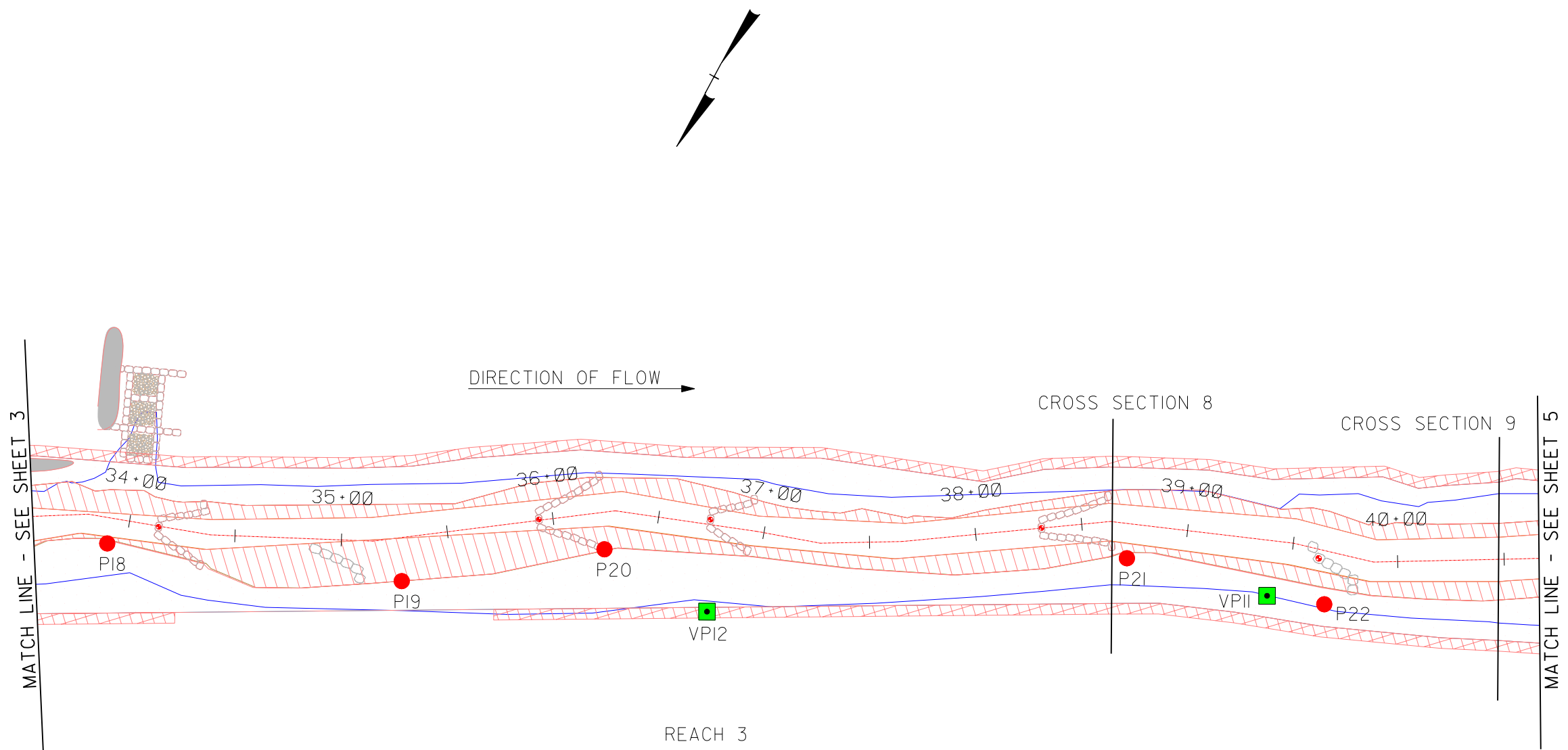
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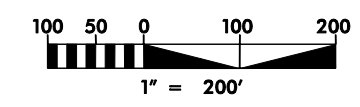
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 - MODIFIED CROSS VANE
 - CONSTRUCTED RIFFLE
 - DOUBLE WING DEFLECTOR
 - ROOTWAD





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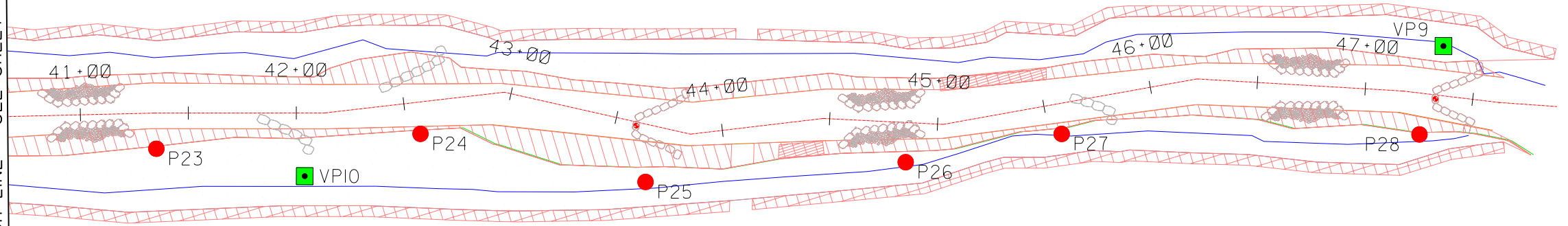
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MATCH LINE - SEE SHEET 4

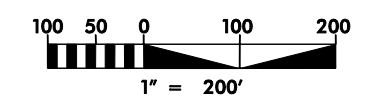
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REACH 3

LEGEND

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- TOE OF TERRACE (10/03)
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- BANKFULL (10/03)
- PHOTO POINT
- VEGETATION PLOT
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- JHOOK
- VANE
- STEP POOL
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- ROOTWAD



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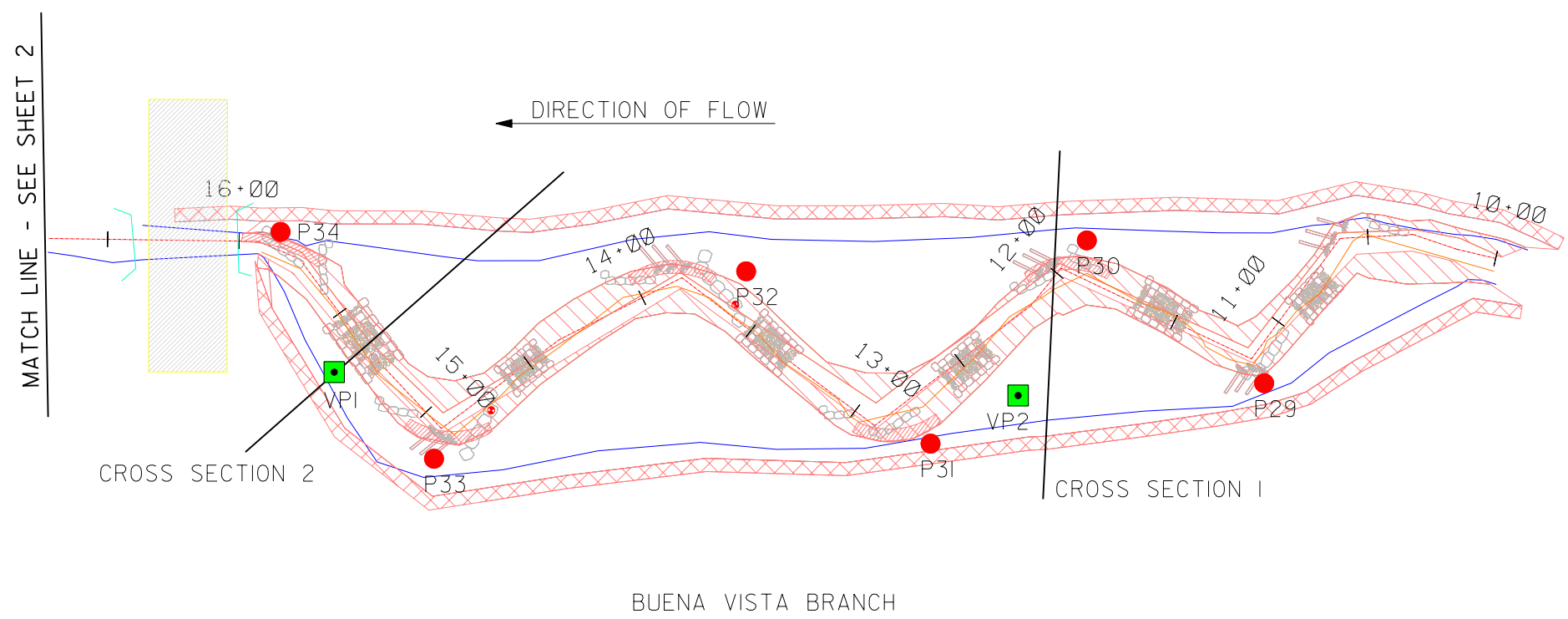
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PROJECT: SILAS CREEK
 STREAM RESTORATION
 2006 MONITORING REPORT
 TITLE: MONITORING PLAN VIEW

CLIENT: NORTH CAROLINA DEPARTMENT
 OF ENVIRONMENT AND
 NATURAL RESOURCES

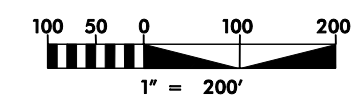
FIGURE 2
 DATE: DEC 2006
 TECHNICIAN: EHJ
 CHECKED BY: KM
 MONITORING
 YEAR 3
 EEP PROJECT NO.
 00335
 SHEET NO.
 5



BUENA VISTA BRANCH

LEGEND

- CHANNEL (10/03)
- TOP OF TERRACE (10/03)
- TOE OF TERRACE (10/03)
- THALWEG (10/03)
- - - BANKFULL (10/03)
- PHOTO POINT
- VEGETATION PLOT
- CROSS VANE
- JHOOK
- VANE
- STEP POOL
- MODIFIED CROSS VANE
- CONSTRUCTED RIFFLE
- DOUBLE WING DEFLECTOR
- ROOTWAD



REVISIONS

NO.	DATE

Prepared by
URS
 URS Corporation - North Carolina
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 Morrisville, North Carolina 27560
 TELEPHONE (919) 461-1100 FAX (919) 461-1415

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FIGURE 2
 DATE: DEC 2006
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 MONITORING
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 SHEET NO.
 6

3.0 PROJECT CONDITION AND MONITORING RESULTS

3.1 VEGETATION ASSESSMENT

3.1.1 Vegetative Problem Areas

No Vegetative Problem Areas were identified during 2005 monitoring (Year 2). During 2006 monitoring (Year 3), mimosa, Japanese honeysuckle, porcelain berry, Chinese privet, multiflora rose, bamboo, tree of heaven, and kudzu were present in varying densities throughout the site. Populations of these non-native, invasive floral species should be monitored due to their propensity to outcompete and overwhelm the more desirable native vegetation planted during restoration. Areas with high densities of one or more of these species were identified as Vegetative Problem Areas and are described in Tables A6a to A6c. Seventeen Vegetative Problem Areas were identified along Silas Creek. No Vegetative Problem Areas were observed on Buena Vista Branch. Vegetative Problem Area Photographs are located in Appendix A-II.

3.1.2 Vegetative Problem Areas Plan View

See Figure 3 in Appendix A-III for the Vegetative Problem Areas Plan View.

3.2 STREAM ASSESSMENT

3.2.1 Procedural Items

3.2.1.1 Morphometric Criteria

Dimension and profile were sampled at a rate as per the March 2004 Mitigation Plan completed by Buck Engineering.

Dimension: Nine permanent cross sections are located on Silas Creek for a total of five riffles and four pools. Two permanent cross sections, a riffle and a pool, are located on Buena Vista Branch.

Profile: The longitudinal survey includes the entire project reach (799 linear feet of Buena Vista Branch, 970 linear feet of Reach 1, 915 linear feet of Reach 2, and 1,807 linear feet of Reach 3), for a total survey length of 4,491 linear feet. Measurements include thalweg, water surface, bankfull, and top of low bank. Each measurement is taken at the top of the feature.

3.2.1.2 Hydrologic Criteria

It is not possible to document bankfull events at Silas Creek at this time. No crest gages are installed at this site to document bankfull events, and there are no USGS stream gage stations located within Forsyth County. The site lies in the central portion of Forsyth County, making surrounding counties' gages far from the project vicinity.

3.2.1.3 Bank Stability Assessments

A detailed BEHI and NBS assessment was not required for the Silas Creek Restoration site during this monitoring year. According to the 2006 Monitoring Guidelines (EEP 2006), an assessment is required during year 5, post construction only.

3.2.2 Stream Problem Areas

The Stream Problem Areas Plan View, data tables, and photos are located in Appendices B-I, B-II, and B-III, respectively.

3.2.3 Fixed Photo Station Photos

Fixed Photo Station Photos are located in Appendix B-IV.

3.2.4 Stability Assessment

**Table Va. Categorical Stream Feature Visual Stability Assessment (% Functioning)
Reaches 1, 2, and 3 - Silas Creek
EEP Project Number 00335**

Feature	Initial*	MY-01**	MY-02**	MY-03	MY-04	MY-05
A. Riffle	100	N/A	N/A	70		
B. Pool	100	N/A	N/A	95		
C. Thalweg	100	N/A	N/A	100		
D. Meanders	100	N/A	N/A	100		
E. Bed General	100	N/A	N/A	95		
F. Bank Condition	100	N/A	N/A	98		
G. Vanes / J Hooks	100	N/A	N/A	61		
H. Wads and Boulders	100	N/A	N/A	100		

* It is assumed that all were 100 percent functional upon completion of construction

** No stability data are presented in previous reports

Table Vb. Categorical Stream Feature Visual Stability Assessment (% Functioning)						
Buena Vista Branch - Silas Creek						
EEP Project Number 00335						
Feature	Initial*	MY-01**	MY-02**	MY-03	MY-04	MY-05
A. Riffle	100	N/A	N/A	78		
B. Pool	100	N/A	N/A	90		
C. Thalweg	100	N/A	N/A	86		
D. Meanders	100	N/A	N/A	100		
E. Bed General	100	N/A	N/A	93		
F. Bank Condition	100	N/A	N/A	99		
G. Vanes / J Hooks	100	N/A	N/A	67		
H. Wads and Boulders	100	N/A	N/A	100		

* It is assumed that all were 100 percent functional upon completion of construction

** No stability data are presented in previous reports

3.2.5 Quantitative Measures Tables (Morphology and Hydrology)

**Table VIa. Baseline Morphology and Hydraulic Summary – Silas Creek
Silas Creek
EEP Project Number 00335**

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)	--	--	--	18	50	30	--	--	40	--	--	--	--	--	40	33	39	36
Floodprone Width (ft)	--	--	--	--	--	--	68	272	--	--	--	--	120	272	--	66	95	79.8
BF Cross Sectional Area (ft ²)	--	--	--	42	150	80	--	--	138	--	--	--	--	--	138	83	120	102
BF Mean Depth (ft)	--	--	--	1.7	4.0	3.0	--	--	3.5	--	--	--	--	--	3.5	2.43	3.42	2.83
BF Max Depth (ft)	--	--	--	--	--	--	--	--	4.5	--	--	--	--	--	4.5	3.27	4.82	4.13
Width/Depth Ratio	--	--	--	--	--	--	--	--	11.7	--	--	--	--	--	11.7	10.3	14.7	12.9
Entrenchment Ratio	--	--	--	--	--	--	1.7	6.8	--	--	--	--	3.0	6.8	--	2	2.7	2.2
Bank Height Ratio	--	--	--	--	--	--	--	--	1.6	--	--	--	--	--	1.0	--	--	--
Wetted Perimeter (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydraulic radius (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pattern																		
Channel Beltwidth (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Radius of Curvature (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Meander Wavelength (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Meander Width Ratio	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Profile																		
Riffle Length (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Riffle Slope (ft/ft)	--	--	--	--	--	--	--	--	0.0028	--	--	--	--	--	0.0028	--	--	--
Pool Length (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pool Spacing (ft)	--	--	--	--	--	--	82	189	--	--	--	--	72	144	--	54	457	210
Substrate																		
d50 (mm)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.74	8	0.94
d84 (mm)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	21.34	128	23.4

**Table VIa. Baseline Morphology and Hydraulic Summary – Silas Creek
Silas Creek
EEP Project Number 00335**

Additional Reach Parameters	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Valley Length (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3461
Channel Length (ft)	--	--	--	--	--	--	--	--	3667	--	--	--	--	--	3667	--	--	3808
Sinuosity	--	--	--	--	--	--	--	--	1.03	--	--	--	--	--	1.03	--	--	1.1
Water Surface Slope (ft/ft)	--	--	--	--	--	--	--	--	0.0025	--	--	--	--	--	0.0025	--	--	0.003
BF Slope (ft/ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.002
Rosgen Classification	--	--	--	--	--	--	--	--	B4c	--	--	--	--	--	B4c	--	--	B4c

**Table VIb. Baseline Morphology and Hydraulic Summary – Buena Vista Branch
Silas Creek
EEP Project Number 00335**

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)	--	--	--	8.0	30.0	18	--	--	14.5	--	--	--	--	--	17.6	16.64	62.72	--
Floodprone Width (ft)	--	--	--	--	--	--	20	119	--	--	--	--	60	160	--	--	--	--
BF Cross Sectional Area (ft ²)	--	--	--	15	52	30	--	--	30.6	--	--	--	--	--	32.2	24.9	85.2	--
BF Mean Depth (ft)	--	--	--	1.1	2.9	1.8	--	--	2.11	--	--	--	--	--	1.8	1.36	1.5	--
BF Max Depth (ft)	--	--	--	--	--	--	--	--	3.21	--	--	--	--	--	2.6	2.29	3.58	--
Width/Depth Ratio	--	--	--	--	--	--	--	--	6.86	--	--	--	--	--	10	--	--	--
Entrenchment Ratio	--	--	--	--	--	--	1.4	8.2	--	--	--	--	3.4	9.1	--	--	--	--
Bank Height Ratio	--	--	--	--	--	--	--	--	1.8	--	--	--	--	--	1.0	--	--	1.7
Wetted Perimeter (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydraulic radius (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pattern																		
Channel Beltwidth (ft)	--	--	--	--	--	--	15.4	23.8	--	--	--	--	53	88	--	54.5	66.9	60.4
Radius of Curvature (ft)	--	--	--	--	--	--	25	100	--	--	--	--	32	53	--	18.8	35.6	29.4
Meander Wavelength (ft)	--	--	--	--	--	--	72	105	--	--	--	--	120	200	--	117.3	164.9	144.6
Meander Width Ratio	--	--	--	--	--	--	1.1	1.6	--	--	--	--	3	5	--	--	--	--
Profile																		
Riffle Length (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	17.3	27.7	24
Riffle Slope (ft/ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.04%	2.46%	1.21%
Pool Length (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	43.1	84.7	62.2
Pool Spacing (ft)	--	--	--	--	--	--	45	160	--	--	--	--	60	100	--	65.1	103.0	87.0
Substrate																		
d50 (mm)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.31	18.44	10.48
d84 (mm)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30.12	84.97	61.55

**Table VIb. Baseline Morphology and Hydraulic Summary – Buena Vista Branch
 Silas Creek
 EEP Project Number 00335**

Additional Reach Parameters	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Valley Length (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Channel Length (ft)	--	--	--	--	--	--	--	--	668	--	--	--	--	--	782	--	--	782
Sinuosity	--	--	--	--	--	--	--	--	1.09	--	--	--	--	--	1.22	--	--	1.23
Water Surface Slope (ft/ft)	--	--	--	--	--	--	--	--	0.0107	--	--	--	--	--	0.009	--	--	--
BF Slope (ft/ft)	--	--	--	--	--	--	--	--		--	--	--	--	--		--	--	--
Rosgen Classification	--	--	--	--	--	--	--	--	E4	--	--	--	--	--	E4	--	--	E4

**Exhibit Table VIIa-1. Morphology and Hydraulic Monitoring Summary – Silas Creek
Silas Creek
EEP Project Number 00335**

Parameter	Reach 1 Cross Section 1 Rifle					Reach 1 Cross Section 2 Pool					Reach 1 Cross Section 3 Pool					Reach 2 Cross Section 4 Riffle				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension																				
BF Width (ft)	35.09	41.11	37.8			33.77	67.32	32.6			33.08	43.07	34.7			35.79	38.7	40.2		
Floodprone Width (ft)	65.96	93.56	>91.5			67.5	122.2	81.7			74.79	79.14	>83.0			95.05	81.39	>79.3		
BF Cross Sectional Area (ft ²)	120	104.9	113.0			135.4	241.8	102.2			82.8	84.99	184.9			86.92	104.2	105.9		
BF Mean Depth	3.42	2.55	3.0			4.01	3.59	3.1			2.5	1.97	5.3			2.43	2.69	2.6		
BF Max Depth	4.5	4.21	4.8			7.1	5.47	6.5			4.34	3.2	8.4			3.27	4.96	5.4		
Width/Depth Ratio	10.27	16.11	12.6			8.42	18.87	10.4			13.22	21.82	6.5			14.73	14.39	15.3		
Entrenchment Ratio	2.1	2.28	>2.4			2	1.81	2.5			2	1.84	>2.4			2.7	2.1	>2.0		
Bank Height Ratio	2.2	--	1.0			1.72	--	1.0			2.06	--	1.0			2.72	--	1.0		
Wetted Perimeter (ft)	--	42.6	40.0			--	69.73	36.3			--	44.19	42.3			--	40.81	42.8		
Hydraulic radius (ft)	--	2.46	2.8			--	3.47	2.8			--	1.92	4.4			--	2.55	2.5		
Substrate																				
d50 (mm)	--	4.46	6			--	11.97	0.23			--	3	0.23			--	17.65	40		
d84 (mm)	--	15.85	14			--	28.87	0.88			--	12.15	0.88			--	77.87	240		

Exhibit Table VIIa-2. Morphology and Hydraulic Monitoring Summary – Silas Creek
Silas Creek
EEP Project Number 00335

Parameter	Reach 2 Cross Section 5 Pool					Reach 2 Cross Section 6 Run*					Reach 3 Cross Section 7 Pool					Reach 3 Cross Section 8 Pool				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension																				
BF Width (ft)	35.27	32.97	29.6			37.47	41.89	32.1			44.74	37.49	35.4			37.31	35.97	27.1		
Floodprone Width (ft)	89.88	92.63	83.0			80.14	102.4	92.2			100.2	52.96	70			82.4	56.92	73.8		
BF Cross Sectional Area (ft ²)	119.8	141.7	143.5			115.7	100.3	91.8			135.5	102	92.6			98.87	146.1	111.5		
BF Mean Depth	3.4	4.3	4.9			2.93	2.39	2.9			3.03	2.72	2.6			2.65	4.06	4.1		
BF Max Depth	5.36	7.67	6.4			4.82	3.74	3.7			5.87	4.69	4.4			4.84	7.68	7.7		
Width/Depth Ratio	10.39	7.67	6.1			13.46	17.5	11.2			14.77	13.78	13.6			14.08	8.86	6.6		
Entrenchment Ratio	2.55	2.81	2.8			2.03	2.44	2.9			2.24	1.41	2.0			2.21	1.58	2.7		
Bank Height Ratio	1.81	--	1.0			1.82	--	1.0			1.72	--	1.0			2.08	--	1.0		
Wetted Perimeter (ft)	--	37.39	34.9			--	43.57	35.6			--	39.77	38.7			--	40.41	33.3		
Hydraulic radius (ft)	--	3.79	4.1			--	2.3	2.6			--	2.56	2.4			--	3.61	3.4		
Substrate																				
d50 (mm)	--	10.83	0.25			--	26.36	40			--	15.06	0.64			--	10.81	0.64		
d84 (mm)	--	92.53	16			--	96.33	240			--	53.14	13			--	30.29	13		

Exhibit Table VIIa-3. Morphology and Hydraulic Monitoring Summary – Silas Creek Silas Creek EEP Project Number 00335						
Parameter	Reach 3 Cross Section 9 Pool					
	MY1	MY2	MY3	MY4	MY5	MY+
Dimension						
BF Width (ft)	37.17	35.66	25.6			
Floodprone Width (ft)	81	79.03	58.3			
BF Cross Sectional Area (ft ²)	106.3	132.4	95.4			
BF Mean Depth	2.86	3.71	3.7			
BF Max Depth	3.7	5.26	5.1			
Width/Depth Ratio	12.99	9.61	6.9			
Entrenchment Ratio	2.2	2.22	2.3			
Bank Height Ratio	2.28	--	1.0			
Wetted Perimeter (ft)	NA	39.5	31.4			
Hydraulic radius (ft)	NA	3.35	3.0			
Substrate						
d50 (mm)	NA	8.99	0.64			
d84 (mm)	NA	21.72	13			

Exhibit Table VIIIb. Morphology and Hydraulic Monitoring Summary – Buena Vista Branch Silas Creek EEP Project Number 00335										
Parameter	Cross Section 1 Riffle					Cross Section 2 Pool				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension										
BF Width (ft)	16.6	10.04	13.6			62.72	14.4	9.8		
Floodprone Width (ft)	85	106	>73.0			88	136	113.6		
BF Cross Sectional Area (ft ²)	24.9	16.2	19.7			85.2	19.6	12.9		
BF Mean Depth	1.5	1.6	1.5			1.36	1.36	1.3		
BF Max Depth	2.29	2.4	2.6			3.58	2.29	1.8		
Width/Depth Ratio	11.09	6.2	9.3			46.17	10.64	7.4		
Entrenchment Ratio	5.3	10.6	>5.4			1.4	9.45	11.7		
Bank Height Ratio	1.74	--	1.0			1.33	--	1.0		
Wetted Perimeter (ft)	--	12	15.5			--	15.33	11.0		
Hydraulic radius (ft)	--	1.4	1.3			--	1.28	1.2		
Substrate										
d50 (mm)	--	12.35	8.6			--	10.35	0.68		
d84 (mm)	--	18.6	15			--	20.2	6.9		

**Exhibit Table VIIc. Morphology and Hydraulic Monitoring Summary – Silas Creek
Silas Creek
EEP Project Number 00335**

Parameter	MY1 (2004)			MY2 (2005)			MY3 (2006)			MY4 (2007)			MY5 (2008)			MY+		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern																		
Channel Beltwidth (ft)	--	--	--	35	45	40	--	--	--									
Radius of Curvature (ft)	--	--	--	200	200	200	--	--	--									
Meander Wavelength (ft)	--	--	--	85	85	85	--	--	--									
Meander Width Ratio	--	--	--	2.3	2.3	2.3	--	--	--									
Profile																		
Riffle Length (ft)	--	--	--	34	166	54	8	53	23									
Riffle Slope (ft/ft)	--	--	--	0.004	0.017	0.008	0.001	0.04	0.01									
Pool Length (ft)	--	--	--	13	200	70.5	12	287	57									
Pool Spacing (ft)	30	388	143	37.9	397	119	12	268	85									
Additional Reach Parameters																		
Valley Length (ft)	--	--	--	--	--	3495	--	--	3495									
Channel Length (ft)	--	--	--	--	--	3949	--	--	3692									
Sinuosity	--	--	--	--	--	1.13	--	--	1.06									
Water Surface Slope (ft/ft)	--	--	--	--	--	0.004	--	--	0.003									
BF Slope (ft/ft)	--	--	--	--	--	0.004	--	--	0.003									
Rosgen Classification	--	--	--	--	--	C/B/F	E5, B5c, C5, B4c											

**Exhibit Table VIId. Morphology and Hydraulic Monitoring Summary – Buena Vista Branch
Silas Creek
EEP Project Number 00335**

Parameter	MY1 (2004)			MY2 (2005)			MY3 (2006)			MY4 (2007)			MY5 (2008)			MY+		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern																		
Channel Beltwidth (ft)	54.5	66.9	60.4	47	73	70	--	--	--									
Radius of Curvature (ft)	19.0	41.0	31.5	15	35	25	--	--	--									
Meander Wavelength (ft)	139.4	167.2	146.1	108	165	155	--	--	--									
Meander Width Ratio	--	--	--	7.5	11.4	10.7	--	--	--									
Profile																		
Riffle Length (ft)	11.4	28.8	21.8	4.8	12.2	8.9	4	96	22									
Riffle Slope (ft/ft)	0.002	0.012	0.007	0.010	0.029	0.020	0.002	3.1	1.2									
Pool Length (ft)	43	84.7	62.2	8	71	21	5	27	13									
Pool Spacing (ft)	65	103	87	9.81	98	52.7	9	189	49									
Additional Reach Parameters																		
Valley Length (ft)	--	--	--	--	--	682	--	--	682									
Channel Length (ft)	--	--	--	--	--	814	--	--	799									
Sinuosity	--	--	--	--	--	1.19	--	--	1.17									
Water Surface Slope (ft/ft)	--	--	0.004	--	--	0.004	--	--	0.003									
BF Slope (ft/ft)	--	--	0.005	--	--	0.004	--	--	0.01									
Rosgen Classification	--	--	E	--	--	E	--	--	E4									

4.0 METHODOLOGY SECTION

All monitoring methodologies follow the most current templates and guidelines provided by EEP. Photographs were taken at high resolution using an Olympus Stylus 4.0 megapixel digital camera. GPS location information was collected using a Trimble Geo XT handheld mapping grade GPS unit. GPS locations were collected on both banks of each cross section and on all four corners of each vegetation plot. Stream and vegetation problem areas were noted in the field on As-Built Plan Sheets. Permanent photo station photographs were taken from locations marked in the Monitoring Year 2 Report, prepared by EcoLogic Associates.

4.1 STREAM METHODOLOGY

The methods used to generate the data in this report are standard fluvial geomorphology techniques as described in *Applied River Morphology* (Rosgen 1996) and related publications from US Forest Service and the interagency Stream Mitigation Guidelines (USACE 2003). URS' field morphology survey was conducted using a Zeiss Level Ni 2 and the data were analyzed and displayed using the Reference Reach Spreadsheet, Version 4.2L (Mecklenburg 2006). Modified Wolman weighted pebble counts were conducted in the vicinity of each cross section. Photographs were taken at each cross section. A photo was taken from the left bank towards the right bank, and from the right bank towards the left bank.

4.2 VEGETATION METHODOLOGY

Two vegetation plots were established by Buck Engineering in 2003. These two plots were also evaluated for Monitoring Year 1 in 2004. In 2005, EcoLogic established 14 10-meter by 10-meter vegetation plots. In 2006, 7 of the 14 monitoring plots established by EcoLogic were inventoried.

Vegetation monitoring methods followed the 2006, Version 4.0 CVS-EEP Protocol for Recording Vegetation (Lee *et al* 2006) for the Year 3 stem counts.. According to the new protocol, the Silas Creek Stream Restoration Project requires the monitoring of 7 vegetation plots. The protocol was used to inventory 7 (2, 3, 6, 8, 10, 13, and 14) of the 14 vegetation plots established by EcoLogic.

Ecologic used rebar to mark all four corners of the vegetation plots and the southwest corner was marked with a 4-foot PVC pipe flagged with orange. The remaining three corners were marked with blue flagging. Planted stems were also marked with blue flagging. GPS coordinates were taken for the southwest corner of each plot and a reference photograph was taken from the southwest corner towards the northeast corner for each plot. Plot photographs are located in Appendix A-IV.

During Year 3 (2006) monitoring, all planted stems were marked with white flagging. Stems found with blue flagging from the previous year were re-flagged with white. Blue flagging was removed. Natural regeneration stems were marked with red flagging and recorded. The results of the stem counts are summarized in Tables A1 to A5 in Appendix A-I.

5.0 REFERENCES

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APPENDIX A

VEGETATION RAW DATA

APPENDIX A-I. VEGETATION SURVEY DATA TABLES

Table A1. Vegetation Metadata

Report Prepared By	Susan Shelingoski
Date Prepared	1/17/2007 8:45
database name	URS-2006-A.mdb
database location	P:\Jobs3\31825348_Monitoring
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	This worksheet, which is a summary of the project and the project data.
Plots	List of plots surveyed.
Vigor	Frequency distribution of vigor classes.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Stem Count by Plot and Spp	Count of living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	335
project Name	Silas Creek
Description	Stream Restoration
length (ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	7

APPENDIX A-I. VEGETATION SURVEY DATA TABLES

Table A2. Vegetation Vigor by Species

	Species	4	3	2	1	0	Missing
	Acer floridanum	6	1				
	Ailanthus altissima						
	Albizia julibrissin						
	Alnus serrulata	2	1				
	Aronia arbutifolia		1				
	Betula nigra	23	5				
	Carya cordiformis						
	Carya ovata	2					
	Cornus amomum	14	1				
	Fraxinus pennsylvanica	1					
	Liquidambar styraciflua						
	Morus alba						
	Pinus serotina						
	Pinus virginiana						
	Quercus phellos	8	4				
	Robinia pseudoacacia						
	Sambucus canadensis						
	Carpinus caroliniana						
	Lindera benzoin	1					
	Liriodendron tulipifera						
	Myrica		2				
	Platanus occidentalis	16	8				
	Acer negundo						
TOT:	23	73	23				

Table A3. Vegetation Damage by Species

	Species	All Damage Categories	(no damage)	Insects	Vine Strangulation
	Acer floridanum	7	7		
	Acer negundo	4	4		
	Ailanthus altissima	1	1		
	Albizia julibrissin	6	6		
	Alnus serrulata	3	3		
	Aronia arbutifolia	1	1		
	Betula nigra	33	33		
	Carpinus caroliniana	1	1		
	Carya cordiformis	1	1		
	Carya ovata	2	2		
	Cornus amomum	15	14		1
	Fraxinus pennsylvanica	5	5		
	Lindera benzoin	1	1		
	Liquidambar styraciflua	6	6		
	Liriodendron tulipifera	4	4		
	Morus alba	1	1		

APPENDIX A-I. VEGETATION SURVEY DATA TABLES

	Species	All Damage Categories	(no damage)	Insects	Vine Strangulation
	Myrica	3	3		
	Pinus serotina	1	1		
	Pinus virginiana	3	3		
	Platanus occidentalis	27	25	2	
	Quercus phellos	13	13		
	Robinia pseudoacacia	2	2		
	Sambucus canadensis	1	1		
TOT:	23	141	138	2	1

Table A4. Vegetation Damage by Plot

	plot	All Damage Categories	(no damage)	Insects	Vine Strangulation
	335-01-0002	7	7		
	335-01-0003	22	21		1
	335-01-0006	16	16		
	335-01-0008	16	14	2	
	335-01-0010	38	38		
	335-01-0013	13	13		
	335-01-0014	29	29		
TOT:	7	141	138	2	1

Table A5. Stem Count by Plot and Species

	Species	Total Stems	# plots	avg# stems	plot 335-01-0002	plot 335-01-0003	plot 335-01-0006	plot 335-01-0008	plot 335-01-0010	plot 335-01-0013	plot 335-01-0014
	Acer floridanum	7	4	1.75		2	1		1		3
	Alnus serrulata	3	2	1.5		2		1			
	Aronia arbutifolia	1	1	1			1				
	Betula nigra	28	5	5.6		1		1	21	2	3
	Carya ovata	2	2	1		1					1
	Cornus amomum	15	3	5		5		1			9
	Fraxinus pennsylvanica	1	1	1				1			
	Lindera benzoin	1	1	1	1						
	Myrica	2	1	2				2			
	Platanus occidentalis	24	7	3.43	1	6	5	5	2	2	3
	Quercus phellos	12	6	2	1		1	1	6	1	2
TOT:	11	96	11		3	17	8	12	30	5	21

Table A6a. Vegetative Problem Areas – Reach 1			
Silas Creek			
EEP Project Number 00335			
Feature/Issue	Station #/Range	Probable Cause	Photo #
Invasive population	11+10	Privet, honeysuckle, rose	R1VPA1
Invasive population	11+50	Privet, honeysuckle, rose	R1VPA1
Invasive population	13+00	Bamboo	R1VPA3
Invasive population	13+00	Mimosa	R1VPA4
Bare Slope	13+80	Herbaceous veg. not established	R1VPA5
Bare Slope	13+90	Herbaceous veg. not established	R1VPA5
Bare Slope	17+10	Herbaceous veg. not established	R1VPA5
Invasive population	19+50	Japanese knotweed, honeysuckle	R1VPA8

Table A6b. Vegetative Problem Areas – Reach 2			
Silas Creek			
EEP Project Number 00335			
Feature/Issue	Station #/Range	Probable Cause	Photo #
Invasive population	21+90	Mimosa	R2VPA1
Invasive population	22+00	Mimosa	R2VPA1
Invasive population	36+00	Mimosa	R2VPA1
Invasive population	26+50	Mimosa	R2VPA3

Table A6c. Vegetative Problem Areas – Reach 3			
Silas Creek			
EEP Project Number 00335			
Feature/Issue	Station #/Range	Probable Cause	Photo #
Invasive population	33+80 to 34+80	Kudzu	R3VPA1
Invasive population	39+00	Mimosa	R3VPA2
Invasive population	39+00	Rose	R3VPA2
Invasive population	33+90 to 34+80	Mimosa	R3VPA2
Bare bank	42+50	No woody vegetation	R3VPA5
Bare bank	44+00	No woody vegetation	R3VPA6

APPENDIX A-II. VEGETATION PROBLEM AREA PHOTOS

Photos taken 9/14/06

REACH 1



R1VPA1



R1VPA3



R1VPA4



R1VPA5



R1VPA8

APPENDIX A-II. VEGETATION PROBLEM AREA PHOTOS

Photos taken 9/14/06

REACH 2



R2VPA1



R2VPA3

REACH 3



R3VPA1



R3VPA2

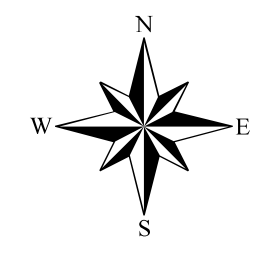
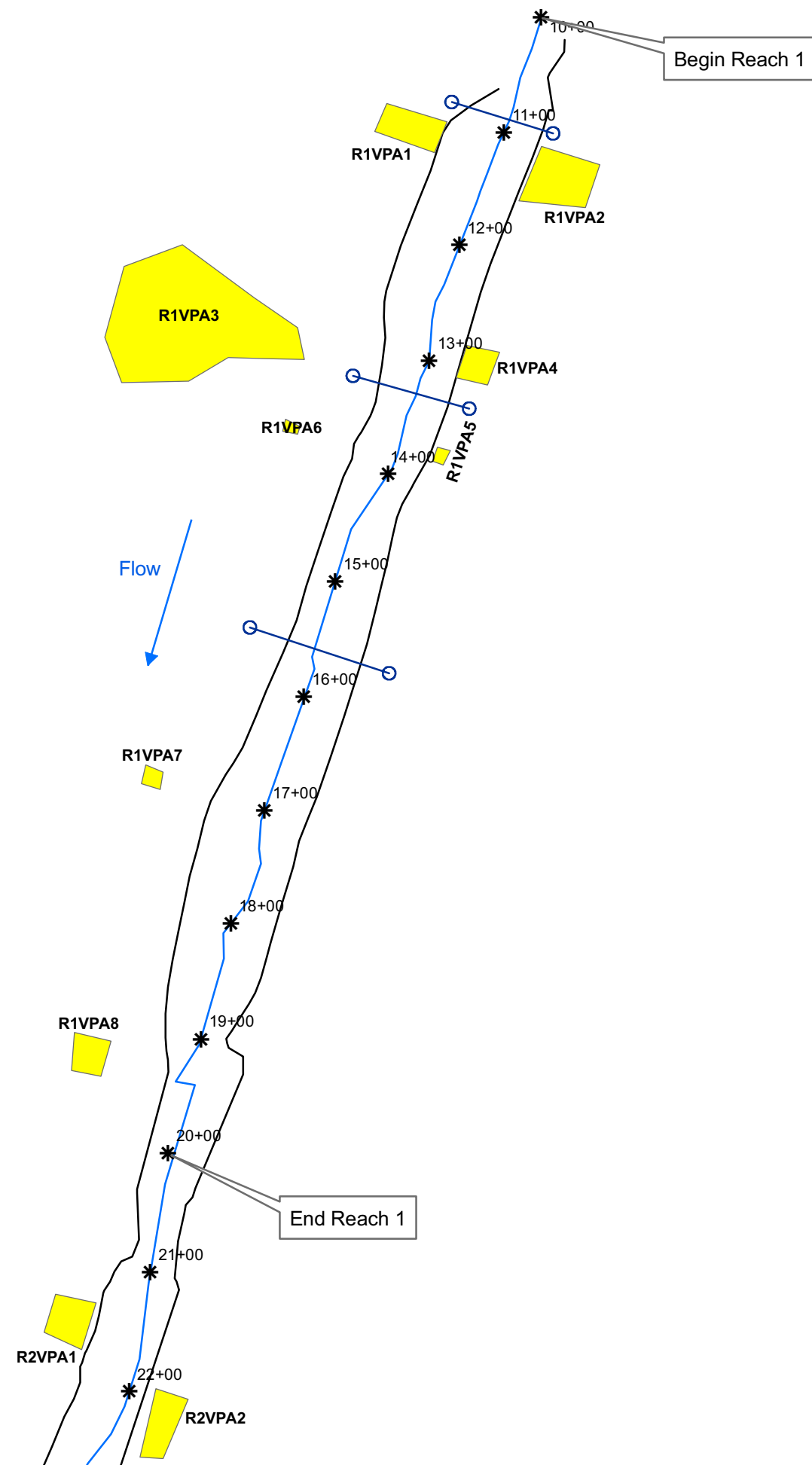


R3VPA5



R3VPA6

Vegetative Problem Areas – Reach 1			
Silas Creek 00335			
2006 Problem #	Feature/Issue	Station #/Range	Probable Cause
R1VPA1	Invasive population	11+10	Privet, honeysuckle, rose
R1VPA1	Invasive population	11+50	Privet, honeysuckle, rose
R1VPA3	Invasive population	13+00	Bamboo
R1VPA4	Invasive population	13+00	Mimosa
R1VPA5	Bare Slope	13+80	Herbaceous veg. not established
R1VPA5	Bare Slope	13+90	Herbaceous veg. not established
R1VPA5	Bare Slope	17+10	Herbaceous veg. not established
R1VPA8	Invasive population	19+50	Japanese knotweed, honeysuckle



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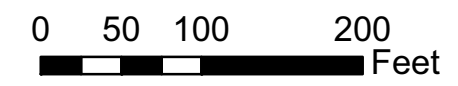
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 Stream Restoration
 Forsyth County, NC

Monitoring Year:
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Project Number:
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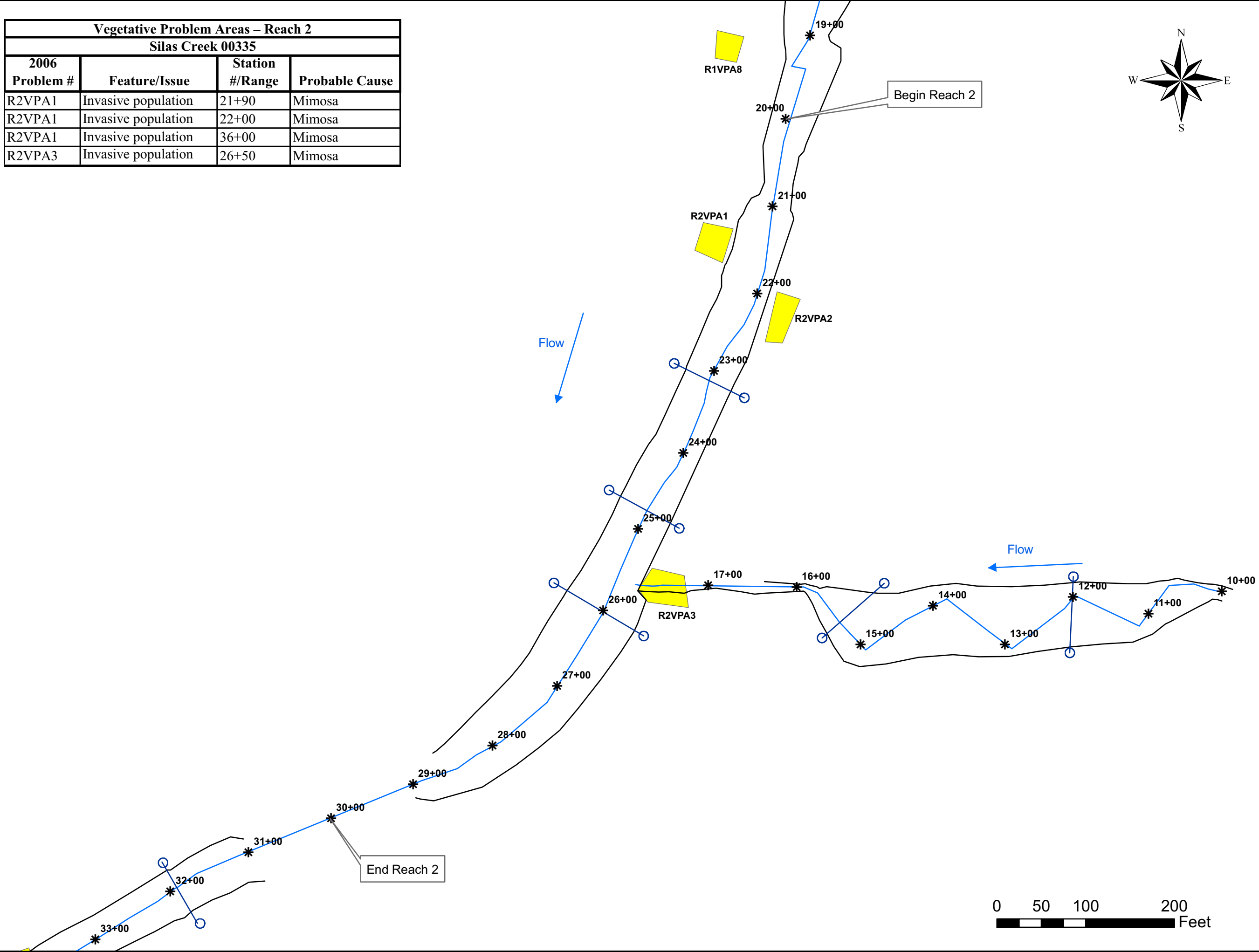
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 January 2007

- Legend**
- Problem Area Concern
 - Stations
 - Cross Section
 - As-Built Streambank
 - As-Built Thalweg



**Figure 3a.Reach 1
 Vegetative
 Problem Areas
 Plan View**

Vegetative Problem Areas – Reach 2			
Silas Creek 00335			
2006 Problem #	Feature/Issue	Station #/Range	Probable Cause
R2VPA1	Invasive population	21+90	Mimosa
R2VPA1	Invasive population	22+00	Mimosa
R2VPA1	Invasive population	36+00	Mimosa
R2VPA3	Invasive population	26+50	Mimosa



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- Legend**
- Problem Area Concern
 - Stations
 - Cross Section
 - As-Built Streambank
 - As-Built Thalweg

Figure 3b. Reach 2
 Vegetative
 Problem Areas
 Plan View

**Vegetative Problem Areas – Reach 3
Silas Creek 00335**

2006 Problem #	Feature/Issue	Station #/Range	Probable Cause
R3VPA1	Invasive population	33+80 to 34+80	Kudzu
R3VPA2	Invasive population	39+00	Mimosa
R3VPA2	Invasive population	39+00	Rose
R3VPA2	Invasive population	33+90 to 34+80	Mimosa
R3VPA5	Bare bank	42+50	No woody vegetation
R3VPA6	Bare bank	44+00	No woody vegetation

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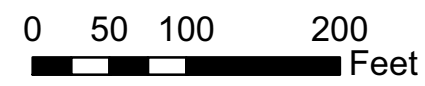
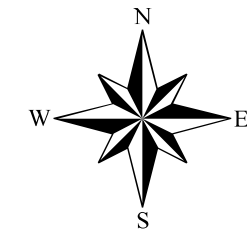
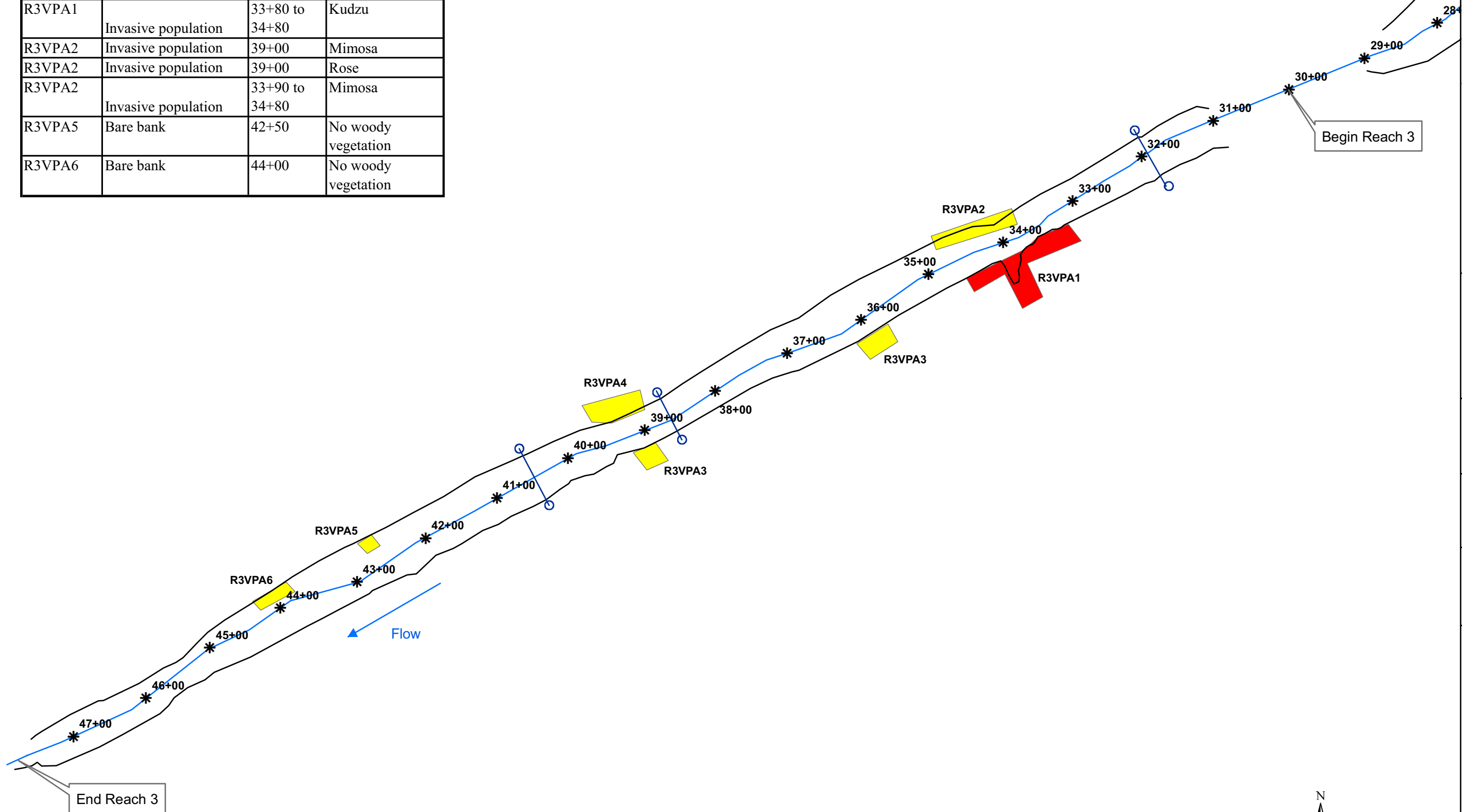
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Project Number:
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Date:
January 2007

- Legend**
- Problem Area Concern
 - Problem Area High Concern
 - Stations
 - Cross Section
 - As-Built Streambank
 - As-Built Thalweg



**Figure 3c. Reach 3
Vegetative
Problem Areas
Plan View**

APPENDIX A-IV. VEGETATION MONITORING PLOT PHOTOS



VP2 (9/14/06)



VP3 (9/14/06)



VP6 (9/14/06)



VP8 (8/24/06)



VP10 (9/14/06)



VP13 (9/14/06)

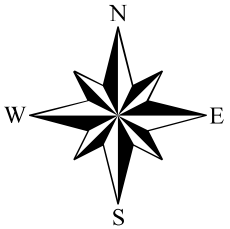
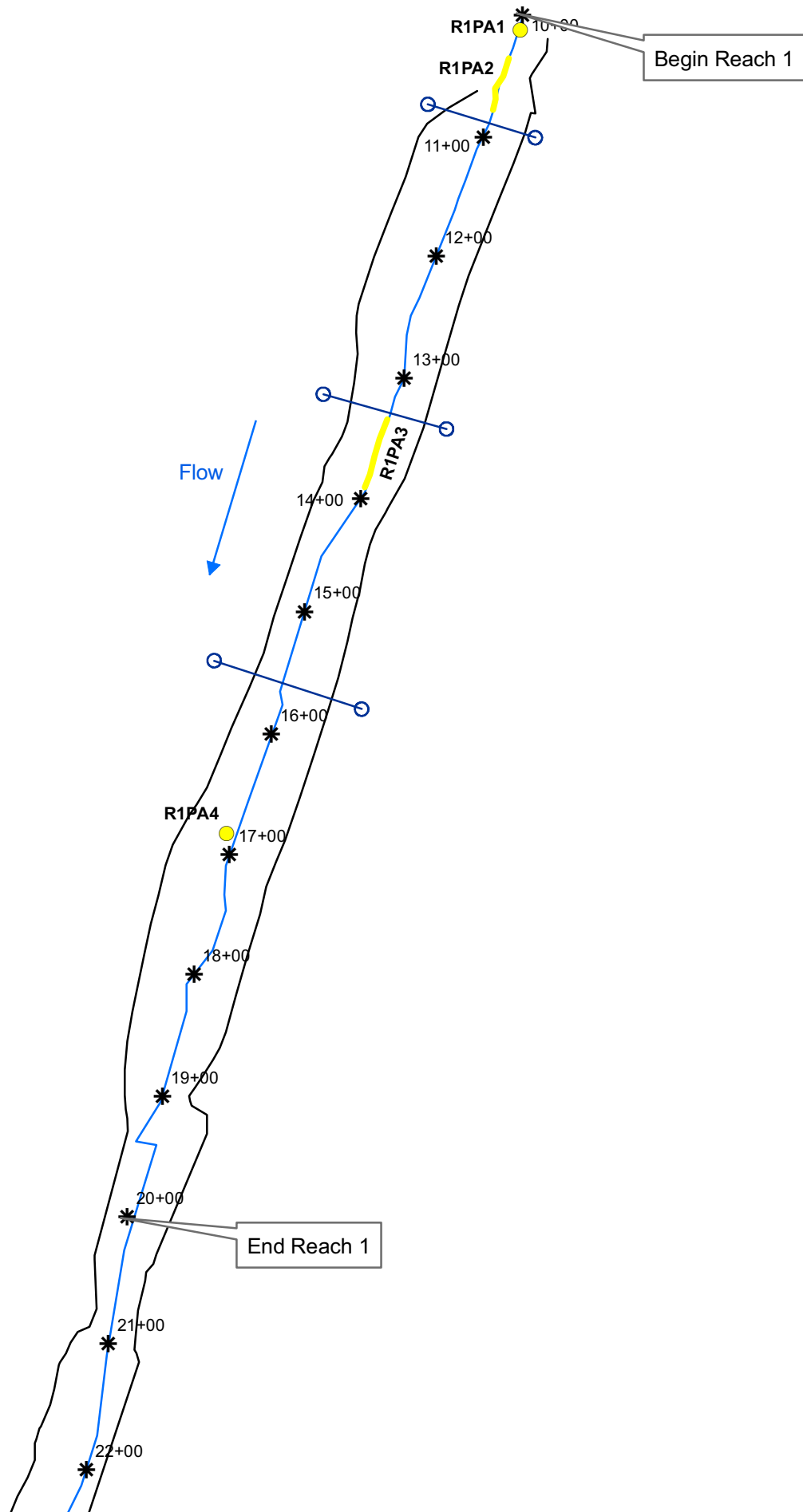


VP14 (9/14/06)

APPENDIX B

GEOMORPHIC RAW DATA

Stream Problem Areas – Reach 1			
Silas Creek 00335			
2006 Problem #	Feature Issue	Station	Suspected Cause
R1PA1	Vane failure	10+00	Improper design and/or construction
R1PA2	Bar formation/Aggradation	10+70	Inability to transport sediment
R1PA3	Bar formation/Aggradation	14+10	Inability to transport sediment
R1PA4	Vane failure	16+80	Improper design and/or construction



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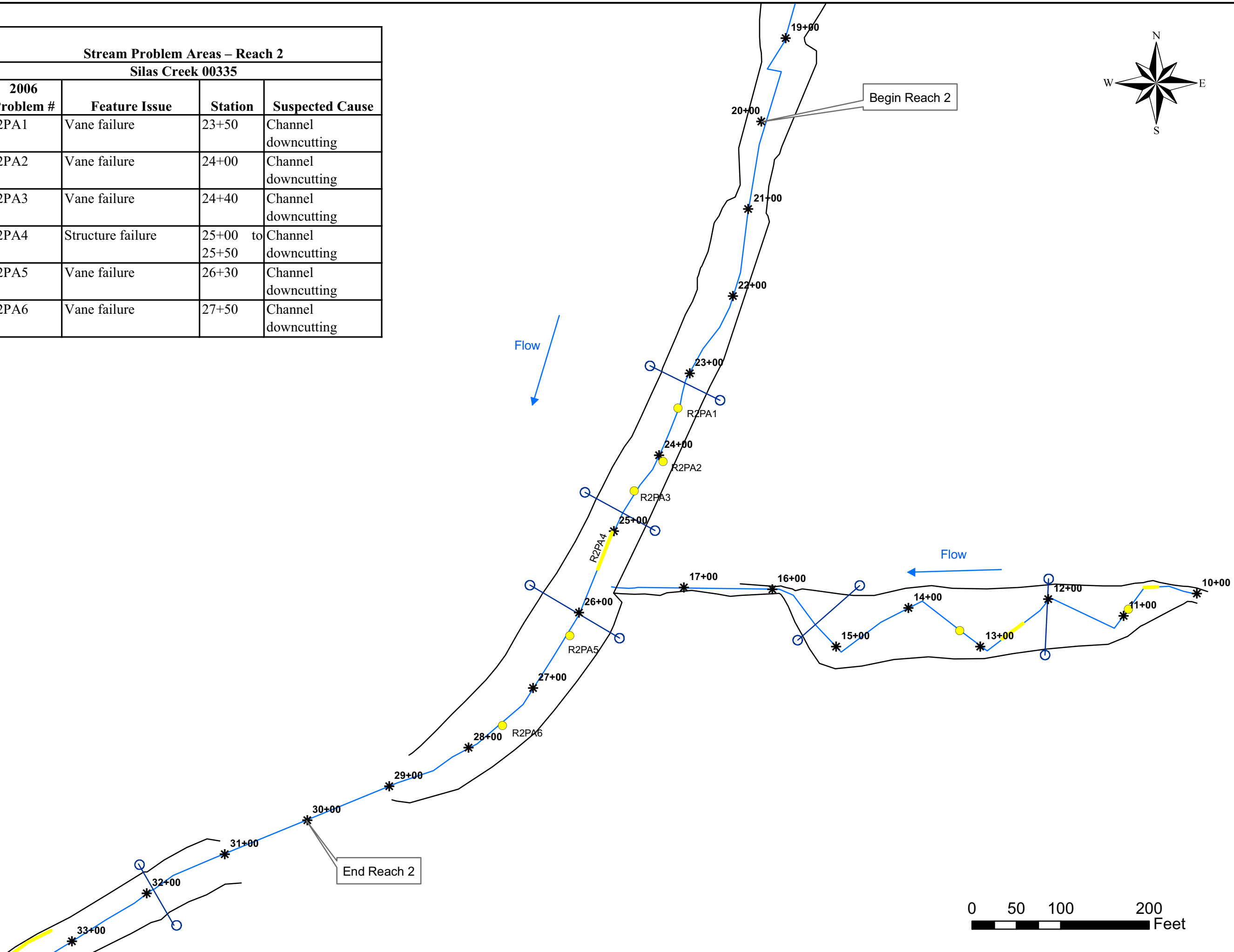
Date:
 January 2007

- Legend**
- Problem Area Concern
 - Problem Area Concern
 - * Stations
 - Cross Section
 - As-Built Streambank
 - As-Built Thalweg

Figure 4a.
 Reach 1 Stream
 Problem Areas
 Plan View



Stream Problem Areas – Reach 2			
Silas Creek 00335			
2006 Problem #	Feature Issue	Station	Suspected Cause
R2PA1	Vane failure	23+50	Channel downcutting
R2PA2	Vane failure	24+00	Channel downcutting
R2PA3	Vane failure	24+40	Channel downcutting
R2PA4	Structure failure	25+00 to 25+50	Channel downcutting
R2PA5	Vane failure	26+30	Channel downcutting
R2PA6	Vane failure	27+50	Channel downcutting



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- Legend**
- Problem Area Concern
 - Problem Area Concern
 - Cross Section
 - As-Built Streambank
 - * Stations
 - As-Built Thalweg

Figure 4b.
 Reach 2 Stream
 Problem Areas
 Plan View

Stream Problem Areas – Reach 3

Silas Creek 00335

2006 Problem #	Feature Issue	Station	Suspected Cause
R3PA1	Bank erosion/Scour	33+20	Bank angle too steep
R3PA2	Bank erosion/Scour	34+50	Bank angle too steep
R3PA3	Bank erosion/Scour	37+80 to 38+10	Bank angle too steep

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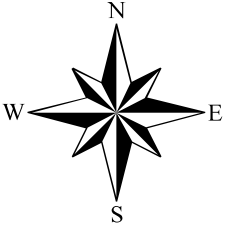
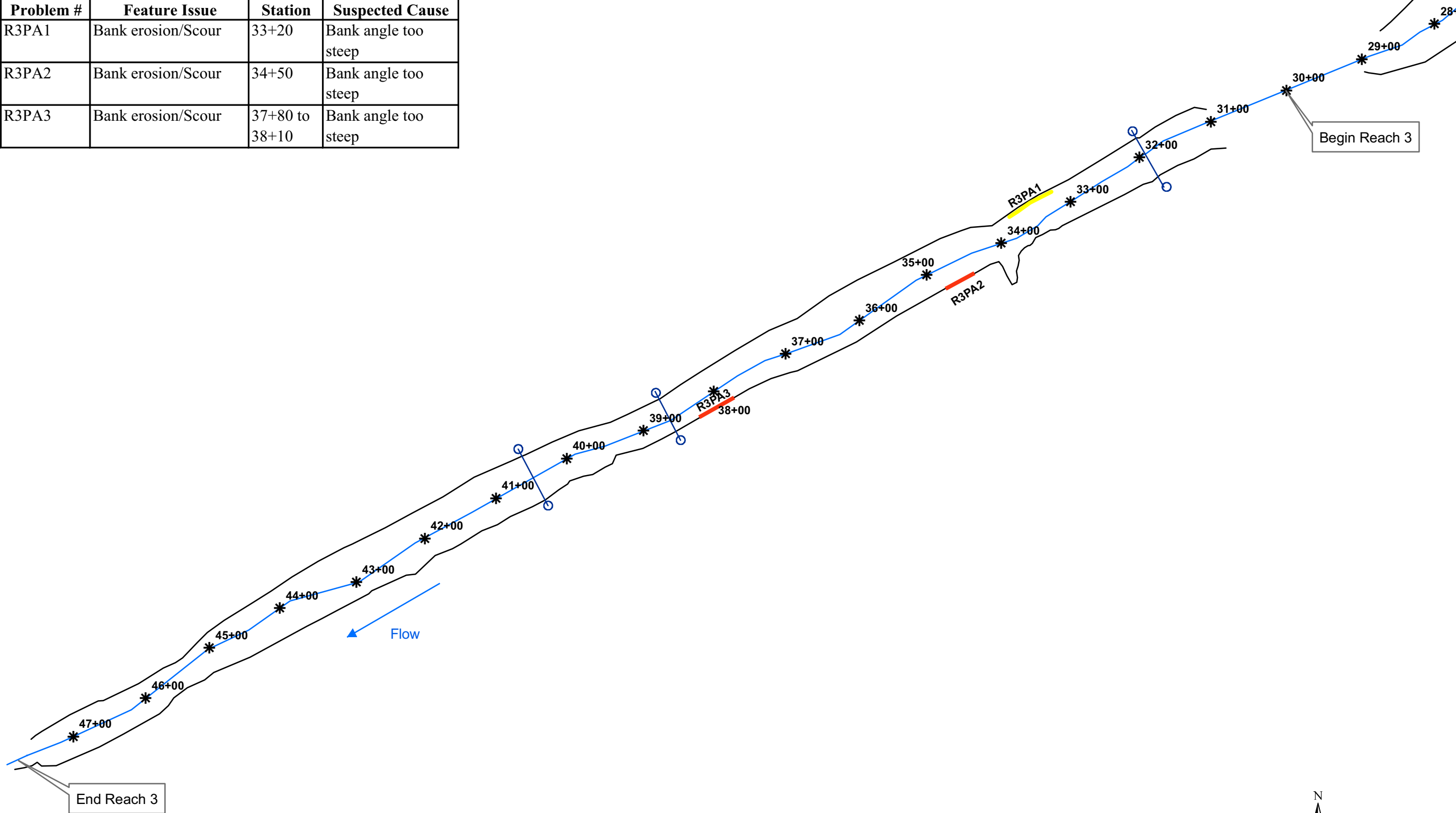
Monitoring Year:
 3 (2006)

Project Number:
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Date:
 January 2007

- Legend**
- Problem Area Concern
 - Problem Area Concern
 - Problem Area High Concern
 - Cross Section
 - As-Built Streambank
 - * Stations
 - As-Built Thalweg

Figure 4c.
 Reach 3 Stream
 Problem Areas
 Plan View



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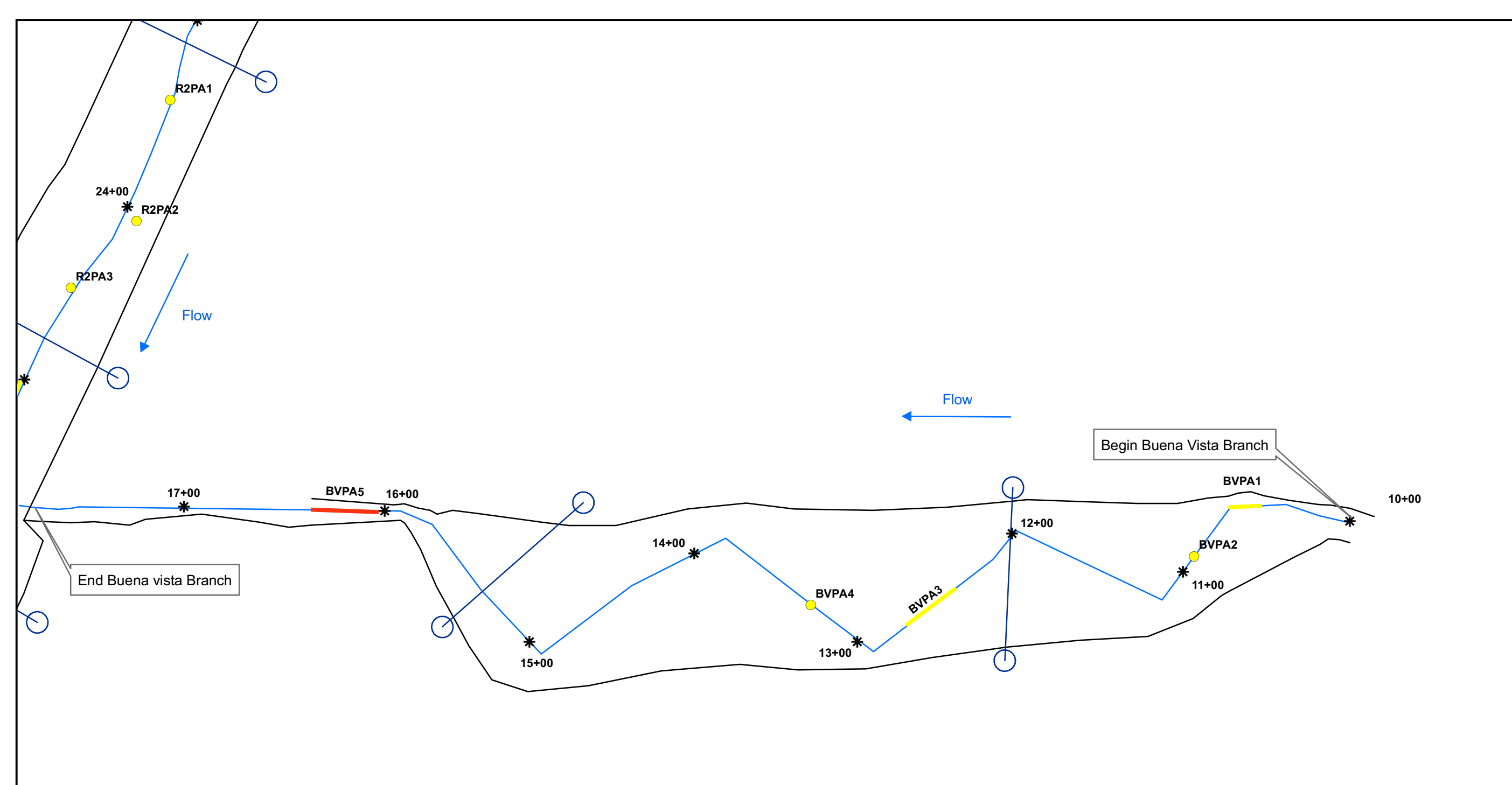
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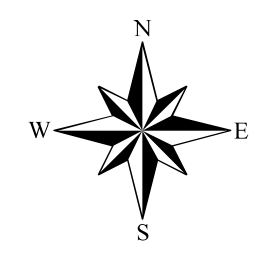
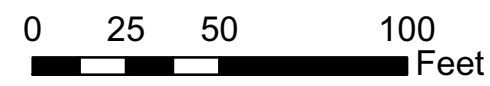
Date:
 January 2007

- Legend**
- Problem Area Concern
 - Problem Area Concern
 - Problem Area High Concern
 - Cross Section
 - As-Built Streambank
 - * Stations
 - As-Built Thalweg

Figure 4d.
 Buena Vista Branch
 Stream Problem Areas
 Plan View



Stream Problem Areas – Buena Vista Branch			
Silas Creek 00335			
2006 Problem #	Feature Issue	Station	Suspected Cause
BVPA1	Bar formation/Aggradation	10+50	Inability to transport sediment
BVPA2	Bar formation/Aggradation	10+90	Inability to transport sediment
BVPA3	Bank erosion	12+50	Bank angle too steep
BVPA4	Bar formation/Aggradation	13+30	Inability to transport sediment
BVPA5	Bar formation/Aggradation	16+00	Inability to transport sediment



APPENDIX B-II. STREAM PROBLEM AREAS DATA TABLES

Table B1a. Stream Problem Areas – Reach 1			
Silas Creek			
EEP Project Number 00335			
Feature Issue	Station	Suspected Cause	Photo #
Vane failure	10+00	Improper design and/or construction	R1PA1
Bar formation/Aggradation	10+70	Inability to transport sediment	R1PA2
Bar formation/Aggradation	14+10	Inability to transport sediment	R1PA3
Vane failure	16+80	Improper design and/or construction	R1PA4

Table B1b. Stream Problem Areas – Reach 2			
Silas Creek			
EEP Project Number 00335			
Feature Issue	Station	Suspected Cause	Photo #
Vane failure	23+50	Channel downcutting	R2PA1
Vane failure	24+00	Channel downcutting	R2PA2
Vane failure	24+40	Channel downcutting	R2PA3
Structure failure	25+00 to 25+50	Channel downcutting	R2PA4
Vane failure	26+30	Channel downcutting	R2PA5
Vane failure	27+50	Channel downcutting	R2PA6

Table B1c. Stream Problem Areas – Reach 3			
Silas Creek			
EEP Project Number 00335			
Feature Issue	Station	Suspected Cause	Photo #
Bank erosion/Scour	33+20	Bank angle too steep	R3PA1
Bank erosion/Scour	34+50	Bank angle too steep	R3PA2
Bank erosion/Scour	37+80 to 38+10	Bank angle too steep	R3PA3

Table B1d. Stream Problem Areas – Buena Vista Branch			
Silas Creek			
EEP Project Number 00335			
Feature Issue	Station	Suspected Cause	Photo #
Bar formation/Aggradation	10+50	Inability to transport sediment	BVPA1
Bar formation/Aggradation	10+90	Inability to transport sediment	BVPA2
Bank erosion	12+50	Bank angle too steep	BVPA3
Bar formation/Aggradation	13+30	Inability to transport sediment	BVPA4
Bar formation/Aggradation	16+00	Inability to transport sediment	BVPA5

APPENDIX B-III. REPRESENTATIVE STREAM PROBLEM AREA PHOTOS

Photos taken 9/14/06

REACH 1



R1PA1



R2PA2



R1PA3



R1PA4

REACH 2



R2PA1



R2PA2

APPENDIX B-III. REPRESENTATIVE STREAM PROBLEM AREA PHOTOS

Photos taken 9/14/06



R2PA3



R2PA4



R2PA5



R2PA6

REACH 3



R3PA1



R3PA2

APPENDIX B-III. REPRESENTATIVE STREAM PROBLEM AREA PHOTOS

Photos taken 9/14/06



R3PA3

BUENA VISTA BRANCH



BVPA1



BVPA2



BVPA3



BVPA4

APPENDIX B-III. REPRESENTATIVE STREAM PROBLEM AREA PHOTOS

Photos taken 9/14/06



BVPA5

APPENDIX B-IV. STREAM PHOTO STATION PHOTOS

Photos taken 9/15/06

REACH 1



PS1



PS2



PS3



PS4



PS5



PS6

APPENDIX B-IV. STREAM PHOTO STATION PHOTOS

Photos taken 9/15/06

REACH 2



PS7



PS8



PS9



PS10



PS11



PS12

APPENDIX B-IV. STREAM PHOTO STATION PHOTOS

Photos taken 9/15/06



PS13



PS14



PS15

REACH 3



PS16



PS17

APPENDIX B-IV. STREAM PHOTO STATION PHOTOS

Photos taken 9/15/06



PS18



PS19



PS20



PS21



PS22



PS23

APPENDIX B-IV. STREAM PHOTO STATION PHOTOS

Photos taken 9/15/06



PS24



PS25



PS26



PS27



PS28

APPENDIX B-IV. STREAM PHOTO STATION PHOTOS

Photos taken 9/15/06

BUENA VISTA BRANCH



PS29



PS30



PS31



PS32



PS33



PS34

APPENDIX B-V. VISUAL MORPHOLOGICAL STABILITY ASSESSMENT

**Table B2a. Visual Morphological Stability Assessment – Silas Creek Reaches 1, 2, and 3
Silas Creek
EEP Project Number 00335**

Feature Category	Metric (per As-built and reference baselines)	(# stable) Number performing as Intended	Total number per As-built	Total number/feet in unstable state	% perform in stable condition	Feature perform. Mean or total
A. Riffles	Present?	13	14	1	93	
	Armor stable (no displacement)?	9	14	5	64	
	Facet grade appears stable?	9	14	5	64	
	Minimal evidence of embedding/fining?	10	14	4	71	
	Length appropriate?	8	14	6	57	
						70
B. Pools*	Present (not subject to severe aggrad. or migration)?	37	31	0	100	
	Sufficiently deep (max pool D:mean Bkf >1.6)	35	31	2	95	
	Length appropriate?	33	31	4	90	
						95
C. Thalweg	Upstream of meander bend (run/inflection) centering?	31	31	0	100	
	Downstream of meander (glide/inflection) centering?	31	31	0	100	
						100
D. Meanders	Outer bend in state of limited/controlled erosion?	31	31	0	100	
	Of those eroding, # w/concomitant point bar formation?	31	31	0	100	
	Apparent Rc within spec?	31	31	0	100	
	Sufficient floodplain access and relief?	31	31	0	100	
						100
E. Bed General	General channel bed aggradation areas (bar formation)	3678	3808	2/130 feet	97	
	Channel bed degradation—areas of increasing downcutting/headcutting?	3508	3808	300 feet	92	
						95
F. Bank	Actively eroding, wasting, or slumping bank	NA	3808	70/3808 feet	98	
						98
G. Vanes	Free of back or arm scour?	21	42	21	50	
	Height appropriate?	27	42	15	64	
	Angle and geometry appear appropriate?	29	42	13	69	
	Free of piping or other structural failures?	26	42	16	62	
						61
H. Wads/ Boulders	Free of scour?	All	Unknown	0	100	
	Footing stable?	All	Unknown	0	100	
						100

* 31 pools were reported in the As-built report. Thirty-seven were observed during 2006 monitoring

APPENDIX B-V. VISUAL MORPHOLOGICAL STABILITY ASSESSMENT

**Table B2b. Visual Morphological Stability Assessment – Buena Vista Branch
Silas Creek
EEP Project Number 00335**

Feature Category	Metric (per As-built and reference baselines)	(# stable) Number performing as Intended	Total number per As-built	Total number/feet in unstable state	% perform in stable condition	Feature perform. Mean or total
A. Riffles*	Present?	8	14	0	100	
	Armor stable (no displacement)?	3	14	5	38	
	Facet grade appears stable?	5	14	3	63	
	Minimal evidence of embedding/fining?	8	14	0	100	
	Length appropriate?	7	14	1	88	
						78
B. Pools**	Present (not subject to severe aggrad. or migration)?	7	14	0	100	
	Sufficiently deep (max pool D:mean Bkf >1.6)	5	14	2	71	
	Length appropriate?	7	14	0	100	
						90
C. Thalweg	Upstream of meander bend (run/inflection) centering?	12	14	2	86	
	Downstream of meander (glide/inflection) centering?	12	14	2	86	
						86
D. Meanders	Outer bend in state of limited/controlled erosion?	7	7	0	100	
	Of those eroding, # w/concomitant point bar formation?	7	7	0	100	
	Apparent Rc within spec?	7	7	0	100	
	Sufficient floodplain access and relief?	7	7	0	100	
						100
E. Bed General	General channel bed aggradation areas (bar formation)	662	782	4/120 feet	85	
	Channel bed degradation—areas of increasing downcutting/headcutting?	782	782	0	100	
						93
F. Bank	Actively eroding, wasting, or slumping bank	NA	782	10/782 feet	99	
						99
G. Vanes***	Free of back or arm scour?	6	12	3	67	
	Height appropriate?	7	12	2	78	
	Angle and geometry appear appropriate?	7	12	2	78	
	Free of piping or other structural failures?	4	12	5	44	
						67
H. Wads/ Boulders	Free of scour?	All	Unknown	0	100	
	Footing stable?	All	Unknown	0	100	
						100

* 14 riffles were reported in the As-built report. Eight were observed during 2006 monitoring

** 14 pools were reported in the As-built report. Seven were observed during 2006 monitoring.

*** 12 vanes were reported in the As-built report. Nine were observed during 2006 monitoring.

APPENDIX B-VI. CROSS SECTION PHOTOS AND ANNUAL OVERLAYS OF PLOTS

Several cross section pins were not able to be located during 2006 monitoring. In instances where pins were not located, URS re-established one or both pins in the field. Data from these cross sections are not comparable to previous years' data. The re-establishment of pins effectively relocates the cross sections.

URS has plotted these data on the same graph for reference only. The data and/or graph should not be used to interpret channel change. URS re-established at least one pin on all cross sections along Silas Creek and Buena Vista Branch.

SILAS CREEK

REACH ONE

Photos taken 8/25/06

APPENDIX B-VI. CROSS SECTION PHOTOS AND ANNUAL OVERLAYS OF PLOTS



XS1 facing right bank



XS1 facing left bank



XS2 facing right bank



XS2 facing left bank

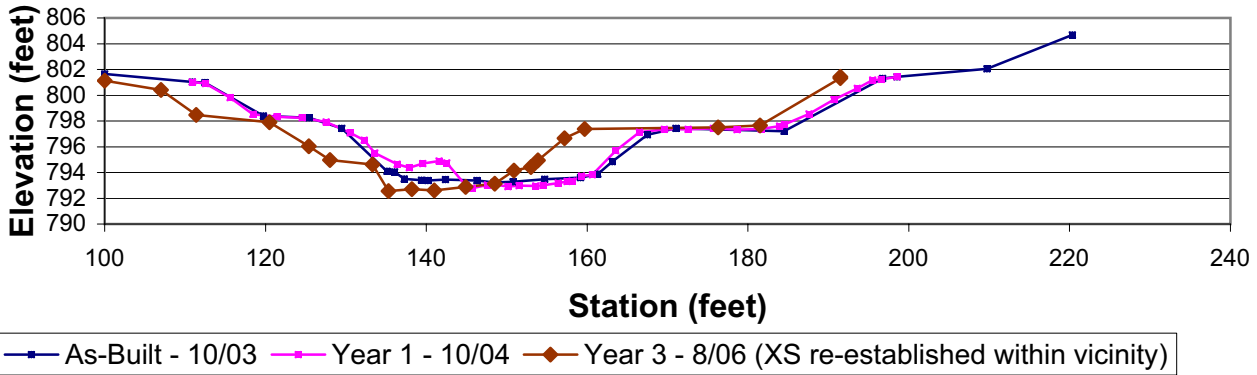


XS3 facing right bank

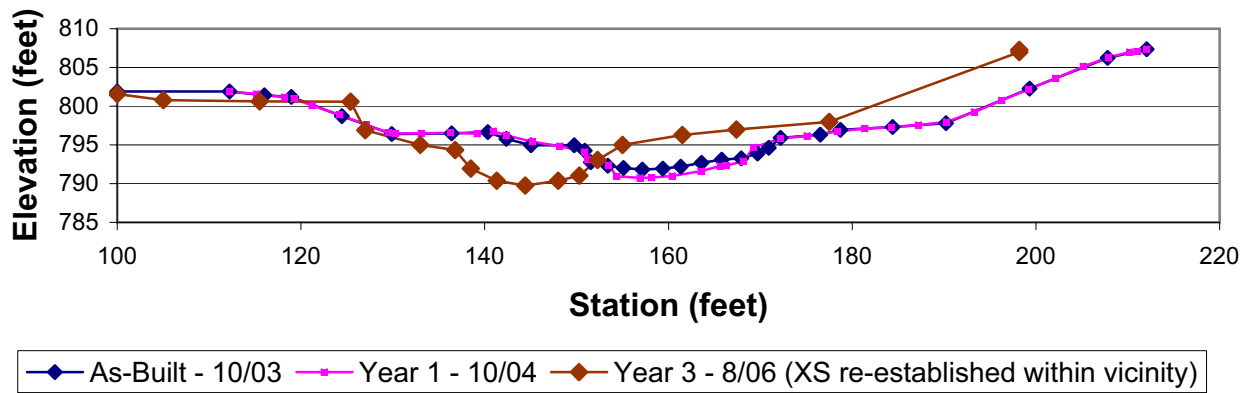


XS3 facing left bank

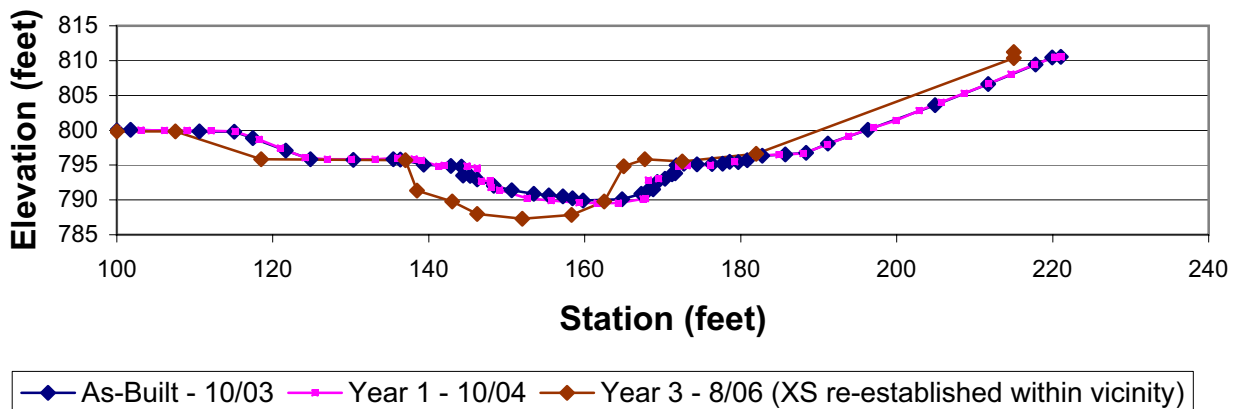
Silas Creek XS 1 - As-Built, Year 1 & 3 Overlay



Silas Creek XS 2 - As-Built, Year 1 & 3 Overlay



Silas Creek XS 3 - As-Built, Year 1 & 3 Overlay



SILAS CREEK

REACH TWO

Photos taken 9/15/06

APPENDIX B-VI. CROSS SECTION PHOTOS AND ANNUAL OVERLAYS OF PLOTS



XS4 facing right bank



XS4 facing left bank



XS5 facing right bank



XS5 facing left bank

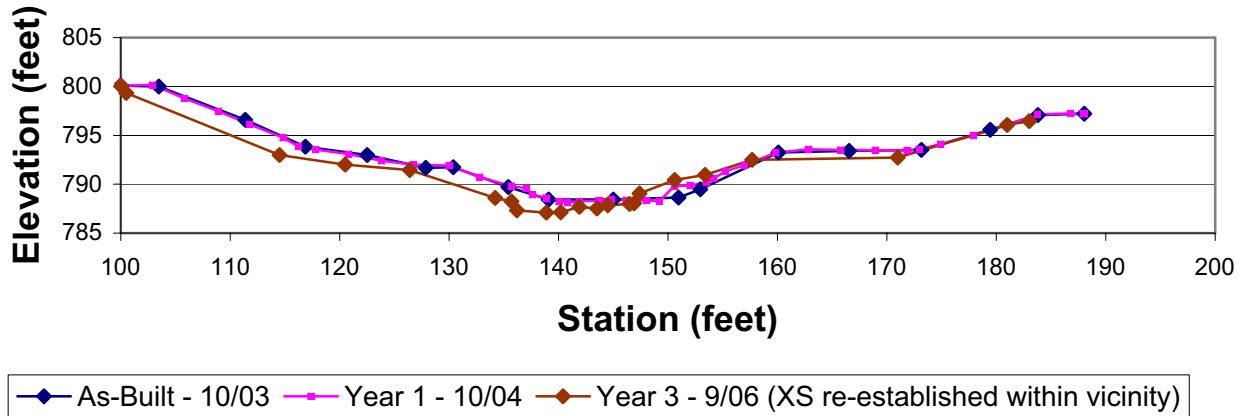


XS6 facing right bank

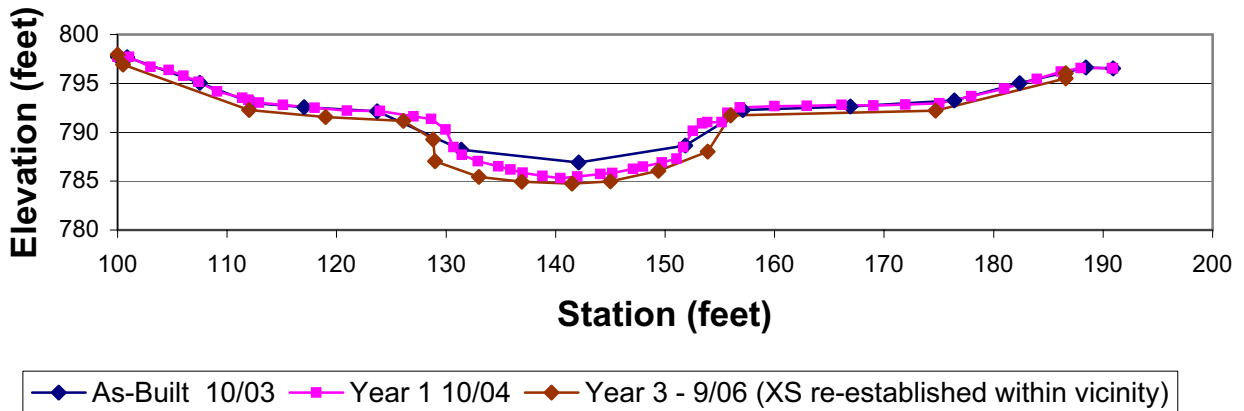


XS6 facing left bank

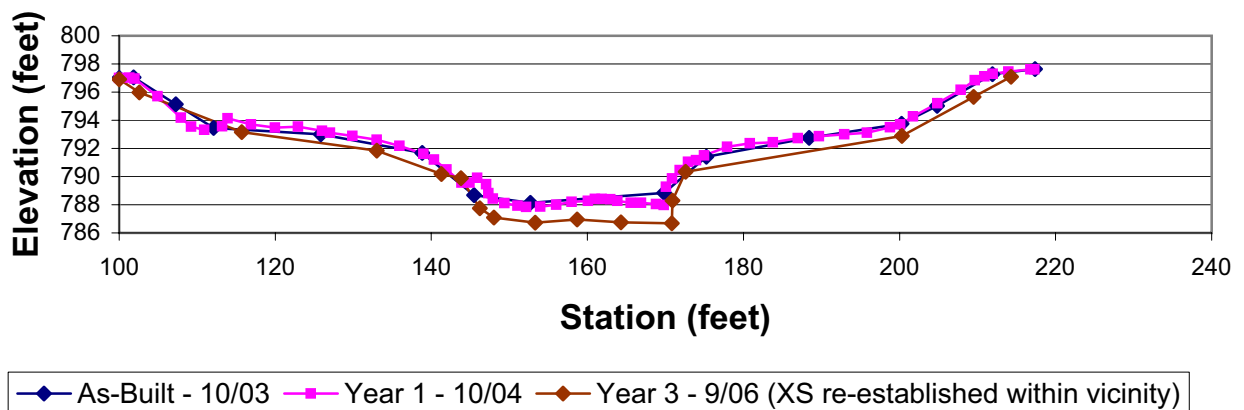
Silas Creek XS 4 - As-Built, Year 1 & 3 Overlay



Silas Creek XS 5 - As-Built, Year 1 & 3 Overlay



Silas Creek XS 6 - As-Built, Year 1 & 3 Overlay



SILAS CREEK

REACH THREE

Photos taken 10/12/06

APPENDIX B-VI. CROSS SECTION PHOTOS AND ANNUAL OVERLAYS OF PLOTS



XS7 facing right bank



XS7 facing left bank



XS8 facing right bank



XS8 facing left bank

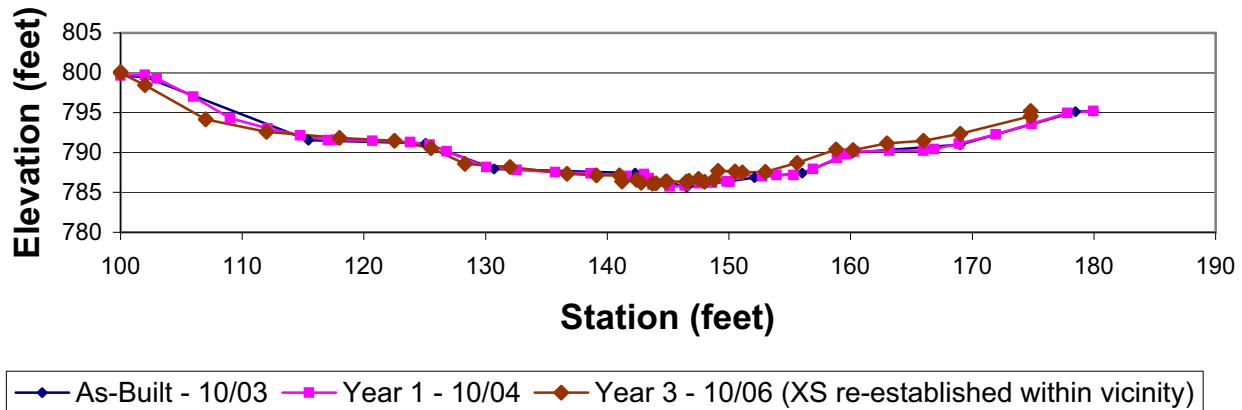


XS9 facing right bank

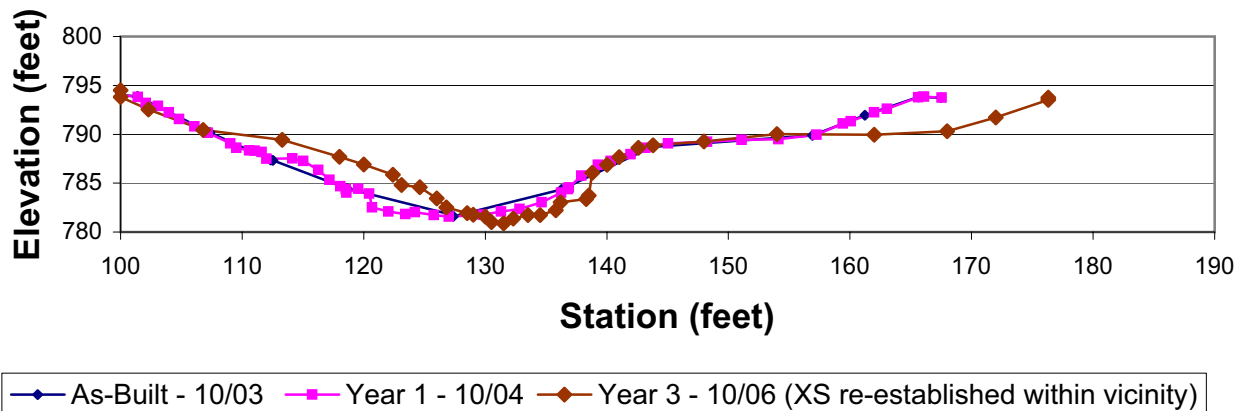


XS9 facing left bank

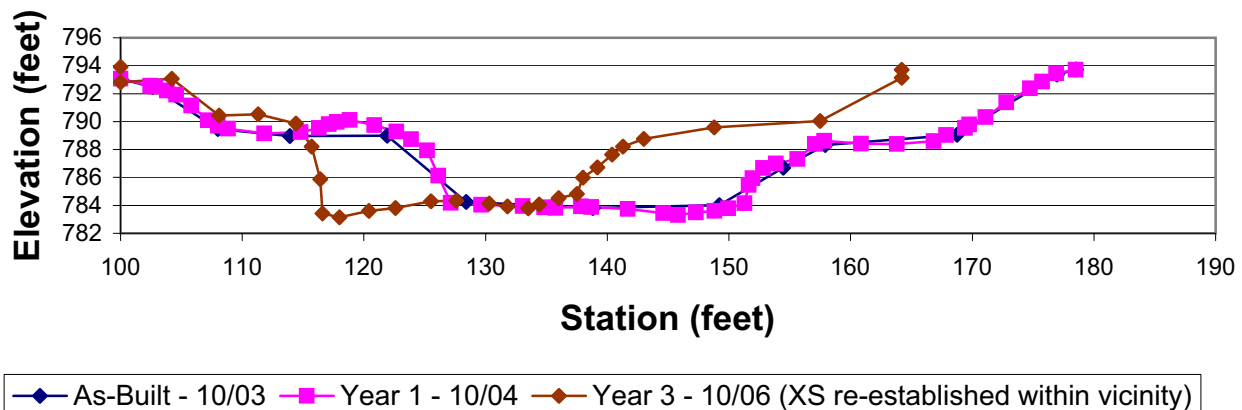
Silas Creek XS 7 - As-Built, Year 1 & 3 Overlay



Silas Creek XS 8 - As-Built, Year 1 & 3 Overlay



Silas Creek XS 9 - As-Built, Year 1 & 3 Overlay



BUENA VISTA BRANCH

Photos taken 11/13/06

APPENDIX B-VI. CROSS SECTION PHOTOS AND ANNUAL OVERLAYS OF PLOTS



XS1 facing right bank



XS1 facing left bank

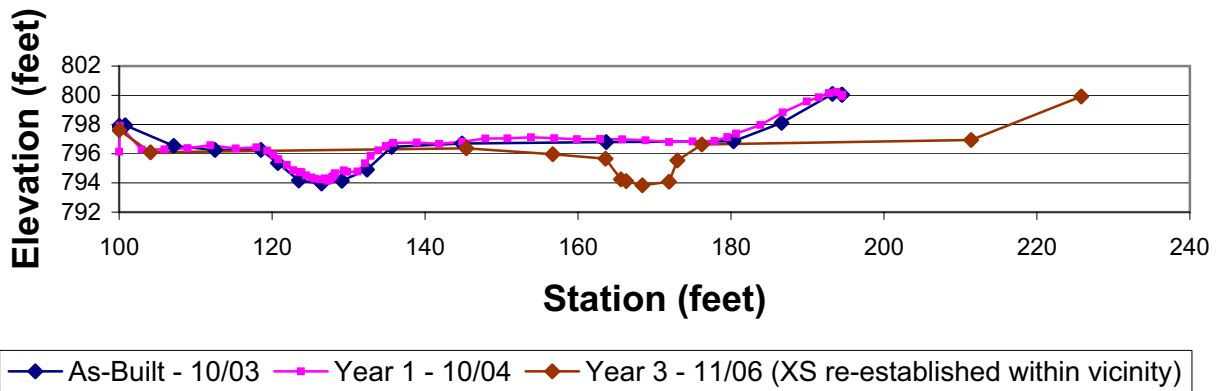


XS1 facing right bank

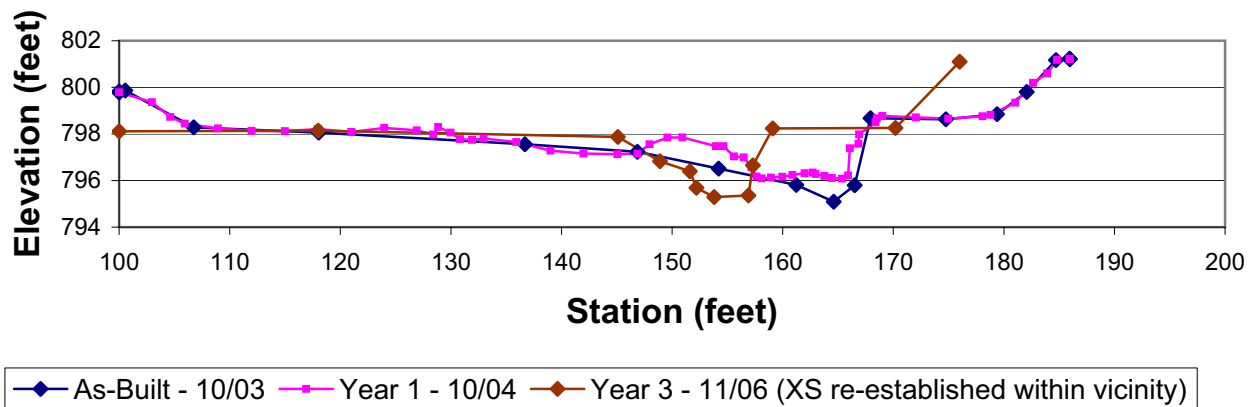


XS1 facing left bank

Buena Vista XS 1 - As-Built, Year 1 & 3 Overlay

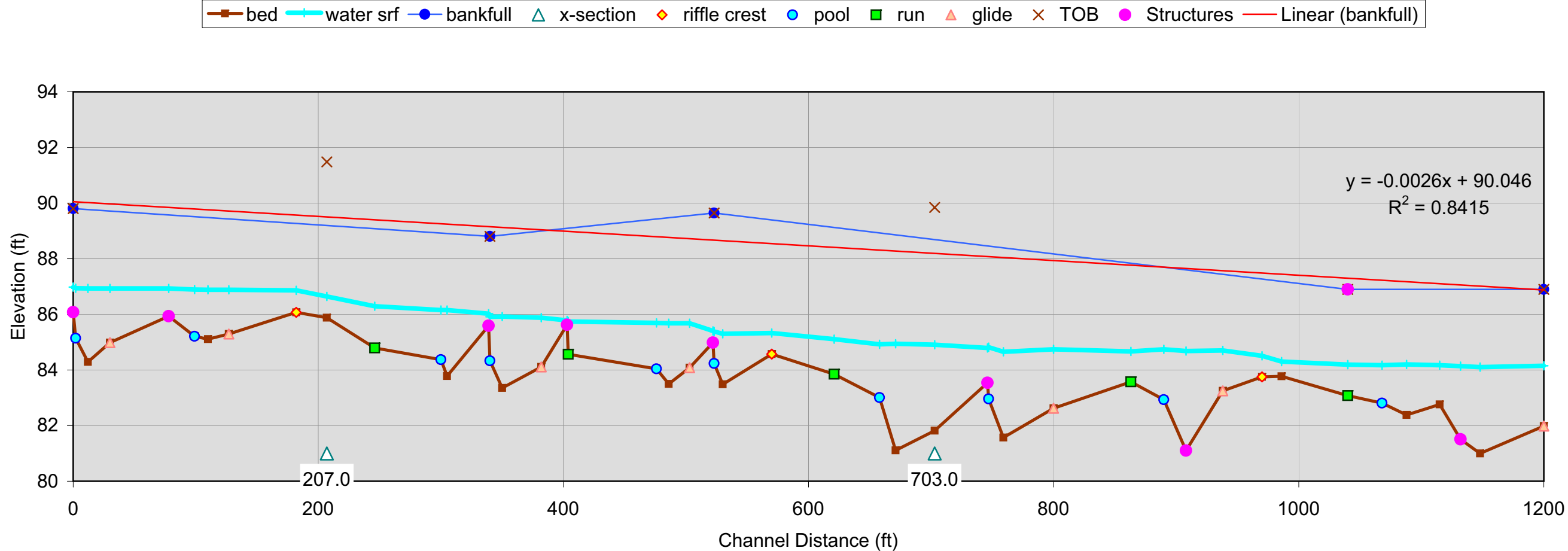


Buena Vista XS 2 - As-Built, Year 1 & 3 Overlay

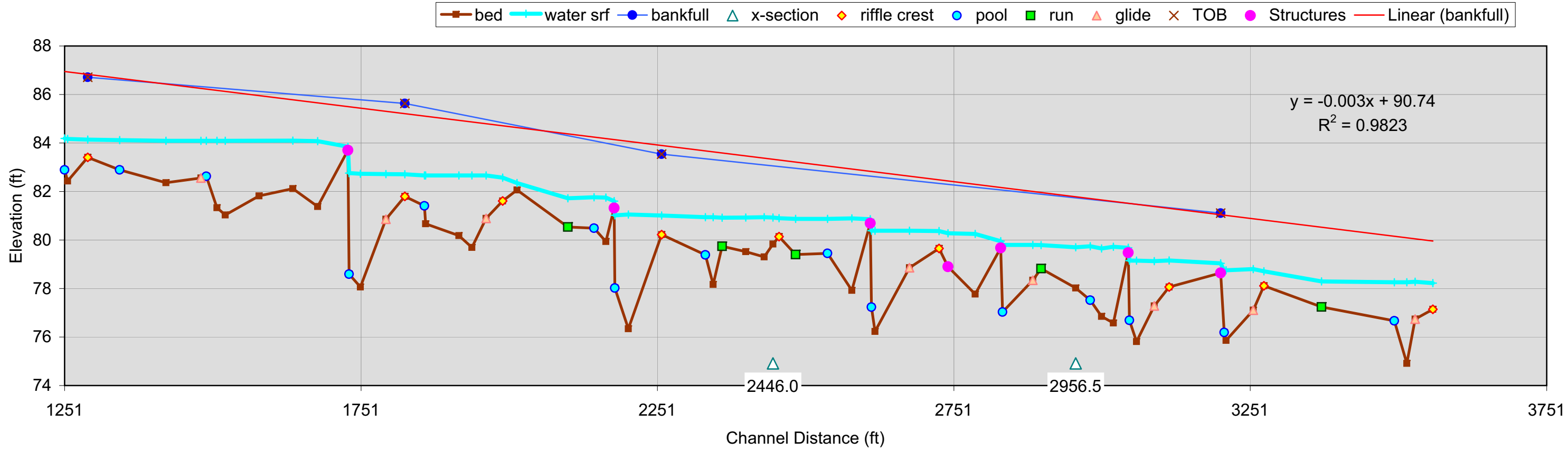


SILAS CREEK

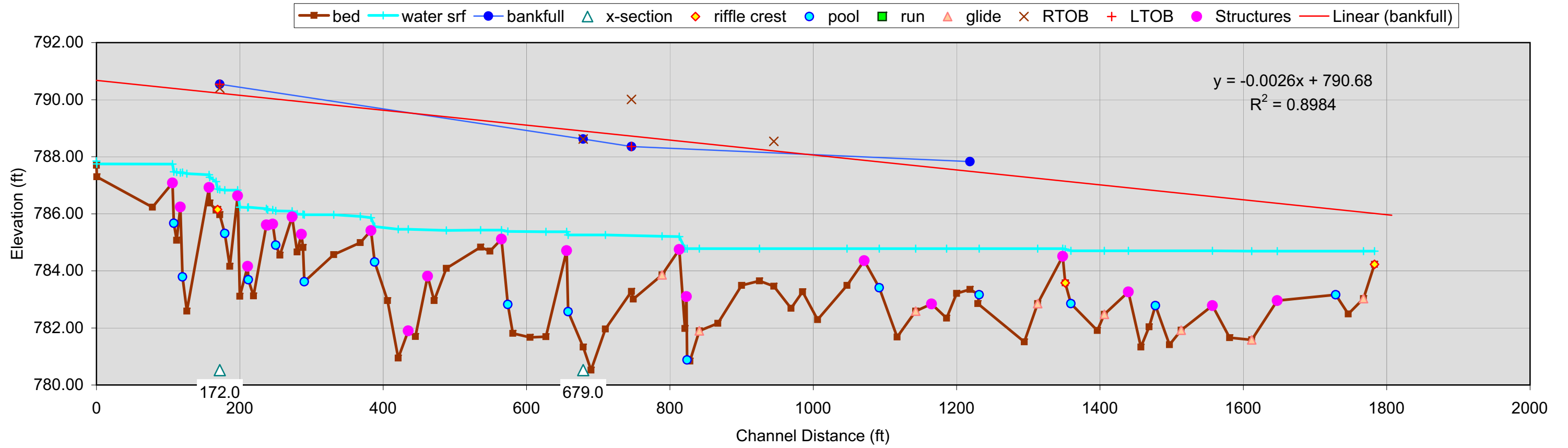
Snow Creek - Reach 1 - 10/24/06



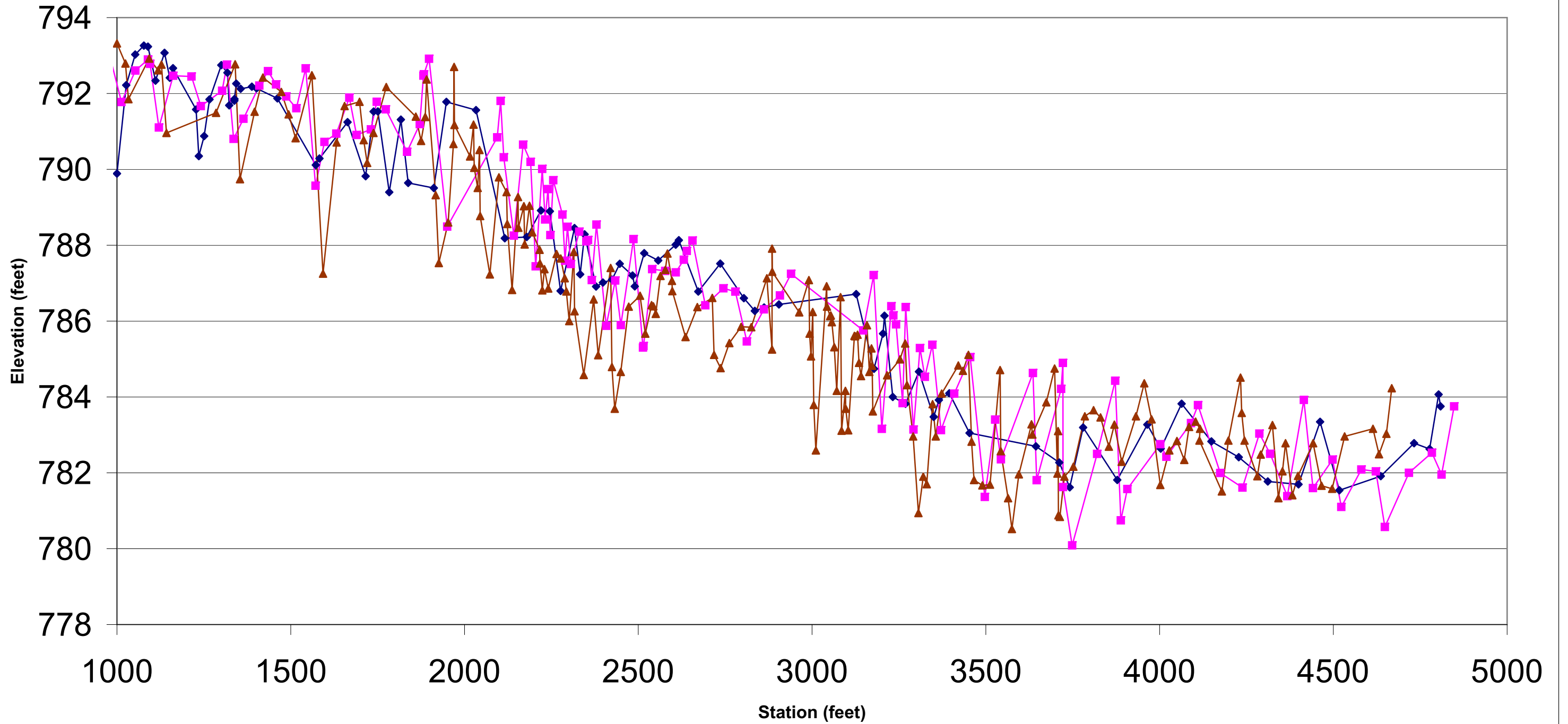
Snow Creek - Reach 2 - 10/25/06



Silas Creek Reach 3 - 10/12/06



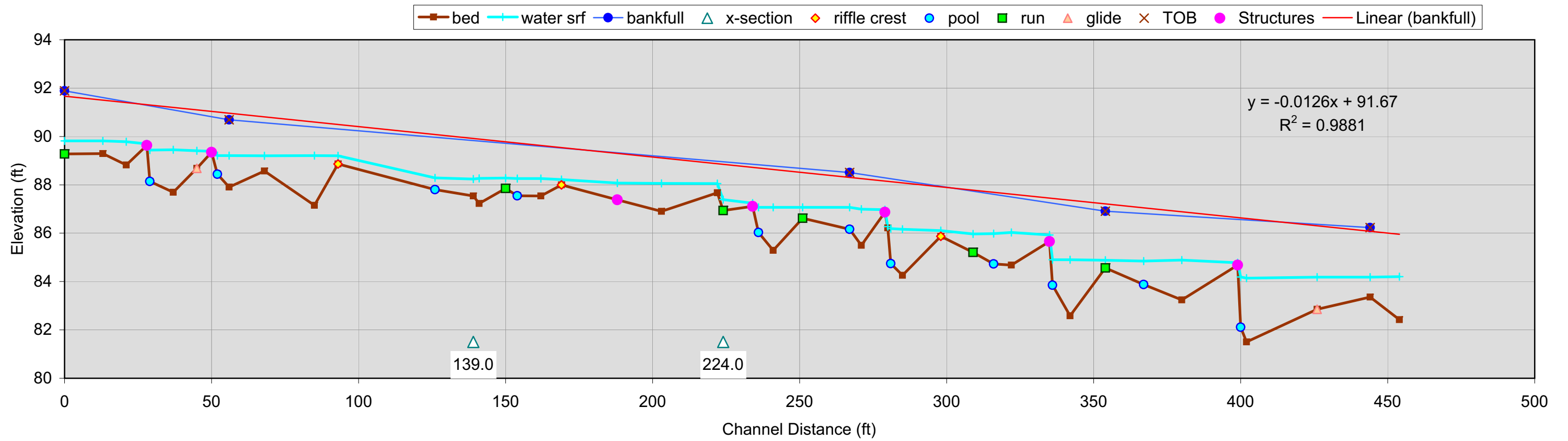
Silas Creak As-Built, Year 1, and Year 3 Overlay



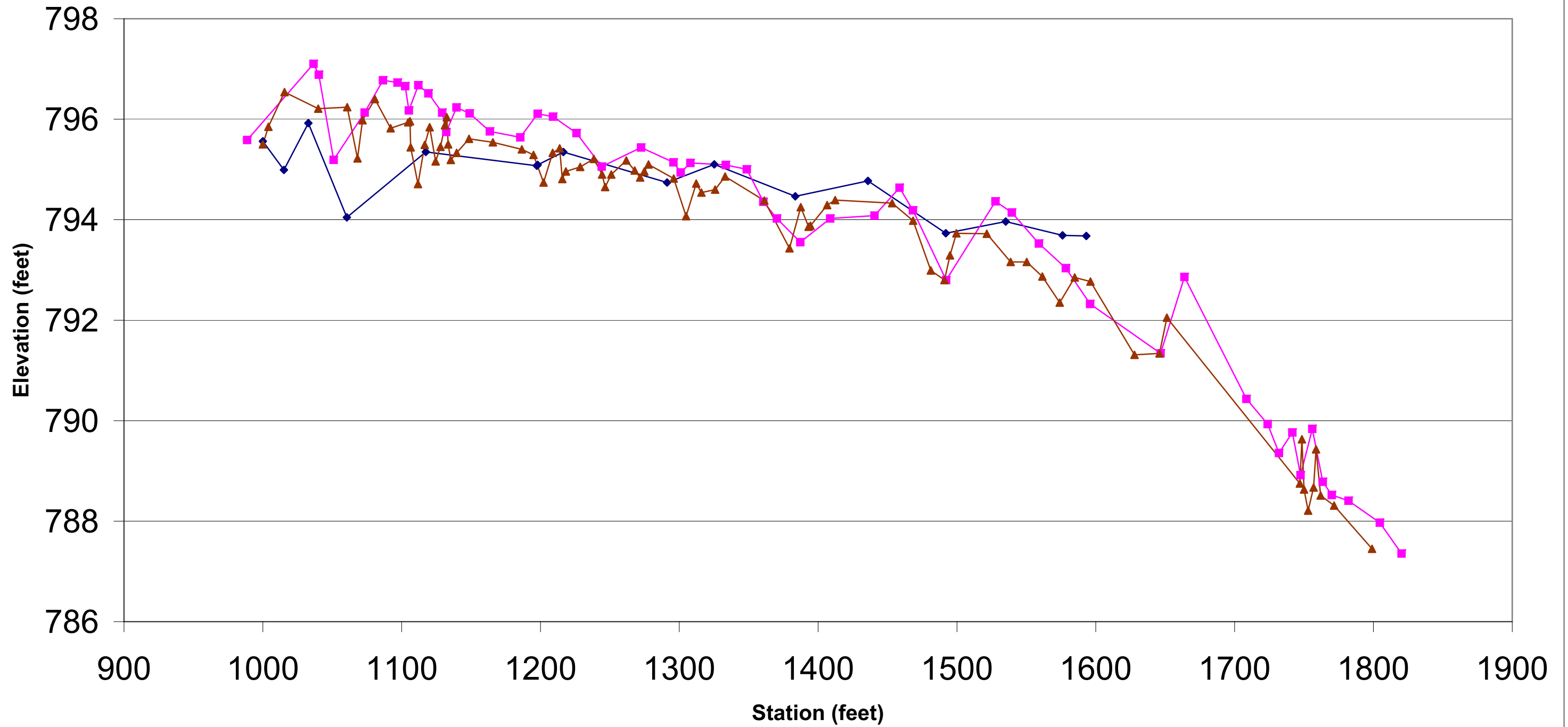
As-Built -10/03 Year 1 - 10/04 Year 3 - 9/06

BUENA VISTA BRANCH

Unnamed Tributary to Snow Creek (10/26/06)



Buena Vista As-Built, Year 1, and Year 3 Overlay



As-Built - 10/03 Year 1 - 10/04 Year 3 - 11/06

SILAS CREEK
REACH ONE

2) Weighted Pebble Count

Feature Percent of Reach

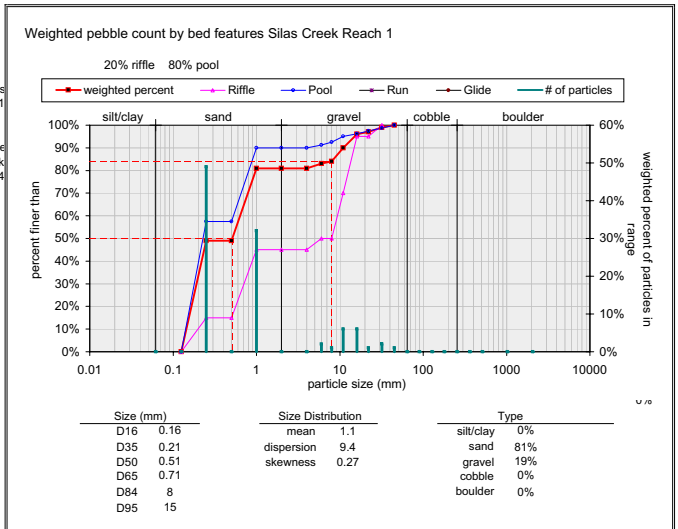
Riffle % Pool % Run % Glide %

Riffle, Pool, Run, Glide

Weighted pebble count by bed features

Material	Size Range (mm)	weighted
silt/clay	0 - 0.062	0.0
very fine sand	0.062 - 0.125	0.0
fine sand	0.125 - 0.25	49.0
medium sand	0.25 - 0.5	0.0
coarse sand	0.5 - 1	32.0
very coarse sand	1 - 2	0.0
very fine gravel	2 - 4	0.0
fine gravel	4 - 6	2.0
fine gravel	6 - 8	1.0
medium gravel	8 - 11	6.0
medium gravel	11 - 16	6.0
coarse gravel	16 - 22	1.0
coarse gravel	22 - 32	2.0
very coarse gravel	32 - 45	1.0
very coarse gravel	45 - 64	0.0
small cobble	64 - 90	0.0
medium cobble	90 - 128	0.0
large cobble	128 - 180	0.0
very large cobble	180 - 256	0.0
small boulder	256 - 362	0.0
small boulder	362 - 512	0.0
medium boulder	512 - 1024	0.0
large boulder	1024 - 2048	0.0
very large boulder	2048 - 4096	0.0
total particle weighted count:		100
bedrock		0.0
clay hardpan		0.0
debris/wood		0.0
artificial		0.0
total weighted count:		100.0

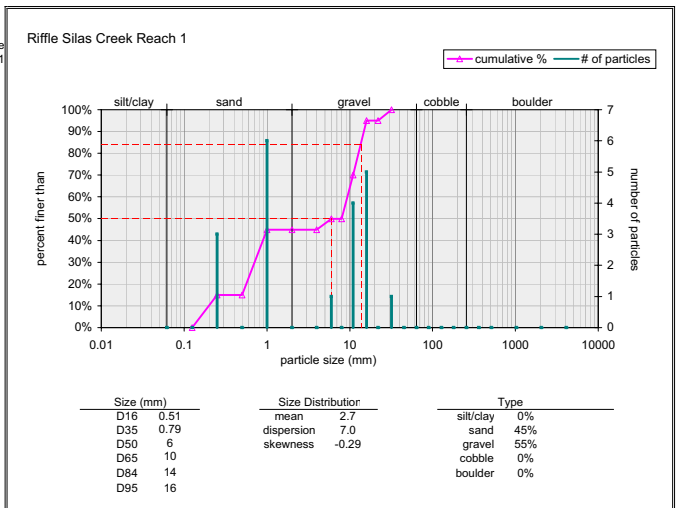
Note:



Riffle

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	3
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	6
very coarse sand	1 - 2	0
very fine gravel	2 - 4	0
fine gravel	4 - 6	1
fine gravel	6 - 8	0
medium gravel	8 - 11	4
medium gravel	11 - 16	5
coarse gravel	16 - 22	0
coarse gravel	22 - 32	1
very coarse gravel	32 - 45	0
very coarse gravel	45 - 64	0
small cobble	64 - 90	0
medium cobble	90 - 128	0
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		20
bedrock		
clay hardpan		
debris/wood		
artificial		
total count:		20

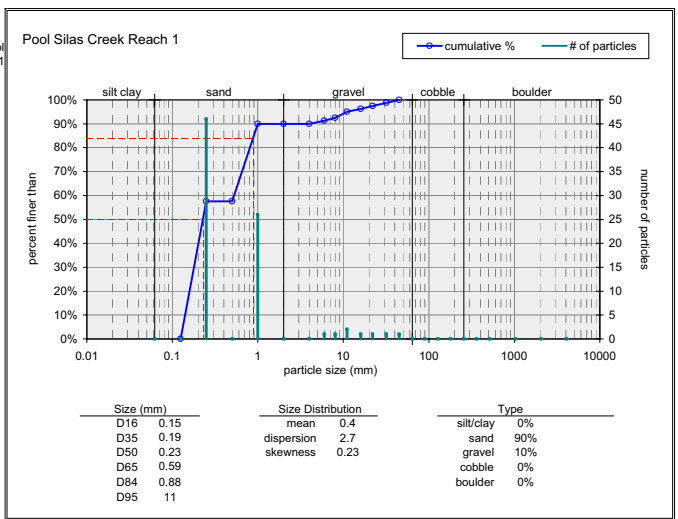
Note:



Pool

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	46
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	26
very coarse sand	1 - 2	0
very fine gravel	2 - 4	0
fine gravel	4 - 6	1
fine gravel	6 - 8	1
medium gravel	8 - 11	2
medium gravel	11 - 16	1
coarse gravel	16 - 22	1
coarse gravel	22 - 32	1
very coarse gravel	32 - 45	1
very coarse gravel	45 - 64	0
small cobble	64 - 90	0
medium cobble	90 - 128	0
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		80
bedrock		
clay hardpan		
debris/wood		
artificial		
total count:		80

Note:



SILAS CREEK
REACH TWO

2) Weighted Pebble Count

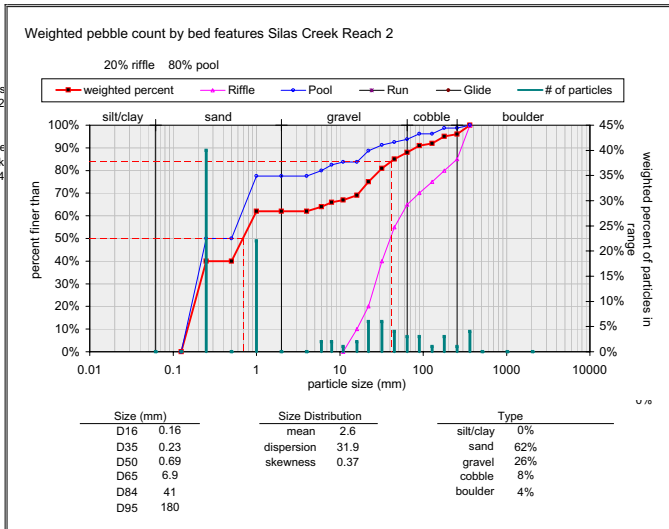
Feature Percent of Reach

Riffle % Pool % Run % Glide %

Weighted pebble count by bed features

Material	Size Range (mm)	weighted
silt/clay	0 - 0.062	0.0
very fine sand	0.062 - 0.125	0.0
fine sand	0.125 - 0.25	40.0
medium sand	0.25 - 0.5	0.0
coarse sand	0.5 - 1	22.0
very coarse sand	1 - 2	0.0
very fine gravel	2 - 4	0.0
fine gravel	4 - 6	2.0
fine gravel	6 - 8	2.0
medium gravel	8 - 11	1.0
medium gravel	11 - 16	2.0
coarse gravel	16 - 22	6.0
coarse gravel	22 - 32	6.0
very coarse gravel	32 - 45	4.0
very coarse gravel	45 - 64	3.0
small cobble	64 - 90	3.0
medium cobble	90 - 128	1.0
large cobble	128 - 180	3.0
very large cobble	180 - 256	1.0
small boulder	256 - 362	4.0
small boulder	362 - 512	0.0
medium boulder	512 - 1024	0.0
large boulder	1024 - 2048	0.0
very large boulder	2048 - 4096	0.0
total particle weighted count:		100
bedrock		0.0
clay hardpan		0.0
debris/wood		0.0
artificial		0.0
total weighted count:		100.0

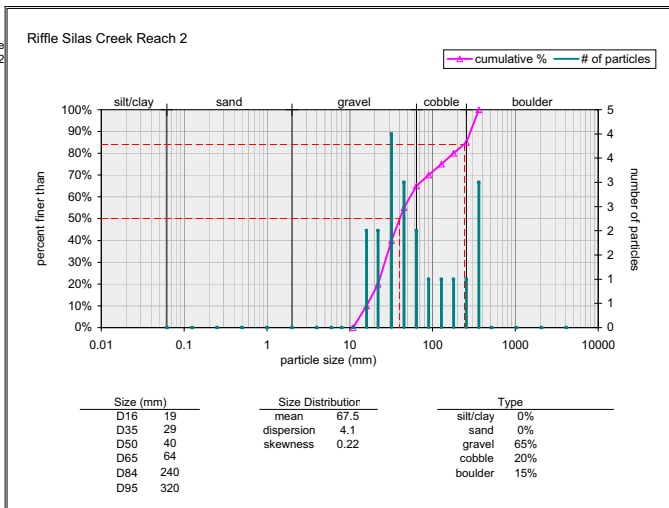
Note: _____



Riffle

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	0
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	0
very coarse sand	1 - 2	0
very fine gravel	2 - 4	0
fine gravel	4 - 6	0
fine gravel	6 - 8	0
medium gravel	8 - 11	0
medium gravel	11 - 16	2
coarse gravel	16 - 22	2
coarse gravel	22 - 32	4
very coarse gravel	32 - 45	3
very coarse gravel	45 - 64	2
small cobble	64 - 90	1
medium cobble	90 - 128	1
large cobble	128 - 180	1
very large cobble	180 - 256	1
small boulder	256 - 362	3
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		20
bedrock		
clay hardpan		
debris/wood		
artificial		
total count:		20

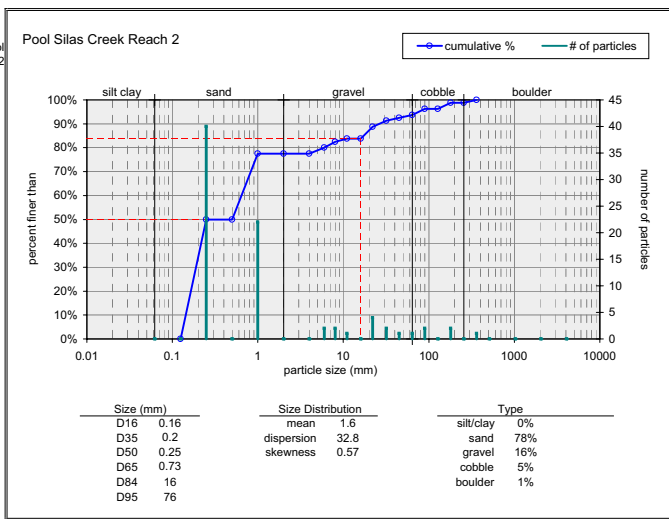
Note: _____



Pool

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	40
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	22
very coarse sand	1 - 2	0
very fine gravel	2 - 4	0
fine gravel	4 - 6	2
fine gravel	6 - 8	2
medium gravel	8 - 11	1
medium gravel	11 - 16	0
coarse gravel	16 - 22	4
coarse gravel	22 - 32	2
very coarse gravel	32 - 45	1
very coarse gravel	45 - 64	1
small cobble	64 - 90	2
medium cobble	90 - 128	0
large cobble	128 - 180	2
very large cobble	180 - 256	0
small boulder	256 - 362	1
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		80
bedrock		
clay hardpan		
debris/wood		
artificial		
total count:		80

Note: _____



SILAS CREEK
REACH THREE

2) Weighted Pebble Count

Feature Percent of Reach

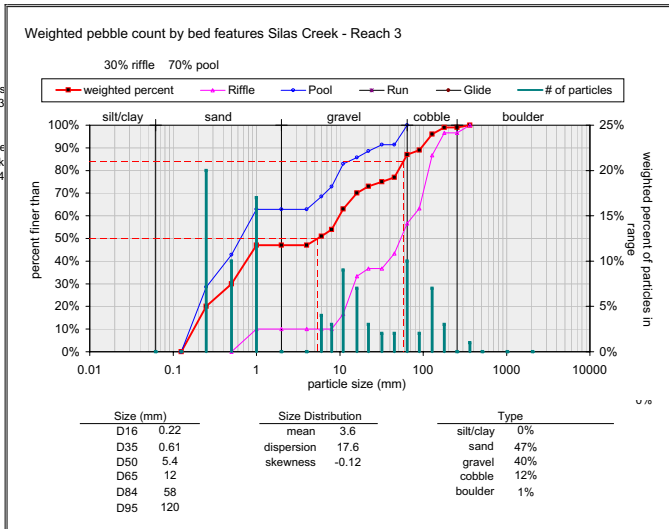
Riffle % Pool %

Run % Glide %

Weighted pebble count by bed features

Material	Size Range (mm)	weighted
silt/clay	0 - 0.062	0.0
very fine sand	0.062 - 0.125	0.0
fine sand	0.125 - 0.25	20.0
medium sand	0.25 - 0.5	10.0
coarse sand	0.5 - 1	17.0
very coarse sand	1 - 2	0.0
very fine gravel	2 - 4	0.0
fine gravel	4 - 6	4.0
fine gravel	6 - 8	3.0
medium gravel	8 - 11	9.0
medium gravel	11 - 16	7.0
coarse gravel	16 - 22	3.0
coarse gravel	22 - 32	2.0
very coarse gravel	32 - 45	2.0
very coarse gravel	45 - 64	10.0
small cobble	64 - 90	2.0
medium cobble	90 - 128	7.0
large cobble	128 - 180	3.0
very large cobble	180 - 256	0.0
small boulder	256 - 362	1.0
small boulder	362 - 512	0.0
medium boulder	512 - 1024	0.0
large boulder	1024 - 2048	0.0
very large boulder	2048 - 4096	0.0
total particle weighted count:		100
bedrock		0.0
clay hardpan		0.0
debris/wood		0.0
artificial		0.0
total weighted count:		100.0

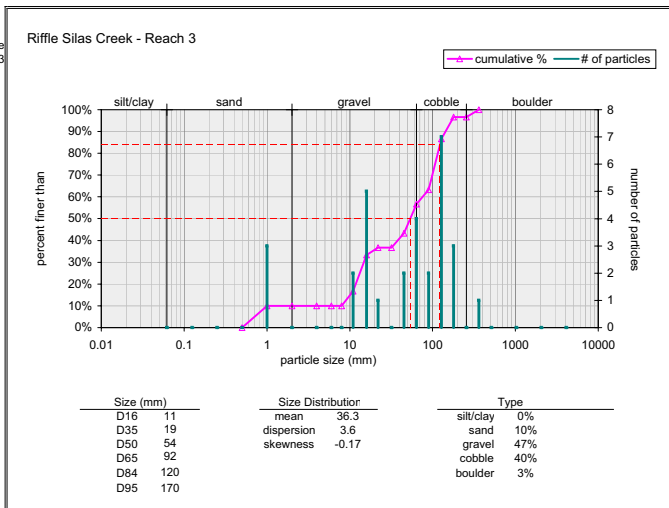
Note: _____



Riffle

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	0
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	3
very coarse sand	1 - 2	0
very fine gravel	2 - 4	0
fine gravel	4 - 6	0
fine gravel	6 - 8	0
medium gravel	8 - 11	2
medium gravel	11 - 16	5
coarse gravel	16 - 22	1
coarse gravel	22 - 32	0
very coarse gravel	32 - 45	2
very coarse gravel	45 - 64	4
small cobble	64 - 90	2
medium cobble	90 - 128	7
large cobble	128 - 180	3
very large cobble	180 - 256	0
small boulder	256 - 362	1
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		30
bedrock		
clay hardpan		
debris/wood		
artificial		
total count:		30

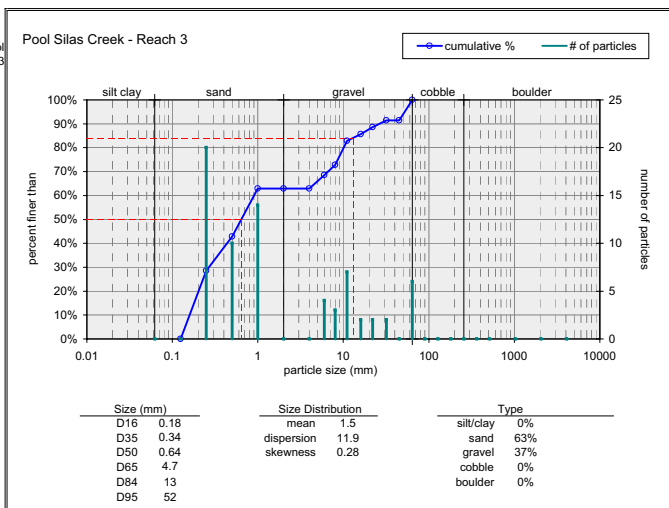
Note: _____



Pool

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	20
medium sand	0.25 - 0.5	10
coarse sand	0.5 - 1	14
very coarse sand	1 - 2	0
very fine gravel	2 - 4	0
fine gravel	4 - 6	4
fine gravel	6 - 8	3
medium gravel	8 - 11	7
medium gravel	11 - 16	2
coarse gravel	16 - 22	2
coarse gravel	22 - 32	2
very coarse gravel	32 - 45	0
very coarse gravel	45 - 64	6
small cobble	64 - 90	0
medium cobble	90 - 128	0
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		70
bedrock		
clay hardpan		
debris/wood		
artificial		
total count:		70

Note: _____



BUENA VISTA BRANCH

2) Weighted Pebble Count

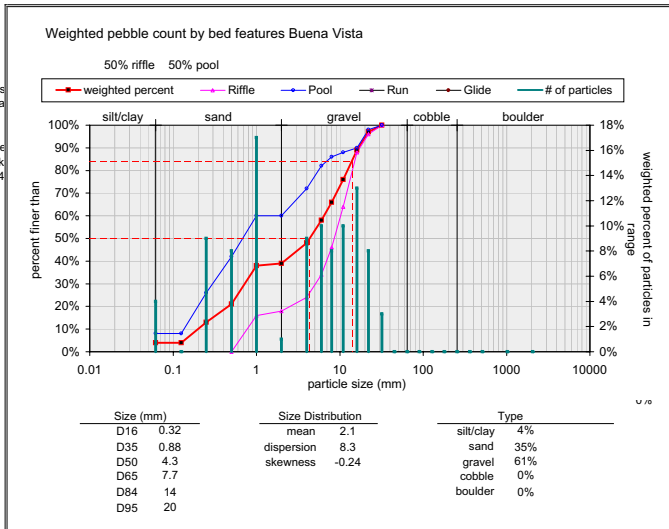
Feature Percent of Reach

Riffle % Run %
 Pool % Glide %

Weighted pebble count by bed features

Material	Size Range (mm)	weighted
silt/clay	0 - 0.062	4.0
very fine sand	0.062 - 0.125	0.0
fine sand	0.125 - 0.25	9.0
medium sand	0.25 - 0.5	8.0
coarse sand	0.5 - 1	17.0
very coarse sand	1 - 2	1.0
very fine gravel	2 - 4	9.0
fine gravel	4 - 6	10.0
fine gravel	6 - 8	8.0
medium gravel	8 - 11	10.0
medium gravel	11 - 16	13.0
coarse gravel	16 - 22	8.0
coarse gravel	22 - 32	3.0
very coarse gravel	32 - 45	0.0
very coarse gravel	45 - 64	0.0
small cobble	64 - 90	0.0
medium cobble	90 - 128	0.0
large cobble	128 - 180	0.0
very large cobble	180 - 256	0.0
small boulder	256 - 362	0.0
small boulder	362 - 512	0.0
medium boulder	512 - 1024	0.0
large boulder	1024 - 2048	0.0
very large boulder	2048 - 4096	0.0
total particle weighted count:		100
bedrock		0.0
clay hardpan		0.0
debris/wood		0.0
artificial		0.0
total weighted count:		100.0

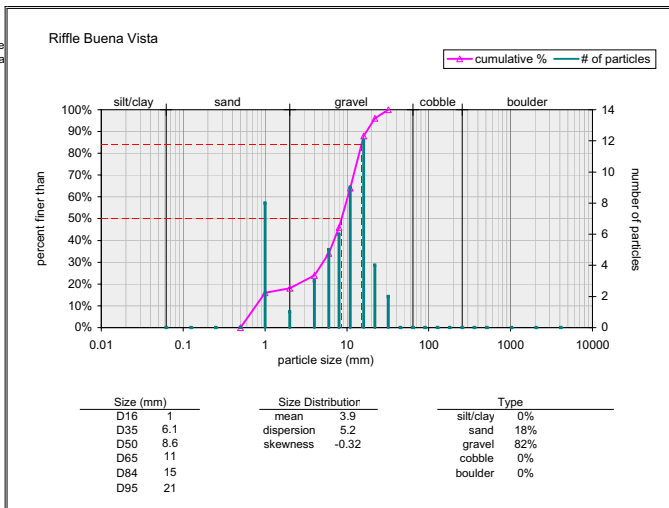
Note:



Riffle

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	0
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	8
very coarse sand	1 - 2	1
very fine gravel	2 - 4	3
fine gravel	4 - 6	5
fine gravel	6 - 8	6
medium gravel	8 - 11	9
medium gravel	11 - 16	12
coarse gravel	16 - 22	4
coarse gravel	22 - 32	2
very coarse gravel	32 - 45	0
very coarse gravel	45 - 64	0
small cobble	64 - 90	0
medium cobble	90 - 128	0
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		50
bedrock		
clay hardpan		
debris/wood		
artificial		
total count:		50

Note:



Pool

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	4
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	9
medium sand	0.25 - 0.5	8
coarse sand	0.5 - 1	9
very coarse sand	1 - 2	0
very fine gravel	2 - 4	6
fine gravel	4 - 6	5
fine gravel	6 - 8	2
medium gravel	8 - 11	1
medium gravel	11 - 16	1
coarse gravel	16 - 22	4
coarse gravel	22 - 32	1
very coarse gravel	32 - 45	0
very coarse gravel	45 - 64	0
small cobble	64 - 90	0
medium cobble	90 - 128	0
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		50
bedrock		
clay hardpan		
debris/wood		
artificial		
total count:		50

Note:

