

Naked Creek Stream Final Mitigation Report

Wilkes County, North Carolina

USGS HUC: 03040101010100

Project ID No. 040619201



EEP Project Manager: Julie Vann

Prepared for:



NC DENR-Ecosystem Enhancement Program

1652 Mail Service Center

Raleigh, North Carolina 27699-1652

August 2007

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Executive Summary

The Naked Creek Stream Restoration project falls within the Eller and Day Properties in Wilkes County, North Carolina approximately 10.6 miles west of Wilkesboro, North Carolina and 18.4 miles east of Boone, North Carolina. The site stream lies within USGS hydrologic unit **03040101010100** in the Yadkin River Basin.

Prior to restoration, the site consisted of one reach (UtNkd), an approximately 2,800 linear foot portion of an unnamed tributary to Naked Creek (Drainage area 0.5 mi²). UtNkd drained a watershed consisting of predominantly forest land and agricultural land. Pasture land surrounded the project reach and the stream banks lacked strong rooted vegetation (e.g. woody or deep rooted herbaceous vegetation). Due to the lack of bank protection and denuded watershed, the stream channel incised (bank height ratios of 1.7) and entrenched (entrenchment ratios of 1.5). In this condition and with regular impacts due to cattle traffic, bank erosion had accelerated and the variety of bed features diminished.

For most of the riparian buffer, pasture grasses dominated with isolated specimens of hardwoods. Riparian zone woody vegetation included red maple (*Acer rubrum*), sycamore (*Plantus occidentalis*), river birch (*Betula nigra*), and yellow poplar (*Liriodendron tulipifera*).

The altered conditions of the stream and the riparian buffer reduced water quality and impaired habitat. Pasture derived nutrients flowing untreated through the riparian zone and fine silts sloughing from the incised banks raised biological and chemical oxygen demand. This with the lack of sufficient reoxygenating riffle features reduced dissolved oxygen within the water column. Water quality has also diminished due to raised turbidity from bank erosion and elevated water temperatures caused by the lack of tree shading. Habitat potential had been reduced by the diminished water quality and loss of physical habitat such as bed features, undercut banks, and a well developed vegetative community.

The reach was restored within the existing floodplain using a Priority II approach. The riparian buffer was replanted with native woody species to restore ecological function to the buffer.

Site restoration work will result in the restoration of approximately 2,562 linear feet of stream and the restoration of 2.92 acres of riparian buffer. With the restoration, water quality should be improved due to a decrease in nutrients, turbidity, and moderation in water temperature. Biological and chemical oxygen demand should be reduced through filtering in the riparian buffer and riverine wetlands. Potential habitats have been added through the creation of bed features, stable undercut stream banks, and reestablishment of riparian vegetative community.

The monitoring will assess the site's stream and riparian areas to determine restoration success. The monitoring plan has been set up based on guidance provided by The Stream Mitigation Guidelines disseminated by the United States Corps of Engineers – Wilmington District (McLendon, Scott, Fox, Becky et al. 2003) and the most current

version of the EEP documents entitled “Content, Format, and Data Requirements for EEP Monitoring Reports”.

Stream restoration will be considered successful through achievement of stable channel geometry, appropriate channel materials, and lack of significant erosion. The Riparian buffer will be investigated for survivability of planted vegetation and exclusion of nuisance species.

The site will be maintained during the monitoring period to ensure accordance with success criteria. Repairs will be completed as necessary to reestablish channel stability and the site will be replanted if vegetation shows signs of significant failure.

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Narrative

The Naked Creek Stream Restoration project falls within the Eller and Day Properties in Wilkes County, North Carolina approximately 10.6 miles west of Wilkesboro, North Carolina and 18.4 miles east of Boone, North Carolina. The stream lies within headwaters of the USGS hydrologic unit **03040101010100** in the Yadkin River Basin. The site as defined by the protective conservation easement surrounding the stream and riparian buffers covers approximately 2.92 acres.

Prior to construction, the site consisted of one reach (UtNkd), an approximately 2,800 linear foot portion of an unnamed tributary to Naked Creek (Drainage area 0.5 mi²). UtNkd drained a watershed consisting of predominantly forest land and agricultural land.

Pasture land surrounded the project reach and the stream banks lacked strong rooted vegetation (e.g. woody or deep rooted herbaceous vegetation). For most of the riparian buffer, pasture grasses dominated with isolated specimens of hardwoods. Riparian zone woody vegetation included red maple (*Acer rubrum*), sycamore (*Plantus occidentalis*), river birch (*Betula nigra*), and yellow poplar (*Liriodendron tulipifera*). Due to the lack of bank protection, and denuded watershed, the stream channel incised (bank height ratios of 1.7) and become entrenched (entrenchment ratios of 1.5). Entrainment calculations predicted that the channel would continue to degrade. The BEHI scores for the reach ranged from High to Very High. In this condition and with regular impacts due to cattle traffic, bank erosion accelerated and the variety of bed features diminished. With active cattle grazing in the area, the channel would have continued to receive impacts. The reach stream type was an incised B4c and without restoration would have likely continued to downcut and widen, resulting in high sediment loads and impaired habitat.

The goal of the restoration project is to improve the water quality and biological habitat of the site's streams, wetlands, and riparian buffers through the following:

- Restore (pattern, dimension, and profile) unstable streams using natural channel design techniques
- Re-establish riparian buffers

A Priority II restoration approach was used for this project. The Priority II approach was used to re-establish an active floodplain and stabilize the stream banks (Rosgen, David L. 1997). This method should decrease stream bank erosion, establish an active floodplain, reduce channel stress during floods, improve aquatic habitat, and reduce fine sediments.

The riparian buffer was planted as three zones. Zone 1 was the stream bank zone consisting of tree and shrub species and native herbaceous seeding typically found along stream banks in the region. Zone 2 was a forested riparian area consisting of selected tree and shrub species, with a range of tolerances of inundation and saturation. Zone 3 was an upland zone that was planted with tree and shrub species less tolerant to inundation and saturation. Zone 1 was planted with live stakes and Zones 1 and 2 were planted with bare root seedlings and containerized plants. Planting spacing was determined according to planting type. The entire easement was planted.

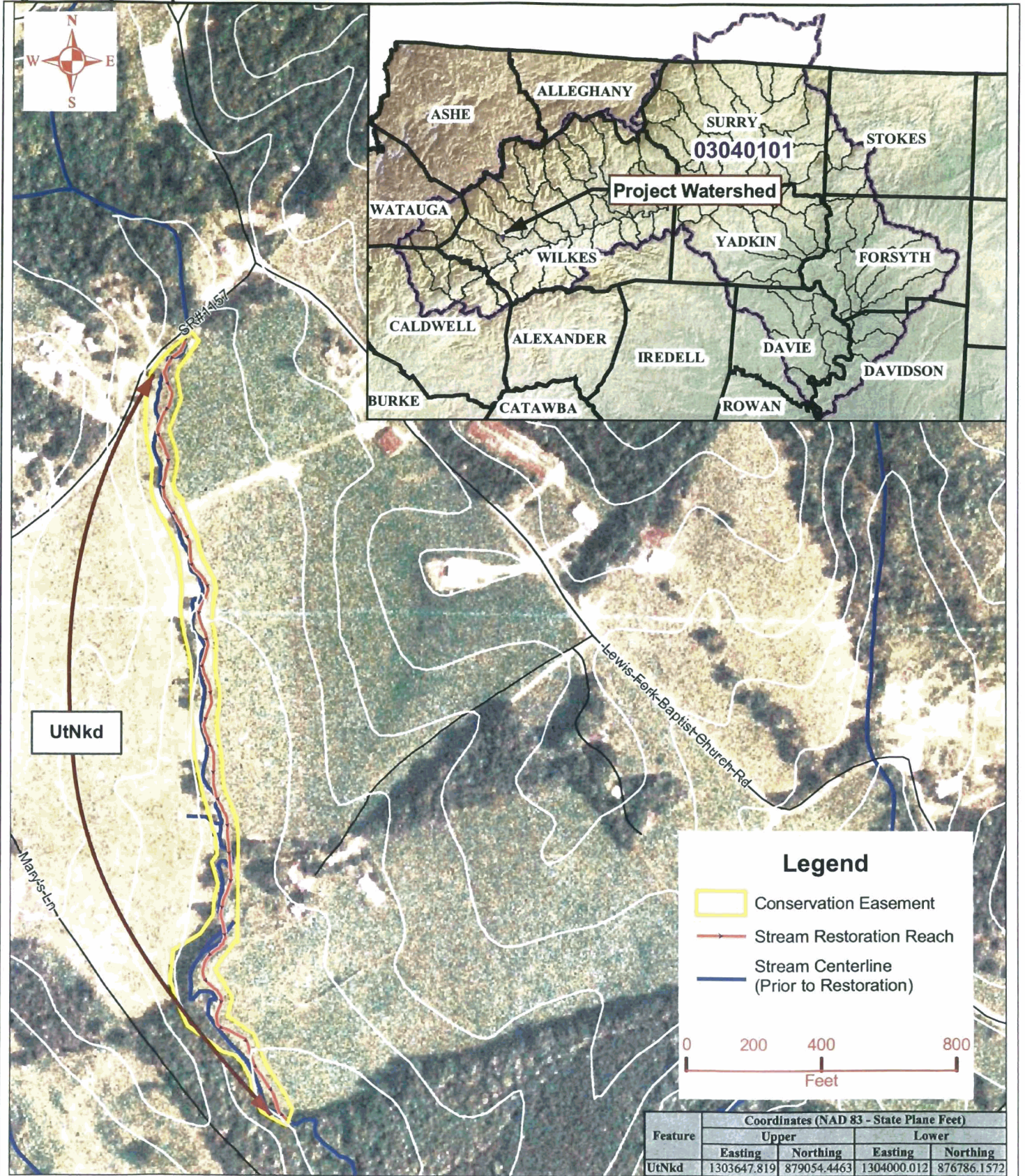
Inspection of the vegetation plots during the baseline monitoring phase showed that the planting density did not match the density prescribed in the planting plan. EEP will request that the contractor provide supplemental plantings during the spring of 2008 to bring the planting density to design specifications. At this time, the Vegetation Baseline Data does not include species names because the young seedlings were difficult to identify. Vegetation Baseline Data will be updated after the supplemental planting.

Table 1: Mitigation Summary Table

Feature	Pre Construction Length/Area	Proposed Length/Area	Mitigation Type	Mitigation Credit Ratio	Mitigation Credits
UtNkd	2,800* ft	2,562 ft	Restoration	1 : 1	2,562 ft
Total Stream Credits (SMU)					2,562 ft
Total Buffer Credits					2.92 ac

* Pre-construction channel contained numerous unstable tight meanders that the restoration work removed and replaced with more stable meanders.

Figure 1: Project Map



Monitoring Plan

The monitoring plan to evaluate the success of the stream restoration project is based on guidance provided by The Stream Mitigation Guidelines (McLendon, Scott, Fox, Becky et al. 2003) disseminated by the United States Corps of Engineers – Wilmington District and recommendations from the Ecosystem Enhancement Program. The collection and summarization of monitoring data will be conducted in accordance with the most current version of the EEP documents entitled “Content, Format, and Data Requirements for EEP Monitoring Reports”

The monitoring will occur annually for five years. The monitoring period should include two separate years with bankfull events. Bankfull events will be verified using an installed crest gauge that will be inspected during each monitoring visit. If a bankfull event has not been documented by the end of the second year of monitoring, a mandatory quarterly check will be required. If there are not two bankfull events, the monitoring period may be extended at the discretion of the Corps of Engineers, Raleigh Regulatory Field Office Project Manager and the 401-Wetlands Unit. Monitoring reports will be submitted during years 1-5.

Monitoring work will include reference photographs, materials sampling, site survey, and visual assessment and mapping of significant features. The success criteria and assessment methods for the sites streams and riparian buffer are provided below.

Stream Monitoring

Success Criteria

The stream geometry will be considered successful if the cross-section geometry, profile, and sinuosity are stable or reach a dynamic equilibrium. It is expected that there will be minimal changes in the designed cross sections, profile, and/or substrate composition. Changes that may occur during the monitoring period will be evaluated to determine if they represent a movement toward a more unstable condition (e.g. down cutting, erosion, mid-channel bars, etc.) or are minor changes that represent an increase in stability (e.g. settling, vegetative changes, coarsening of bed material, etc.).

An initial, though not exclusive, indicator of success will be adherence to design or reference ratios of stream geometry found in the Baseline Morphology and Hydraulic Summary table or in comparable and stable reference systems.

Deviation from the design ratios will not necessarily denote failure as it is possible to maintain stability and not stay within the design geometry. Additionally, determination of true bankfull will be difficult until the stream has had adequate flooding events to create strong bankfull indicators. The following key indicators of stability provide a more complete picture of stream stability:

- Stream Type: Maintenance of the design stream type or progression or conversion to stable stream type such as B, C, or E will indicate stability
- Bank Height Ratio: Bank height ratio between 1.0 and 1.1 will indicate flood flows have access to the active floodplain and that higher flows do not apply excessive stresses to stream banks

Assessment Methods

The survey of channel dimension consists of 6 permanent cross sections placed at unique stream segments throughout the project extent. The cross sections represent 4 riffles and 2 pools. Annual photographs showing both banks and upstream and downstream views will be taken for each cross section.

The survey of the longitudinal profile covers the entire extent of the project reaches. Newly-constructed meanders will be surveyed to provide pattern measurements.

Channel material measurements will be collected at each cross section.

Fifteen permanent photo stations have been set up to visually monitor stream conditions. These photo stations are mapped on the As-Built drawings.

The entire restored length of stream will be investigated for channel stability and in-stream structure functionality. Any evidence of channel instability will be identified, mapped, and photographed. All structures will be inventoried for functionality and photographed.

Riparian Buffer

Success Criteria

The success of riparian and wetland vegetation planting will be gauged by stem counts of planted species. Stem counts of over 320 trees per acres after 3 years, 288 trees per acre after 4 years, and 260 trees per acre after 5 year will be considered successful. Photos taken at established photo points should indicate maturation of riparian vegetation community.

Assessment Methods

The success of vegetation plantings will be measured through stem counts. Five (5) permanent quadrants will be used to sample the riparian buffer and restoration wetlands. Each quadrant covers 100 square meters. During the counts, the health of the vegetation will be noted. The vegetation survey will occur during the growing season. Permanent photo points have been set up for each quadrant.

References

- McLendon, Scott, Becky Fox, et al. (2003). Stream Mitigation Guidelines. United States Army Corps of Engineers - Wilmington District, United States Environmental Protection Agency, North Carolina Wildlife Resources Commission and North Carolina Department of Natural Resources - Division of Water Quality.
- Rosgen, David L. (1997). A Geomorphic Approach to Restoration of Incised Rivers. Management of Landscapes Disturbed by Channel Incision.
- Tuttle, John W. (1997). Soil Survey of Wilkes County, North Carolina. Natural Resources Conservation Service, United States Department of Agriculture.
- United States Army Corps of Engineers (1987). Corps of Engineers Wetlands Delineation Manual. Waterways Experiment Station, Environmental Laboratory.

Attachment 1

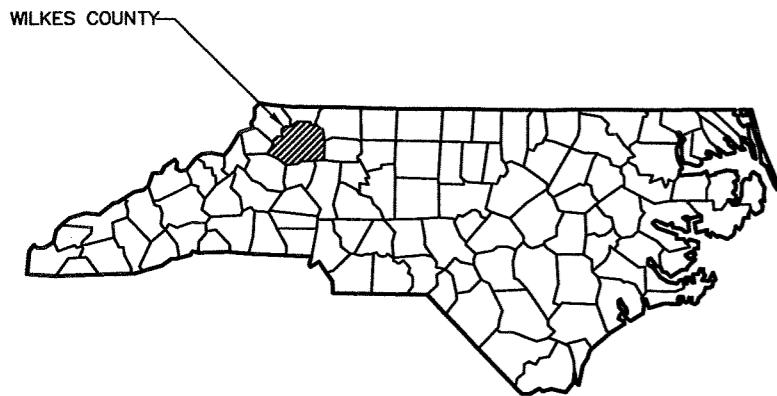
As-Built Drawings

AS-BUILT DRAWINGS FOR *NAKED CREEK* STREAM RESTORATION PROJECT

WILKES COUNTY, NORTH CAROLINA
STATE PROJECT NO.: 040619201A

NC-EEP CONTACT: JULIE VANN (919) 715-1950

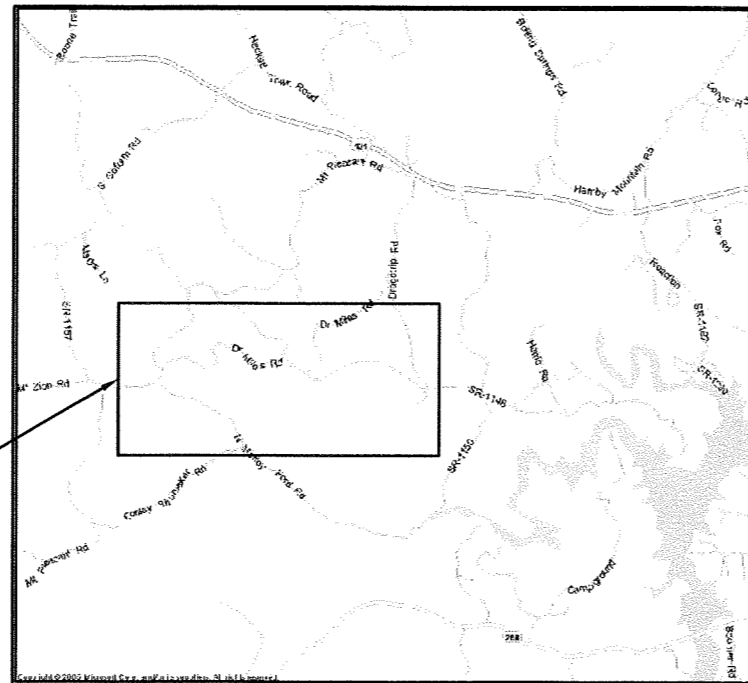
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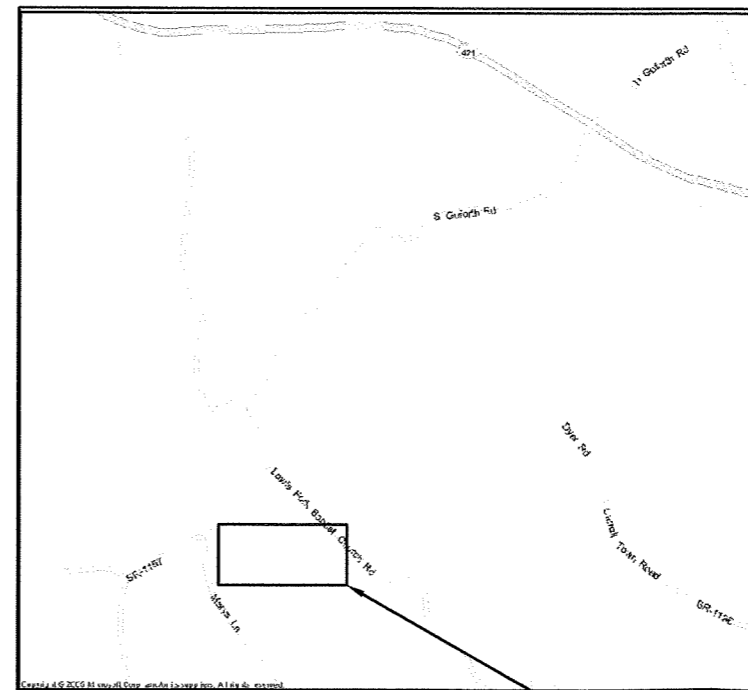
STATE OF NORTH CAROLINA

PROJECT AREA

SURVEY PREPARED BY:



VICINITY MAP



LOCATION MAP

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	COVER SHEET
2-7	PLAN SHEETS

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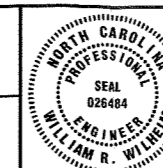
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TITLE:

AS-BUILT



DATE: 08/01/07

HORIZONTAL SCALE:

VERTICAL SCALE:

DRAWN BY: JJK

DESIGNED BY: ARK

CHECKED BY: WRS

PROJECT:

NAKED CREEK
STATE CONSTRUCTION ID
NO: 040619201A

ATTACHED REFERENCE FILES:

JOB NUMBER:
011795018




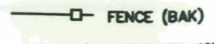



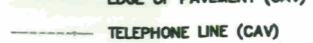







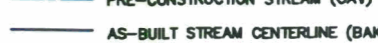








SHEET NUMBER:
1

STRUCTURE MOVED
UPSTREAM

MATCHLINE SEE SHEET 13

CHANNEL STABILIZATION AND RIP RAP

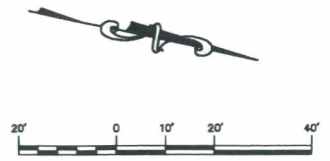
LEGEND
FEATURE NAME (SOURCE)

 PHOTO POINT (KHA)	 EASEMENT (CUR)
 VEGETATION MONITORING PLOT (KHA)	 FENCE (BAK)
 ROCK CROSS VANE (BAK)	 PRECONSTRUCTION FENCE (CAV)
 ROCK A-VANE (BAK)	 EDGE OF PAVEMENT (CAV)
 RIP RAP (BAK)	 TELEPHONE LINE (CAV)
 ROOTWAD (BAK)	 OVERHEAD POWER LINE (CAV)
 LOG VANE (BAK)	 GUY LINE (CAV)
 MONITORING CROSS SECTIONS (KHA)	 DESIGN STREAM TOP OF BANK (KHA)
 STREAM CROSSING/FORD (BAK)	 PRE-CONSTRUCTION STREAM (CAV)
 STREAM CROSSING W/CULVERT (BAK)	 AS-BUILT STREAM CENTERLINE (BAK)
 SURVEYOR'S BENCHMARKS (CAV, BAK)	 AS-BUILT TOP OF BANK (BAK)
 MONITORING BENCHMARKS (KHA)	 VEGETATION MONITORING PLOT (KHA)

SOURCES

KHA - KIMLEY-HORN AND ASSOCIATES, INC. (DESIGN BASED ON CAV MAPPING)
 CAV - CAVANAUGH ASSOCIATES, P.A. (BASE/PRE-CONSTRUCTION MAPPING)
 BAK - BAKER ENGINEERING NY, INC. (AS-BUILT MAPPING)
 CUR - CURRENT SURVEYING AND MAPPING, P.A. (STATE PROPERTY EASEMENT SURVEYOR)

PLANTED ACRES = 2.92



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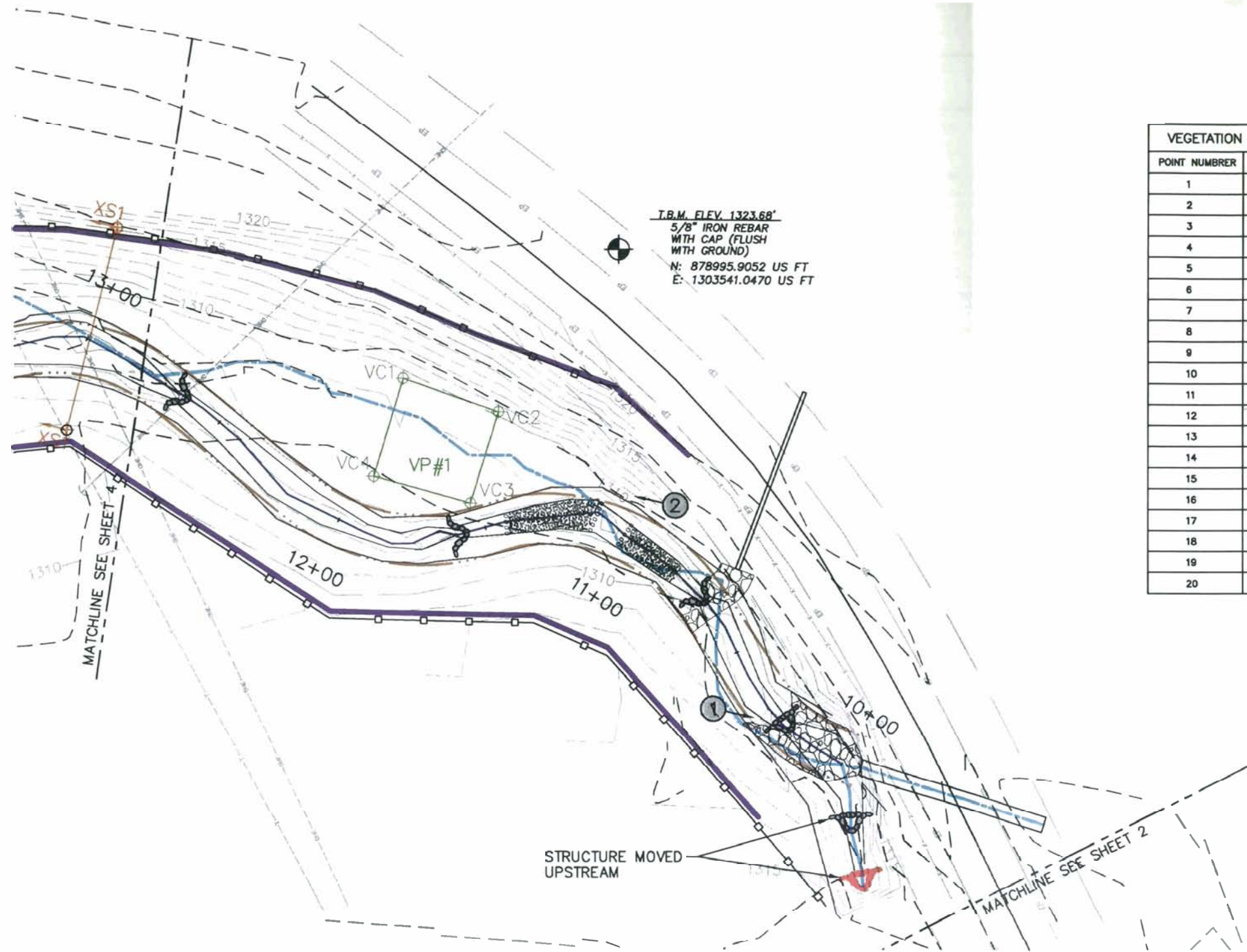


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 HORIZONTAL SCALE:
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 DRAWN BY: JIK
 DESIGNED BY: ARK
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PROJECT: **NAKED CREEK STATE CONSTRUCTION ID NO.: 040619201A**

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NOTE:
STRUCTURES SHOWN
IN RED VARY FROM
THE DESIGN.



VEGETATION PLOT MONITORING CONTROL POINTS

POINT NUMBER	POINT TAG	NORTHING	EASTING
1	VC1	878937.6305	1303595.7584
2	VC2	878969.6963	1303599.5650
3	VC3	878967.2706	1303629.8125
4	VC4	878935.1638	1303628.2089
5	VC5	878716.8337	1303595.7108
6	VC6	878781.7716	1303595.5887
7	VC7	878781.7462	1303611.9076
8	VC8	878715.3560	1303616.0404
9	VC9	878238.8832	1303704.1393
10	VC10	878304.3131	1303701.2231
11	VC11	878305.6913	1303712.2540
12	VC12	878240.6355	1303720.0466
13	VC13	877913.0134	1303764.5696
14	VC14	877978.1274	1303757.1446
15	VC15	877977.1997	1303772.6940
16	VC16	877912.3357	1303778.7246
17	VC17	878852.8169	1303975.3137
18	VC18	878908.5974	1303941.6805
19	VC19	878917.5288	1303955.2972
20	VC20	878861.4809	1303990.4754

CROSS SECTION MONITORING CONTROL POINTS

POINT NUMBER	POINT TAG	NORTHING	EASTING
21	XSEC1-1	878837.8342	1303569.1512
22	XSEC1-2	878836.1209	1303635.3200
23	XSEC2-1	878772.1609	1303581.8941
24	XSEC2-2	878795.0420	1303649.6580
25	XSEC3-1	878478.1767	1303663.0478
26	XSEC3-2	878489.2874	1303728.1311
27	XSEC4-1	877807.0008	1303729.1342
28	XSEC4-2	877802.1601	1303799.3876
29	XSEC5-1	877042.8050	1303784.2700
30	XSEC5-2	877096.5104	1303818.4546
31	XSEC6-1	876969.1105	1303858.1676
32	XSEC6-2	876985.7281	1303919.8874



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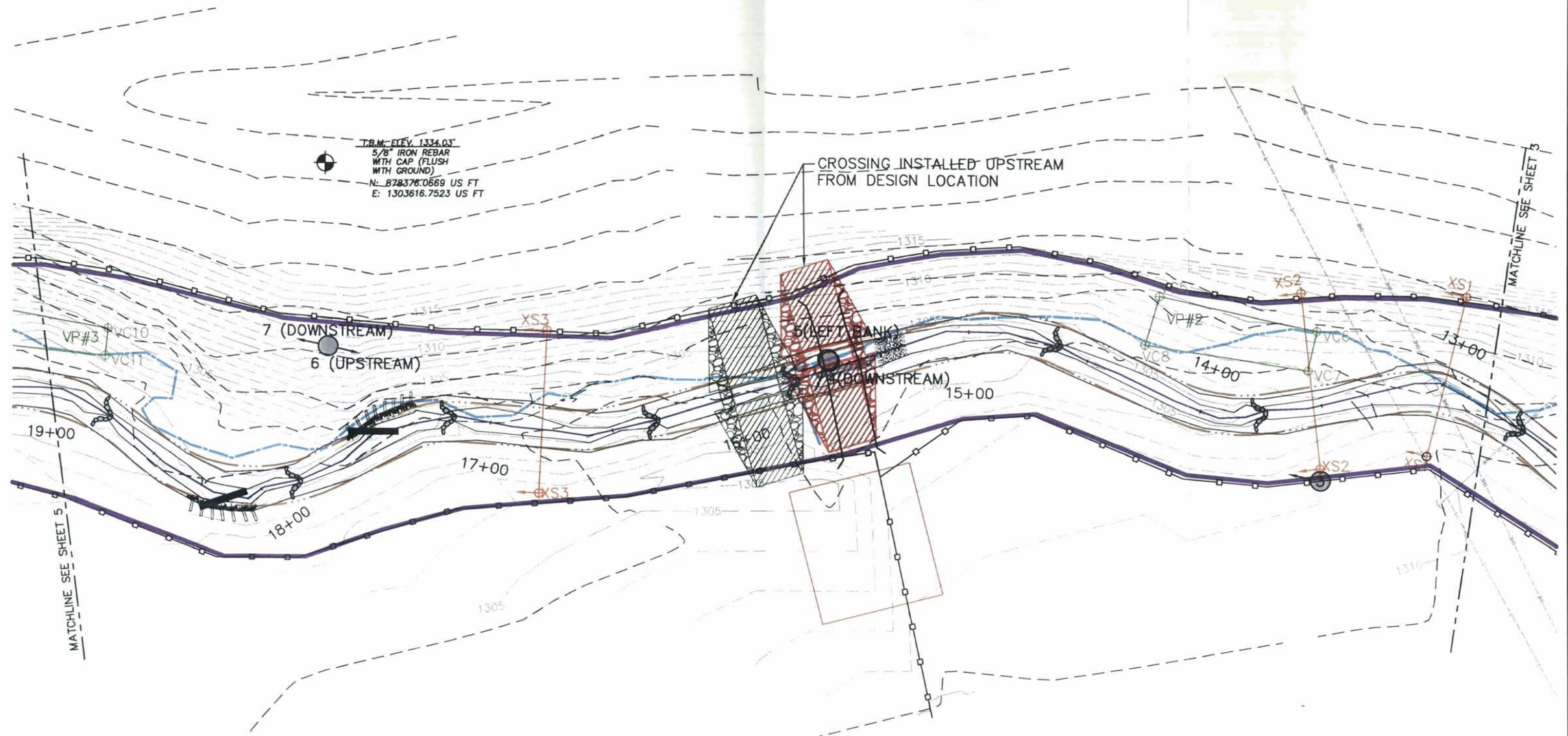
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SHEET NUMBER: 3



T.B.M. ELEV. 1334.03'
 5/8" IRON REBAR
 WITH CAP (FLUSH
 WITH GROUND)
 N: 878376.0669 US FT
 E: 1303616.7523 US FT

CROSSING INSTALLED UPSTREAM
 FROM DESIGN LOCATION

VP#3
 VVC10
 VVC11

7 (DOWNSTREAM)
 6 (UPSTREAM)

XS3

5 (LEFT BANK)
 8 (DOWNSTREAM)

VP#2

XS2

XS1

19+00

18+00

17+00

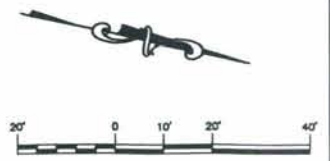
15+00

14+00

13+00

MATCHLINE SEE SHEET 5

MATCHLINE SEE SHEET 3



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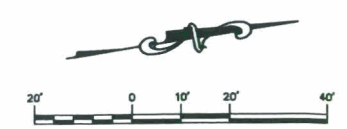
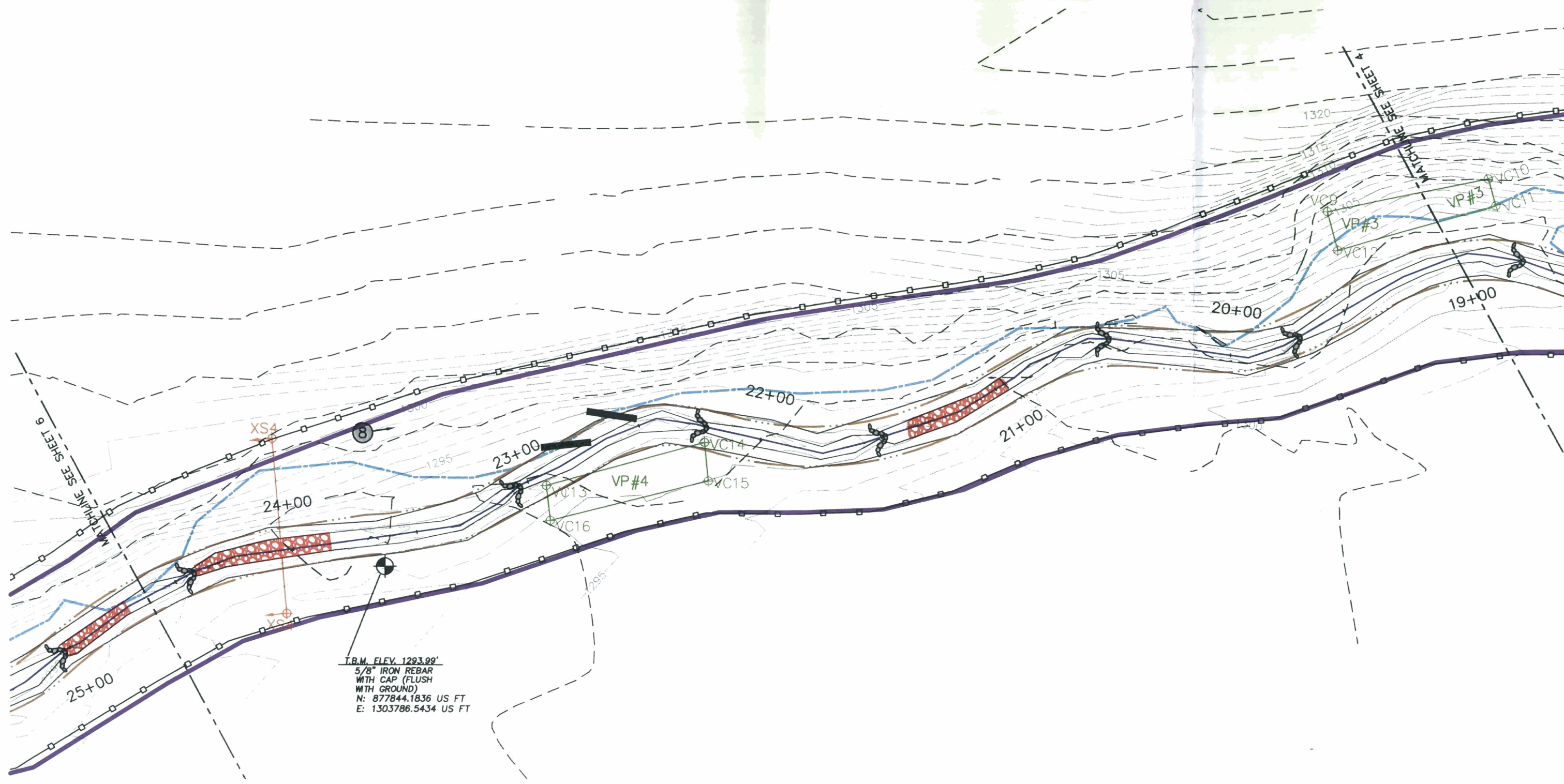
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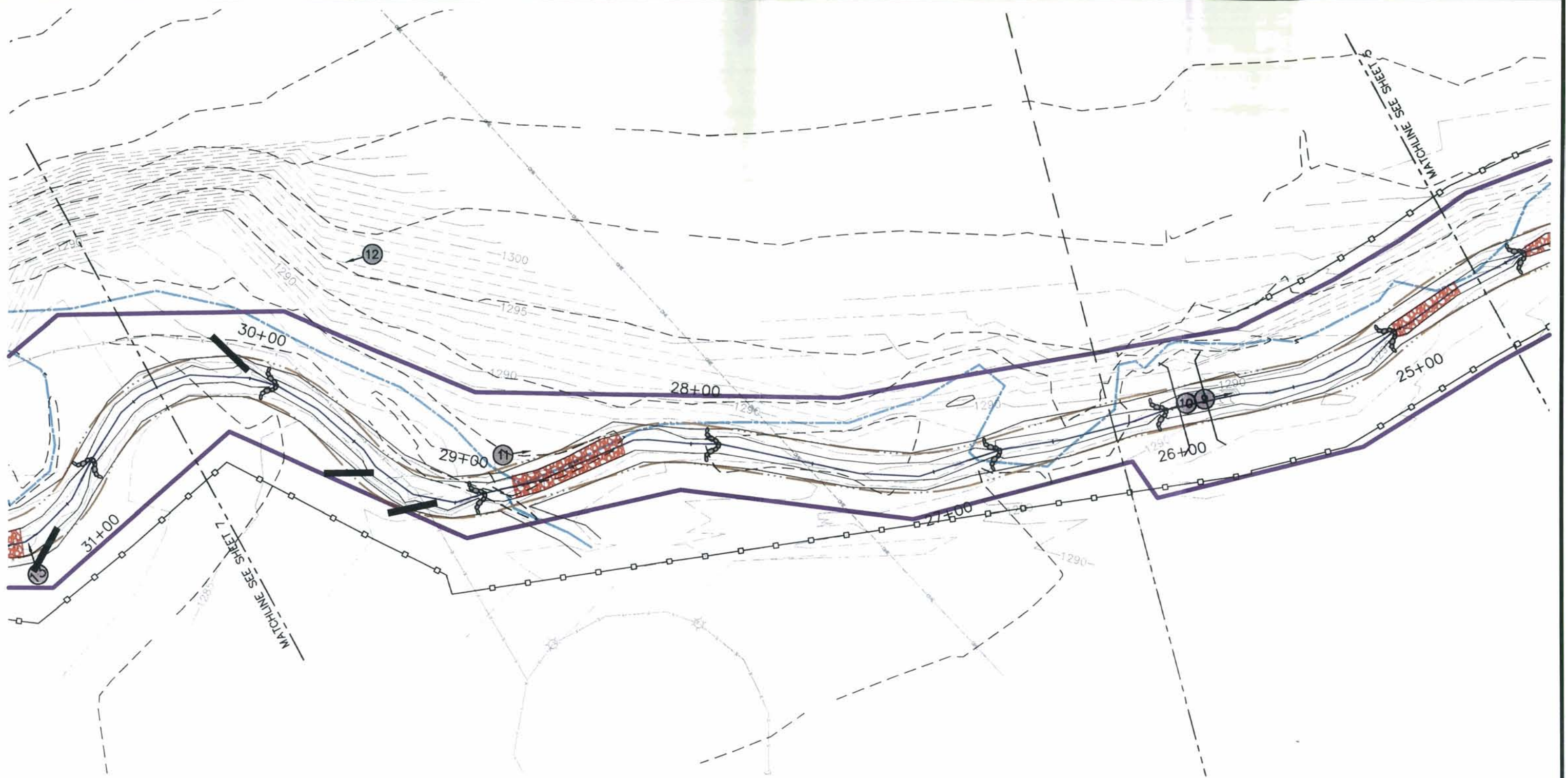
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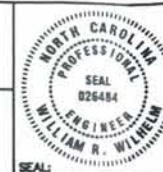
P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
PHONE (919) 677-2000 FAX (919) 677-2050

CLIENT:

**NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM**

TITLE:

AS-BUILT



DATE: 08/01/07
 HORIZONTAL SCALE:
 DRAWN BY: JK
 DESIGNED BY: ARK
 CHECKED BY: WRW

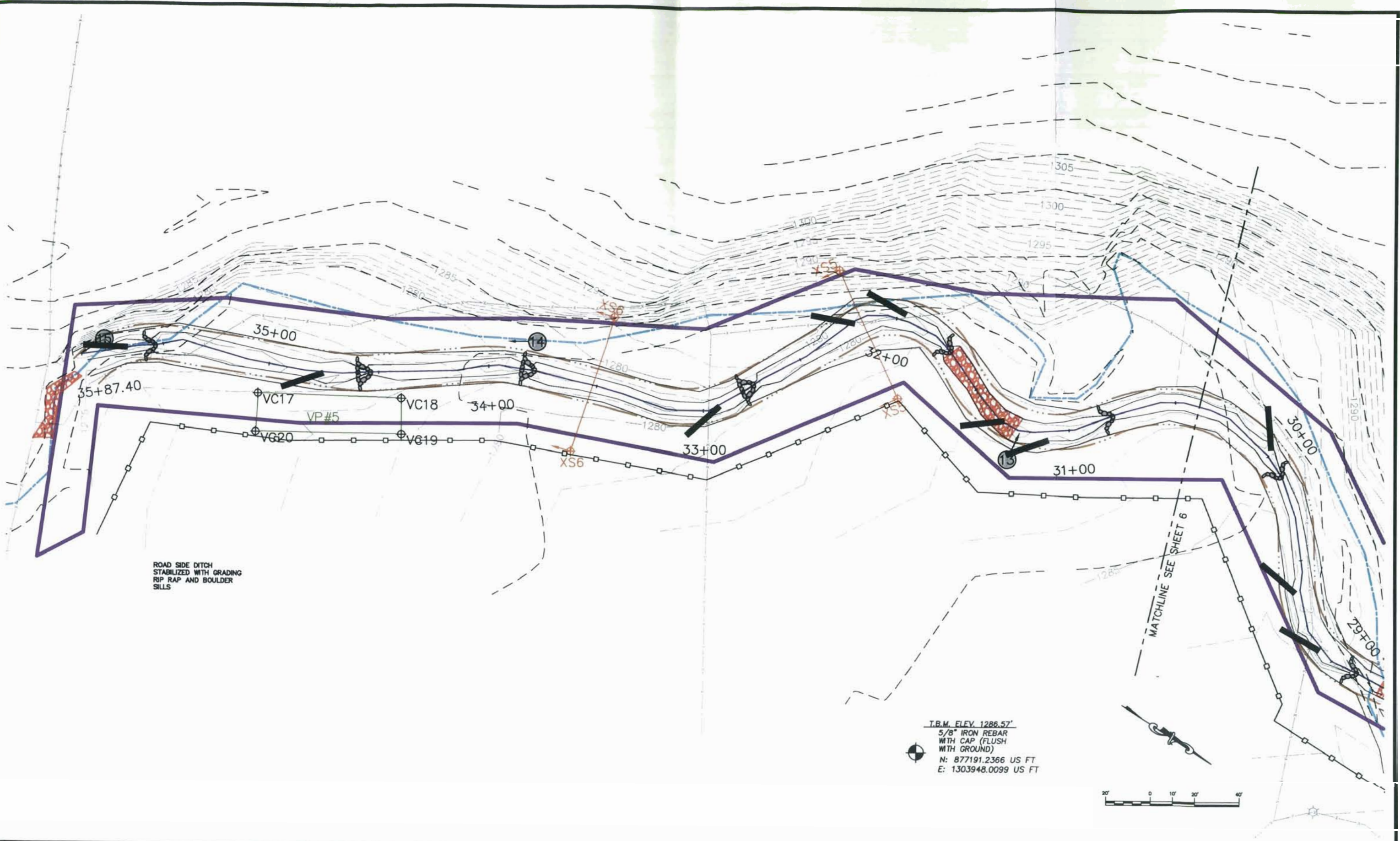
PROJECT:

**NAKED CREEK
STATE CONSTRUCTION ID
NO.: 040619201A**

ATTACHED REFERENCE FILE:

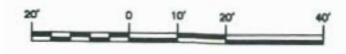
JOB NUMBER:
011795018

SHEET NUMBER:
6



ROAD SIDE DITCH
STABILIZED WITH GRADING
RIP RAP AND BOULDER
SILLS

T.B.M. ELEV. 1286.57'
5/8" IRON REBAR
WITH CAP (FLUSH
WITH GROUND)
N: 877191.2366 US FT
E: 1303948.0099 US FT



2	FENCELINE AND RECORDED EASEMENT REVISED PER SURVEY FROM CURRENT SURVEYING AND MAPPING 10-01-07	12-20-07	JK	ARK
1	REVISED PER EEP COMMENTS	11-15-07	JK	ARK
REV. NO.	REVISION	DATE	DRAWN BY	CHECKED BY

This document, together with the concepts and designs presented herein, is an instrument of service, is intended only for the specific purpose and client for which it was prepared. In the event of any discrepancy between the drawings on this document and the original survey data, the original survey data shall prevail. Copyright Kimley-Horn and Associates, Inc., 2007.

PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.
P.O. BOX 83088 - RALEIGH, NORTH CAROLINA 27636-0088
PHONE: (919) 877-2000 FAX: (919) 877-2000

CLIENT: **NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM**

TITLE: **AS-BUILT**

DATE: 08/01/07
PROJECT: **NAKED CREEK STATE CONSTRUCTION ID NO: 040619201A**

011795018 7

Attachment 2:

Baseline Monitoring

Site Photos

Monitoring and Vegetation Photos July 2007



Photo 1: Looking upstream at culvert at top of project.



Photo 2: Looking downstream at channel and wet area near right bank.


Title		Naked Creek Stream Restoration Baseline Monitoring Photos	
Prepared For 	Project	Naked Creek Stream Restoration Wilkes, North Carolina	
		Date	SCO Number
		8/29/07	040619201



Photo 3: Looking downstream at channel



Photo 4: Looking downstream from upper crossing at channel.


Title	Naked Creek Stream Restoration Baseline Monitoring Photos			
Prepared For	Project	Naked Creek Stream Restoration Wilkes, North Carolina		Prepared By
		Date	SCO Number	
	8/29/07	040619201		



Photo 5: Looking at left bank at drainage swale entering channel from left side.



Photo 6: Looking upstream from hillside on right bank.



Title		Naked Creek Stream Restoration Baseline Monitoring Photos	
Prepared For	Project	Naked Creek Stream Restoration Wilkes, North Carolina	
		Date	SCO Number
	8/29/07	040619201	
		 Kimley-Horn and Associates, Inc.	



Photo 7: Looking downstream from hillside on right bank.

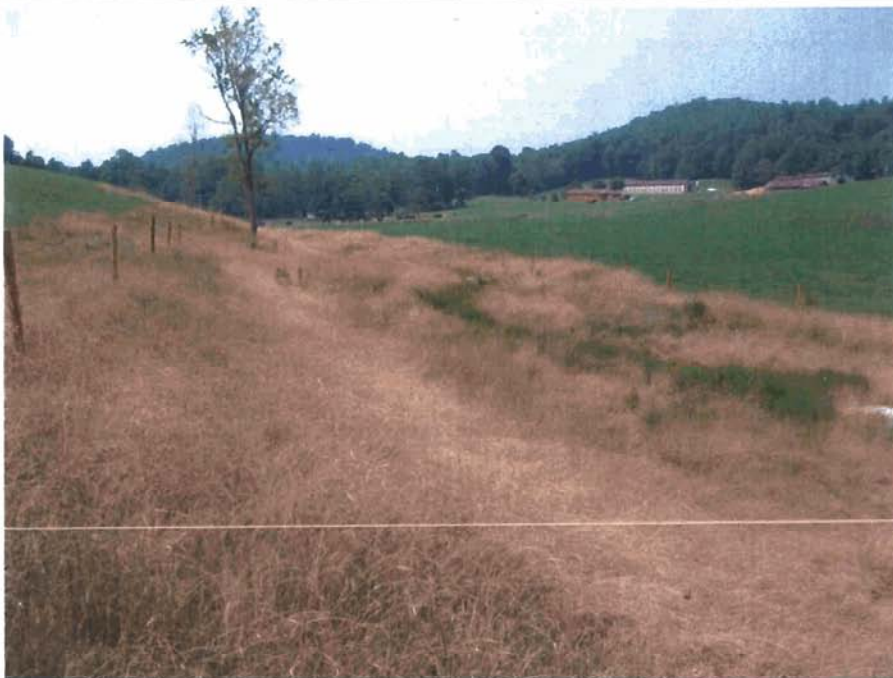


Photo 8: Looking upstream from hillside on right bank.



Title	Naked Creek Stream Restoration Baseline Monitoring Photos			
Prepared For	Project	Naked Creek Stream Restoration Wilkes, North Carolina		Prepared By
		Date	SCO Number	
		8/29/07	040619201	



Photo 9: Looking upstream at channel from lower crossing.



Photo 10: Looking downstream at channel from lower crossing.


Title		Naked Creek Stream Restoration Baseline Monitoring Photos	
Prepared For 	Project	Naked Creek Stream Restoration Wilkes, North Carolina	
		Prepared By	
		Date	SCO Number
	8/29/07	040619201	



Photo 11: Looking upstream ~~from~~ right bank.



Photo 12: Looking downstream from hillside.



Title		Naked Creek Stream Restoration Baseline Monitoring Photos	
Prepared For	Project	Naked Creek Stream Restoration Wilkes, North Carolina	
		Prepared By	
	Date	SCO Number	
	8/29/07	040619201	



Photo 13: Looking from left bank toward right bank at wet area draining into right side of channel.



Photo 14: Looking downstream from right bank at channel and riparian area.



Title		Naked Creek Stream Restoration Baseline Monitoring Photos	
Prepared For 	Project	Naked Creek Stream Restoration Wilkes, North Carolina	
		Date	SCO Number
		8/29/07	040619201
			Prepared By  Kimley-Horn and Associates, Inc.



Photo 15: Looking downstream from right bank at rip-rap toe protection.



Title		Naked Creek Stream Restoration Baseline Monitoring Photos	
Prepared For 	Project	Naked Creek Stream Restoration Wilkes, North Carolina	
		Date	SCO Number
		8/29/07	040619201
		Prepared By  Kimley-Horn and Associates, Inc.	



Photo VP1: Looking north at vegetation plot VP1



Photo VP2: Looking north at vegetation plot VP2





Title		Naked Creek Stream Restoration Baseline Monitoring Photos	
Prepared For	Project	Naked Creek Stream Restoration Wilkes, North Carolina	Prepared By
	Date	SCO Number	 Kimley-Horn and Associates, Inc.
	8/29/07	040619201	



Photo VP 3: Looking northeast of vegetation plot VP3




Photo VP 4: Looking northwest at vegetation plot VP4

Title		Naked Creek Stream Restoration Baseline Monitoring Photos	
Prepared For 	Project	Naked Creek Stream Restoration Wilkes, North Carolina	
	Date	SCO Number	Prepared By  Kimley-Horn and Associates, Inc.
	8/29/07	040619201	



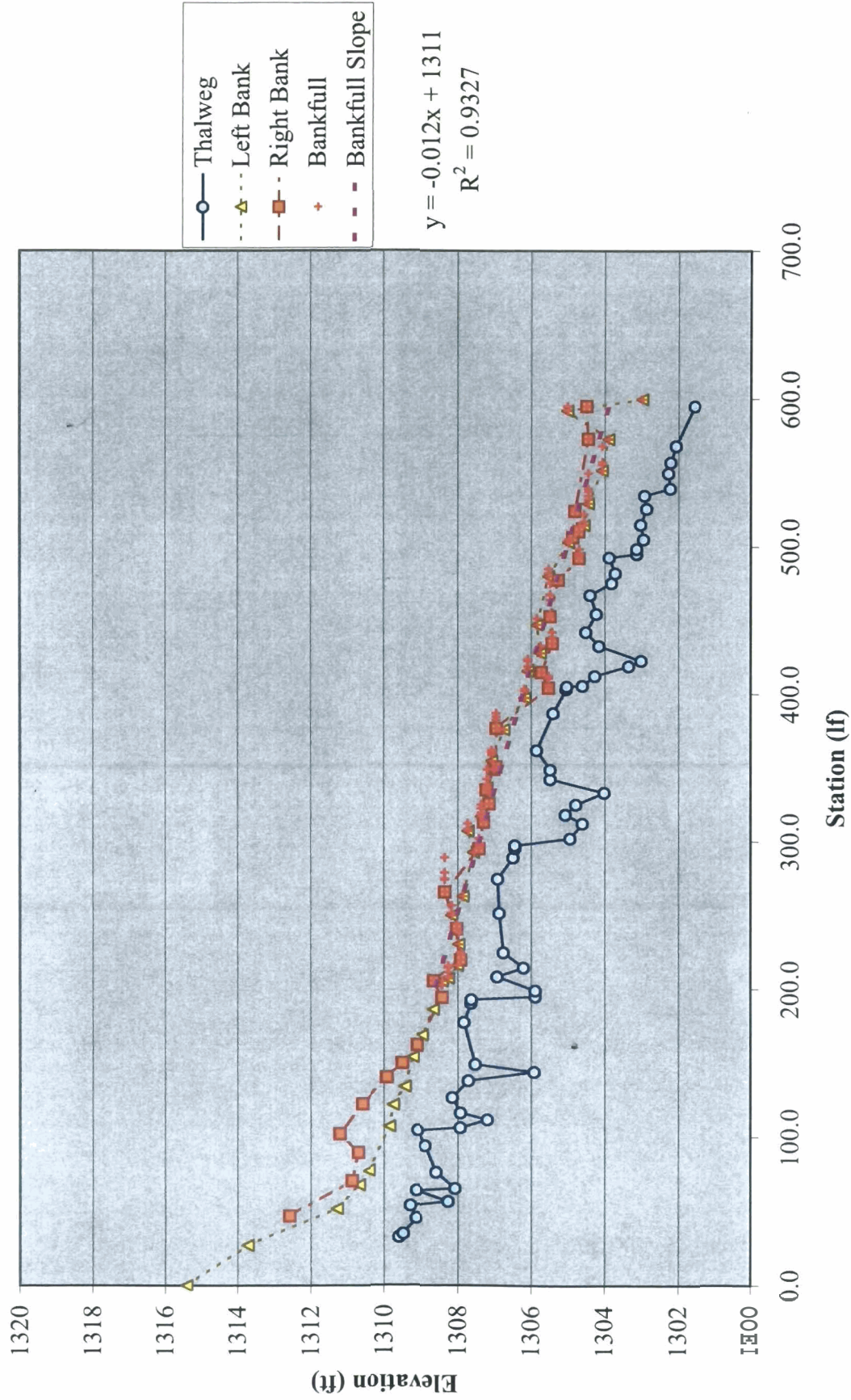
VP 5: Looking southeast at vegetation plot VP5

Title		Naked Creek Stream Restoration Baseline Monitoring Photos	
Prepared For 	Project	Naked Creek Stream Restoration Wilkes, North Carolina	
		Date	SCO Number
		8/29/07	040619201

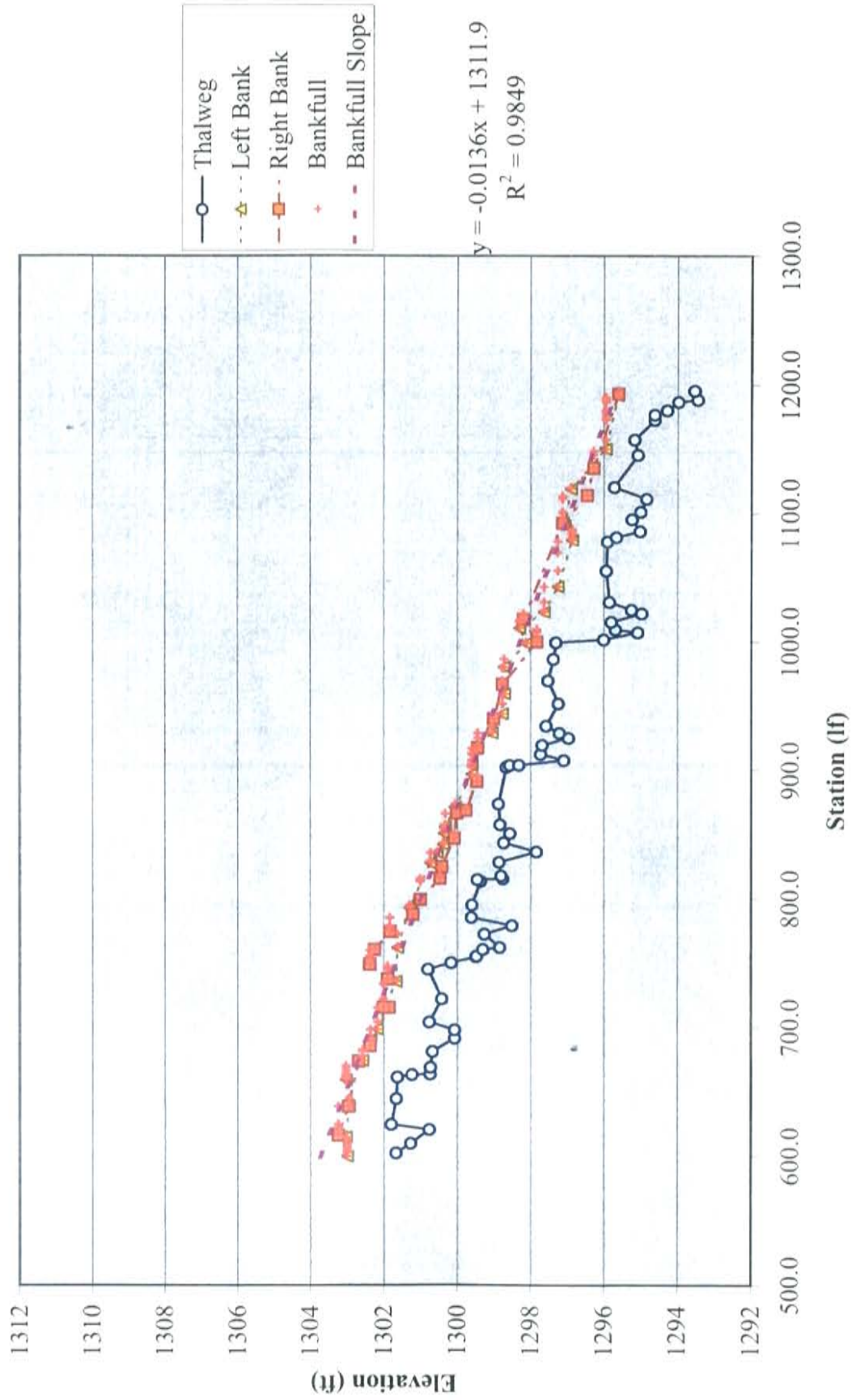
Baseline Profile

July 2007

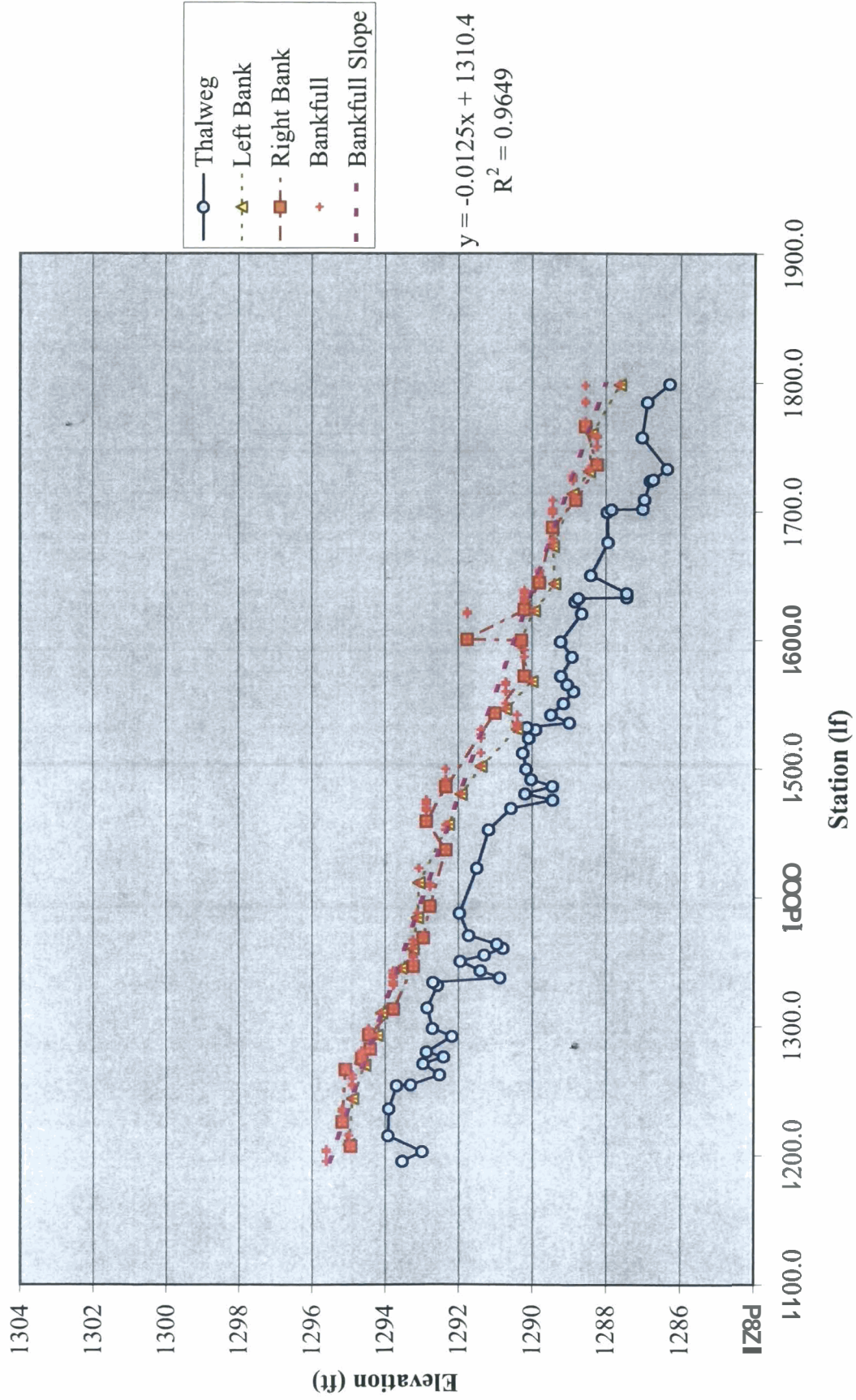
Naked Creek Baseline Profile July 2007



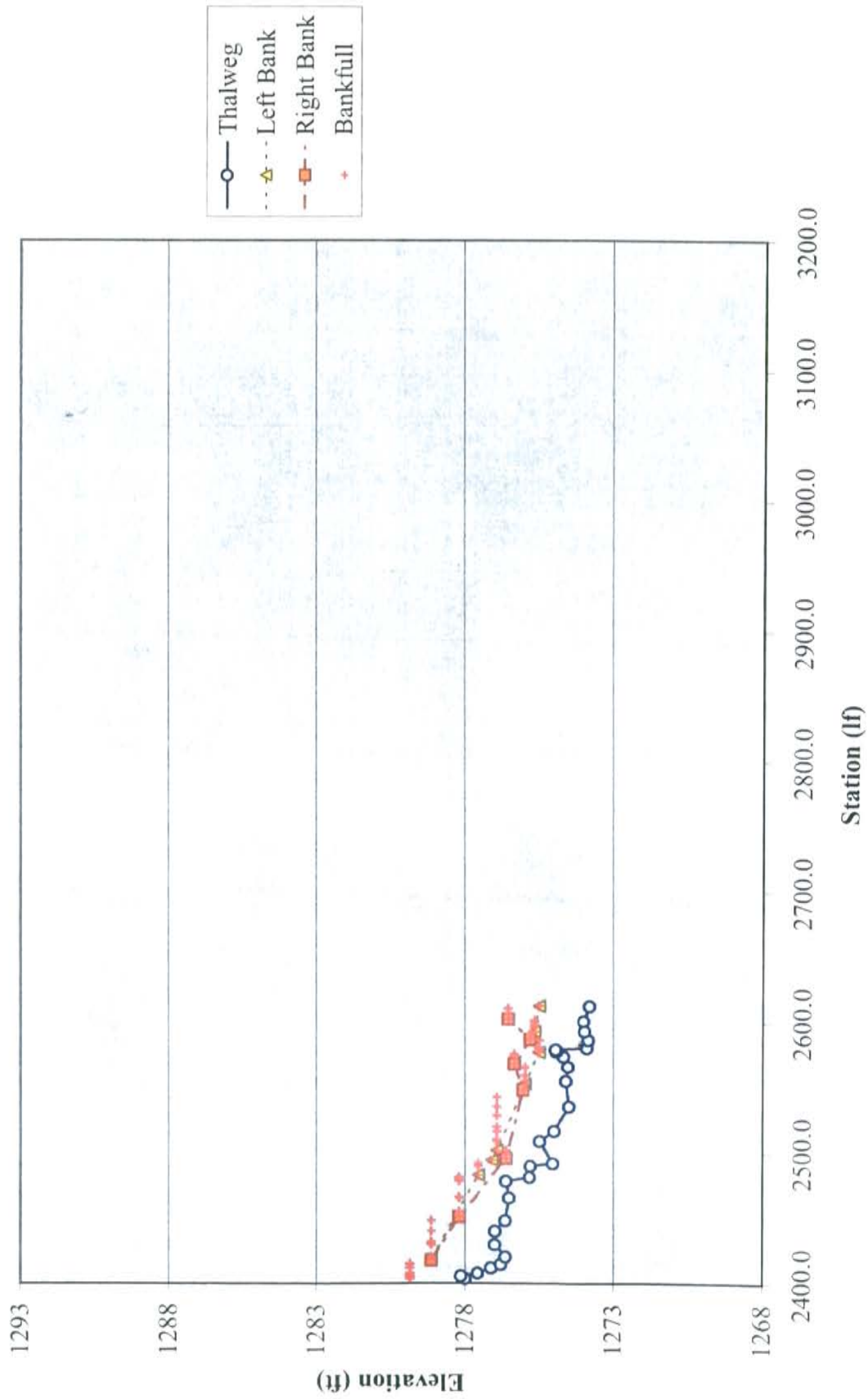
Naked Creek Baseline Profile July 2007



Naked Creek Baseline Profile July 2007



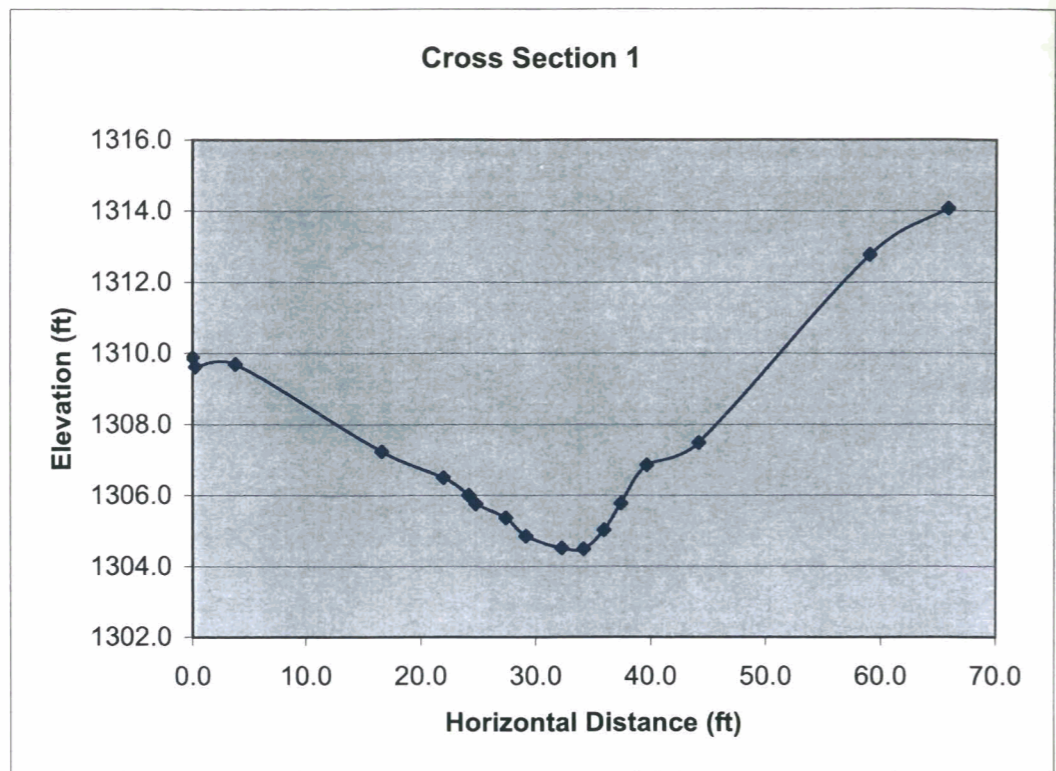
Naked Creek Baseline Profile July 2007



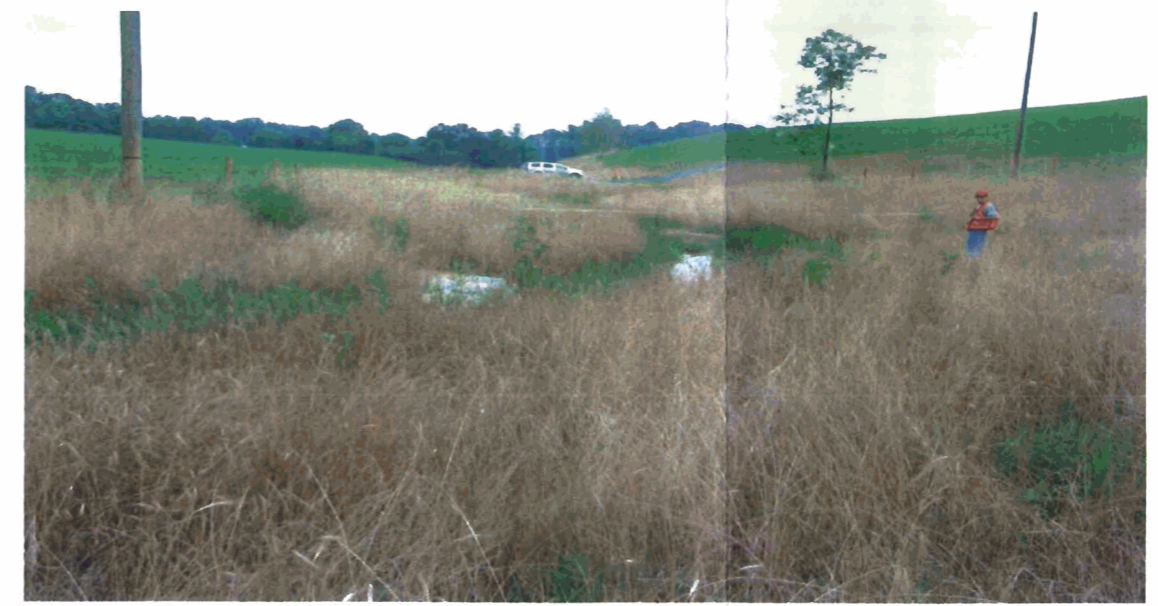
Baseline Cross Sections

July 2007

STA (ft)	Elev (ft)	Desc.
0.0	1309.9	
0.2	1309.6	
3.8	1309.7	
16.6	1307.2	
21.9	1306.5	
24.1	1306.0	
24.8	1305.7	LEW
27.4	1305.3	
29.1	1304.8	
32.3	1304.5	
34.2	1304.5	
35.9	1305.0	
37.4	1305.8	REW
39.7	1306.8	BKF
44.2	1307.5	
59.0	1312.8	
65.9	1314.1	



W_{bkf} (ft)	D_{bkf} (ft)	A_{bkf} (SF)
20.3	1.3	27.3



Looking Downstream

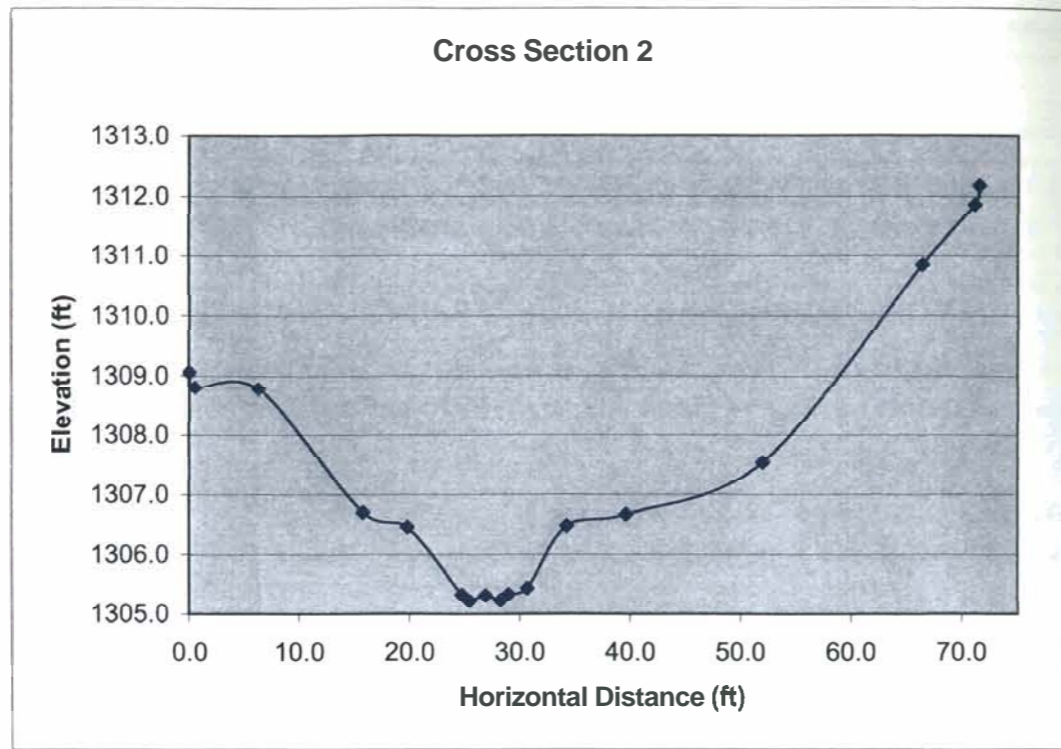


Looking at Left and Right Banks



Looking Upstream

STA (ft)	Elev (ft)	Desc.
0.0	1309.0	
0.5	1308.8	
6.3	1308.8	
15.8	1306.7	
19.8	1306.4	
24.8	1305.3	LEW
25.5	1305.2	
26.9	1305.3	
28.3	1305.2	
29.0	1305.3	REW
30.7	1305.4	
34.3	1306.5	BKF
39.6	1306.7	
52.0	1307.5	
66.4	1310.8	
71.1	1311.8	
71.5	1312.2	



W_{bkf} (ft)	D_{bkf} (ft)	A_{bkf} (SF)
14.8	0.8	11.7



Looking Downstream

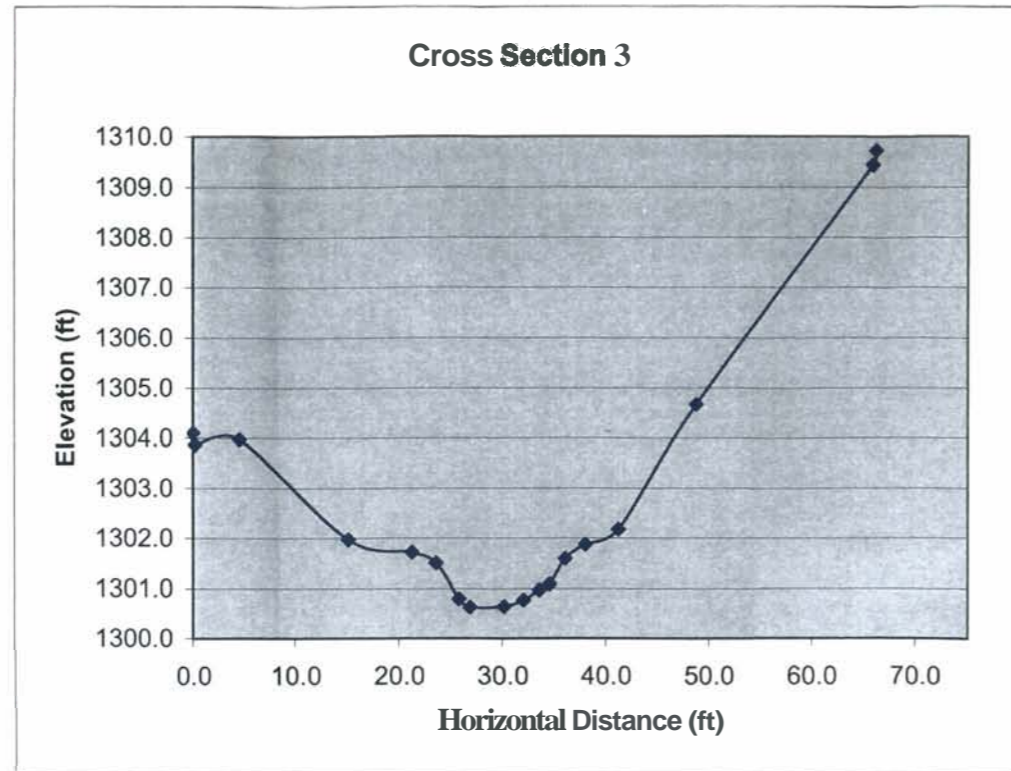


Looking at Left and Right Banks



Looking Upstream

STA (ft)	Elev (ft)	Desc.
0.0	1304.1	
0.2	1303.9	
4.6	1304.0	
15.1	1302.0	
21.3	1301.7	
23.6	1301.5	
25.8	1300.8	LEW
26.9	1300.6	
30.1	1300.6	
32.0	1300.8	REW
33.5	1301.0	
34.5	1301.1	
36.0	1301.6	BKF
38.0	1301.9	
41.2	1302.2	
48.7	1304.7	
65.9	1309.4	
66.2	1309.7	



W_{bkf} (ft)	D_{bkf} (ft)	A_{bkf} (SF)
13.4	0.7	8.8



Looking Downstream

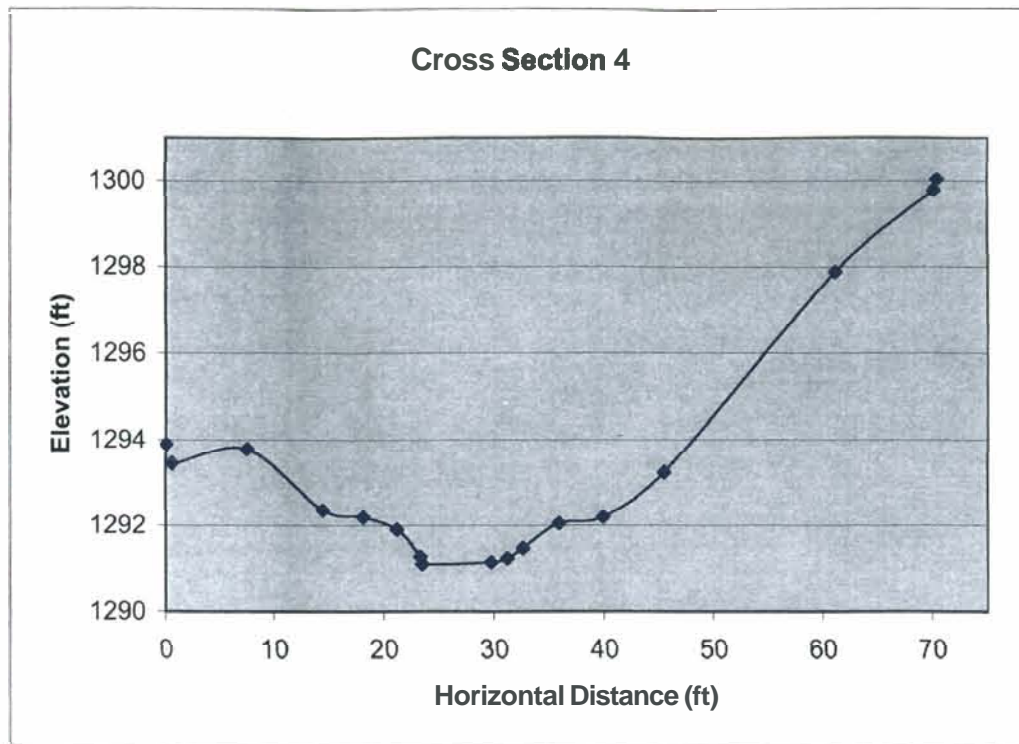


Looking at Left and Right Banks



Looking Upstream

STA (ft)	Elev (ft)	Desc.
0	1293.879	
0.59	1293.437	
7.49	1293.767	
14.47	1292.345	
18.12	1292.176	
21.19	1291.885	
23.31	1291.257	LEW
23.49	1291.085	
29.76	1291.132	
31.21	1291.226	REW
32.63	1291.461	
35.9	1292.036	BKF
39.93	1292.185	
45.5	1293.225	
61.12	1297.868	
70.11	1299.77	
70.42	1300.029	



W_{bkf} (ft)	D_{bkf} (ft)	A_{bkf} (SF)
16.5	0.6	10.3



Looking Downstream

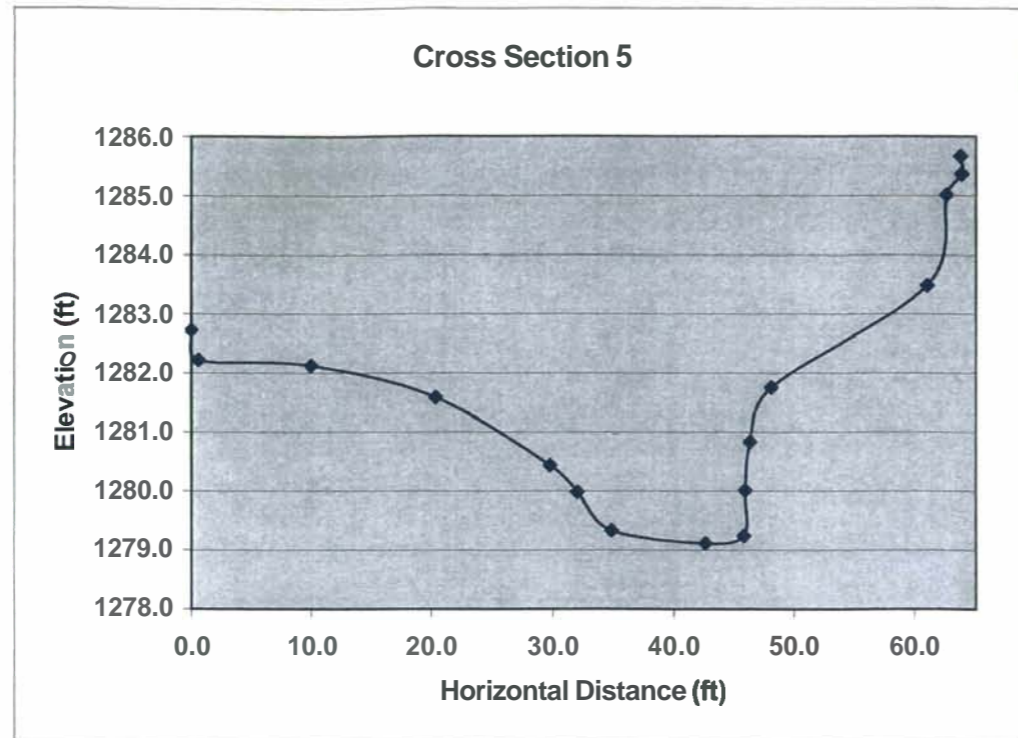


Looking at Left and Right Banks



Looking Upstream

STA (ft)	Elev (ft)	Desc.
0.0	1282.7	
0.6	1282.2	
10.0	1282.1	
20.3	1281.6	
29.8	1280.4	
32.0	1280.0	LEW
34.9	1279.3	
42.6	1279.1	
45.8	1279.2	
45.9	1280.0	REW
46.3	1280.8	
48.1	1281.7	BKF
61.0	1283.5	
62.6	1285.0	
63.8	1285.4	
63.7	1285.7	



W_{bkf} (ft)	D_{bkf} (ft)	A_{bkf} (SF)
31.1	1.5	46.4



Looking Downstream

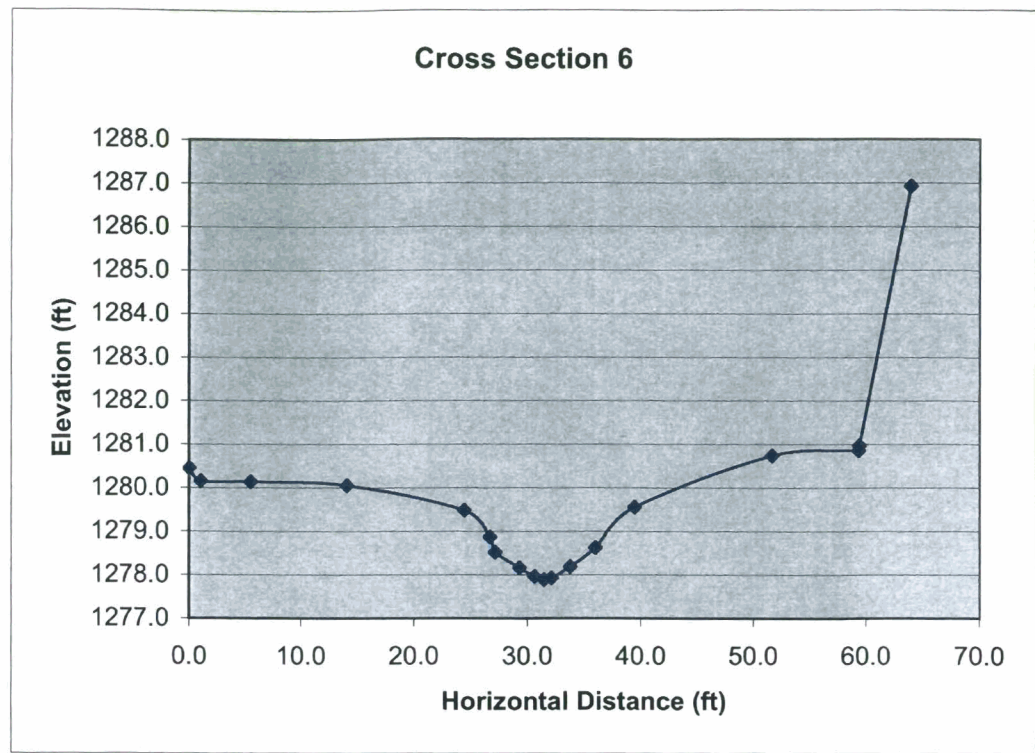


Looking at Left and Right Banks



Looking Upstream

STA (ft)	Elev (ft)	Desc.
0.0	1280.4	
1.0	1280.1	
5.5	1280.1	
14.1	1280.0	
24.5	1279.5	
26.7	1278.9	
27.2	1278.5	
29.3	1278.1	LEW
30.6	1277.9	
31.5	1277.9	
32.1	1277.9	
33.8	1278.2	REW
36.0	1278.6	
39.5	1279.5	BKF
51.7	1280.7	
59.3	1280.9	
59.4	1281.0	
63.9	1286.9	



W_{bkf} (ft)	D_{bkf} (ft)	A_{bkf} (SF)
16.3	0.9	14.9



Looking Downstream



Looking at Left and Right Banks



Looking Upstream

Baseline Vegetation

July 2007

Baseline Vegetation Counts				
Veg Plot	Count - Thriving	Count - Weak	Total	Per Acre
VP1	5	1	6	243
VP2	2	3	5	202
VP3	2	2	4	162
VP4	8	0	8	324
VP5	5	0	5	202

Veg Plot Size =100 square meters

Supplemental planting planned for Late Winter / Early Spring 2008