601 West Mitigation Report

Union County, North Carolina

USGS HUC: 03040105081010

Project ID No. D 06054-E

Prepared by:

Environmental Banc & Exchange
909 Capability Drive, Suite 3100
Raleigh, NC 27606

Prepared for:

NCDENR-Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, North Carolina 27699-1652

June 2008

Executive Summary

The 601 West Stream Restoration Site (Site) lies within a conservation easement located within a parcel owned by Anna P. Howey. The Site falls within Union County, North Carolina approximately eight miles south of Monroe, North Carolina. The streams within the Site drain a portion of the USGS hydrologic unit 03040105081010 within the Yadkin River Basin and 03-07-14 NCDWQ sub-basin.

Prior to restoration, the Site included one stream system (UT) that is an unnamed tributary to Lane's Creek. UT has a drainage area of approximately 0.41 square miles. During the past two decades, the watershed for UT has predominantly consisted of crop land.

Prior to restoration, the Site consisted of primarily agricultural fields. For most of the length of the streams, the area adjacent to the existing channel had remained cleared and has been compacted due to agricultural practices. Within the lower section, a limited riparian buffer exists, but it has a significant population of invasive and exotic species. The stream channel appears to have been straightened.

Due to the modification to the watershed, surrounding agricultural area, and channel, the channel has downcut and expanded in width. In some sections, bedrock limited downcutting, but accelerated lateral bank erosion and subsequent channel widening. These conditions impaired water quality by increasing sediment loads, increasing nutrient and pollution inputs due to direct contribution and lack of filtration by the riparian buffer, increased turbidity, elevated water temperature due to lack of significant shading by the riparian buffer, and reduced oxygen levels due to increased BOD and lack of reoxygenating features such as riffles. Wildlife habitat had been impaired by a lack of physical habitat in-stream or in the buffer, poor water quality, and impaired floodplain dynamics.

The stream was restored using a combination of Rosgen Priority I and II approaches. The channel restoration brought about stable channel geometry, introduced bed and bank features, stabilized the channel banks, and reconnected the channel to a floodplain. In total, channel restoration work restored 4,532 linear feet of stream. The riparian buffer was restored through conditioning the soil and planting native vegetation. Buffer restoration restored 11.5 acres of riparian buffer. Table 1 provides a summary of restoration values.

The stream restoration will improve water quality by reducing sediment inputs from unstable banks, decreasing nutrient and pollutants inputs by reducing direct contributions and filtering sheet flow within the riparian buffer, increase oxygen levels by decreasing BOD and introducing reoxygenating features such as riffle. Wildlife habitat will improve through the introduction of physical in-stream habitat and buffer habitat, improving water quality, and reestablishing flood plain dynamics.

Monitoring in 2008 through 2012 will assess the Site's stream and riparian areas to determine restoration success. The monitoring plan has been established 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”. Streams will be monitored for stability using cross section and longitudinal profile surveys and photo documentation. Riparian areas will be monitored for plant survival using stem counts.

Table of Contents

List of Tables

List of Figures

List of Attachments

Narrative

The 601 West Stream Restoration Site (Site) lies within a conservation easement located within a parcel owned by Anna P. Howey. The Site falls within Union County, North Carolina approximately eight miles south of Monroe, North Carolina. The streams within the Site drain a portion of the USGS hydrologic unit 03040105081010 within the Yadkin River Basin and 03-07-14 NCDWQ sub-basin.

Prior to restoration, the Site included one stream system (UT) that is an unnamed tributary to Lane's Creek. UT has a drainage area of approximately 0.41 square miles. During the past two decades, the watershed for UT has predominantly consisted of crop land.

Prior to restoration, the Site consisted of primarily agricultural fields. For most of the length of the streams, the area adjacent to the existing channel had remained cleared and has been compacted due to agricultural practices. Within the lower section, a limited riparian buffer exists, but it has a significant population of invasive and exotic species. The stream channel appears to have been straightened.

Due to the modification to the watershed, surrounding agricultural area, and channel, the channel has downcut and expanded in width. In some sections, bedrock limited downcutting, but accelerated lateral bank erosion and subsequent channel widening. These conditions impaired water quality by increasing sediment loads, increasing nutrient and pollution inputs due to direct contribution and lack of filtration by the riparian buffer, increased turbidity, elevated water temperature due to lack of significant shading by the riparian buffer, and reduced oxygen levels due to increased BOD and lack of reoxygenating features such as riffles. Wildlife habitat had been impaired by a lack of physical habitat in-stream or in the buffer, poor water quality, and impaired floodplain dynamics.

The goals of the project relate to providing ecological improvements to the Site's streams and riparian buffers through beneficial modifications of hydrology, water quality, and habitat.

Goals related to hydrology include:

- Re-establishing floodplain connection by raising bed elevations
- Increase flood storage by re-establishing floodplain

Goals related to water quality include:

- Reducing turbidity by reducing sediment inputs
- Reducing water temperatures by providing shading
- Increasing / stabilizing oxygen levels by reducing BOD/COD and increasing reoxygenating turbulence

Goals related to habitat include:

- Improve bed habitat by increasing riffle – pool diversity, reducing sediment deposition, and improving low flow water depths
- Improve bank habitat by increasing stability and woody biomass
- Improve floodplain habitat by establishing microtopography and hydrology, removing invasive vegetation, and increasing habitat diversity
- Improve food web dynamics by adding biomass (such as detritus, woody debris, and leaf matter) and re-establishing floodplain connection

The restoration achieves these goals through the following objectives:

- Stabilizing channel bed and banks through modifying dimension, pattern, and profile using natural channel design
- Installing in-stream structures such as rock vanes
- Installing in-bank structures such as root wads
- Raising stream bed elevations
- Restoring soils in riparian buffer
- Removing invasive vegetation
- Planting native vegetation in riparian buffer

Priority I and Priority II restoration approaches were 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). The Priority I approach was used to raise bed elevations and reconnect the channel to the abandoned floodplain. These methods were primarily employed to re-establish an appropriate stream cross section, bed form and pattern in order to improve habitat and ecosystem functions. The streams were also connected to flood plains which will re-establish more natural riparian conditions.

The riparian buffer was planted as five zones. Zone 1, the stream channel zone, was planted with fast growing; obligate pioneer species able to provide stability to the channel. Zone 2 was the stream bank zone consisting of planted tree and shrub species and seeded native herbaceous species typically found along stream banks in the region. Zone 3 was a forested riparian area consisting of selected tree and shrub species tolerant of range of inundation and saturation. Zone 4 was a bottomland area consisting of selected tree and shrub species adapted to extended periods of inundation and saturation. Zone 5 was a transitional zone consisting of Zone 3 species tolerant of edge habitats. Zone 1 was planted with live stakes and the remaining zones were planted with bare roots seedlings. Planting spacing was determined according to planting type. The entire easement was planted as described above.

Table 1: Mitigation Summary Table

Project Stream	Stream Restoration Linear Footage	Stream Enhancement Level II Linear Footage	Wetland Restoration Acreage	Wetland Enhancement Acreage	Riparian Buffer Restoration
UT	4,532	0	0	0	11.5
Total Site	**4,532**	**0**	**0**	**0**	**11.5**
Total SMU	**4,532**	**0**	**-**	**-**	**-**
Total WMU	**-**	**-**	**0**	**0**	**-**

Table 2: Mitigation Unit Summary

Contract Stream Mitigation Units (SMU)	As-built Stream Mitigation Units (SMU)	Contract Wetland Mitigation Units (WMU)	As-built Wetland Mitigation Units (WMU)
4,500	4,532	0	0

Modifications to the Restoration Plan and Construction Plan Summary

The following is a summary of changes that were made from the Restoration Plan to the construction plans as well as changes implemented during construction. Most of the changes resulted from the contractor hitting bedrock while excavating the channel or installing structures.

Station 114+00 to 115+00 – The contractor had to re-align the stream through this section in order to excavate the channel. Also, the proposed Rock Cross Vane that would have been at Station 115+00 was deleted since it was not possible to build because of the bedrock in this area. The bedrock should provide bed stabilization in this section.

Station 117+25 – A log sill was added at this station to help stabilize the bed.

Station 123+75 – The proposed Rock Cross Vane was deleted from this location because of the existing bedrock. The bedrock should provide bed stabilization at this location.

Station 123+40 – During restoration of the main channel it was necessary to stabilize the side tributary flowing into the channel from the right bank. This tributary is shown on the plan sheets as Station 200+00 to Station 200+67 and includes two small rock sills and two small constructed riffles.

Station 125+00 – Deleted Log Sill because of bedrock in this riffle.

Station 124+75 to 125+75 – Realigned channel due to bedrock conflicts while excavating.

Station 132+75 – Did not install Log Sill since bed profile elevations worked out to be flat at the tail of riffle.

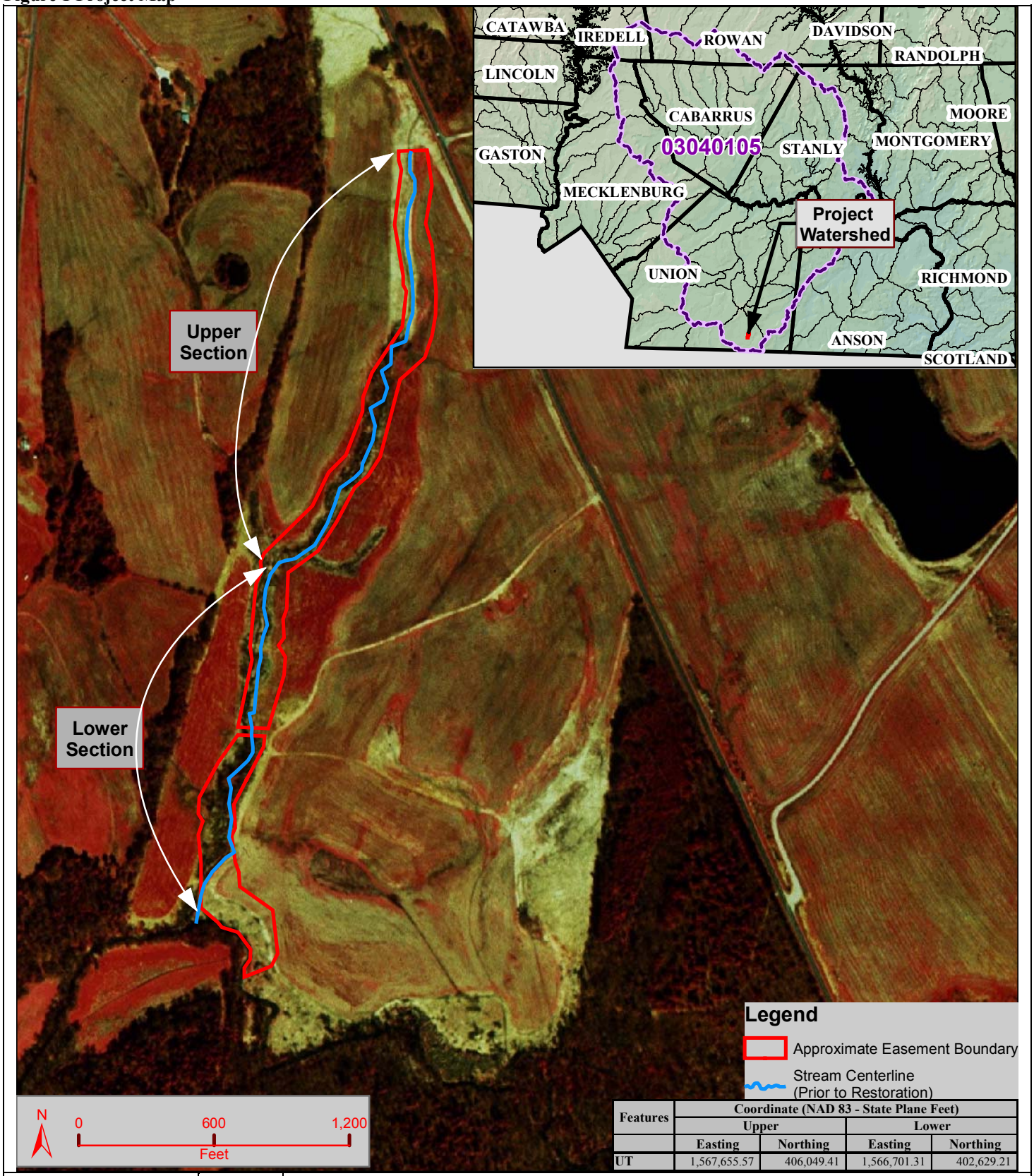
Station 143+60 to 144+75 – Had to realign the proposed channel through this section to ensure enough distance remained between the proposed channel's right top of bank and the main channel's left top of bank. This was a minor readjustment to the north-east.

Station 144+65 – Added a Rock Cross Vane at this location to help with the additional drop needed to be able to tie into to the downstream channel at the base flow elevation.

Station 145+50 – Dropped the elevation of the A-Vane 1 foot to allow the channel to tie into the base flow elevation of the main channel at the confluence.

Vernal Pools – The Construction Drawings called out eleven vernal pools. Those vernal pool locations were adjusted in the field to better match the new topography and more effectively catch storm water draining from the fields. Ten vernal pools were actually constructed (see Record Set drawings). Some of them were built larger to allow more storage in the swales that carry more storm water from the adjacent fields.

Figure 1 Project Map



Features	Coordinate (NAD 83 - State Plane Feet)			
	Upper		Lower	
	Easting	Northing	Easting	Northing
UT	1,567,655.57	406,049.41	1,566,701.31	402,629.21

Prepared For: Ecosystem Enhancement	**Project**	601 West Stream Restoration, Union County, North Carolina	
	Date 8/12/08	**Project Number** 012620007	

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".

Monitoring work will occur annually for five years and includes reference photographs, channel materials sampling, site survey, and visual assessment and mapping of significant features. The success criteria and assessment methods for the Site's 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, or bank erosion) or are minor changes that represent an increase in stability (e.g. settling, vegetative changes, coarsening of bed material, etc.).

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.

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 3 riffles and 3 pools. Annual photographs showing both banks will be taken for each cross section.

The survey of the longitudinal profile covers 3,000 feet of the project reaches. Newly-constructed meanders will be surveyed to provide pattern measurements.

Right and left bank view permanent photo stations have been set up to visually monitor stream conditions. These photo stations are mapped on the Record 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.

Riparian Buffer Vegetation

Success Criteria

The success of riparian and wetland vegetation planting will be gauged by stem counts of planted species. Riparian and wetland vegetation will be considered successful with the survival of 260 planted stems per acre at the end of the fifth year of monitoring, with survival of 320 planted stems per acre at the end of the third year of monitoring as an interim measure of success. 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 permanent plots will be used to sample the riparian buffer. Each quadrant covers 1000 square feet. 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 plot.

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 Natrual Resources - Division of Water Quality.

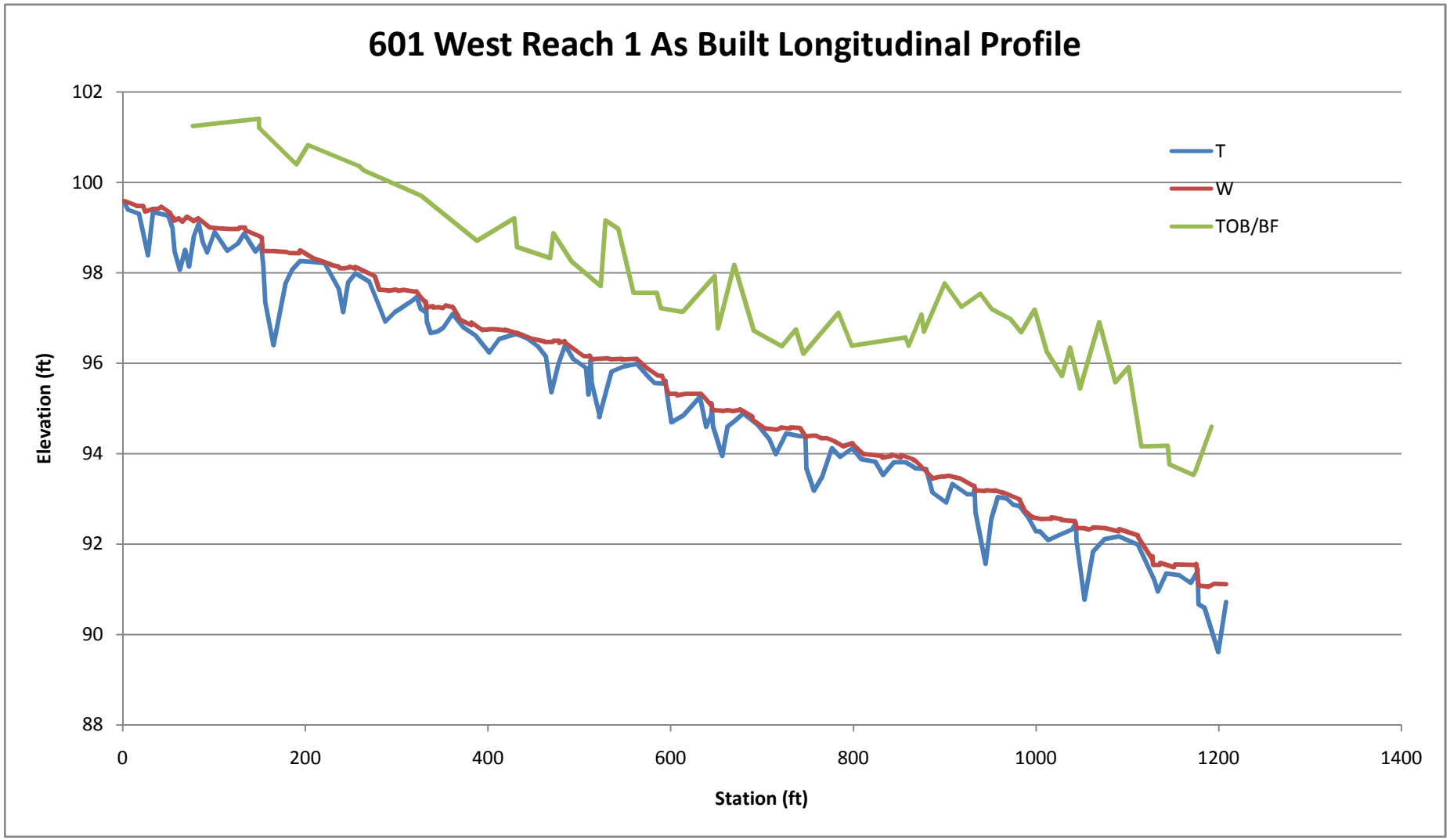
Rosgen, David L. (1997). A Geomorphic Approach to Restoration of Incised Rivers. Management of Landscapes Disturbed by Channel Incision.

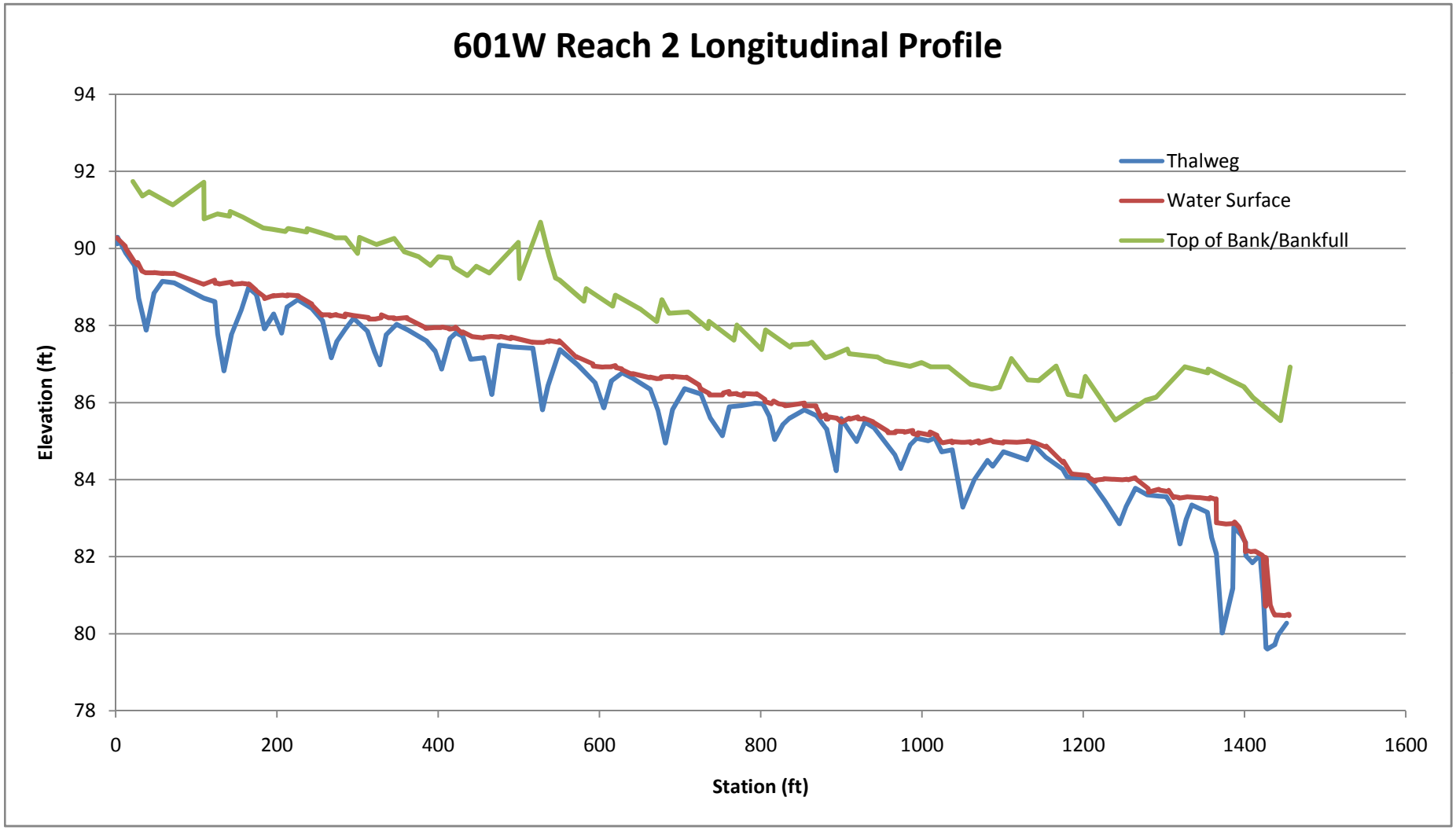
Attachment 1
Record Drawings

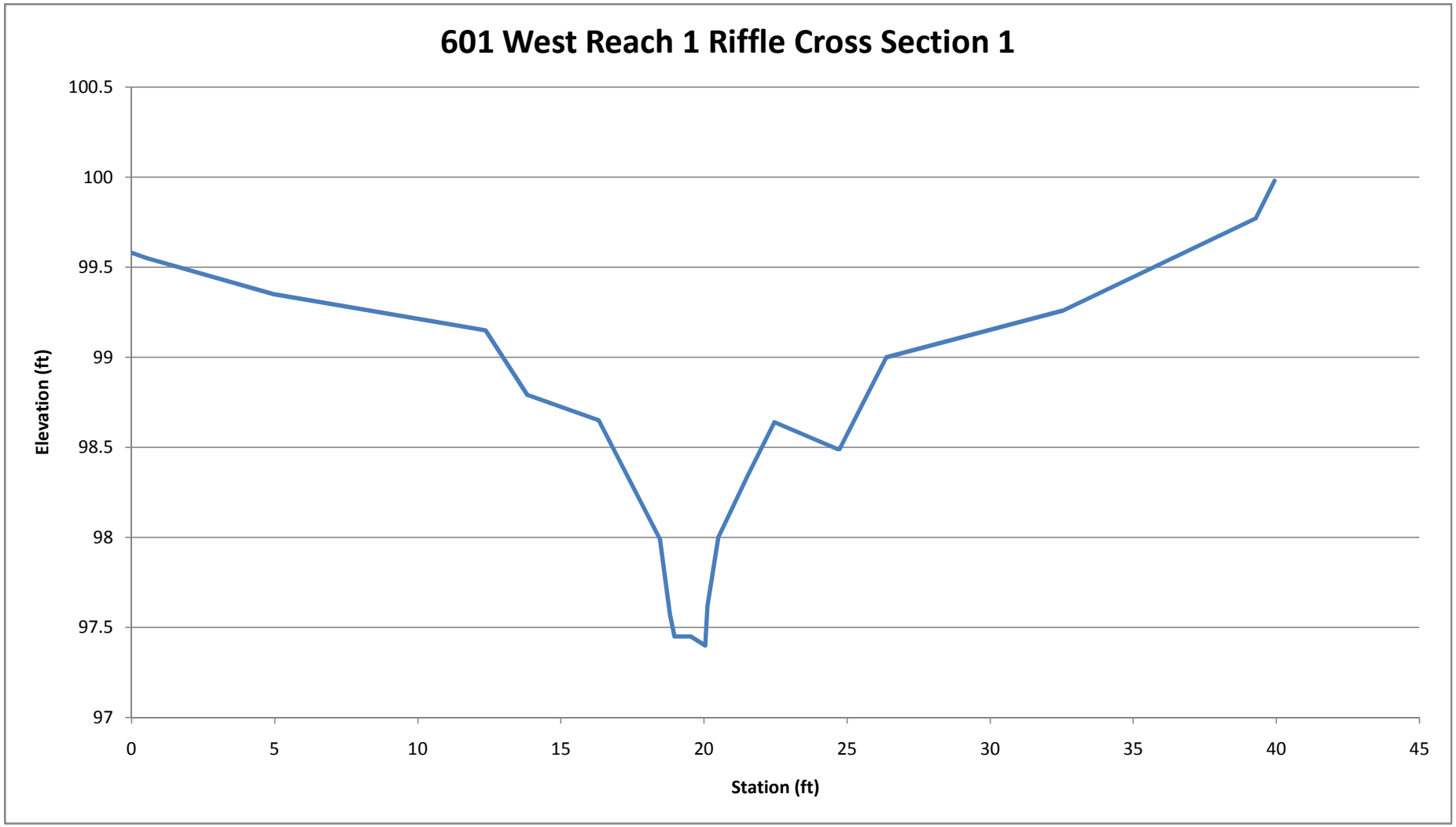
(See Record Drawing Set separate from this document – Dated 06/13/2008)

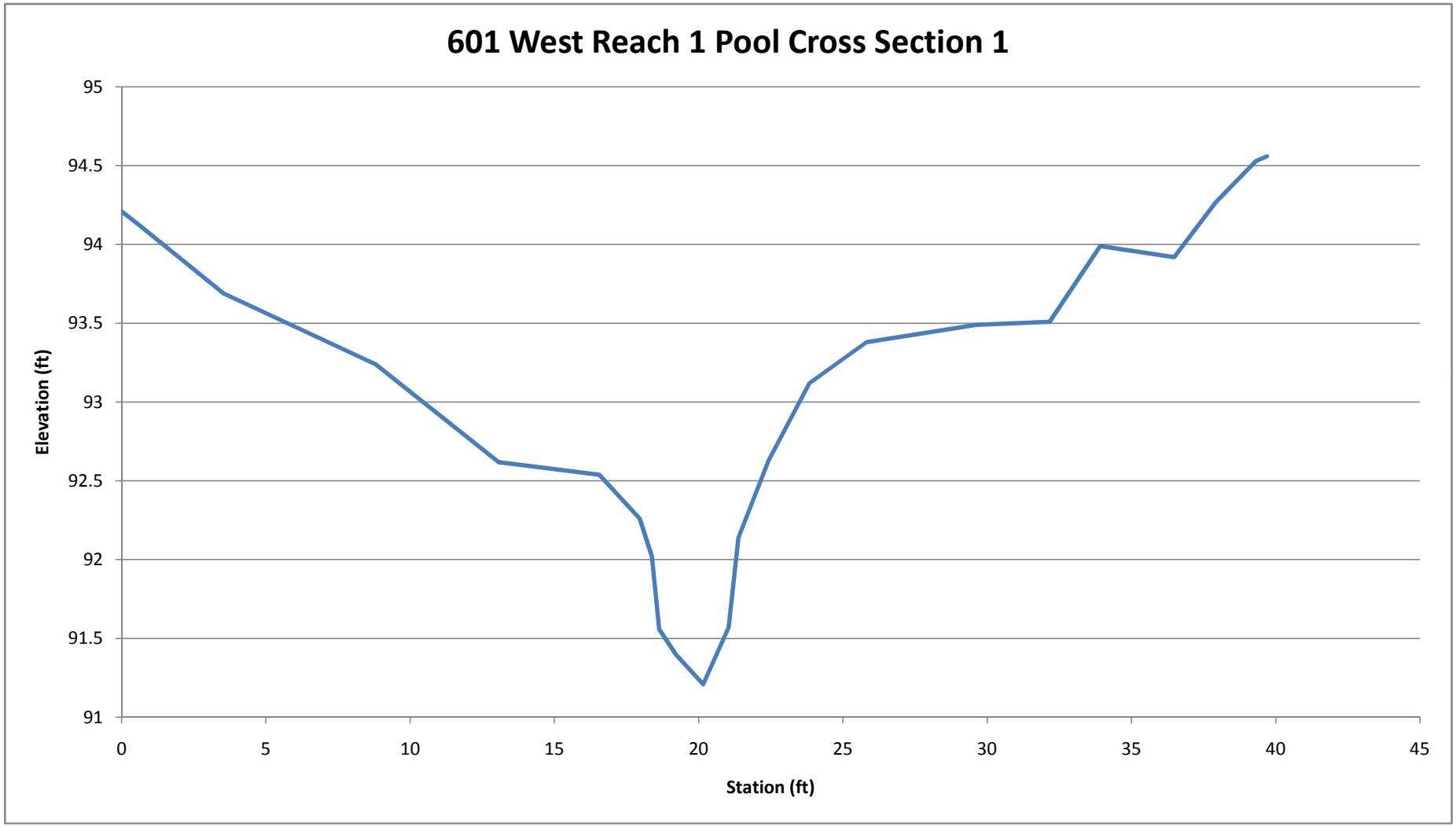
Attachment 2
Baseline Monitoring

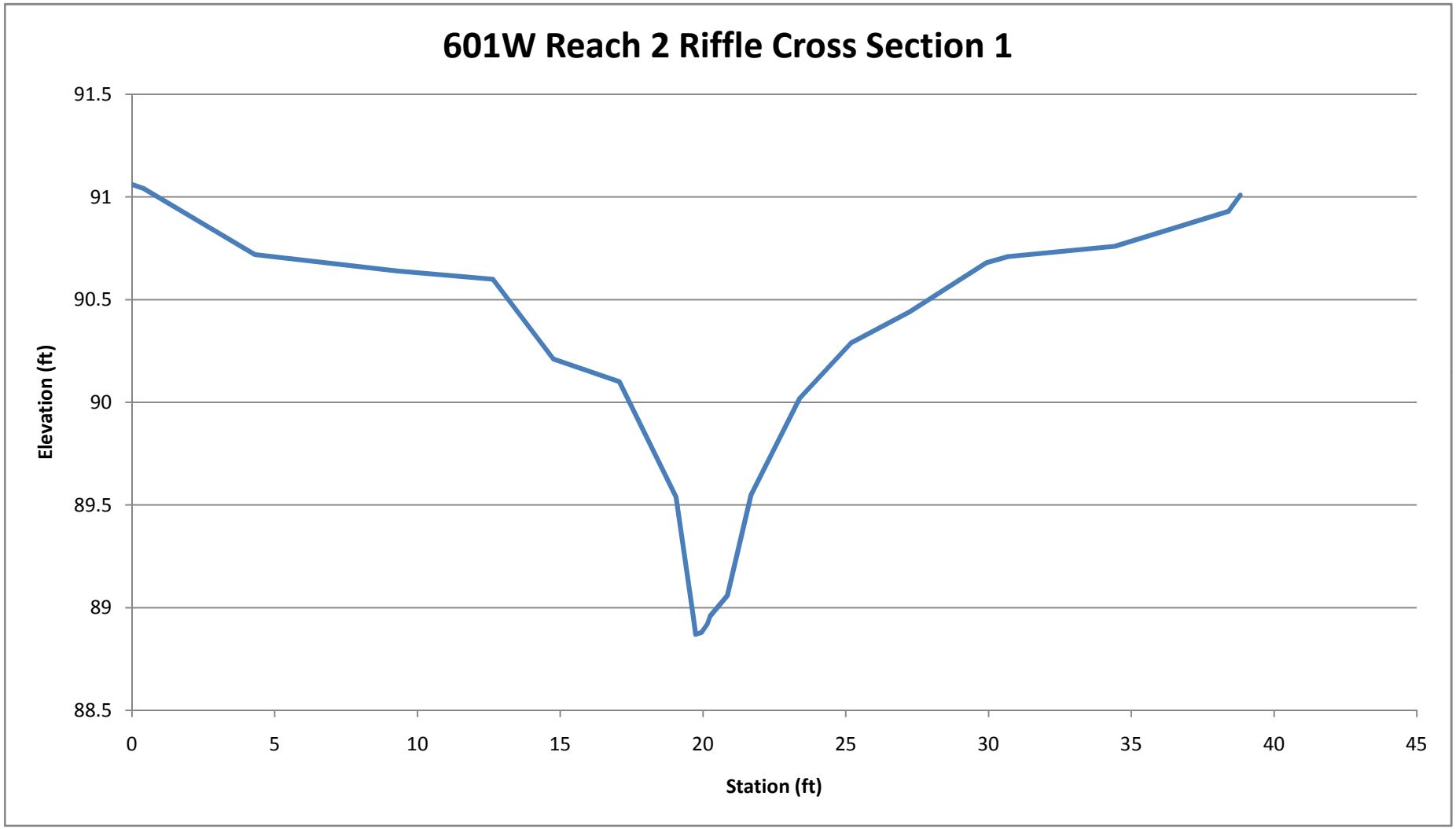
Stream Geomorphology

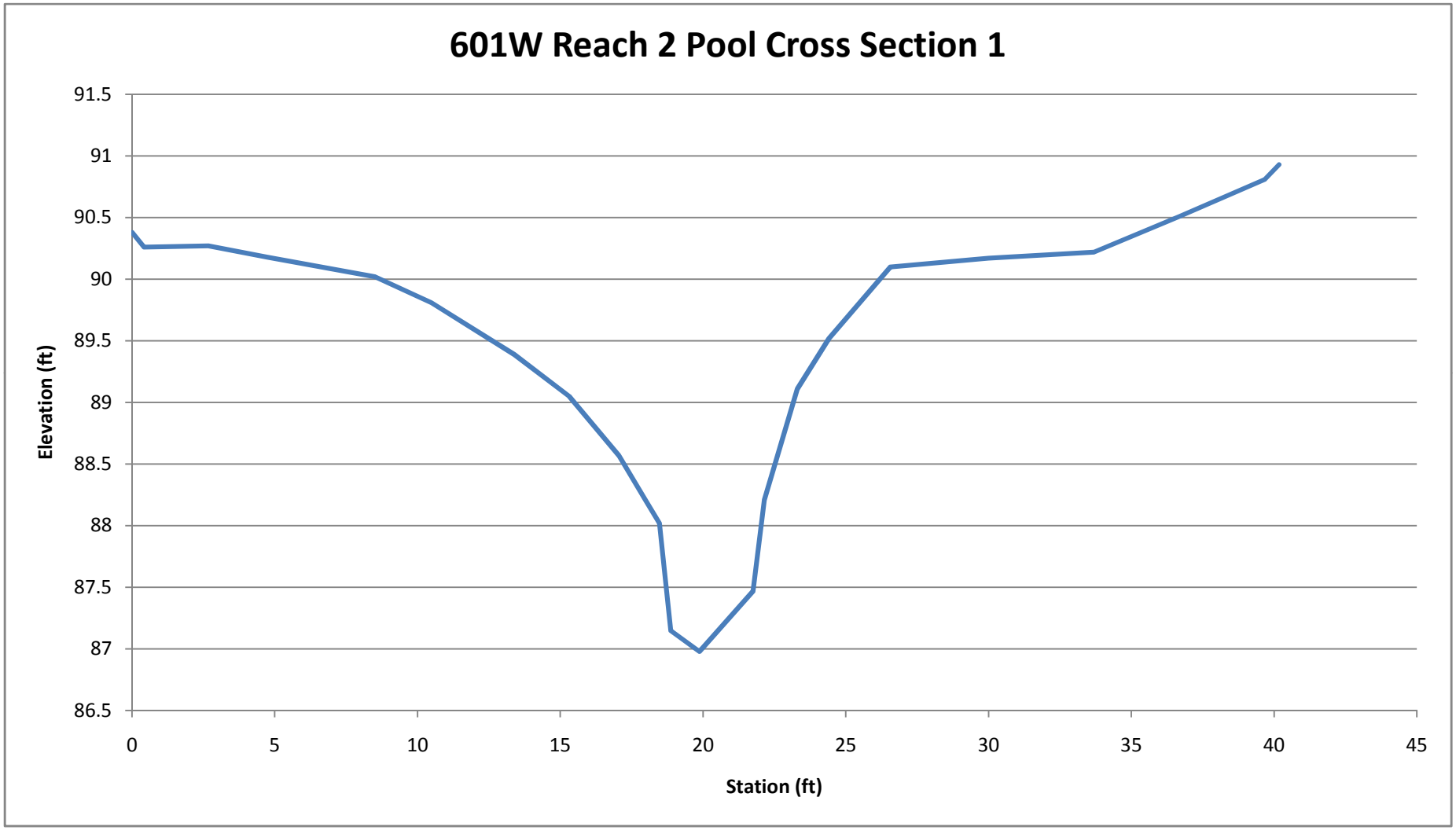

601 West Reach 1 As Built Longitudinal Profile
102
100
98
96
94
92
90
88
Elevation (ft)
0
200
400
600
800
1000
1200
1400
Station (ft)
T
W
TOB/BF

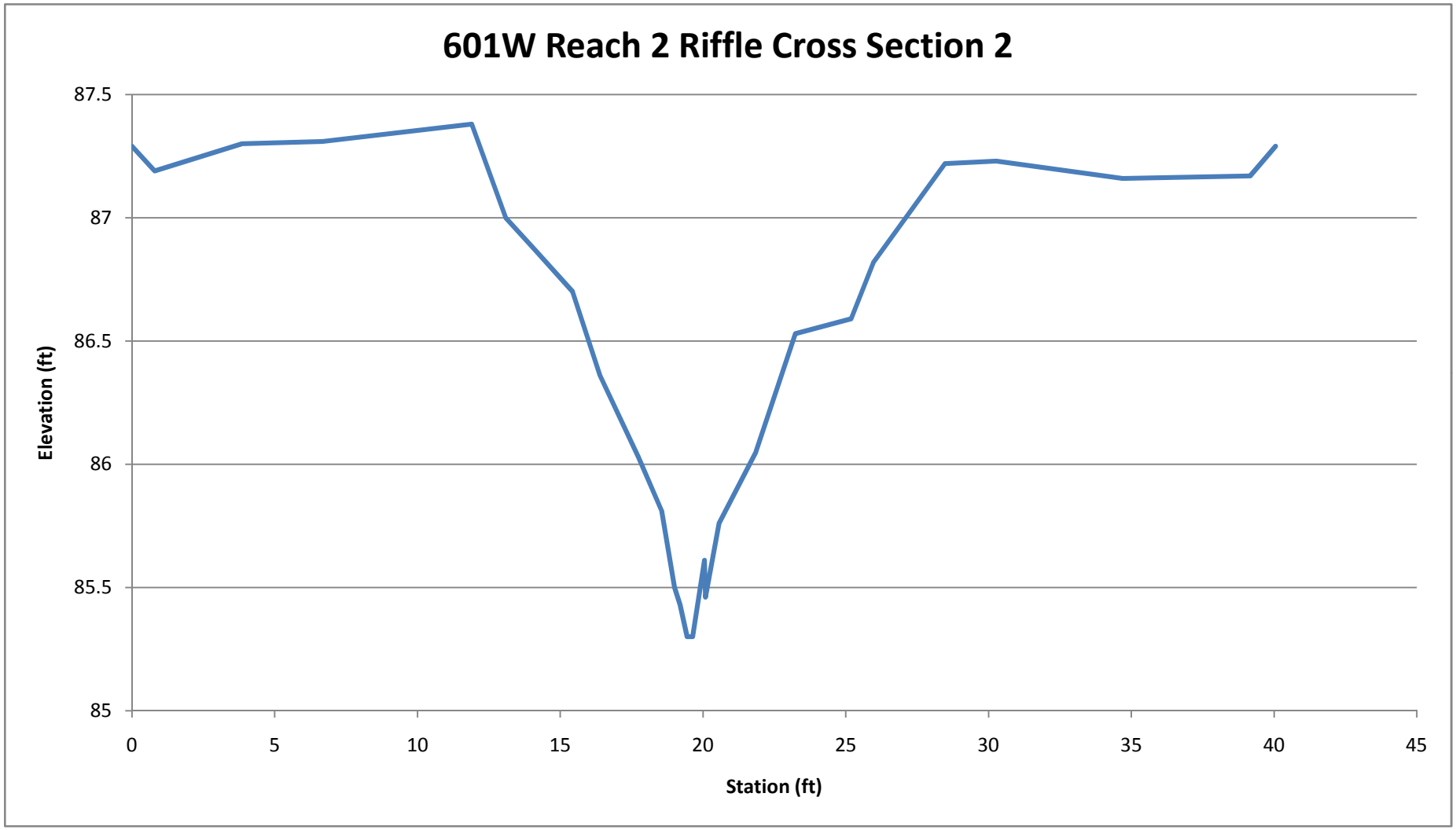

601W Reach 2 Longitudinal Profile
Elevation (ft)
94
92
90
88
86
84
82
80
78
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Thalweg
Water Surface
Top of Bank/Bankfull

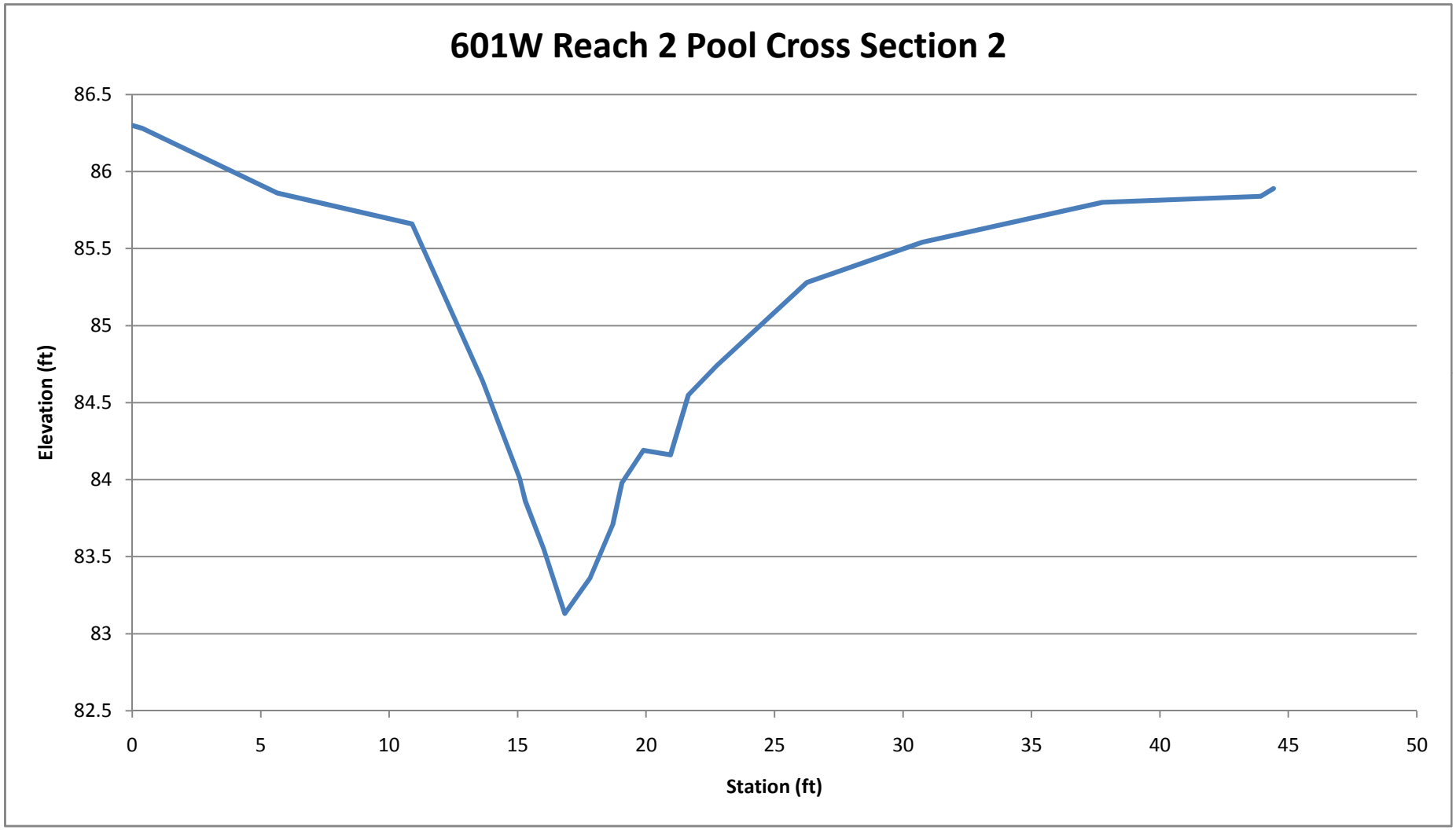

601 West Reach 1 Riffle Cross Section 1
100.5
100
99.5
99
98.5
98
97.5
97
Elevation (ft)
0
5
10
15
20
25
30
35
40
45
Station (ft)


601 West Reach 1 Pool Cross Section 1
Elevation (ft)
95
94.5
94
93.5
93
92.5
92
91.5
91
0
5
10
15
20
25
30
35
40
45
Station (ft)


601W Reach 2 Riffle Cross Section 1
91.5
91
90.5
90
89.5
89
88.5
Elevation (ft)
0
5
10
15
20
25
30
35
40
45
Station (ft)


601W Reach 2 Pool Cross Section 1
Elevation (ft)
91.5
91
90.5
90
89.5
89
88.5
88
87.5
87
86.5
0
5
10
15
20
25
30
35
40
45
Station (ft)


601W Reach 2 Riffle Cross Section 2
87.5
87
86.5
86
85.5
85
Elevation (ft)
0
5
10
15
20
25
30
35
40
45
Station (ft)


601W Reach 2 Pool Cross Section 2
86.5
86
85.5
85
84.5
84
83.5
83
82.5
Elevation (ft)
0
5
10
15
20
25
30
35
40
45
50
Station (ft)

Permanent Photo Point #1 (May 29, 2008)

Permanent Photo Point #2 (May 29, 2008)

Photo Page 2

Permanent Photo Point #3 (May 29, 2008)

Permanent Photo Point #4 (May 29, 2008)

Permanent Photo Point #5 (May 29, 2008)

Permanent Photo Point #6 (May 29, 2008)

Permanent Photo Point #7 (May 29, 2008)

Permanent Photo Point #8 (May 29, 2008)

Photo Page 5

Permanent Photo Point #9 (May 29, 2008)

Permanent Photo Point #10 (May 29, 2008)

Permanent Photo Point #11 (May 29, 2008)

Permanent Photo Point #12 (May 29, 2008)

Permanent Photo Point #13 (May 29, 2008)

Permanent Photo Point #14 (May 29, 2008)

Permanent Photo Point #15 (May 29, 2008)

Permanent Photo Point #16 (May 29, 2008)

Permanent Photo Point #17 (May 29, 2008)

R1 Starting Point Photo (May 29, 2008)

Photo Page 10

R1 Ending Point Photo (May 29, 2008)

R1 PXS1: Looking Downstream (May 29, 2008)

Photo Page 11

R1 PXS1: Looking Upstream (May 29, 2008)

R1 PXS1: Looking at Left Bank (May 29, 2008)

R1 PXS1: Looking at Right Bank (May 29, 2008)

R1 RXS1: Looking Downstream (May 29, 2008)

Photo Page 13

R1 RXS1: Looking Upstream (May 29, 2008)

R1 RXS1: Looking at Left Bank (May 29, 2008)

R1 RXS1: Looking at Right Bank (May 29, 2008)

R2 Starting Point Photo (May 29, 2008)

Photo Page 15

R2 Ending Point Photo (May 29, 2008)

R2 PXS1: Looking Downstream (May 29, 2008)

R2 PXS1: Looking Upstream (May 29, 2008)

R2 PXS1: Looking at Left Bank (May 29, 2008)

Photo Page 17

R2 PXS1: Looking at Right Bank (May 29, 2008)

R2 PXS2: Looking Downstream (May 29, 2008)

R2 PXS2: Looking Upstream (May 29, 2008)

R2 PXS2: Looking at Left Bank (May 29, 2008)

Photo Page 19

R2 PXS2: Looking at Right Bank (May 29, 2008)

R2 RXS1: Looking Downstream (May 29, 2008)

Photo Page 20

R2 RXS1: Looking Upstream (May 29, 2008)

R2 RXS1: Looking at Left Bank (May 29, 2008)

Photo Page 21

R2 RXS1: Looking at Right Bank (May 29, 2008)

R2 RXS2: Looking Downstream (May 29, 2008)

R2 RXS2: Looking Upstream (May 29, 2008)

R2 RXS2: Looking at Left Bank (May 29, 2008)

R2 RXS2: Looking at Right Bank (May 29, 2008)

Vegetation

Environmental Banc & Exchange

IPO Number: NC-01-2007

Monitoring Plots Baseline Data

Site:__601 West____ Plot:____W1_____ Date:___ 9-May-08

No	Species	Coordinates X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor
1	QM	0.80	9.56	6	51		3
2	QP	0.82	2.35	2	41		1
3	AT	1.84	7.17	1	34		3
4	BN	2.81	4.45	4	55		4
5	BN	3.44	9.80	1	29		1
6	BN	3.95	2.15	2	51		3
7	AT	4.50	7.63	2	34		3
8	CO	5.03	5.41	4	26		4
9	AT	6.55	2.96	2	39		3
10	QM	7.14	8.45	3	54		2
11	BN	7.80	5.92	2	41		4
12	BN	7.99	0.26	3	49		4
13	BN	8.81	3.92	1	44		4
				<1.37m		>1.37m	

Vigor Code

4 = Excellent
3 = Good
2 = Weak
1 = Unlikely to survive
0 = Dead
M = Missing

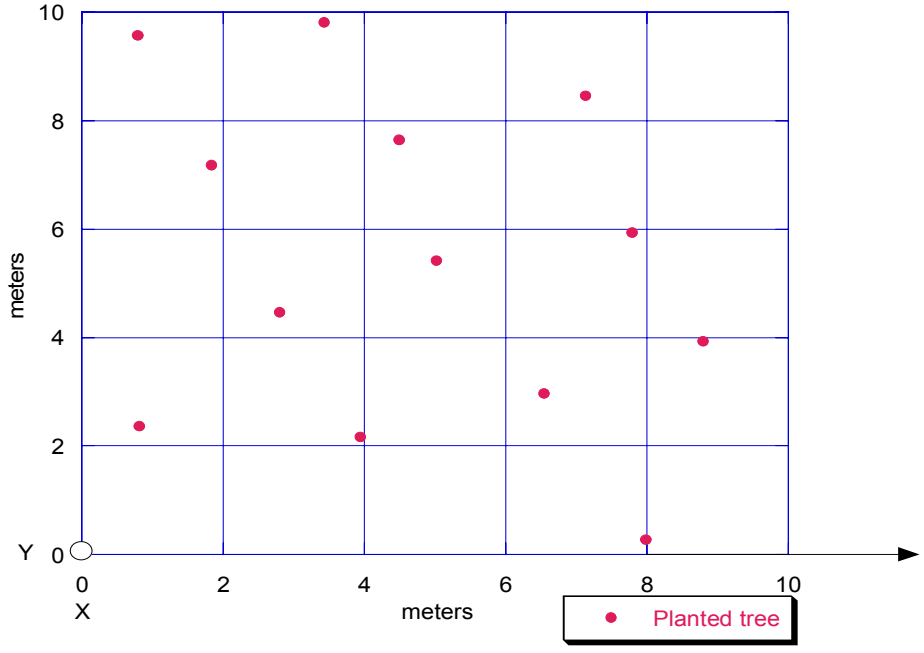
Species Code

AT = Asimina triloba
BN = Betula nigra
CO = Carya ovata
FP = Fraxinus pennsylvanica
QM = Quercus michauxii
QN = Quercus nigra
QP = Quercus phellos
Q = Quercus species unknown

Plot Photograph is taken from origin toward opposite corner.

601 West

Plot W1



Azimuth = 113° magnetic

Plot origin is the most Southwest corner and is identified by a 10' section of PVC pipe.

Environmental Banc & Exchange

IPO Number: NC-01-2007

Monitoring Plots Baseline Data

Site:__601 West____ Plot:____W2_____ Date:___ 9-May-08

No	Species	Coordinates X (m)	Coordinates Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor
1	BN	0.53	9.68	5	61		2
2	QP	0.55	1.26	2	44		2
3	QP	1.14	4.03	1	42		1
4	QM	2.18	6.50	5	66		4
5	QN	3.15	0.16	1	36		1
6	BN	3.19	9.11	4	49		3
7	QN	3.92	2.53	1	51		1
8	Q	4.53	4.79	1	40		1
9	QN	5.38	7.04	2	50		1
10	BN	5.93	0.21	3	41		1
11	QN	6.20	9.30	5	78		1
12	Q	6.76	3.03	6	55		2
13	QP	7.55	5.71	1	50		3
14	Q	8.55	8.61	3	58		1
15	QM	9.35	2.49	3	56		2
				<1.37m		>1.37m	

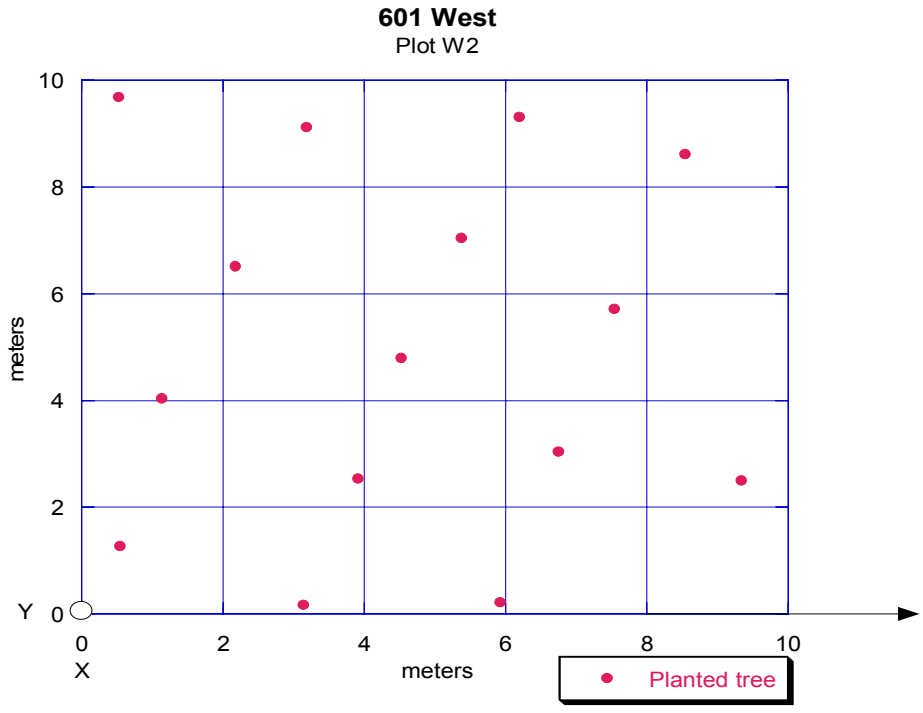
Vigor Code

4 = Excellent
3 = Good
2 = Weak
1 = Unlikely to survive
0 = Dead
M = Missing

Species Code

AT = Asimina triloba
BN = Betula nigra
CO = Carya ovata
FP = Fraxinus pennsylvanica
QM = Quercus michauxii
QN = Quercus nigra
QP = Quercus phellos
Q = Quercus species unknown

Plot Photograph is taken from origin toward opposite corner.



Azimuth = 93° magnetic

Plot origin is the most Southwest corner and is identified by a 10' section of PVC pipe.

Environmental Banc & Exchange

IPO Number: NC-01-2007

Monitoring Plots Baseline Data

Site:__601 West____ Plot:____W3_____ Date:___ 9-May-08

No	Species	Coordinates X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor
1	FP	1.03	0.93	1	28		4
2	FP	1.09	3.13	2	52		4
3	FP	1.24	5.18	1	21		4
4	QP	1.60	7.62	4	62		3
5	CO	3.59	2.73	5	37		4
6	CO	3.88	5.11	4	18		1
7	QP	4.46	7.64	5	55		1
8	BN	4.49	9.89	6	59		3
9	QP	5.79	1.22	3	51		2
10	FP	6.08	3.36	2	47		4
11	QN	6.40	5.85	4	52		2
12	FP	6.90	8.01	2	38		4
13	QN	8.30	0.45	2	73		1
14	QM	8.73	3.18	1	18		4
15	QN	9.13	6.14	2	61		1
16	QN	9.55	9.00	2	44		1
				<1.37m		>1.37m	

Vigor Code

4 = Excellent
3 = Good
2 = Weak
1 = Unlikely to survive
0 = Dead
M = Missing

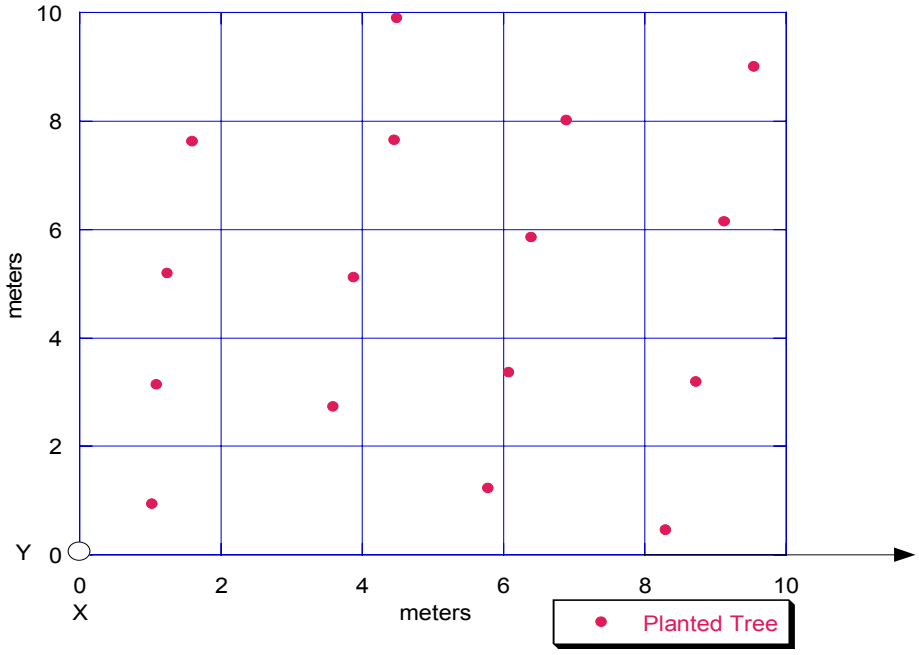
Species Code

AT = Asimina triloba
BN = Betula nigra
CO = Carya ovata
FP = Fraxinus pennsylvanica
QM = Quercus michauxii
QN = Quercus nigra
QP = Quercus phellos
Q = Quercus species unknown

Plot Photograph is taken from origin toward opposite corner.

601 West

Plot W3



Azimuth = 95° magnetic

Plot origin is the most Southwest corner and is identified by a 10' section of PVC pipe.

Environmental Banc & Exchange

IPO Number: NC-01-2007

Monitoring Plots Baseline Data

Site:__601 West____ Plot:____W4_____ Date:___ 9-May-08

No	Species	Coordinates X (m)	Coordinates Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor
1	QM	0.78	4.93	2	32		2
2	QM	0.89	2.23	3	23		2
3	FP	1.08	7.25	2	44		4
4	FP	1.24	9.52	2	31		4
5	FP	3.19	4.56	2	51		4
6	FP	3.23	2.07	2	35		4
7	QN	3.35	7.24	2	54		2
8	QN	3.44	9.60	1	40		1
9	Q	5.52	2.19	2	35		2
10	AT	5.59	6.79	1	16		2
11	Q	5.60	4.41	4	63		1
12	AT	5.69	9.01	1	17		4
13	BN	7.66	1.94	3	53		4
14	Q	8.00	8.32	2	61		2
15	BN	8.14	6.45	1	45		4
16	Q	8.53	4.13	1	19		6
17	FP	9.95	1.79	2	57		4
				<1.37m		>1.37m	

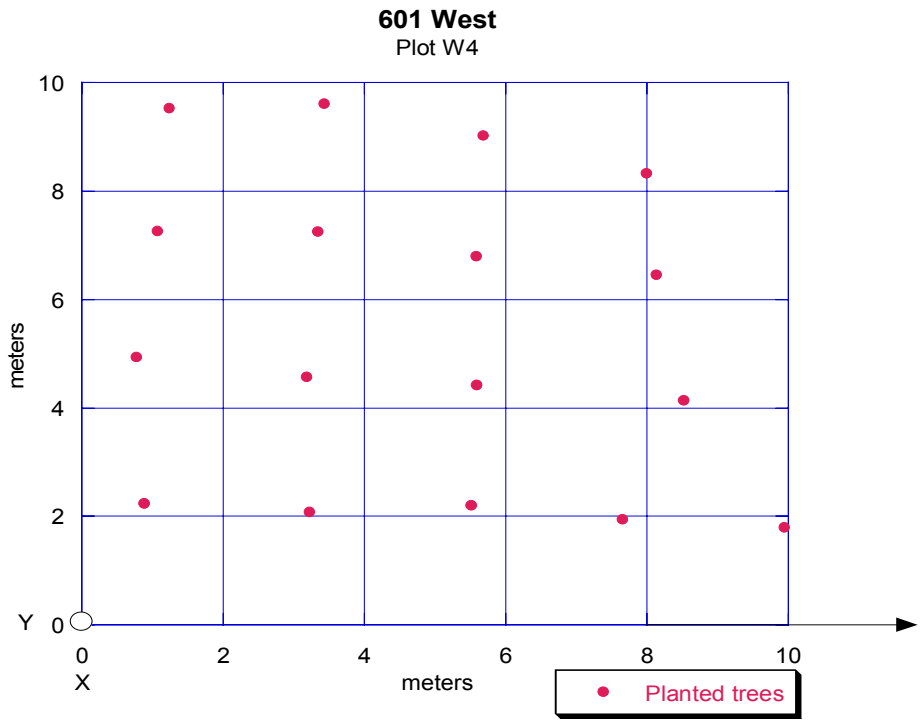
Vigor Code

4 = Excellent
3 = Good
2 = Weak
1 = Unlikely to survive
0 = Dead
M = Missing

Species Code

AT = Asimina triloba
BN = Betula nigra
CO = Carya ovata
FP = Fraxinus pennsylvanica
QM = Quercus michauxii
QN = Quercus nigra
QP = Quercus phellos
Q = Quercus species unknown

Plot Photograph is taken from origin toward opposite corner.



Azimuth = 103° magnetic

Plot origin is the most Southwest corner and is identified by a 10' section of PVC pipe.

Environmental Banc & Exchange

IPO Number: NC-01-2007

Monitoring Plots Baseline Data

Site:__601 West____ Plot:____W5_____ Date:___ 9-May-08

No	Species	Coordinates X (m)	Coordinates Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor
1	BN	2.08	7.73	3	56		4
2	QM	2.19	5.29	1	11		4
3	AT	2.47	2.69	0	10		2
4	FP	2.92	0.20	0	20		3
5	QM	4.40	9.95	4	49		2
6	QM	4.74	3.46	2	36		3
7	Q	4.75	7.82	1	20		1
8	CO	4.80	5.61	0	8		4
9	QM	4.96	1.26	4	55		3
10	CO	7.14	0.80	0	8		3
11	CO	7.18	8.09	0	8		4
12	BN	7.20	3.16	2	50		4
13	CO	7.23	5.55	1	11		4
14	QP	9.25	9.55	3	54		4
15	BN	9.56	4.46	6	59		3
16	BN	9.62	7.05	5	54		4
17	QP	9.66	1.97	2	43		4
				<1.37m		>1.37m	

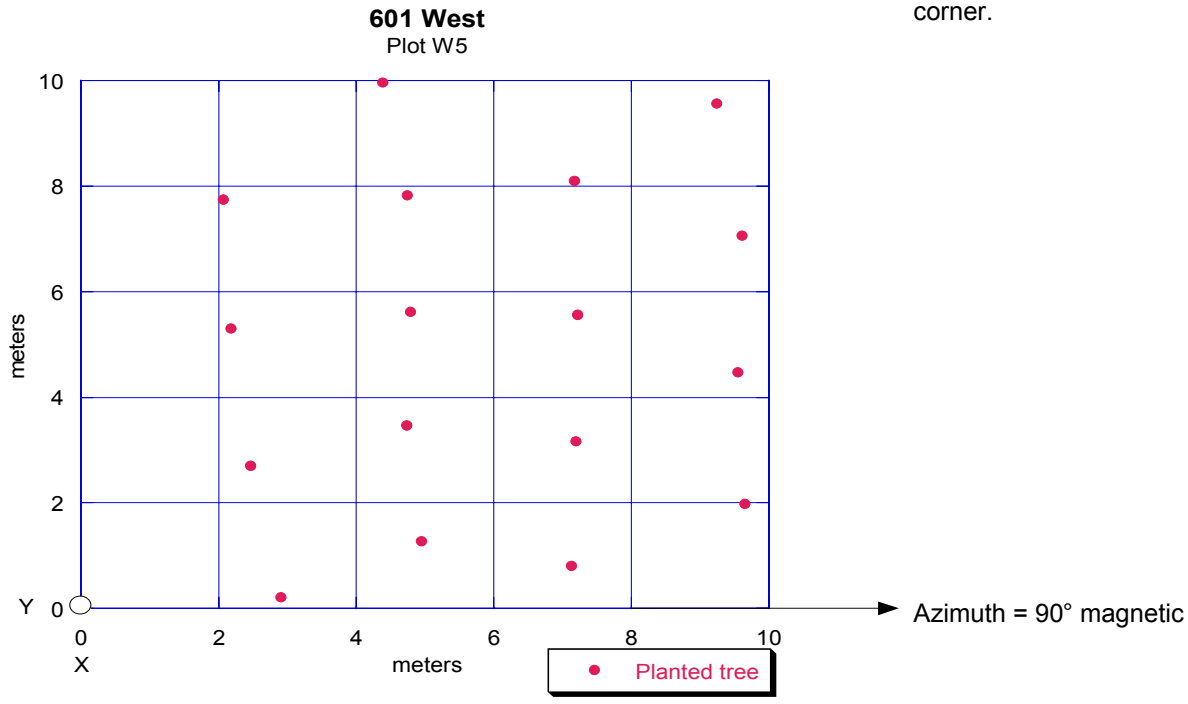
Vigor Code

4 = Excellent
3 = Good
2 = Weak
1 = Unlikely to survive
0 = Dead
M = Missing

Species Code

AT = Asimina triloba
BN = Betula nigra
CO = Carya ovata
FP = Fraxinus pennsylvanica
QM = Quercus michauxii
QN = Quercus nigra
QP = Quercus phellos
Q = Quercus species unknown

Plot Photograph is taken from origin toward opposite corner.



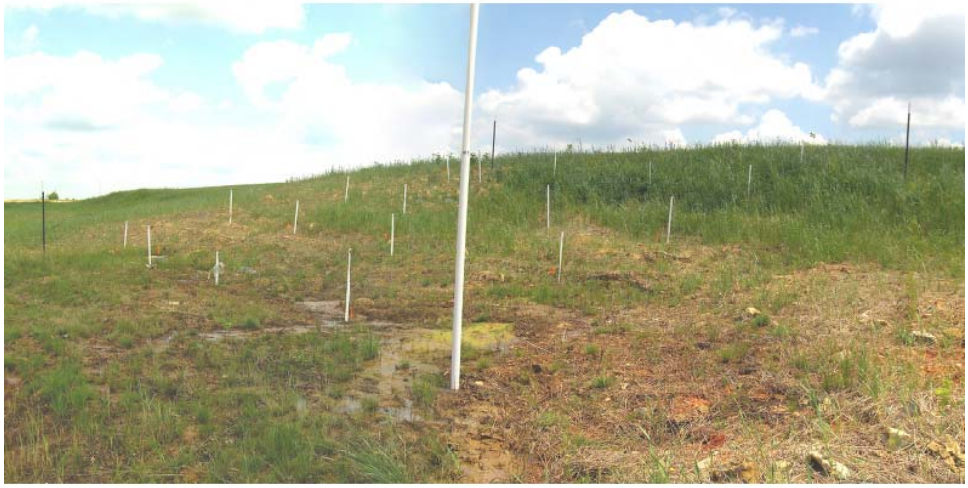
Plot origin is the most Southwest corner and is identified by a 10' section of PVC pipe.

601 West Vegetation Plot Photos
June, 2008

Vegetation Plot 1

Vegetation Plot 2

Vegetation Plot 3



Vegetation Plot 4

Vegetation Plot 5