North Muddy Creek
Stream and Wetland Restoration

Year 5 Monitoring Report
Project ID Number: 16-D06115
EEP Project # 92611

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1.0 SUMMARY

This annual monitoring report details the activities completed during the 2013 (Year 5) growing season on the North Muddy Creek Mitigation Site. Construction of the site, including planting of trees, was completed in December 2008. The 2013 data represents results from the fifth year of hydrology and vegetation monitoring for both streams and wetlands.

The stream design for the North Muddy Site involved restoration, enhancement, and preservation associated with five separate stream reaches. Wetland components included riparian and non-riparian wetland restoration, enhancement, and preservation. After construction, it was determined that the project was comprised of generated 3,974 linear feet of stream restoration, 673 linear feet of stream enhancement, and 3,313 linear feet of stream preservation. Wetlands included 11.4 acres of riparian restoration, 3.7 acres of riparian enhancement, 2.5 acres of riparian preservation, and 2.6 acres of non-riparian restoration.

This annual report presents the data from 9 cross sections, 3,112 linear feet of longitudinal profile, 3 crest gauges, 8 automated groundwater monitoring stations, 3 automated rain gauges, 11 vegetation monitoring plots, and photographic reference locations; as specified in the approved Mitigation Plan (EBX 2009).

The Year 5 stream channel data continues to indicate that the restored stream is generally stable and is providing the intended habitat and hydrologic functions. With the exception of some isolated areas of stream bed aggradation and degradation, stream bank erosion, grade control degradation, and thalweg migration; the longitudinal profiles, cross sections, and visual assessments indicate little adjustment in stream dimension when compared to the as-built conditions. Since project completion at least three bankfull events have occurred at the project site; one occurring in 2013 (Year 5).

Data from the groundwater monitoring stations revealed the upper soil surfaces were saturated for more than seven percent of the growing season at all stations. Burke County weather station data in conjunction with on-site rain gauges documented precipitation and was used to validate groundwater monitoring station data. On-site rainfall was, on average, above normal during the majority of the growing season.

Vegetation plot (VP) monitoring during Year 5 indicates planted stem densities were between 324 and 931 stems per acre with an average of 644 planted stems per acre for the entire restoration site. All monitored plots meet the success criterion for >260 stems per acre. The increase in percent survival for (VP4 at UT6) since the Year 3 monitoring is the result of a supplemental planting effort in the spring of 2012. When planted and natural stems are combined the average stem density for the entire restoration site is approximately 2,321 stems per acre, which is well above the final success criterion of 260 stems per acre. With respect to each restoration area, UT1 has an average of 617 planted stems per acre, UT5 has 850, and UT 6 has 583. Additionally, an intensive exotic invasive plant control effort was initiated in the summer of 2011 with follow up treatments administered in 2012 and 2013.

2.0 INTRODUCTION

2.1 Project Description

The North Muddy Creek Stream and Wetland Mitigation Site was identified and developed through the North Carolina Ecosystem Enhancement Program (NCEEP) full delivery process. The site is located along the McDowell/Burke County line approximately nine miles east of Marion, North Carolina (Figure 1). The project streams lie within the Catawba River Basin (Hydrologic Unit Code 03050101040020) and the North Carolina Division of Water Quality (NCDWQ) sub-basin 03-08-30.

The mitigation site consists of five distinct stream systems totaling 7,960 linear feet and three adjacent wetland areas encompassing 20.2 acres. The five distinct unnamed tributaries (UT) are identified as UT1, UT2, UT4, UT5, and UT6. Unnamed Tributary 1 (UT1) is located just north of Interstate 40 on the McDowell/Burke County line, whereas UT2, UT4, UT5, and UT6 are located south of Interstate 40 on the McDowell/Burke County line. The USGS Marion East and Glen Alpine topographic quadrangles (Figure 2) shows UT1 drains to Muddy Creek, UT2 drains to North Muddy, and the remaining streams drain to South Muddy Creek. All five reaches drain watersheds consisting of predominately forested and agricultural land. On-site topography, soils, and existing wetlands demonstrated that the site historically supported wetlands. The site is defined by conservation easements surrounding the streams and adjacent riparian buffers that total approximately 34.8 acres.

Channel restoration (improved pattern, dimension, and longitudinal profile) was completed on UT1, UT6, and the lower portion of UT5. Stream enhancement activities (improved dimension and longitudinal profile) were limited to the middle reach of UT5. The headwater reaches of UT2, UT4, and UT5 were protected under preservation criteria.

Prior to restoration UT1 and adjacent wetlands were highly disturbed due to the presence of livestock, channelization, and ditching. The lower reach of UT5 had been channelized and portions of the riparian wetland had been impaired due to row cropping. Channelization, ditching, and riparian disturbances associated with historical agricultural practices had severely degraded UT6 and the associated wetlands.

The 2013 monitoring season represents Year 5 of the monitoring period. Monitoring during 2013 included stream, wetland, and vegetation monitoring stations (Figure 3) as approved in the Mitigation Plan (EBX, 2009).

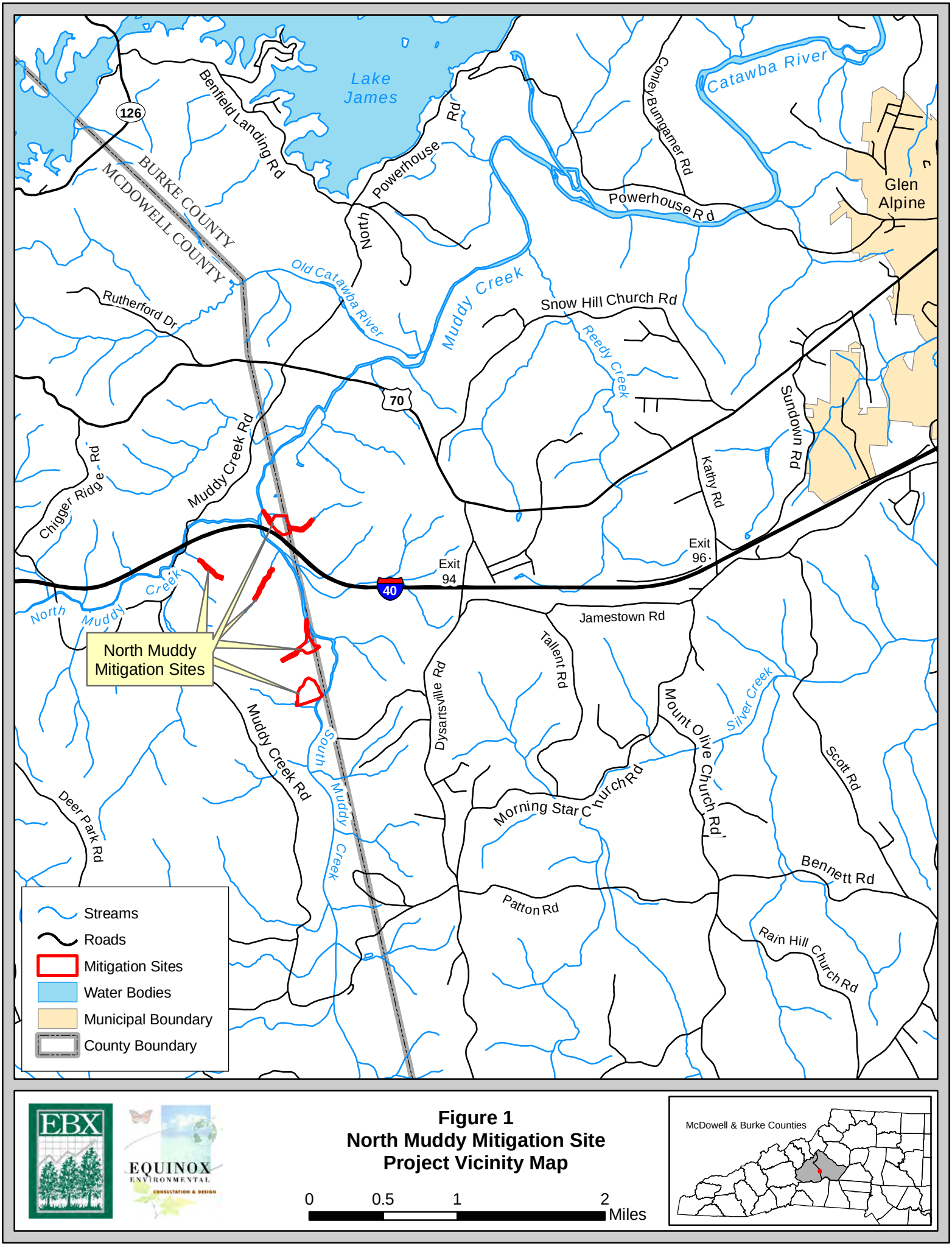
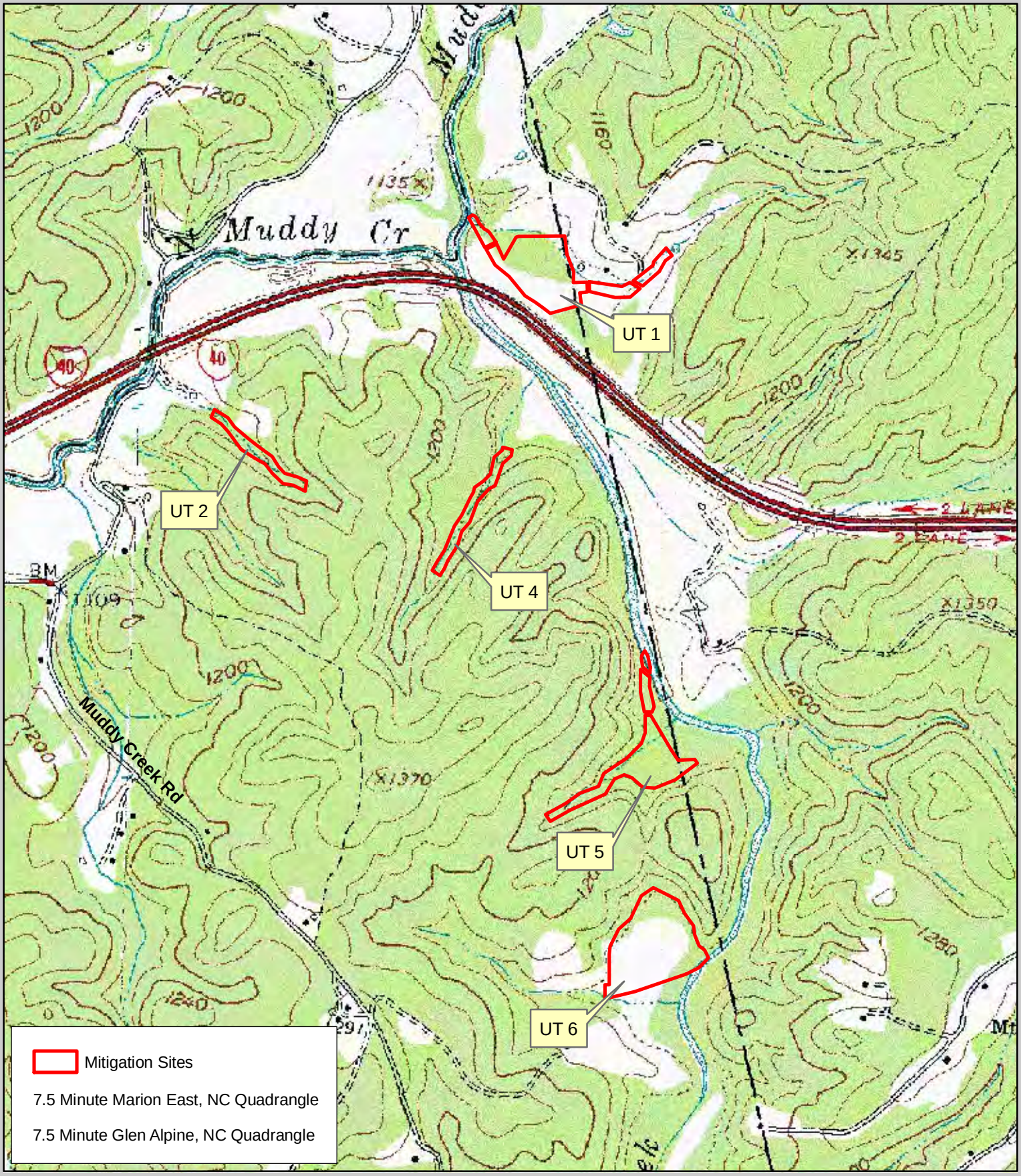


Figure 1
North Muddy Mitigation Site
Project Vicinity Map

0 0.5 1 2 Miles

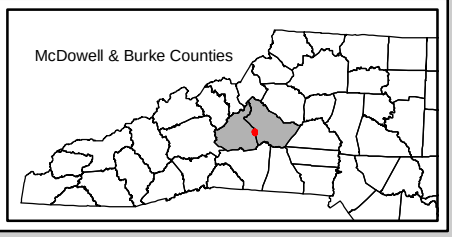


EBX

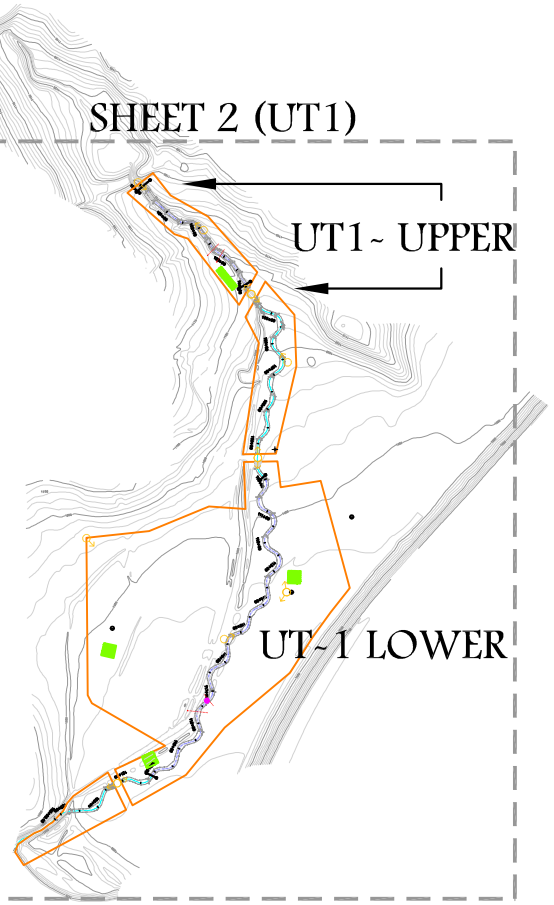
EQUINOX ENVIRONMENTAL CONSULTATION & DESIGN

Figure 2
North Muddy Mitigation Site
USGS Map

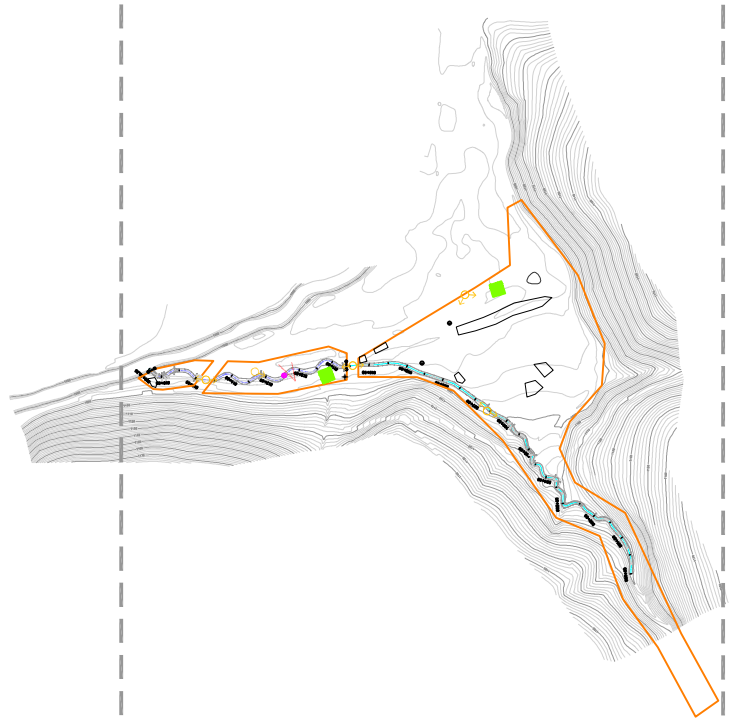
0 750 1,500 3,000 Feet



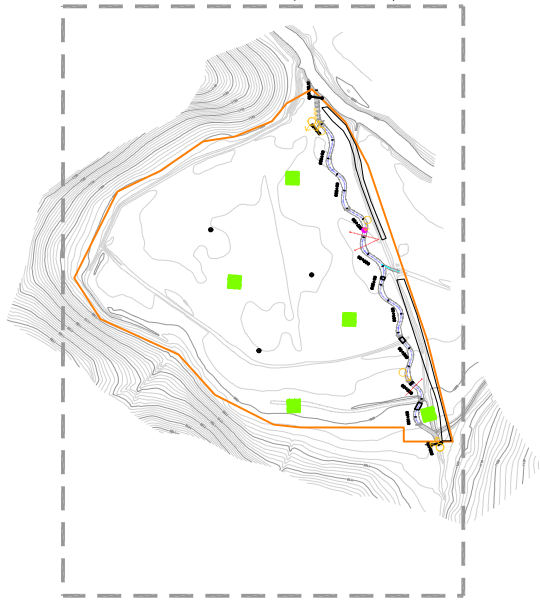
SHEET 2 (UT1)



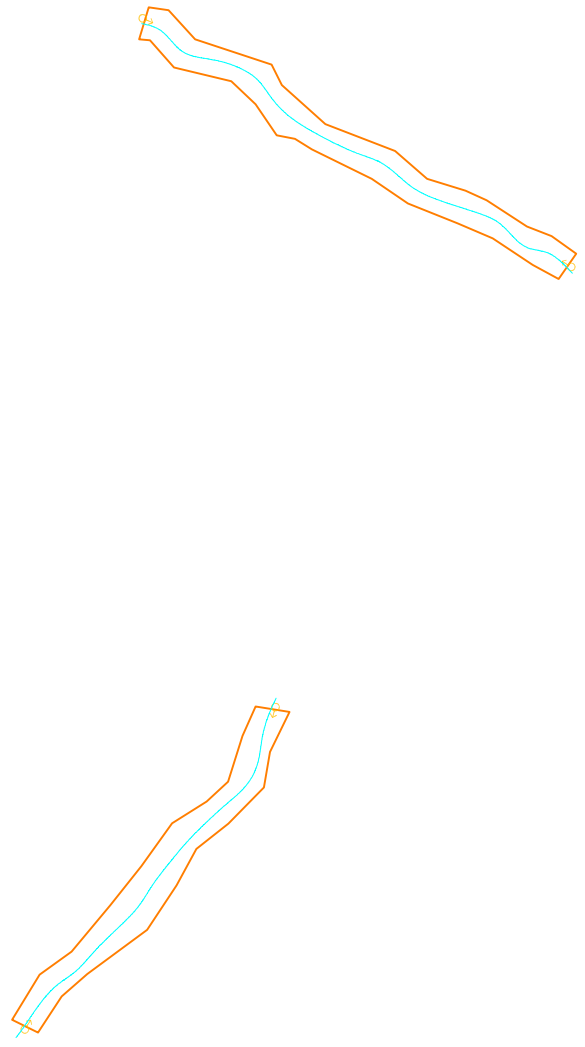
SHEET 3 (UT~5)



SHEET 4 (UT~6)



SHEET 5 (UT~2 & UT~4)



LEGEND

- Vegetation Monitoring Plots
- Easement Boundary
- Stream
- Longitudinal Profile Reach
- Longitudinal Profile Begin/End
- Cross Section
- Crest Gauge
- Wetland Gauge
- Rain Gauge
- Photo Point
- Constructed Riffle
- A-Vane
- Cross Vane
- J-Hook
- Log Sill
- Root Wad

SCALE 1" = 500'

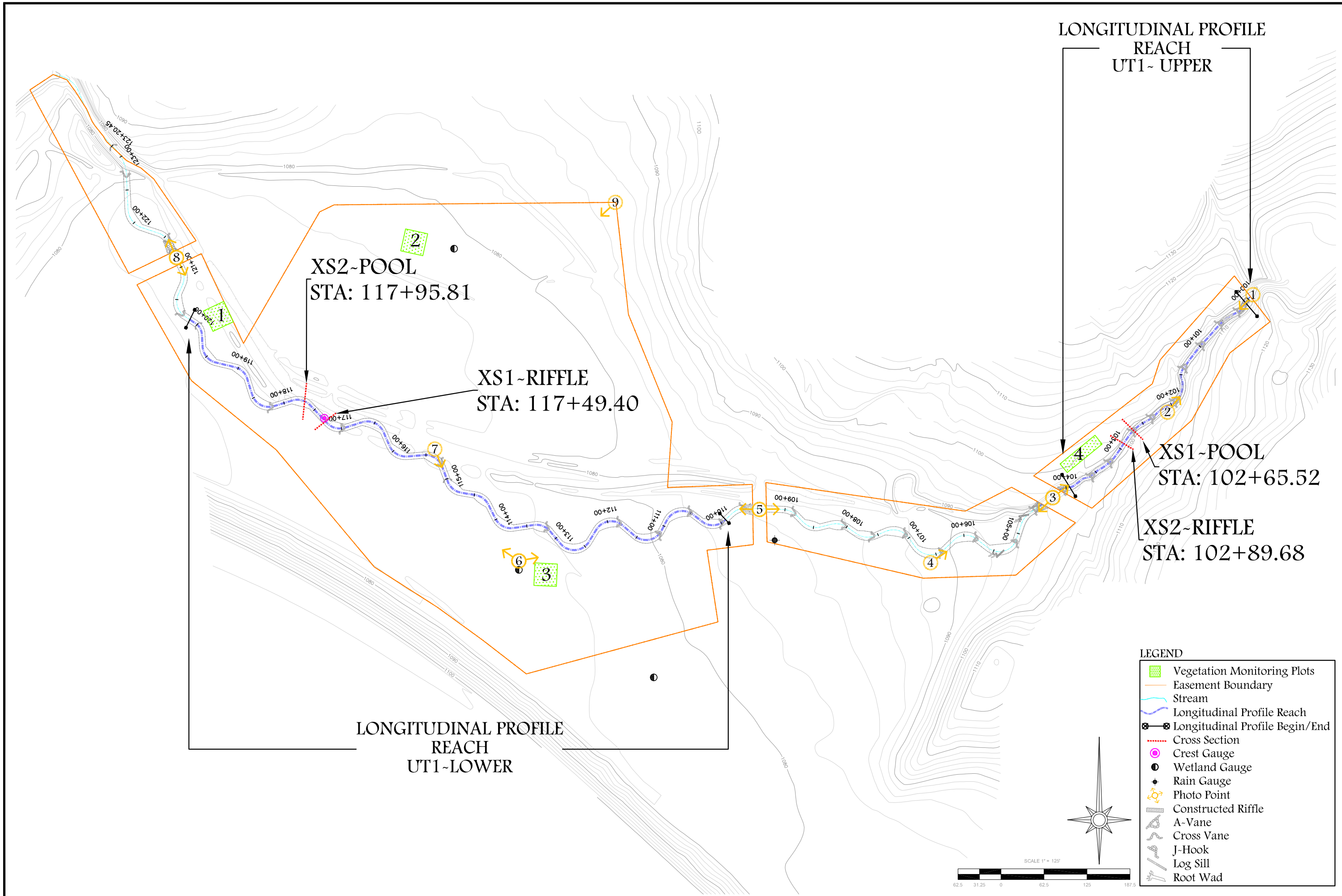
250 125 0 250 500 750

North Muddy Creek

Burke & McDowell County, NC

Monitoring Plan
FIGURE 3

Sheet:
1
of 5



North Muddy Creek

Burke & McDowell County, NC

UT1 Monitoring Plan
FIGURE 3

Sheet:
2
of 5

REACH
UT5

XS2~RIFFLE
STA: 512+36.17

XS1~POOL
STA: 512+16.30

LEGEND

- Vegetation Monitoring Plots
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- Cross Vane
- J-Hook
- Log Sill
- Root Wad

SCALE 1" = 150'

75 37.5 0 75 150 225

North Muddy Creek

Burke & McDowell County, NC

UT5 Monitoring Plan
FIGURE 3

Sheet:
3
of 5

LONGITUDINAL PROFILE
REACH
UT-6

XS3-RIFFLE
STA: 606+56.85

XS2-POOL
STA: 606+25.85

XS1-RIFFLE
STA: 601+87.17

600+00
601+00
602+00
603+00
604+00
605+00
606+00
607+00
608+00
609+00
610+00
610+92.11

1
2
3
4
5

LEGEND

- Vegetation Monitoring Plots
- Easement Boundary
- Stream
- Longitudinal Profile Reach
- Longitudinal Profile Begin/End
- Cross Section
- Crest Gauge
- Wetland Gauge
- Rain Gauge
- Photo Point
- Constructed Riffle
- A-Vane
- Cross Vane
- J-Hook
- Log Sill
- Root Wad

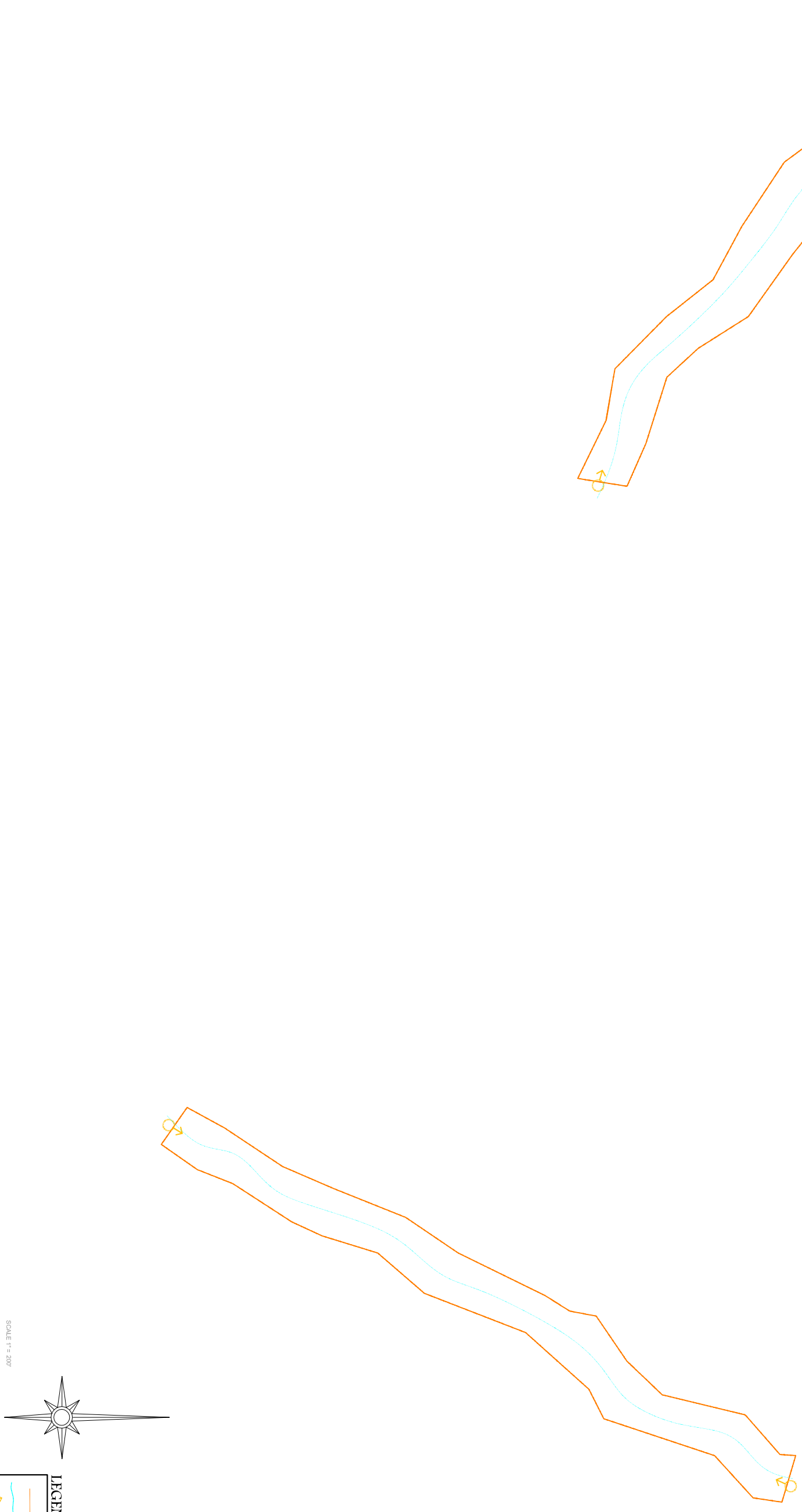
SCALE 1" = 100'

50 25 0 50 100 150

North Muddy Creek
Burke & McDowell County, NC

UT6 Monitoring Plan
FIGURE 3

Sheet:
4
of 5



Sheet:
5
of 5

UT2 & UT4 Monitoring Plan
FIGURE 3

North Muddy Creek
Burke & McDowell County, NC

2.2 Project Purpose

The objective of the project was to provide 5,014 stream mitigation units (SMU's), 12.0 acres of riparian wetland mitigation units (WMU's), and 2.4 acres of non-riparian WMU's for the NC EEP full delivery process in the Catawba 03-08-30 Basin. In conjunction with providing mitigation credits; riparian habitat, aquatic habitat, and water quality improvements are expected as a result of the ecological restoration and enhancement practices.

The North Muddy Creek Mitigation Report (EBX 2009) documented 3,974 linear feet of stream restoration, 337 linear feet of stream enhancement Level I, 336 linear feet of stream enhancement Level II, and 3,313 linear feet of stream preservation resulting in 4,996 SMU's (Table 1). Wetland mitigation components stated within the Mitigation Report documented 11.4 riparian restoration acres, 3.7 riparian enhancement acres, 2.5 riparian preservation acres, and 2.6 non-riparian restoration acres resulting in 16.4 WMU's (Table 1).

Table 1. Project Mitigation Structure and Objectives

Reach Name	As-Built Length (feet)	Riparian Wetland (acres)	Non-Riparian Wetland (acres)	Total Wetland (acres)	Restoration Approach
UT1	2,257				Restoration
UT2	1,172				Preservation
UT4	1,421				Preservation
UT5	550				Restoration
UT5	337				Enhancement I
UT5	336				Enhancement II
UT5	720				Preservation
UT6	1,167				Restoration
UT1 - Wetland		3.3		6.6	Restoration
UT1 – Wetland		3.0			Enhancement
UT1 – Wetland		0.3			Preservation
UT5 – Wetland		0.7		2.9	Enhancement
UT5 – Wetland		2.2			Preservation
UT6 - Wetland		8.1	2.6	10.7	Restoration
Total Site	7,960	17.6	2.6	20.2	
Total Mitigation Units	4,996	13.8	2.6		

Annual monitoring of the site is required to demonstrate successful mitigation based on criteria established in the Restoration Plan (EBX, 2007) and through a comparison to as-built and reference conditions. The success criteria components adhere to guidance provided by the United States Army Corps of Engineers (USACE) – Wilmington District (USACE, 2003) and recommendations from the NC EEP. Stream, hydrology, and vegetation monitoring are conducted annually for five years or until success criteria have been met. This Annual Monitoring Report details the results of the monitoring efforts for Year 5 at the North Muddy

Creek Stream and Wetland Mitigation Site. Results from the Year 5 monitoring efforts are included within the following sections and in the current condition plan view Appendix A.

2.3 Project History and Schedule

The project was constructed in the summer and fall of 2008 and the five year monitoring is expected to be completed in the winter of 2013 (Table 2). Service providers and primary contacts are listed in Table 3.

Table 2. Project Activity and Reporting History

Month / Year	Activity
September 2007	Restoration Plan
September 2008	Construction Completed
December 2008	Planting Completed
March 2009	Supplemental Planting
April 2009	Mitigation Plan / As-Built Report
December 2009	Year 1 Annual Monitoring Report
December 2010	Year 2 Annual Monitoring Report
April 2011	Supplemental Planting
June – July 2011	Exotic Invasive Plant Control
December 2011	Year 3 Annual Monitoring Report
January and July 2012	Exotic Invasive Plant Control
December 2012	Year 4 Annual Monitoring Report
December 2013	Year 5 Annual Monitoring Report

Table 3. Project Contacts

Contact	Provider Information
Full Delivery Service Contractor Norton Webster	Environmental Banc & Exchange 909 Capability Drive Suite 3100 Raleigh, North Carolina 27606 (919) 829-9909
Designer William Wilhelm	Kimley-Horn and Associates, Inc. 4651 Charlotte Park Drive, Suite 300 Charlotte, North Carolina 28217 (704) 333-5131
Construction/Seeding Contractor Robert Grady	RFG Construction Inc. 1907 Cambridge Drive Kinston, North Carolina 28504 (252) 523-2405
Planting Contractor Robert Cato	Superior Wildlife Services 2105 Sparre Drive Kinston, North Carolina 28504 (252) 939-0465
Monitoring Contractor Steve Melton	Equinox Environmental Consultation & Design, Inc. 37 Haywood Street, Suite 100 Asheville, North Carolina 28801 (828) 253-6856

3.0 STREAM MONITORING

3.1 Stream Success Criteria

As stated in the Mitigation Plan, the stream geometry will be considered successful if the cross-section geometry, profile, and sinuosity are stable or reach a dynamic equilibrium. While the channels may not adhere to the design or reference ratios of stream geometry, the streams will be considered stable if the following key indicators are present:

- *Stream Type*: Maintenance of the design stream type or progression toward or conversion to a stable stream type such as B, C, or E will indicate stability.
- *Bank Height Ratio*: Bank height ratio between 1.0 and 1.2 will indicate that flood flows have access to the active floodplain and that higher flows do not apply excessive stresses to stream banks.

A minimum of two bankfull events is required during the 5-year monitoring period. If two bankfull events do not occur the monitoring period may be extended at the discretion of the USACE.

3.2 Stream Morphology Monitoring Plan

The stream monitoring program will document annual system development and progress towards achieving the success criteria. Monitoring will occur annually for 5-years or until the final success criteria are achieved, whichever is longer. The locations of the individual stream monitoring components described below are shown in Figures 3-7.

3.2.1 Cross-Sections

A total of nine cross-sections were installed during the as-built data collection effort. Cross-sections for UT1 include one riffle and one pool for each of the two monitored reaches. The UT5 restoration reach includes one riffle and one pool cross-section, while UT6 includes two riffles and one pool cross-section. Each cross-section was marked on both banks with permanent iron pins to establish known elevations and stationing for comparisons between annual data collection efforts. Annual cross-sectional survey points include all present breaks in slope; including top of bank, bankfull, inner berm, and thalweg. Cross-sectional photos are collected annually to visually document left and right bank conditions.

3.2.2 Longitudinal Profile

Four permanent longitudinal profile reaches were established during the as-built data collection effort. Two reaches are in UT1, an upper (UT1-Upper) and lower reach (UT1-Lower), whereas UT5 and UT6 include the entire lengths of the restoration reaches. The beginning and end of each longitudinal profile reach was marked on both banks with permanent iron pins to establish elevation benchmarks for annual data comparison and analysis. Longitudinal profile measurements include thalweg, water surface, bankfull, and top of low bank. Annual thalweg and water surface measurements are collected at the head and tail of each bedform type.

3.2.3 Substrate

Bed substrate assessment sites were established at each permanent cross-section. Annual pebble counts are collected utilizing methods adapted from Harrelson et al. (1994). A minimum of 100 particles are selected and measured from each channel feature type sampled. Sampled materials are placed into size classes using the traditional Wentworth scale classes subdivided based on phi scale. These classes are grouped into broader sediment size categories (e.g. sand, gravel or cobble) and are utilized to compare substrate changes from as-built conditions.

3.2.4 Hydrology

Crest gauges installed on each restoration reach tributary are utilized to document bankfull events during the monitoring period. Crest gauges are checked during each site visit to document the highest flow between visits. Gauge height readings are recorded and digital images of floodplain debris lines and sediment deposition are collected to document annual bankfull events.

3.2.5 Photo Reference Stations

A total of 23 photo stations were established throughout the site to subjectively evaluate overall trends in project progression and general site conditions over the duration of the monitoring effort. Additionally, the entire site is visually assessed annually to document any other areas of concern. These areas of concern were photo-documented.

3.3 Stream Morphology Monitoring Results

The Year 5 annual stream morphology data were collected between February and November 2013. Reference station photos were collected in January 2013 prior to leaf out to document the general conditions of the site. The Year 5 cross-section, longitudinal profile, and substrate data collection efforts occurred in February 2013. Visual assessments and bankfull documentation was noted during each site visit during the annual monitoring effort. A final site assessment and data collection effort occurred in September 2013.

3.3.1 Cross-Sections

Cross-sectional data collected during the Year 5 monitoring effort have been compared with the previous data sets (Appendices B and C). The Year 5 channel cross-sectional data shows minimal differences between years indicating that the overall stream dimensions have remained stable.

3.3.2 Longitudinal Profile

Longitudinal profile surveys were conducted along the four separate reaches of the restoration project, totaling approximately 3,112 linear feet. The surveys conducted included reach UT1-Upper from STA 100+10 to STA 103+97 (387 linear feet), reach UT1-Lower from STA 109+95 to STA 120+59 (1,064 linear feet), reach UT5 from STA 510+59 to STA 516+40 (581 linear

feet), and reach UT6 from STA 600+05 to STA 610+85 (1,080 linear feet). The longitudinal profiles documented bed elevations, stream features, and in-stream grade control structures as compared to the as-built profiles (Appendices B and C). With the exception of some isolated and minor areas of stream bed aggradation and degradation, stream bank erosion, grade control degradation, and thalweg migration; stream profiles between monitoring years indicate little adjustment.

3.3.3 Substrate

Pebble count data collected during Year 5 indicates little change in substrate size composition between years. Substrate composition within the stream channels is primarily silt/clay and fine sand particles within both the riffle and pool habitat types. The Year 5 pebble count data summary plots are included in Appendix B.

3.3.4 Hydrology

Since project completion at least four bankfull events have occurred within the project site. An initial bankfull event was documented in May 2009, which registered at 0.05 feet above bankfull on UT6. In January 2010 a significant bankfull event occurred at all three monitored UTs. No bankfull event was recorded in 2012; however, one bankfull event occurred during May of the final 2013 monitoring year, registering higher than the crest gauge, with sediment lines on surrounding vegetation reaching as high as 1.5 feet above the crest gauge.

Table 4. Crest Gauge Data

Month/Year Recorded	UT1 (ft above bkf)	UT5 (ft above bkf)	UT6 (ft above bkf)
May 2009	0.00	0.00	0.05
January 2010	>4.00	3.50	>4.00
May (13) 2013	>4.00	>4.00	>4.00

3.3.5 Photo Reference Stations

The Year 5 reference station photos are included in Appendix D. Stream areas of concern (SPA) identified through the morphological monitoring and visual assessments include isolated areas of stream bed aggradation and degradation, stream bank erosion, and grade control degradation (Table 5). Representative photos of these areas taken during the Year 5 monitoring effort are included in Appendix D.

Table 5. Stream Areas Requiring Observation

SPA	Feature	Reach	STA	Description	Recommendation
1	Riffle	UT1	105+00	Riffle down cutting	No action recommended
2	Pool	UT1	105+25	Reduced pool depth due to aggradation	No action recommended
3	Riffle	UT1	105+70	Riffle down cutting	No action recommended
4	Riffle	UT1	107+90	Riffle down cutting	No action recommended
5	Riffle	UT1	110+40	Riffle down cutting	No action recommended
6	Pool	UT5	510+75	Reduced pool depth due to aggradation	No action recommended
7	Stream Bank	UT5	515+10	Bank scour	No action recommended
8	Stream Bank	UT5	515+50	Bank scour	No action recommended
9	Rock Vane	UT5	515+80	Grade control structure piping	No action recommended
10	Pool	UT6	601+00	Reduced pool depth due to aggradation	No action recommended
11	Riffle	UT6	601+30	Riffle down cutting	No action recommended
12	Pool	UT6	601+60	Reduced pool depth due to aggradation	No action recommended
13	Pool	UT6	602+25	Reduced pool depth due to aggradation	No action recommended
14	Riffle	UT6	603+75	Riffle down cutting	No action recommended
15	Beaver	UT6	610+00	Beaver dam	Dam removal
16	Structure	UT6	610+70	Grade control structure piping	No action recommended
17	Structure	UT6	610+80	Grade control structure piping	No action recommended

3.4 Stream Conclusions

The Year 5 morphological monitoring and visual assessments indicate a stable system when compared to the as-built conditions. While the majority of pools and riffles were of appropriate depth, stream areas of concern identified during Year 5 were primarily associated with isolated cases of pool aggradation and riffle degradation. As a whole, morphological data and visual assessment suggest that the North Muddy Restoration Project appears to be approaching a desired state of equilibrium. Furthermore, the project is meeting the established success criteria specified in the Restoration Plan (EBX 2007). Table 6 summarizes the riffle morphologic parameters between monitoring years; details of the morphologic parameters are provided in Appendices B and C. Lastly, beaver activity was documented on the downstream end of UT6 near the confluence with North Muddy Creek.

Table 6. Summary of Morphologic Monitoring Parameters

Unnamed Tributary 1 – Upper Reach						
Parameter	**As-Built**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Bankfull Cross-Section Area Abkf (sq ft)	4.2	4.2	3.9	3.5	3.6	3.4
Bankfull Width Wbkf (ft)	6.0	5.8	5.8	5.6	5.8	5.6
Bankfull Width/Depth Ratio	8.6	8.0	8.5	8.9	9.3	9.1
Bankfull Mean Depth Dbkf (ft)	0.7	0.7	0.7	0.6	0.6	0.6
Bankfull Max Depth Dmax (ft)	1.2	1.2	1.2	1.1	1.1	1.1

Table 6 Continued. Summary of Morphologic Monitoring Parameters

Unnamed Tributary 1 – Lower Reach						
Parameter	**As-Built**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Bankfull Cross-Section Area Abkf (sq ft)	3.1	3.1	3.1	3.0	3.0	2.7
Bankfull Width Wbkf (ft)	5.5	6.2	6.4	6.5	6.0	5.7
Bankfull Width/Depth Ratio	9.9	12.2	12.9	14.3	12.0	11.8
Bankfull Mean Depth Dbkf (ft)	0.6	0.5	0.5	0.5	0.5	0.5
Bankfull Max Depth Dmax (ft)	1.0	1.0	0.9	0.9	0.9	0.9

Unnamed Tributary 5						
Parameter	**As-Built**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Bankfull Cross-Section Area Abkf (sq ft)	5.4	5.0	5.0	5.1	5.1	5.0
Bankfull Width Wbkf (ft)	7.2	7.2	7.6	8.5	8.2	7.3
Bankfull Width/Depth Ratio	9.7	10.3	11.6	14.0	13.3	10.7
Bankfull Mean Depth Dbkf (ft)	0.7	0.7	0.7	0.6	0.6	0.7
Bankfull Max Depth Dmax (ft)	1.2	1.2	1.2	1.2	1.2	1.3

Unnamed Tributary 6						
Parameter	**As-Built**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Average Bankfull Cross-Section Area Abkf (sq ft)	6.1	7.7	7.7	7.6	7.7	7.3
Average Bankfull Width Wbkf (ft)	10.5	10.5	10.8	10.9	10.9	10.5
Average Bankfull Width/Depth Ratio	14.5	14.7	15.2	15.7	15.5	15.0
Average Bankfull Mean Depth Dbkf (ft)	0.7	0.7	0.7	0.7	0.7	0.7
Average Bankfull Max Depth Dmax (ft)	1.3	1.4	1.6	1.6	1.7	1.6

4.0 HYDROLOGY

4.1 Hydrologic Success Criteria

As stated in the Restoration Plan, the hydrology success criteria for the site is based on improvements to the frequency and duration of soil saturation of the restored wetlands as compared to reference wetlands (EBX 2007). The groundwater hydrological characteristics of the existing reference wetlands serve as the target for the restored wetlands. The restored wetlands are in similar landscape positions and should have hydrological responses similar to the reference wetlands. The minimum requirement for the restoration of wetland hydrology will also be based on the USACE guidelines (USACE, 1987) including saturation of the upper 12 inches of surface soils for 7 percent of the growing season. The growing season for McDowell County extends from March 28 to November 4 (222 days). The growing season is based on the fifty percent probability of a 28°F or greater minimum temperature between these dates (NRCS, 2013).

4.2 Description of Hydrology Monitoring Efforts

Prior to the 2009 growing season, eight automated groundwater gauges were installed within the restored wetland areas (Figure 3). The UT1 wetland area includes two gauges within the restoration sites and one reference gauge within a fully functional wetland immediately adjacent to the restored area. The UT5 wetland area contains one gauge within the enhancement wetland and one within the preservation wetland. Finally, three gauges were installed within the UT6 wetland restoration area. As part of the monitoring program an Ecotone automated rain gauge was installed at each project area prior to the start of the growing season. The monitoring protocol for the site specified that automated monitoring station data be downloaded bi-monthly and checked for malfunctions at the same time. During 2013, rain gauge malfunctions at UT1, UT5, and UT6 resulted in data gaps for rainfall events occurring during the growing season.

Automated Gauges
Groundwater gauges were installed at a minimum depth of 23 inches below the ground surface. Automated gauges compensate for changes in atmospheric pressure and were set to record water elevation above the bottom of the sensor daily at 08:00 and 20:00 hours.

Automated rain gauges were installed in open areas to prevent inaccurate readings due to overhead vegetation. Gauges automatically record rainfall with a tipping bucket calculated to record to 0.01 of an inch.

Data Interpretation
Unless erroneous readings were observed between the two daily groundwater readings, the 08:00 daily reading was utilized for the daily hydrology level. For days in which a significant difference between the 08:00 and 20:00 reading was observed (N = 0), the data were compared to water level readings immediately before and after the data in question as the method to determine erroneous readings. Daily rainfall readings were summed to obtain monthly totals.

During monitoring years in which below normal precipitation resulted in groundwater levels not meeting hydrologic requirements, the groundwater hydrology from the reference gauges was compared to the restoration and enhancement data to determine the level of correlation between the data.

4.3 Results of Hydrology Monitoring

The following Year 5 hydroperiod statistics were calculated for each monitoring station following the growing season: 1) most consecutive days and percent of the growing season that the water table was within 12 inches of the soil surface; 2) cumulative number of days and percent of growing season that the water table was within 12 inches of the soil surface; and 3) number of times the water table rose to within 12 inches of the soil surface (Table 7). Individual groundwater graphs and raw hydrograph data collected from the monitoring gauges are provided in Appendix E.

During Year 5 all groundwater gauges met the success criteria as stated in the Restoration Plan (Table 7) (EBX 2007). Gauge data results for the UT1 wetland area ranged from approximately 20.7 to 100.0 percent hydroperiod attainment during the growing season with the reference gauge (UT1 – 1) meeting criteria for 100.0 percent of the season. Gauge data for the UT5 wetland area, including the reference gauge (UT5 – 1), resulted in a consecutive hydroperiod range between 100 percent during the growing season. Gauges at UT6 documented 100 percent hydroperiod.

Table 7. Hydrologic Monitoring Results

2013 Maximum Hydroperiod (Growing Season March 28 – November 4, 222 Days)																							
Gauge ID	Year 5 Consecutive		Year 4 Consecutive		Year 3 Consecutive		Year 2 Consecutive		Year 1 Consecutive		Year 5 Cumulative		Year 4 Cumulative		Year 3 Cumulative		Year 2 Cumulative		Year 1 Cumulative		Year 5	Year 4	Year 3	Year 2	Year 1
	Days	Percent of Growing Season	Days	Percent of Growing Season	Days	Percent of Growing Season	Days	Percent of Growing Season	Days	Percent of Growing Season	Days	Percent of Growing Season	Days	Percent of Growing Season	Days	Percent of Growing Season	Days	Percent of Growing Season	Days	Percent of Growing Season	Occurrences				
UT1 – 1	222	100.0	65	29.3	67	30.2	42	18.9	51	23	222	100	157	70.7	136	61.3	129	58.1	150	67.6	1	6	7	11	8
UT1 – 2	222	100.0	222	100	71	32	41	18.5	88	39.6	222	100	222	100	149	67.1	95	42.8	155	69.8	1	1	5	11	5
UT1 - 3	46	20.7	18	8.1	35	15.8	14	6.3	22	9.9	138	62	76	34.2	48	21.6	34	15.3	86	38.7	6	7	5	6	17
UT5 – 1	222	100.0	117	52.7	74	33.3	74	33.3	96	43.2	222	100	219	98.6	176	79.3	182	82	178	80.2	1	2	5	3	3
UT5 - 2	222	100.0	62	27.9	66	29.7	82	36.9	89	40.1	222	100	161	72.5	108	48.6	129	58.1	136	61.3	1	9	8	7	5
UT6 - 1	222	100.0	222	100	153	68.9	222	100	112	50.5	222	100	222	100	213	95.9	222	100	192	86.5	1	1	2	1	2
UT6 - 2	222	100.0	92	41.4	157	70.7	222	100	115	51.8	188	85	161	72.5	183	82.4	222	100	197	88.7	1	2	3	1	3
UT6 - 3	222	100.0	115	51.8	136	61.3	222	100	111	50	222	100	184	82.9	201	90.5	222	100	191	86	1	2	4	1	2

4.3.1 Site Data

Groundwater depths and daily precipitation for individual monitoring gauges are graphed in (Appendix E). This representation of the hydrography demonstrates the reaction of groundwater levels to specific rainfall events at each monitoring location.

4.3.2 Climate Data

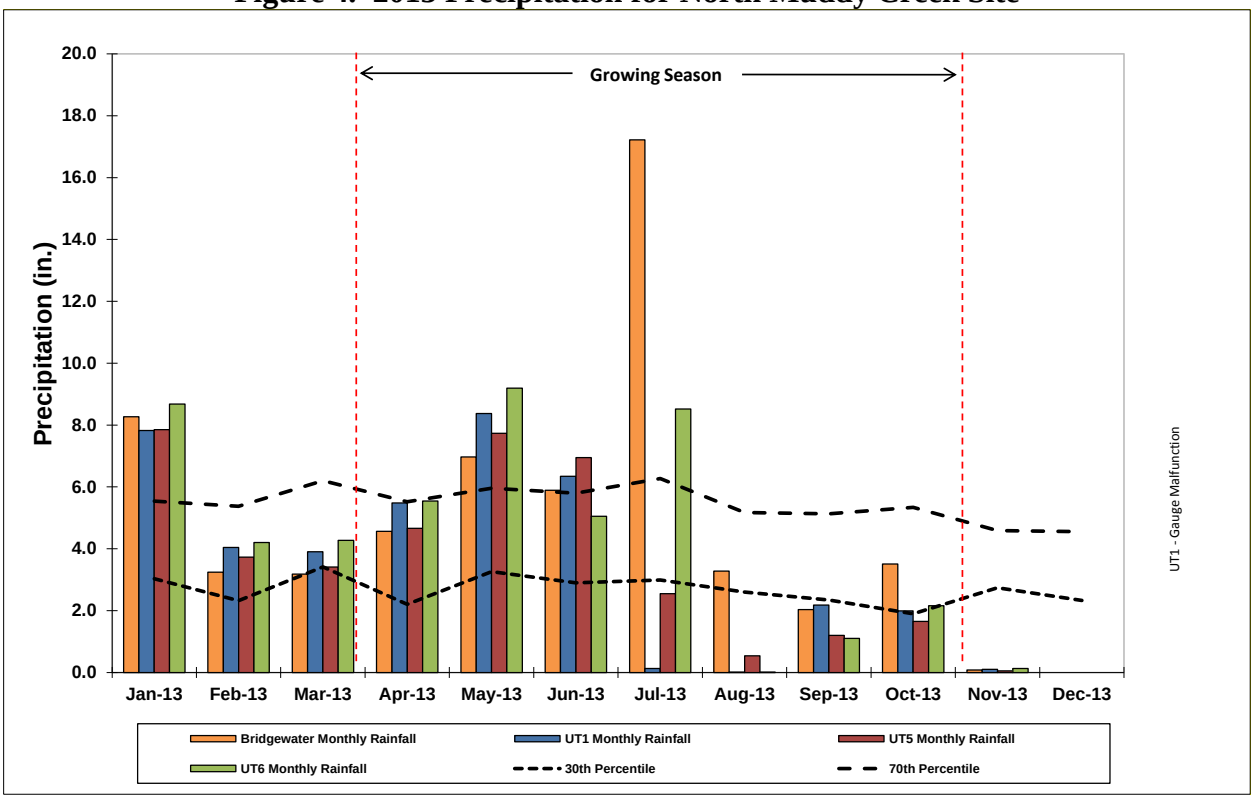
On-site monthly rainfall for 2012 was compared to historical and observed precipitation records for Burke County (Table 8 and Figure 4). Historical and observed precipitation data reported herein is from the Burke County Bridgewater hydro station (NRCS 2002; NCCRONOS 2012). The Bridgewater station recorded rainfall amounts during 2013 that exceeded the historical averages in January, February, April, May, June, and July. On-site rain gauges at UT-1, UT-2, and UT-3 recorded 40.22 inches, 37.23 inches, and 40.32 inches, respectively; which was significantly less than the Bridgewater Station (58.23 inches). However, this is likely a result of data gaps caused by rain gauge malfunctions during July and August.

Table 8. Comparison of Normal Rainfall to 2013 Observed Rainfall

Month	Average (inches)	Normal Limits (inches)		Burke Precipitation (inches)	UT1 Precipitation (inches)	UT5 Precipitation (inches)	UT6 Precipitation (inches)
		30 Percent	70 Percent				
January	4.22	3.03	5.54	8.27	7.82	7.85	8.68
February	3.95	2.32	5.37	3.24	4.04	3.73	4.20
March	4.96	3.41	6.20	3.18	3.90	3.41	4.27
April	4.08	2.20	5.52	4.56	5.48	4.66	5.54
May	4.86	3.26	5.96	6.97	8.37	7.73	9.19
June	4.52	2.90	5.80	5.89	6.34	6.95	5.05
July	4.82	2.99	6.27	17.22	0.13**	2.55**	8.51**
August	4.17	2.60	5.17	3.28	0.01**	0.54**	0.01**
September	4.24	2.34	5.13	2.03	2.18	1.20	1.10
October	3.88	1.90	5.34	3.51	1.99	1.65	2.16
November	3.85	2.74	4.59	0.08	0.10	0.05	0.13
December	3.67	2.33	4.55	---	---	---	---
Annual	---	45.23	56.10	---	---	---	---
Total	51.23	---	---	58.23	40.22	37.23	40.32

**Gauge malfunction for portion of the month.

Figure 4. 2013 Precipitation for North Muddy Creek Site



4.4 Hydrologic Conclusions

Data collected from the groundwater monitoring gauges in 2013 indicate that all of the hydrologic monitoring stations recorded saturation of the upper 12 inches of surface soils for at least 7 percent of the growing season. Hydroperiods ranged from 46 (20.7%) to 222 (100.0%) consecutive days during the growing season for the UT1 wetland area. UT1 hydroperiods ranged from 20.7 percent to 100 percent; UT2 and UT3 both had 100 percent hydroperiods at all monitoring wells. With the exception of UT1-3, all wells at UT1, UT2, and UT3 have met the hydroperiod success criteria during all five years of monitoring. UT1-3 has met four out of five monitoring years.

5.0 VEGETATION

5.1 Vegetation Success Criteria

Successful establishment of vegetation for the North Muddy Creek Stream and Wetland Restoration Project is the survival of 320 planted stems per acre by the end of Year 3 such that the site will achieve the final requirement of 260 planted stems per acre by Year 5 (USACE 2003).

5.2 Description of Species and Vegetation Monitoring

Eleven plots, or approximately 1% of all three restoration areas combined, were established within the project easement area: ten standard (10 m x 10 m) plots and one non-standard (5 m x 20 m) plot (Figure 3). Four plots were established on UT1, two on UT5, and five on UT6. Vegetation monitoring plots at UT1 comprise 1% of the restoration area for this tributary, 2.5% for UT5, and 1% for UT6, respectively. These plots were established within the planted restoration areas in accordance with the CVS-EEP Level II monitoring protocol (Lee et al. 2008). Approximately 0.025 acre in size, vegetation plots were monitored to determine the success of planted vegetation and the overall trajectory of woody plant restoration and regeneration at the project site. Plots were placed within the applicable planting zones to capture the heterogeneity of the designed vegetative communities. However, given that several planting zones were too narrow to accommodate the standard or non-standard plots, all vegetation plots included vegetation within riparian, wetland, and upland planting zones. An additional supplemental planting effort occurred in April 2011 within areas previously noted as having low stem densities. A total of 10 tree species were planted on the site (Table 9). Taxonomic nomenclature follows Weakley (2008).

Table 9. Planted Tree Species

Common Name	Scientific Name	FAC Status
Willow Oak	*Quercus phellos*	FACW-
Water Oak	*Quercus nigra*	FAC
Swamp Chestnut Oak	*Quercus michauxii*	FACW-
Cherrybark Oak	*Quercus pagoda*	FAC+
Shagbark Hickory	*Carya ovata*	FACU
River Birch	*Betula nigra*	FACW
Common Pawpaw	*Asimina triloba*	FAC
American Sycamore	*Platanus occidentalis var. occidentalis*	FACW-
Green Ash	*Fraxinus pennsylvanica*	FACW
Buttonbush	*Cepalanthus occidentalis*	OBL

5.3 Results of Vegetation Monitoring

Planted stem counts for each of the 11 vegetation monitoring plots were recorded by species (Table 10). Year 5 monitoring documented densities ranging from 324 to 931 planted stems per

acre across all vegetation plots. The average planted stem density for the entire restoration site is 644 stems per acre. With respect to each restoration reach, UT1 had an average of 617 planted stems per acre, UT5 had 850 stems per acre, and UT6 had 583 planted stems per acre (Table 11).

Table 10. Results of 2013 Vegetation Monitoring by Plot

Species	UT1				UT5		UT6				
	Plot ID				Plot ID		Plot ID				
	VP1	VP2	VP3	VP4	VP1	VP2	VP1	VP2	VP3	VP4	VP5
Asimina triloba					3				3		
Betula nigra	2						2	4	2	2	3
Carya ovata									4		
Cephalanthus occidentalis	6	10		4	8	1		8		1	9
Fraxinus pennsylvanica			1		1	2	7	2		4	2
Platanus occidentalis var. occidentalis	2	5				2	1		1	1	
Quercus michauxii	3	4	1		6	3		1	5		
Quercus nigra	1		4	2		1			2		
Quercus pagoda	1					3					
Quercus phellos	5		2	5	1	11	2	2	3		1
Diospyros virginiana			1	1							
TOTALS	**20**	**19**	**9**	**12**	**19**	**23**	**12**	**17**	**20**	**8**	**15**

Table 11. Summary of Vegetation Monitoring Results

Reach ID	Plot ID	Stems Planted	2012 Stems	Percent Survival	Stems per Acre					
					Stems Planted	2009 Year 1	2010 Year 2	2011* Year 3	2012 Year 4	2013 Year 5
UT1	VP1	26	20	77%	1,053	890	890	931	850	809
	VP2	20	19	95%	810	809	809	769	769	769
	VP3	15	9	60%	607	405	405	445	445	364
	VP4	16	13	81%	648	567	607	607	526	526
UT5	VP1	26	19	73%	1,053	891	850	890	809	769
	VP2	35	23	66%	1,417	1,215	1,255	1,214	931	931
UT6	VP1	16	12	75%	648	567	567	526	486	486
	VP2	14	17	121%	567	567	486	769	688	688
	VP3	23	20	87%	931	729	769	809	809	809
	VP4	17	8	47%	688	243	121	283	445**	324
	VP5	30	15	50%	1,215	688	486	607	486	607
					Average Density	688	659	713	659	644

Average stems per acre: 644
Range of stems per acre: 324-931
*Increases between Year 2 and Year 3 are the result of a supplemental planting effort in April 2011.
**Increases for (UT6 VP4) between Year 3 and Year 4 are the result of an additional supplemental planting effort in April 2012.

A visual estimate of herbaceous vegetation cover within the monitoring plots was conducted to assess the overall stability of the restoration site (Table 12). On average, herbaceous vegetation covered 95% of the monitored plots. Observations of herbaceous cover throughout the project area were noted during the visual assessment and are documented in Appendix A; fixed station and vegetation plot photos are included in Appendix D. Herbaceous cover on VP1 of UT6 has remained low throughout the monitoring period, possibly due to poor soil quality in the area. Herbaceous cover typically consists of annual ragweed (*Ambrosia artemisiifolia)*, orchard grass (*Dactylis glomerata*), dogfennel (*Eupatorium capillifolium*), daisy fleabane (*Erigeron annuus*), Queen Anne's lace (*Daucus carota*), arrowleaf tearthumb (*Polygonum sagittatum*), hollow-stem Joe-pyeweed (*Eutrochium fistulosum*), rush species (*Juncus sp*), blackberry (*Rubus sp*), American hog-peanut (*Amphicarpaea bracteata*), narrow-leaved sunflower (*Helianthus angustifolius*), and goldenrod (*Solidago sp.*).

Table 12. Estimated Herbaceous Total Percent Cover

Reach ID	Plot ID	Estimated Herbaceous Cover (%)
UT1	VP1	100%
	VP2	100%
	VP3	100%
	VP4	100%
UT5	VP1	95%
	VP2	100%
UT6	VP1	60%
	VP2	90%
	VP3	99%
	VP4	100%
	VP5	100%

Commonly encountered woody volunteer species have also been documented throughout the five-year monitoring period (Table 13). Volunteer plant recruitment was highest at UT 1 with an average of 2,478 stems per acre followed by UT5 with an average of 2,246 stems per acre. Some of the most common recruits include American sycamore, green ash, Eastern box elder, red maple, and yellow poplar.

Table 13. Volunteer Tree Species

Reach ID	Common Name	Scientific Name	FAC Status
UT1	Eastern Box Elder	*Acer negundo var. negundo*	FACW
	Eastern Red Maple	*Acer rubrum var. rubrum*	FAC
	Buttonbush	*Cephalanthus occidentalis*	OBL
	American Persimmon	*Diospyros virginiana*	FAC
	Green Ash	*Fraxinus pennsylvanica*	FACW
	Yellow Poplar	*Liriodendron tulipifera var. tulipifera*	FACU
	American Sycamore	*Platanus occidentalis var. occidentalis*	FACW-
	Black Cherry	*Prunus serotina var. serotina*	FACU
	Willow Oak	*Quercus phellos*	FACW-
	Smooth Sumac	*Rhus glabra*	UPL
	Common Elderberry	*Sambucus canadensis*	FACW-
UT5	Tag Alder	*Alnus serrulata*	FACW
	River Birch	*Betula nigra*	FACW
	Sweet Gum	*Liquidambar styraciflua*	FAC+
	Yellow Poplar	*Liriodendron tulipifera var. tulipifera*	FACU
	American Sycamore	*Platanus occidentalis var. occidentalis*	FACW-
	Swamp Chestnut Oak	*Quercus michauxii*	FACW-
	Eastern Red Maple	*Acer rubrum var. rubrum*	FACW
	American hornbeam	*Carpinus caroliniana*	FAC
UT6	Eastern Red Maple	*Acer rubrum var. rubrum*	FAC
	Tag Alder	*Alnus serrulata*	FACW
	Buttonbush	*Cephalanthus occidentalis*	OBL
	Yellow Poplar	*Liriodendron tulipifera var. tulipifera*	FACU
	Pine	*Pinus sp.*	FACU
	American Sycamore	*Platanus occidentalis var. occidentalis*	FACW-
	Willow Oak	Quercus phellos	FACW-
	Smooth Sumac	*Rhus glabra*	UPL
	Swamp rose	*Rosa palustris*	OBL
	Black willow	*Salix nigra*	OBL
	Silky Dogwood	*Cornus amomum*	FACW+
	Black Cherry	*Prunus serotina var. serotina*	FACU

5.4 Vegetation Observations and Conclusions

Overall, planted stems are surviving well at the North Muddy Creek Stream and Wetland Restoration Site. Approximately 63 percent of planted stems for the entire restoration site had

good or excellent vigor scores, with only 8% of planted stems identified as dead or missing. Common buttonbush (*Cephalanthus occidentalis*) was affected the most by damage; primarily a result of vine strangulation.

All of the vegetation monitoring plots are on target to meet the final success criterion of 260 stems per acre (Appendix A).

Intensive control efforts were initiated in Year 3 to control invasive non-native plants such as multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), sericea lespedeza (*Lespedeza cuneata*), privet (*Ligustrum sp*.), and kudzu (*Pueraria montana var. lobata*) within the easement boundary (Appendix A). Follow up treatments were also administered during 2012 and 2013. Appendix A shows the areas in which invasive exotic plants were treated during Year 4 and 5. Appendix F contains the progress report that provides a summary of the invasive exotic management activities conducted during this period.

6.0 CONCLUSIONS AND RECOMENDATIONS

- Morphologic data and observations of stream conditions at the site indicate generally stable conditions between as-built year and Year 5 monitoring. Areas of concern are relatively minor and restricted to isolated cases of pool aggradation and riffle scour. As a whole, morphological data and visual assessment of the project suggest that the restored streams are stable and reaching a desired state of equilibrium. Furthermore, data indicates that the project is meeting established criteria specified in the North Muddy Restoration Plan (EBX 2007).

- Data collected from the groundwater monitoring gauges in 2013 indicate that all of the hydrologic monitoring stations recorded saturation of the upper 12 inches of surface soils for at least 7 percent of the growing season. Hydroperiods ranged from 46 (20.7%) to 222 (100.0%) consecutive days during the growing season for the UT1 wetland area. UT1 hydroperiods ranged from 20.7 percent to 100 percent; UT2 and UT3 both had 100 percent hydroperiods at all monitoring wells. With the exception of UT1-3, all wells at UT1, UT2, and UT3 have met the hydroperiod success criteria during all five years of monitoring. UT1-3 has met four out of five monitoring years.

- Average density of planted stems for the entire restoration site for 2013 was found to be 644 stems per acre. UT1 had an average of 617 planted stems per acre, UT5 had 850, and UT6 had 583 planted stems per acre. Due to the additional supplemental planting of UT6 in April 2012, vegetation plot 4 indicates an increase in survivability between years. All of the vegetation monitoring plots meeting the final success criteria of 260 planted stems per acre. The average stem density across the whole site for planted and volunteer combined is approximately 2,321 stems per acre. Lastly, a final treatment of remaining populations of invasive exotic plants was administered in 2013.

7.0 REFERENCES

EBX (Environmental Banc & Exchange). 2007. Restoration Plan – North Muddy Creek Site. McDowell and Burke Counties, North Carolina. Project ID No. 16-D06115.

EBX (Environmental Banc & Exchange). 2009. North Muddy Creek Mitigation Report. McDowell and Burke Counties, North Carolina. Project ID No. 16-D06115.

Harrelson, Cheryl, C. Rawlins and J. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Rocky Mountain Forest and Range Experiment Station. USDA Forest Service. Fort Collins, CO.

Lee, M.T., Peet, R.K., Roberts, S.D. and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. http://cvs.bio.unc.edu/methods.htm

NCCRONOS (North Carolina Climate Retrieval and Observations Network of the Southeast Database). State Climate Office of North Carolina. Version 2.7.2. Bridgewater Hydro (311081). http://www.nc-climate.ncsu.edu/cronos/ Accessed November 2012.

NRCS (Natural Resources Conservation Service). Accessed October 2012. Climate Analysis for Wetlands by County. http://www.wcc.nrcs.usda.gov/climate/wetlands.html

NRCS (Natural Resource Conservation Service). 2002 National Climate and Water Center. Bridgewater WETS Station at Burke County – NC 5340 (1971-2000). FIPS/County (FIPS). http://www.wcc.nrcs.usda.gov/ftpref/support/climate/wetlands/nc/37023.txt Accessed October 2012.

USACE (U.S. Army Corps of Engineers). 1987. Corps of Engineers Wetlands Delineation Manual. Tech report Y-87-1. AD/A176.

USACE (U.S. Army Corps of Engineers). 2003. Stream Mitigation Guidelines. U.S. Army Corps of Engineers – Wilmington District, U.S. Environmental Protection Agency, North Carolina Wildlife Resources Commission, and North Carolina Department of Environment and Natural Resources Division of Water Quality. Wilmington, North Carolina.

Weakley, A.S. 2008. Flora of the Carolinas, Virginia, Georgia, northern Florida, and surrounding areas. Working draft of 7 April 2008. University of North Carolina Herbarium (NCU). North Carolina Botanical Garden. University of North Carolina at Chapel Hill.

APPENDIX A

Current Condition Plan View

SHEET 2 (UT1)

UT1-UPPER

UT1-LOWER

SHEET 3 (UT5)

SHEET 4 (UT6)

SHEET 5 (UT2 & UT4)

UT4

UT2

Prepared for: EBX

Prepared by: EQUINOX ENVIRONMENTAL

SCALE 1" = 500'

250 125 0 250 500 750

LEGEND

- Easement Boundary
- Stream
- Longitudinal Profile Reach
- Longitudinal Profile Begin/End
- Cross Section
- Crest Gauge
- Rain Gauge
- Photo Point
- Constructed Riffle
- A-Vane
- Cross Vane
- J-Hook
- Log Sill
- Root Wad
- Control Point

Notes:

1. Coordinate System is State Plane Feet NAD 83.
2. Base map information provided by Kinley Horn. Dwg title: ACAD-01835600-BASE3.dwg
3. Aerial photography is McDowell County 2010

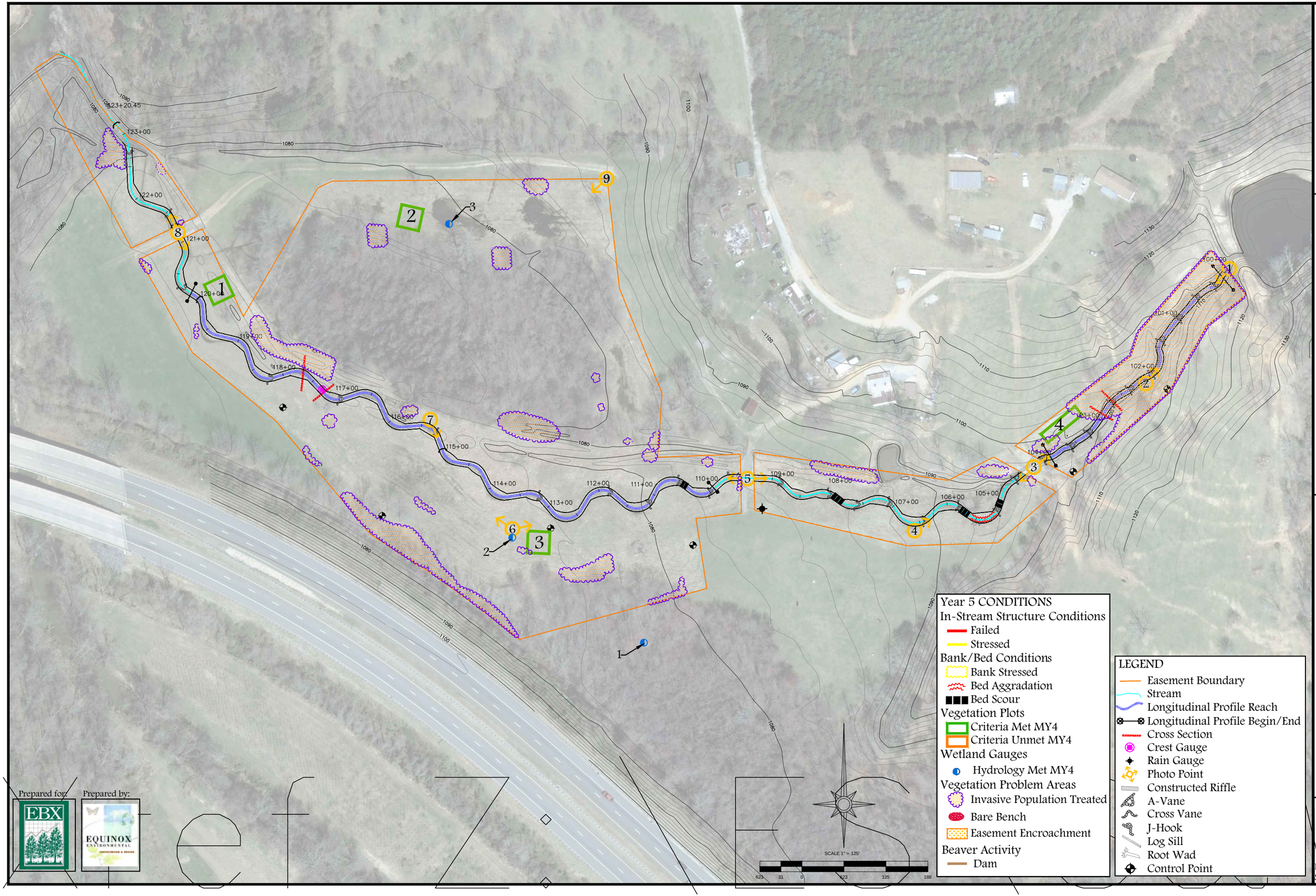
North Muddy Creek

Burke & McDowell Counties, NC

Current Condition Plan View
Draft
Year 5 Monitoring-2013
OVERVIEW

Sheet:
1
of 5

Date:
Septemberl 2013



Year 5 CONDITIONS

In-Stream Structure Conditions
- Failed
- Stressed

Bank/Bed Conditions
- Bank Stressed
- Bed Aggradation
- Bed Scour

Vegetation Plots
- Criteria Met MY4
- Criteria Unmet MY4

Wetland Gauges
- Hydrology Met MY4

Vegetation Problem Areas
- Invasive Population Treated
- Bare Bench
- Easement Encroachment

Beaver Activity
- Dam

LEGEND
- Easement Boundary
- Stream
- Longitudinal Profile Reach
- Longitudinal Profile Begin/End
- Cross Section
- Crest Gauge
- Rain Gauge
- Photo Point
- Constructed Riffle
- A-Vane
- Cross Vane
- J-Hook
- Log Sill
- Root Wad
- Control Point

Prepared for: EBX

Prepared by: EQUINOX ENVIRONMENTAL

Notes:
1. Coordinate System is State Plane Feet NAD 83.
2. Base map information including stationing provided by Kimley Horn.
   Dwg title: ACAD-018336001-BASE3.dwg
3. Aerial photography is McDowell County 2010

North Muddy Creek

Burke & McDowell Counties, NC

Current Condition Plan View
Draft
Year 5 Monitoring-2013
UT1

Sheet: 2 of 5

Date: September 2013

North Muddy Creek

Burke & McDowell Counties, NC

Current Condition Plan View
Draft
Year 5 Monitoring-2013
UT5

Notes:
1. Coordinate System is State Plane Feet NAD 83.
2. Base map information including stationing provided by Kimley Horn.
   Dwg title: ACAD-018336001-BASE3.dwg
3. Aerial photography is McDowell County 2010

Sheet:
3
of 5

Date:
September 2013

Prepared for: EBX

Prepared by: EQUINOX ENVIRONMENTAL

SCALE 1" = 150'
75 38 0 75 150 225

Year 5 CONDITIONS
In-Stream Structure Conditions
- Failed
- Stressed

Bank/Bed Conditions
- Bank Stressed
- Bed Aggradation
- Bed Scour

Vegetation Plots
- Criteria Met MY4
- Criteria Unmet MY4

Wetland Gauges
- Hydrology Met MY4

Vegetation Problem Areas
- Invasive Population Treated
- Bare Bench
- Easement Encroachment

Beaver Activity
- Dam

LEGEND
- Easement Boundary
- Stream
- Longitudinal Profile Reach
- Longitudinal Profile Begin/End
- Cross Section
- Crest Gauge
- Rain Gauge
- Photo Point
- Constructed Riffle
- A-Vane
- Cross Vane
- J-Hook
- Log Sill
- Root Wad
- Control Point

North Muddy Creek

Burke & McDowell Counties, NC

Current Condition Plan View
Draft
Year 5 Monitoring-2013
UT6

Notes:
1. Coordinate System is State Plane Feet NAD 83.
2. Base map information including stationing provided by Kinley Horn.
   Dwg title: ACAD-018336001-BASE3.dwg
3. Aerial photography is McDowell County 2010

Sheet: 4 of 5

Date: September 2013

Prepared for: EBX

Prepared by: EQUINOX ENVIRONMENTAL

Year 5 CONDITIONS
In-Stream Structure Conditions
- Failed
- Stressed

Bank/Bed Conditions
- Bank Stressed
- Bed Aggradation
- Bed Scour

Vegetation Plots
- Criteria Met MY4
- Criteria Unmet MY4

Wetland Gauges
- Hydrology Met MY4

Vegetation Problem Areas
- Invasive Population Treated
- Bare Bench
- Easement Encroachment

Beaver Activity
- Dam

LEGEND
- Easement Boundary
- Stream
- Longitudinal Profile Reach
- Longitudinal Profile Begin/End
- Cross Section
- Crest Gauge
- Rain Gauge
- Photo Point
- Constructed Riffle
- A-Vane
- Cross Vane
- J-Hook
- Log Sill
- Root Wad
- Control Point

SCALE 1" = 100'

UT2

UT4

Notes:
1. Coordinate System is State Plane Feet NAD 83
2. Base map information provided by Kinley Horn.
   Dwg title: ACAD-0183.6601-BASE3.dwg
3. Aerial photography is McDowell County 2010

North Muddy Creek

Burke & McDowell Counties, NC

Current Condition Plan View
Draft
Year 5 Monitoring-2013
UT2 & UT4

Sheet:
5
of 5

Date:
September 2013

Prepared for: EBX

Prepared by: EQUINOX ENVIRONMENTAL

SCALE 1" = 200'

100 50 0 100 200' 300

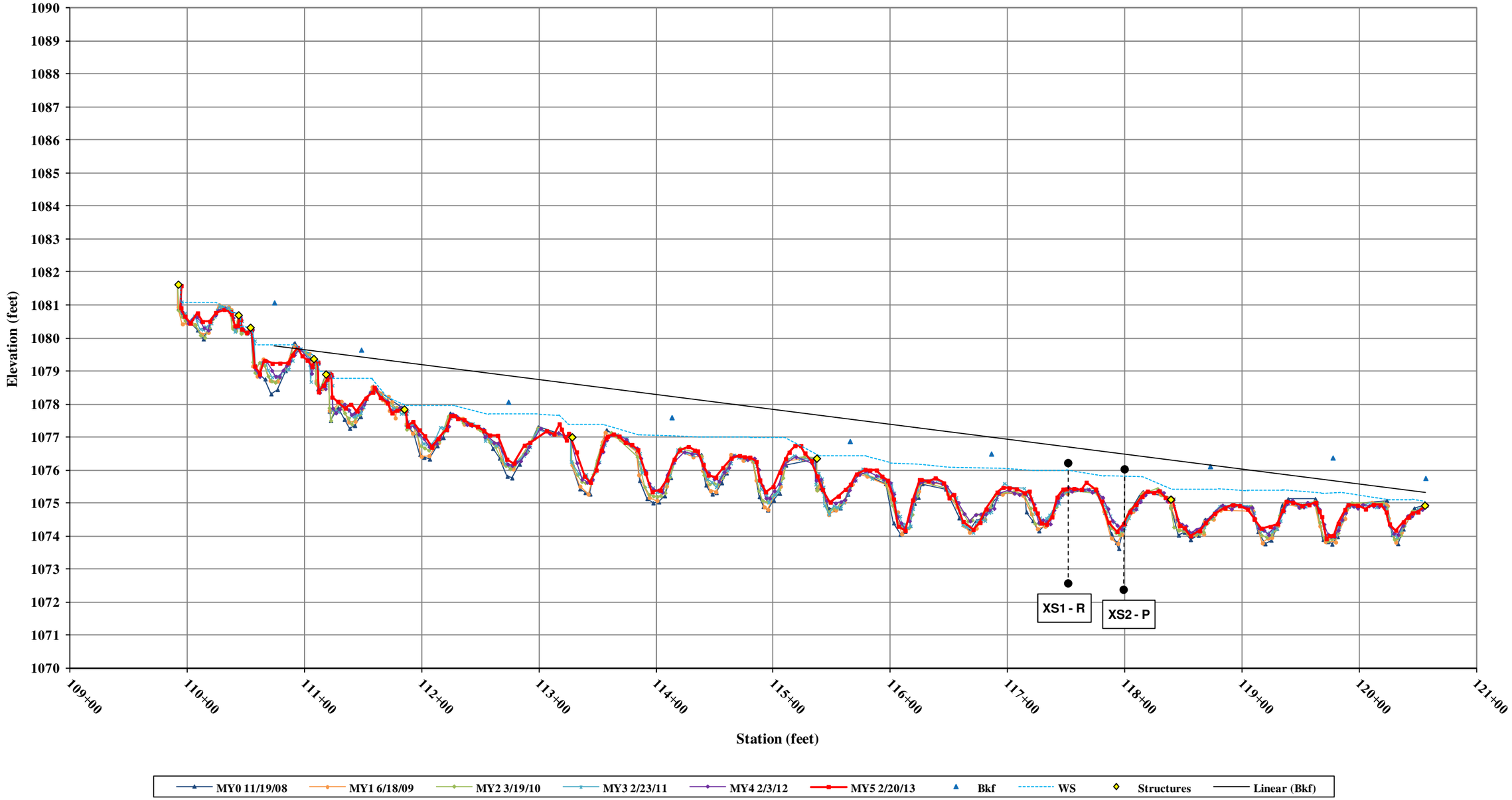
LEGEND
- Easement Boundary
- Preservation Stream
- Photo Point
- Invasive Population Treated

APPENDIX B

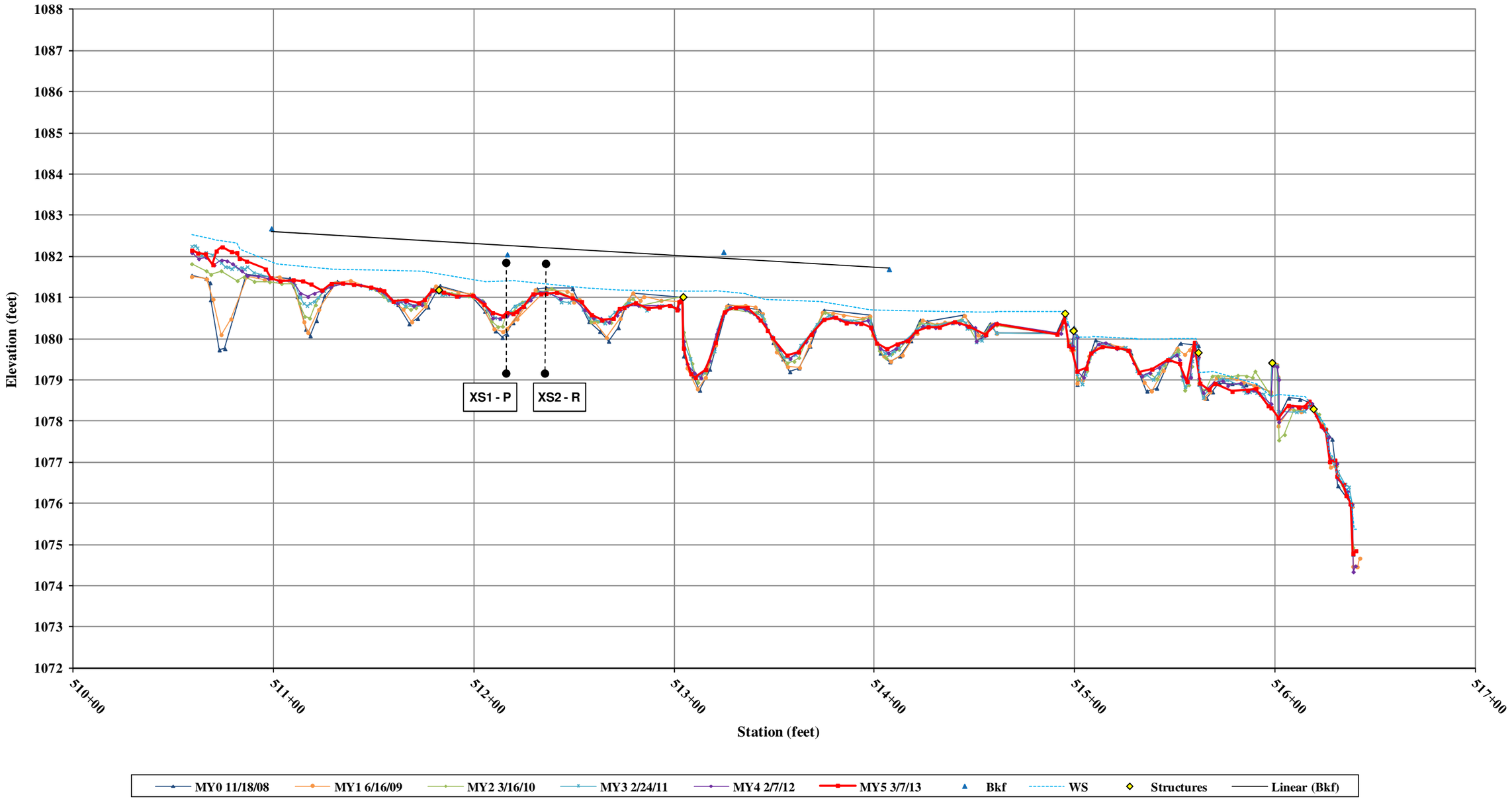
2013 Longitudinal Profile, Cross-Section, and Substrate Data

North Muddy Creek UT1-Upper
Longitudinal Profile

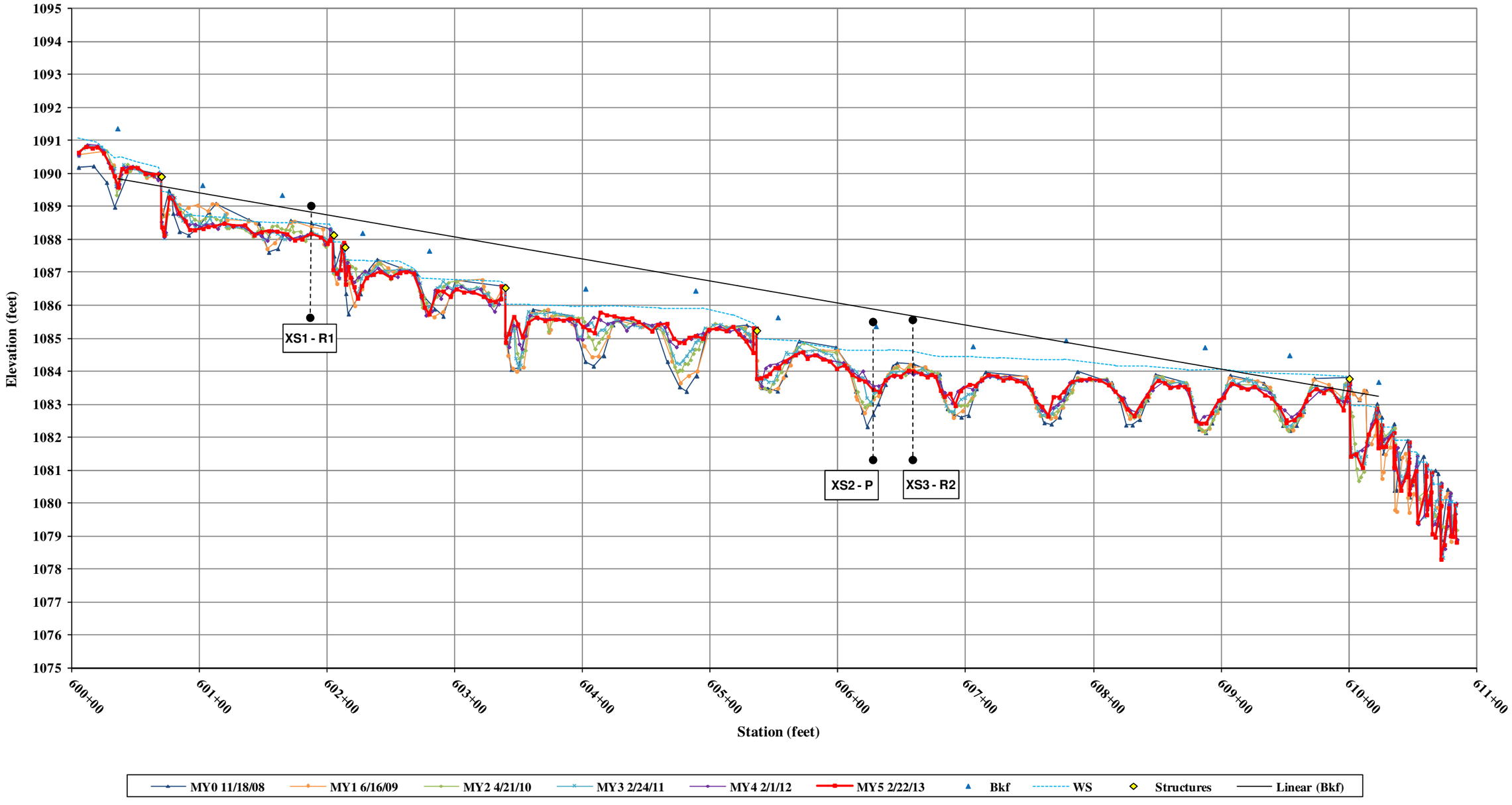
North Muddy Creek UT1-Lower
Longitudinal Profile



North Muddy Creek UT5
Longitudinal Profile



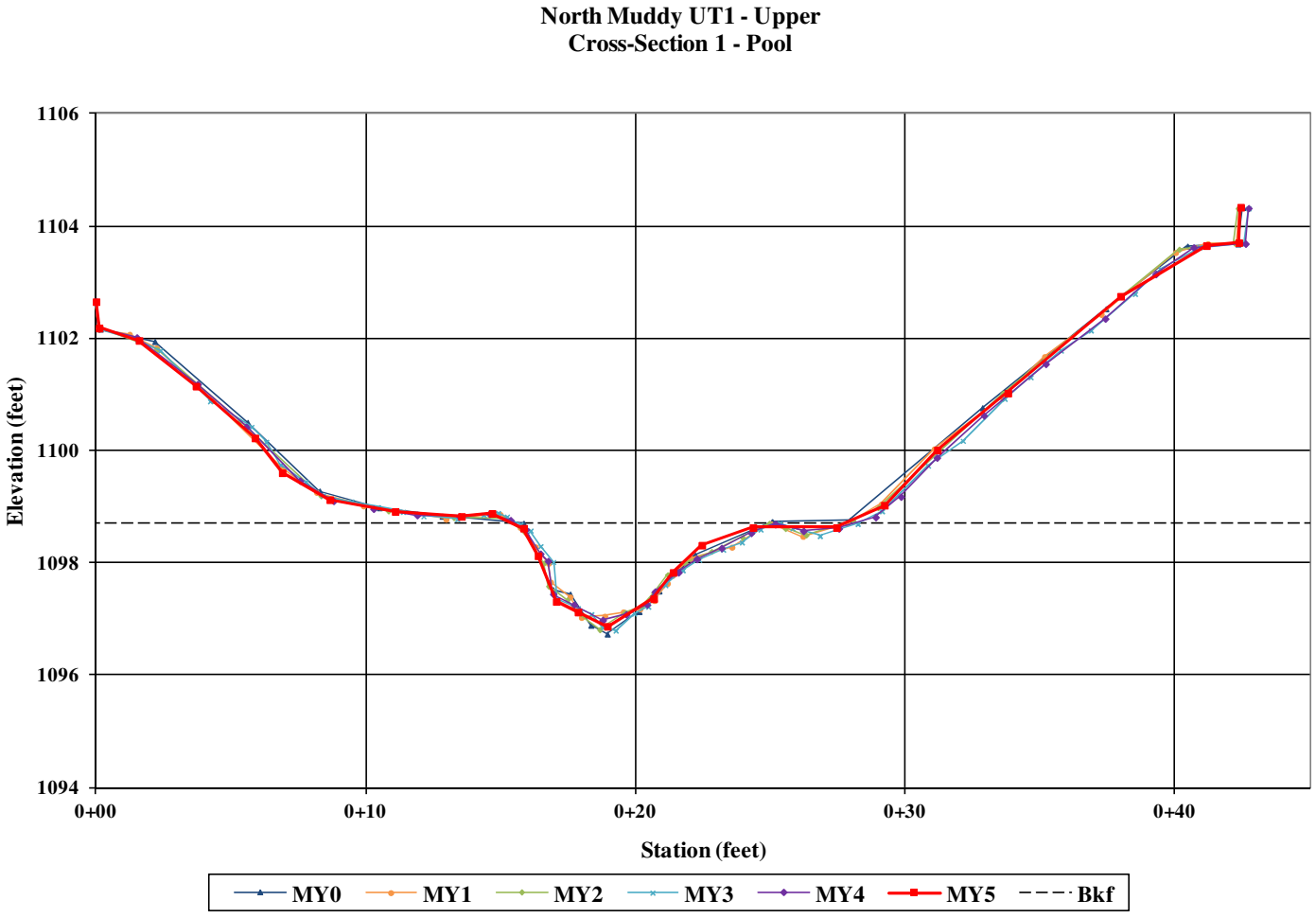
North Muddy Creek UT6
Longitudinal Profile



UT1 Upper – Cross-Section 1 – Pool

Looking at Left Bank

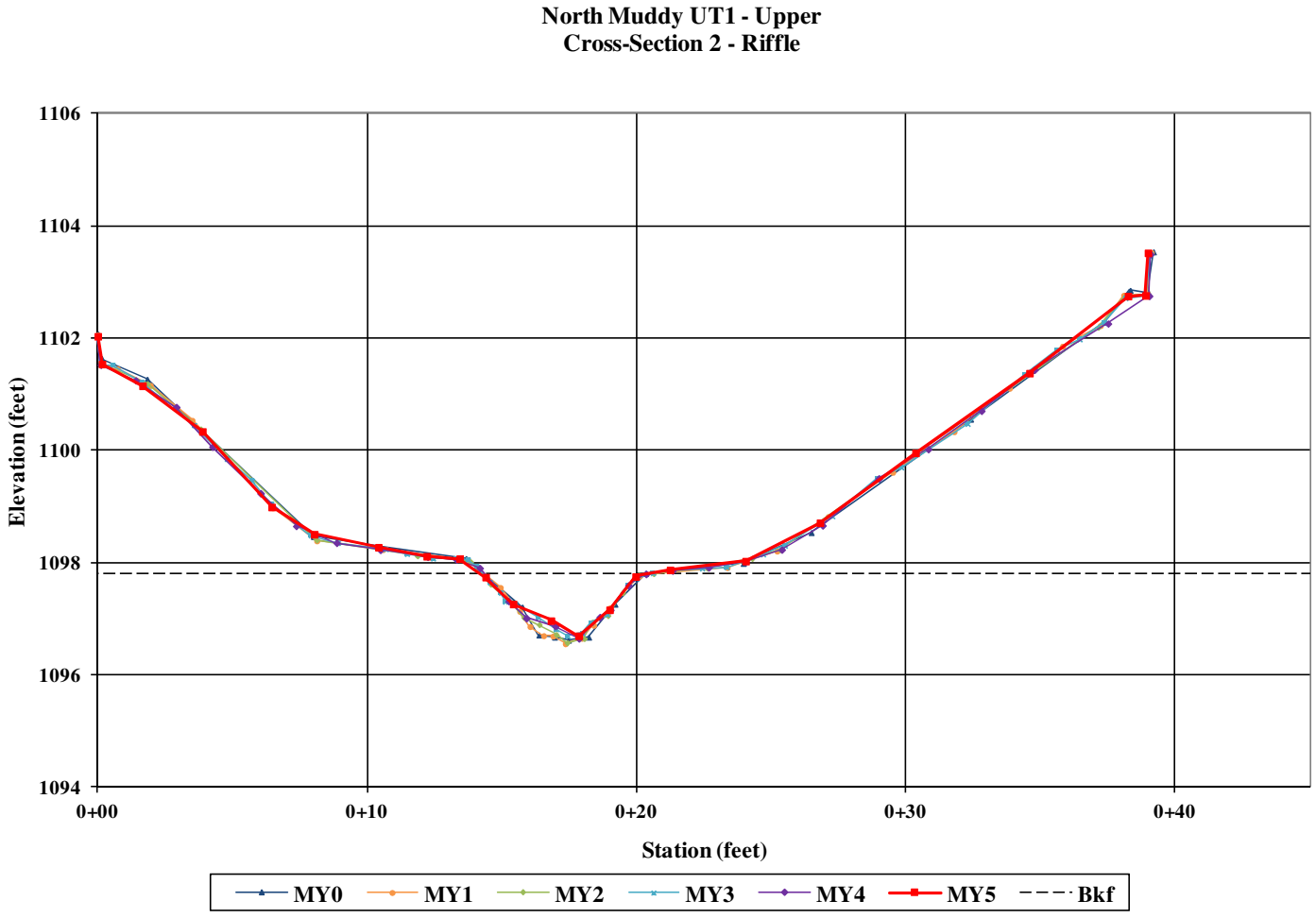
Looking at Right Bank



UT1 Upper – Cross-Section 2 – Riffle

Looking at Left Bank

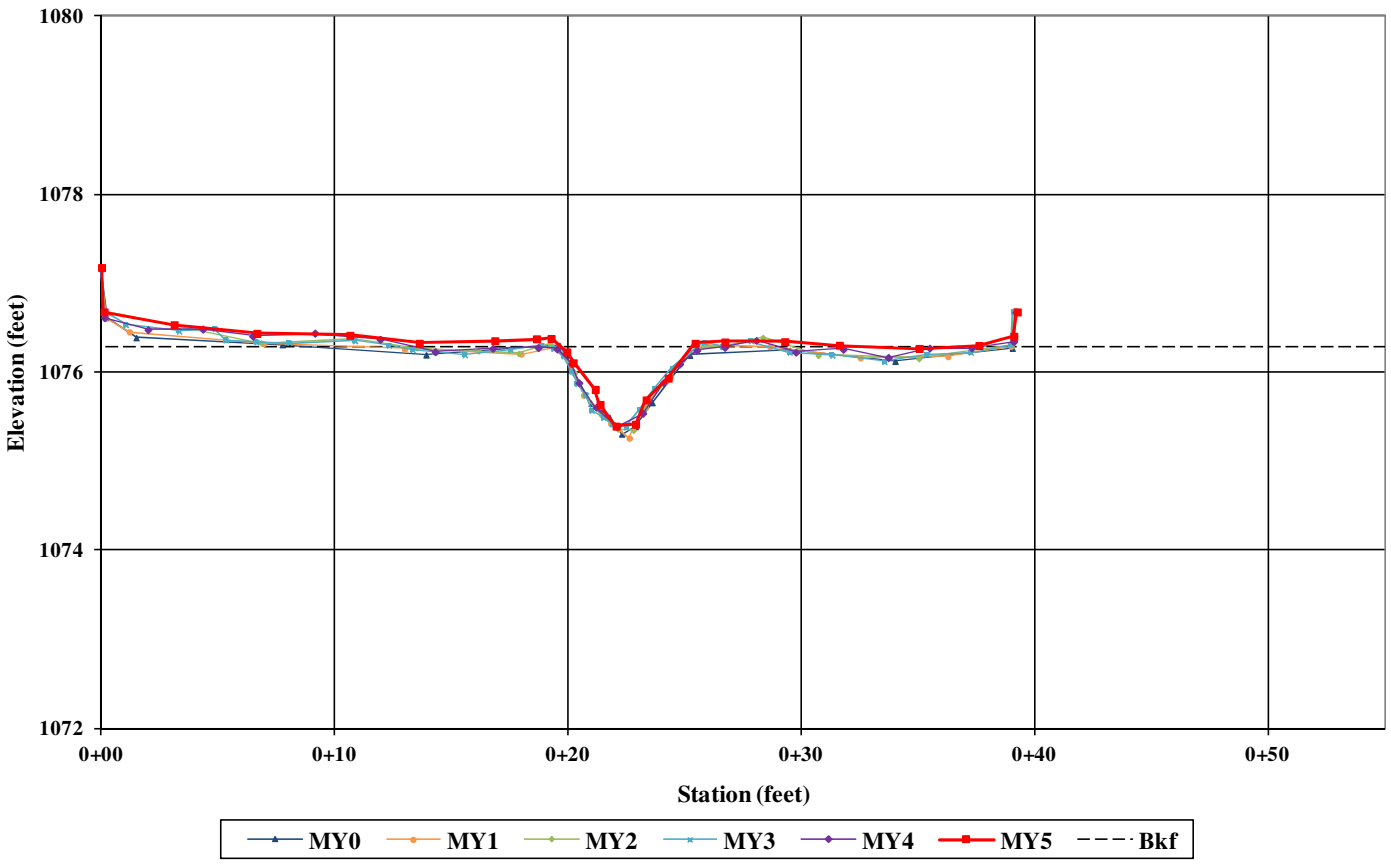
Looking at Right Bank



UT1 Lower – Cross-Section 1 – Riffle

Looking at Left Bank

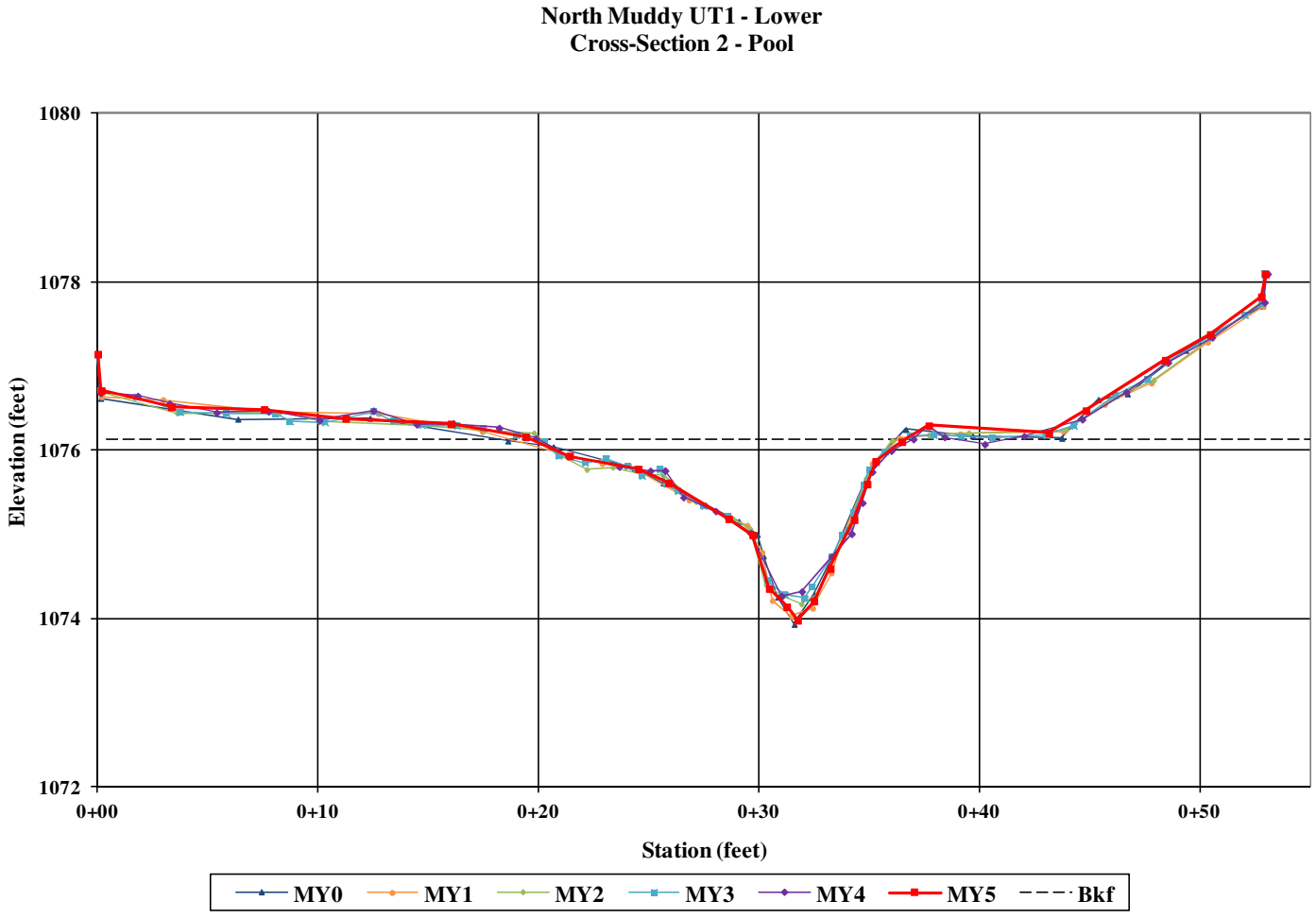
Looking at Right Bank



UT1 Lower – Cross-Section 2 – Pool

Looking at Left Bank

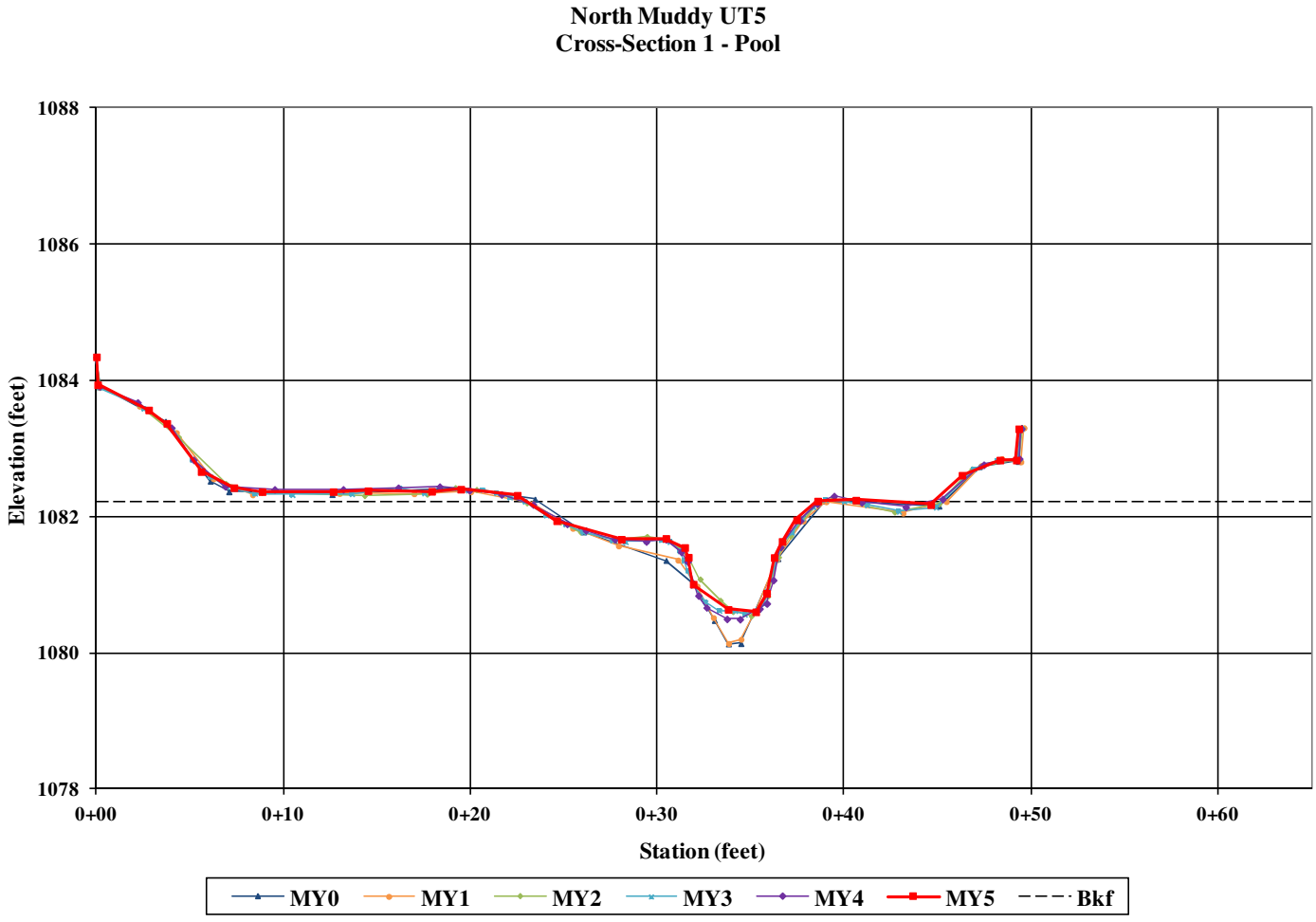
Looking at Right Bank



UT5 – Cross-Section 1 – Pool

Looking at Left Bank

Looking at Right Bank

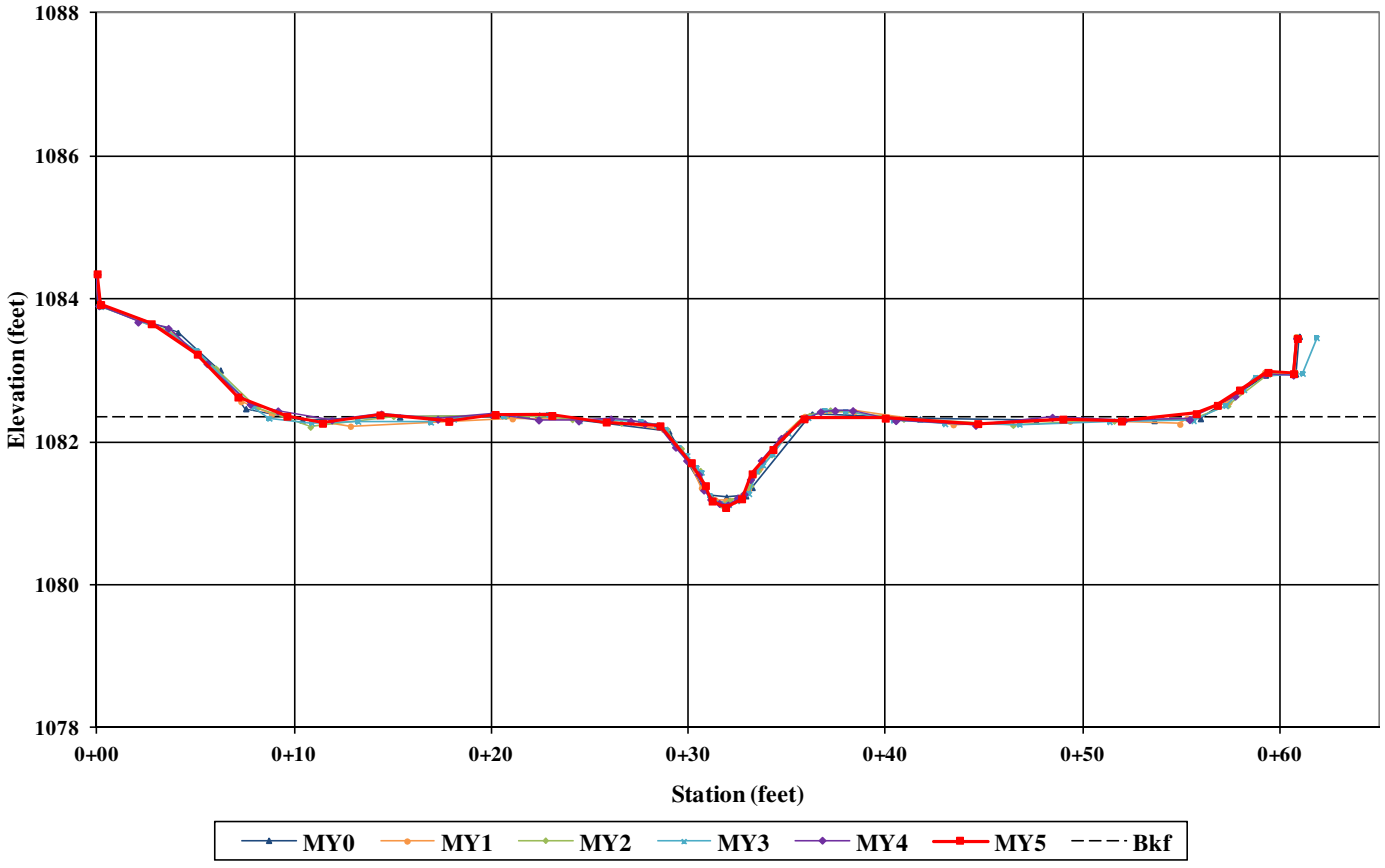


UT5 – Cross-Section 2 – Riffle

Looking at Left Bank

Looking at Right Bank

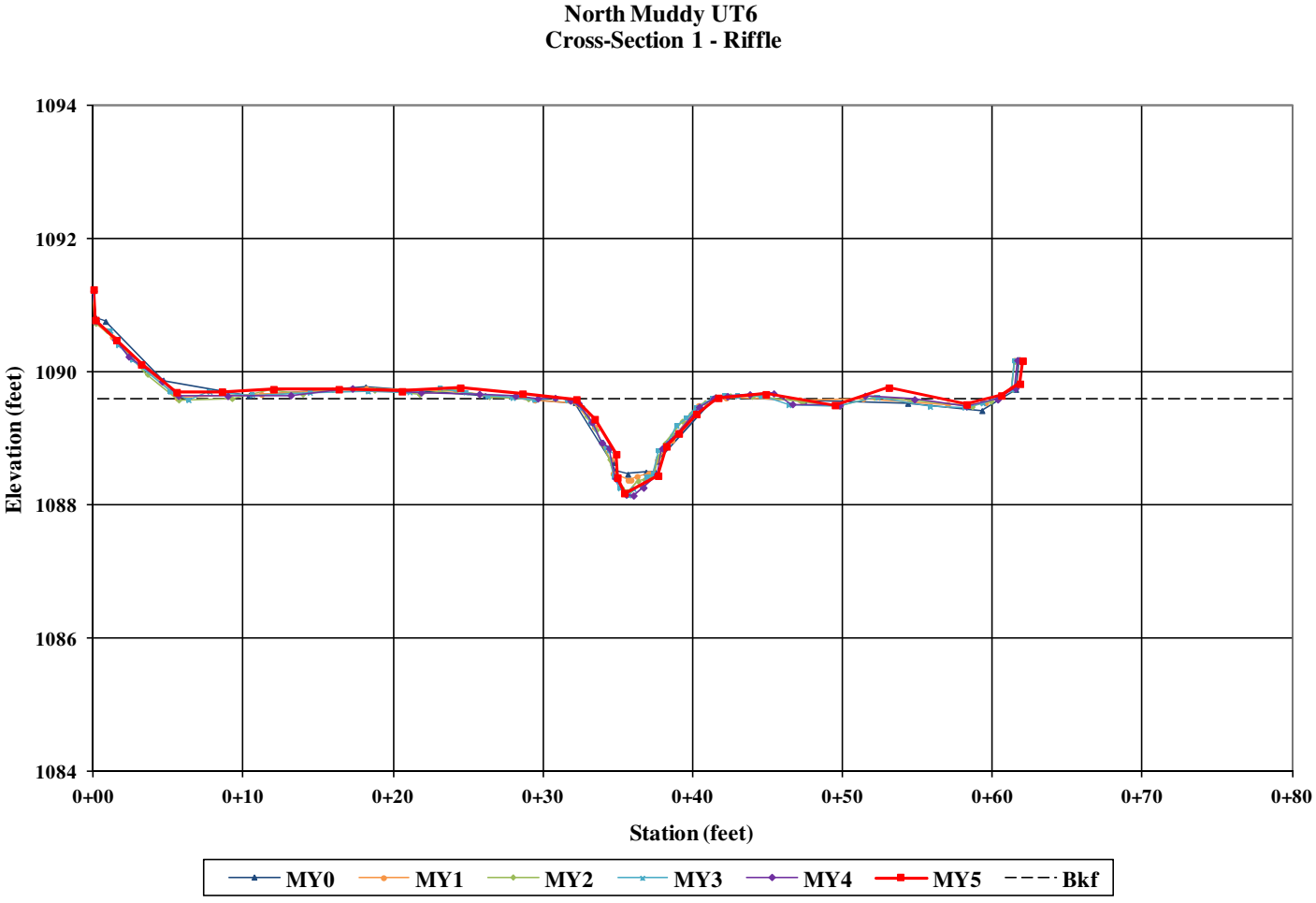
North Muddy UT5
Cross-Section 2 - Riffle



UT6 – Cross-Section 1 – Riffle

Looking at Left Bank

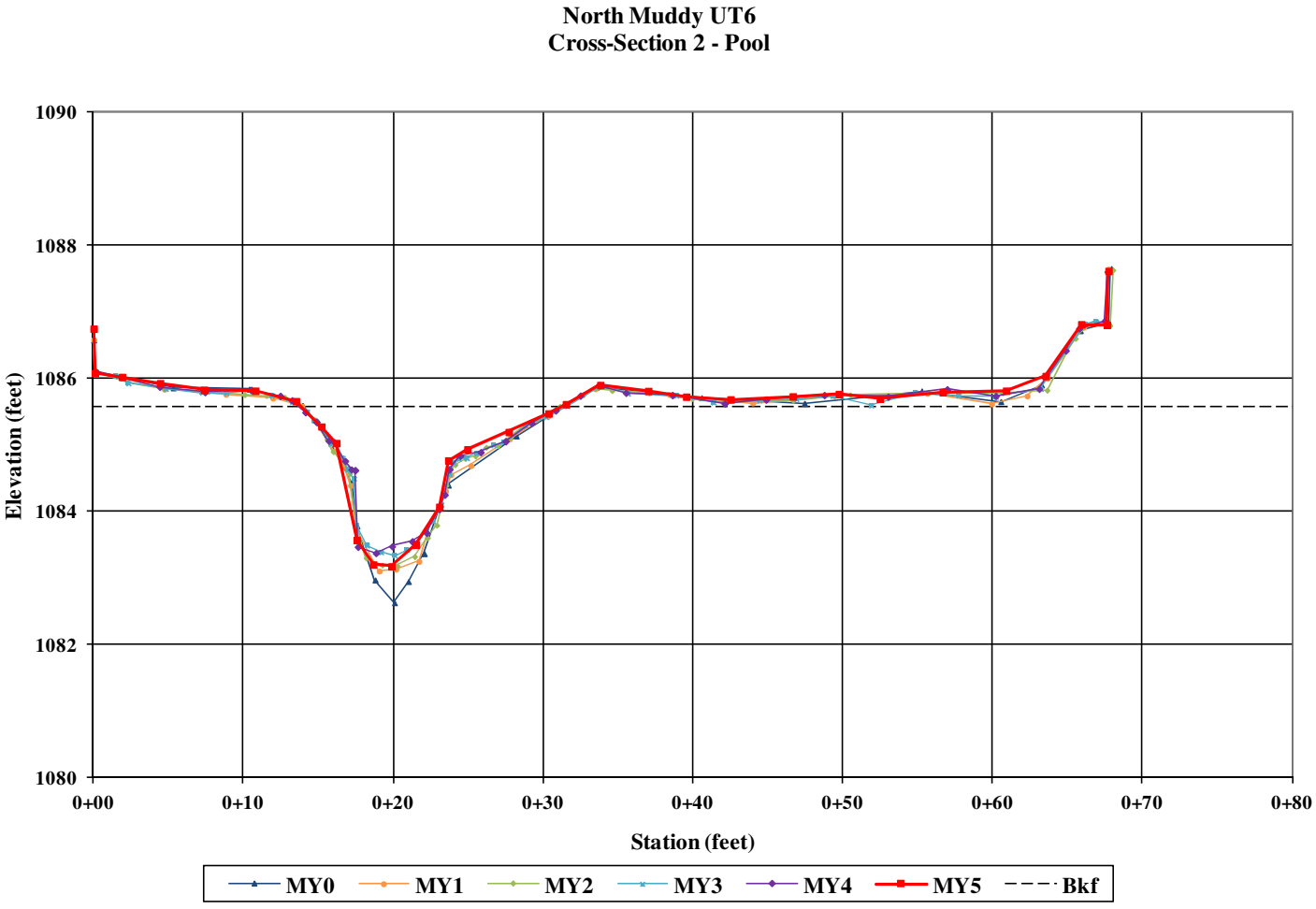
Looking at Right Bank



UT6 – Cross-Section 2 – Pool

Looking at Left Bank

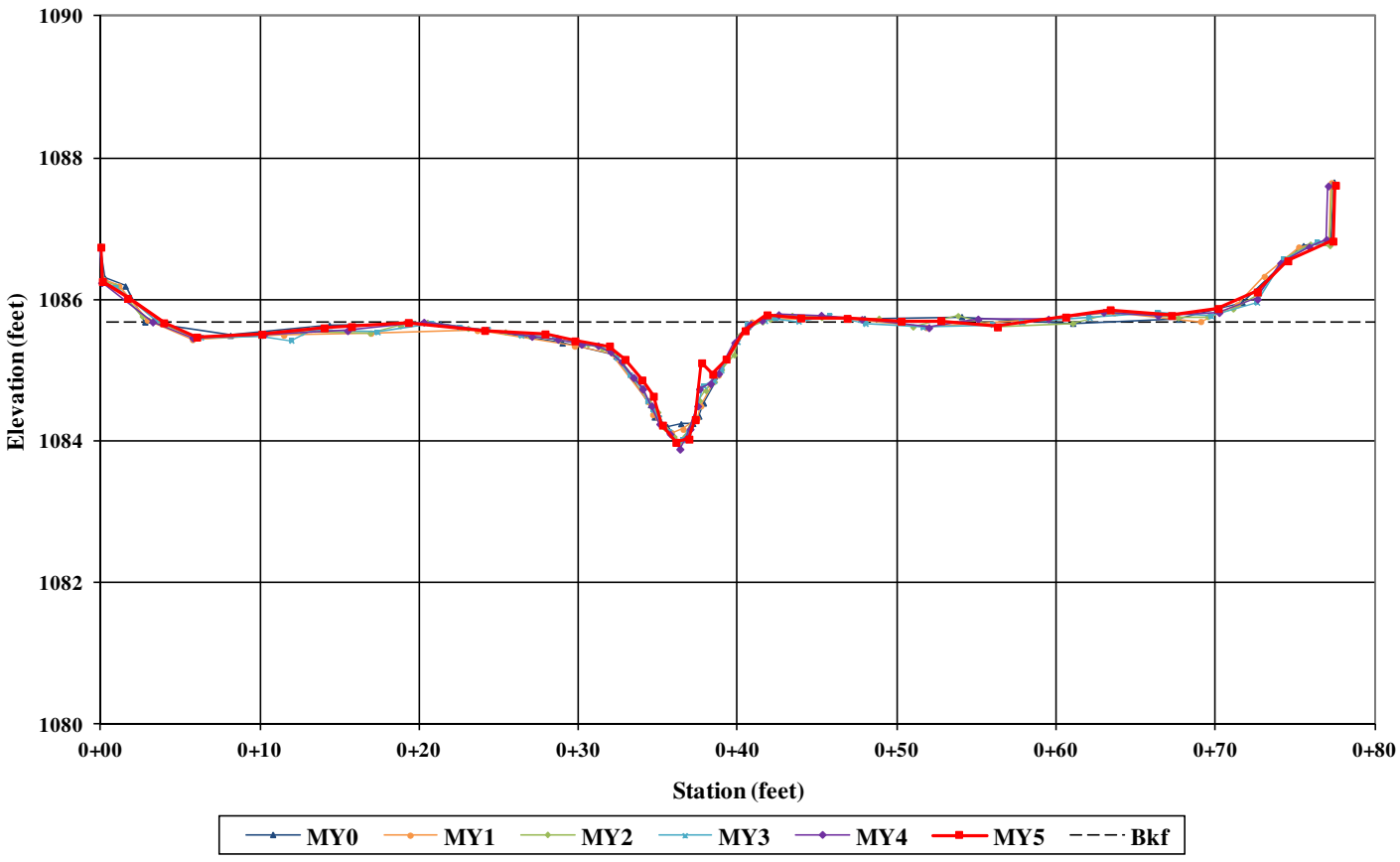
Looking at Right Bank



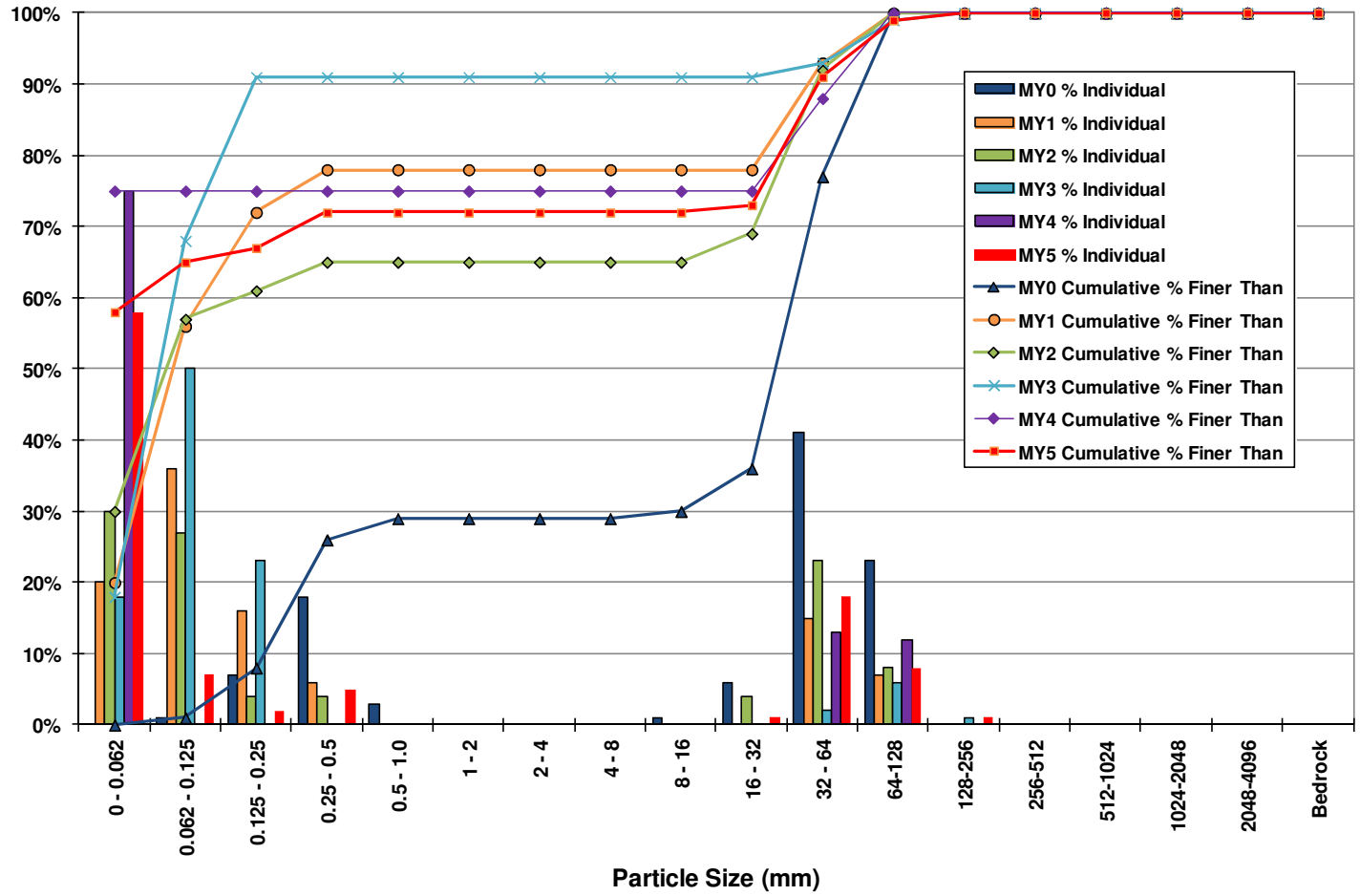
UT6 – Cross-Section 3 – Riffle

Looking at Left Bank

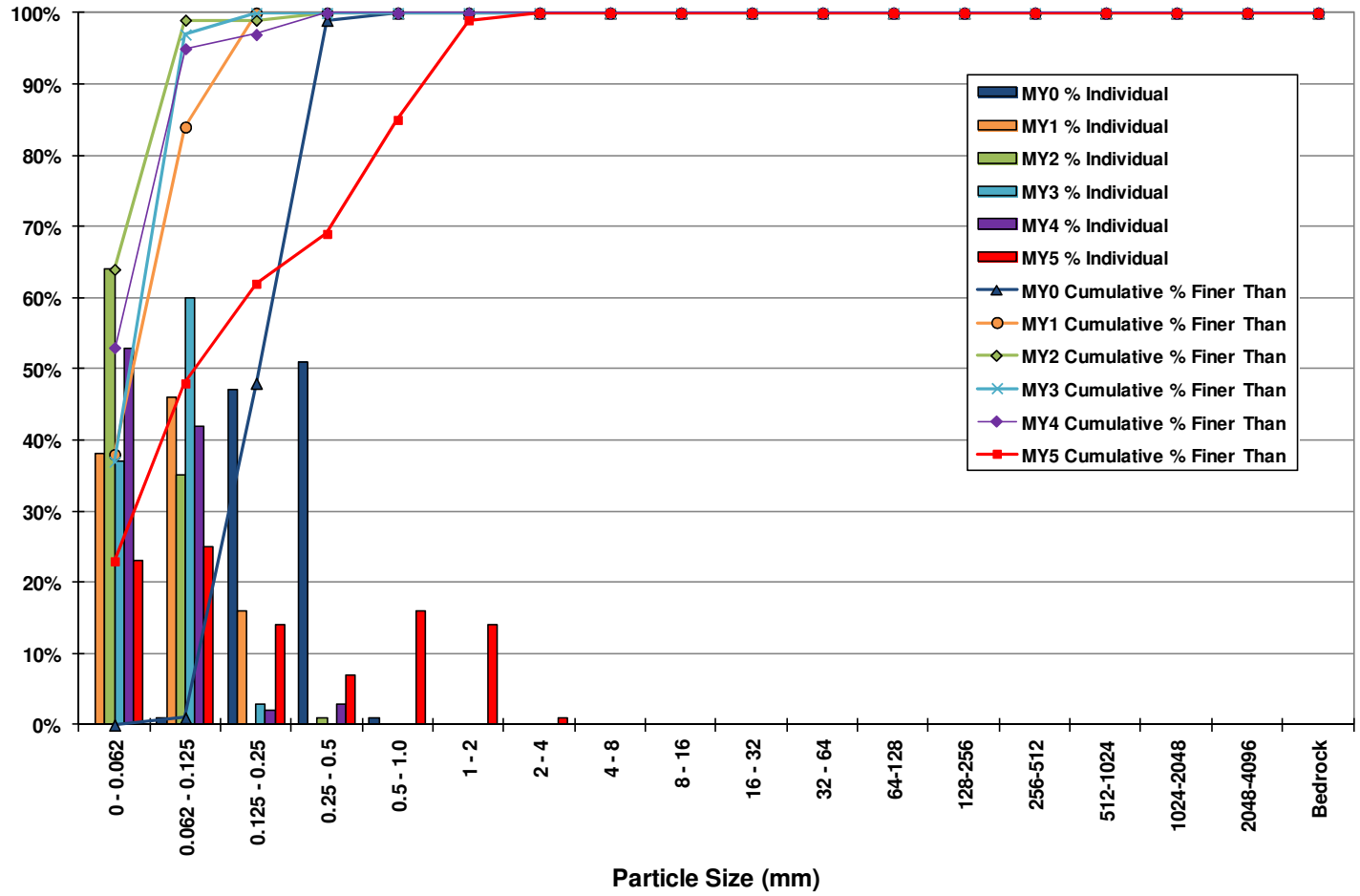
Looking at Right Bank



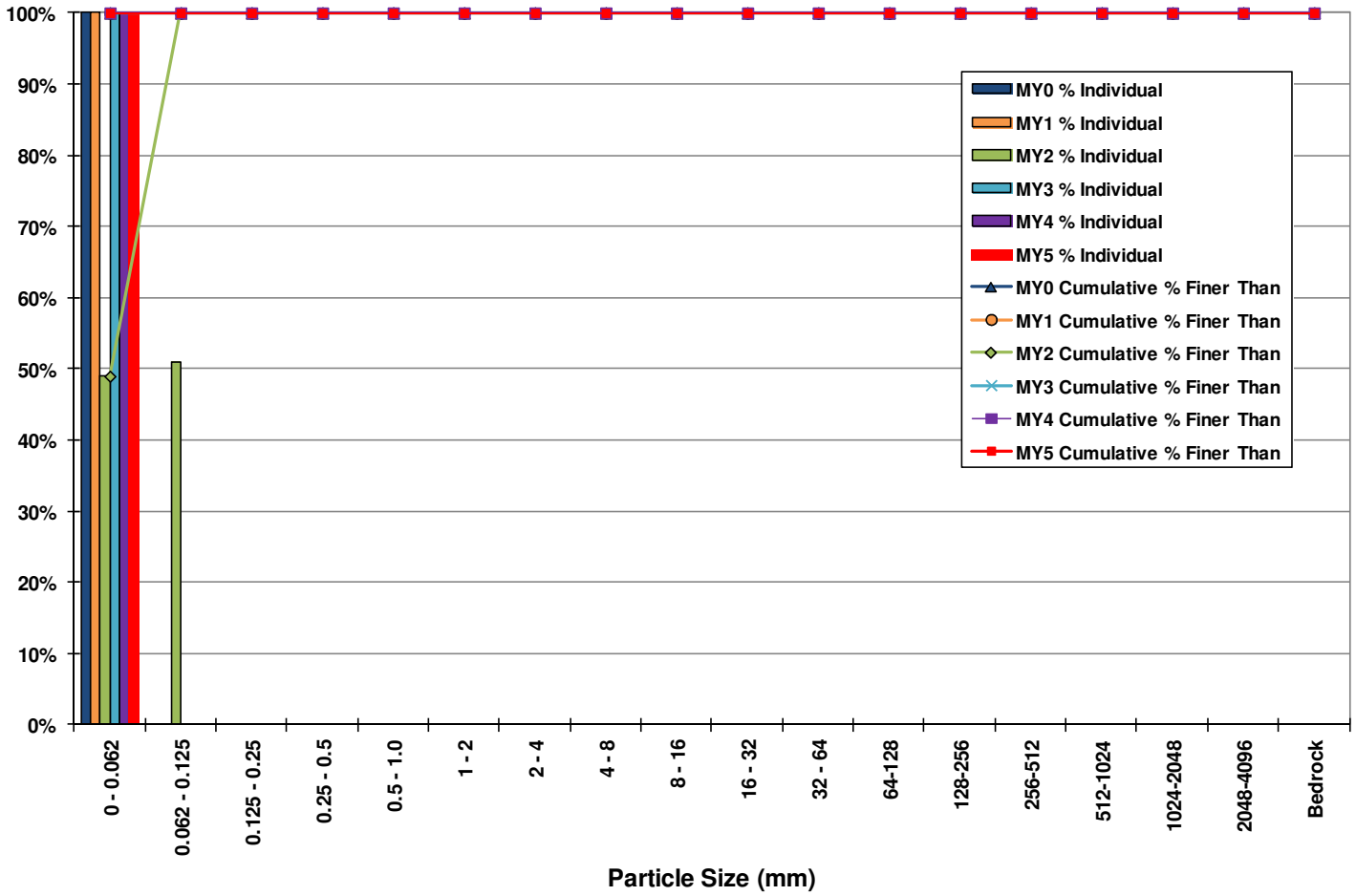
UT1 Upper – Cross Section 1 – Pool
Pebble Count



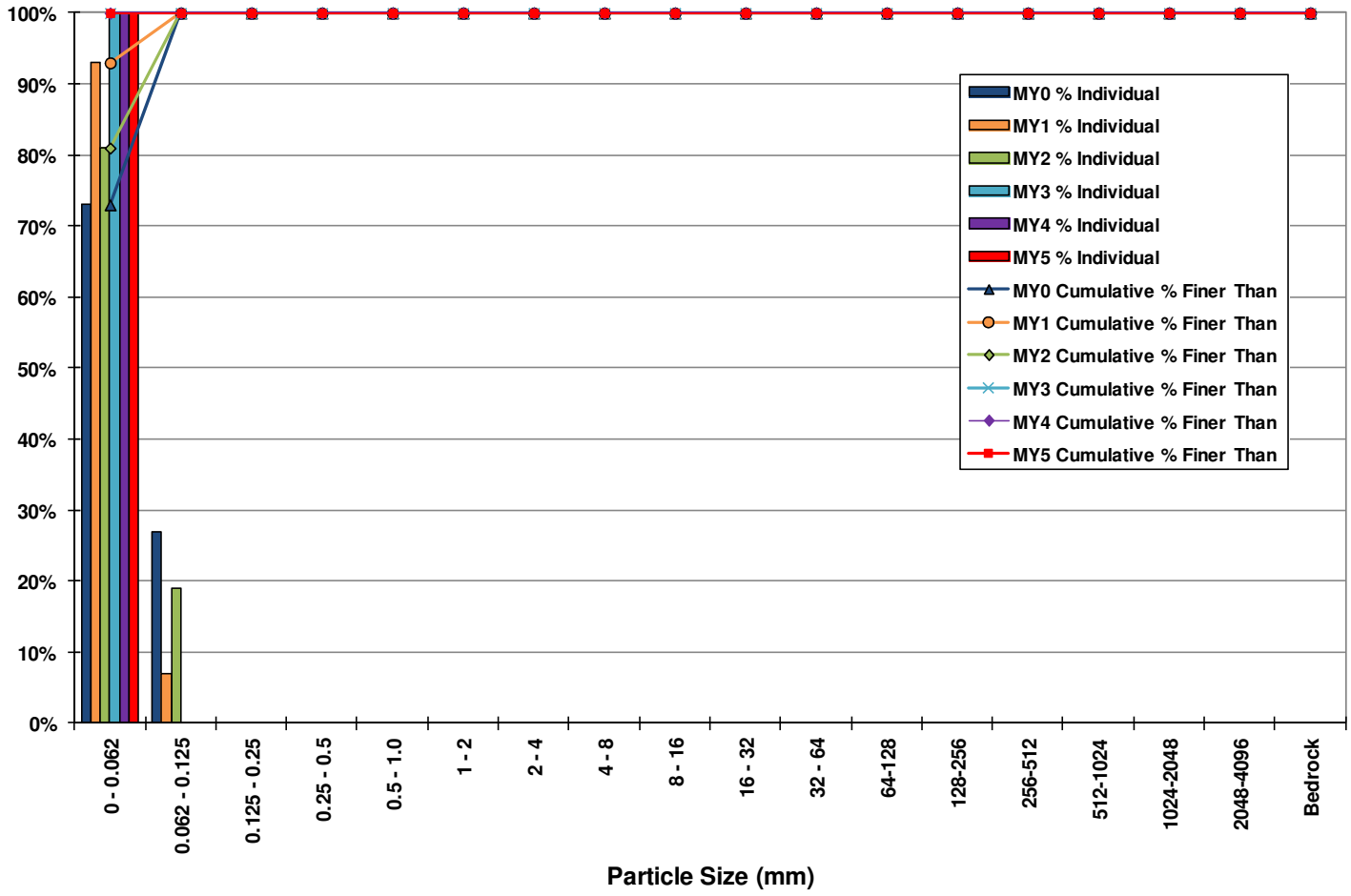
UT1 Upper – Cross Section 2 – Riffle
Pebble Count



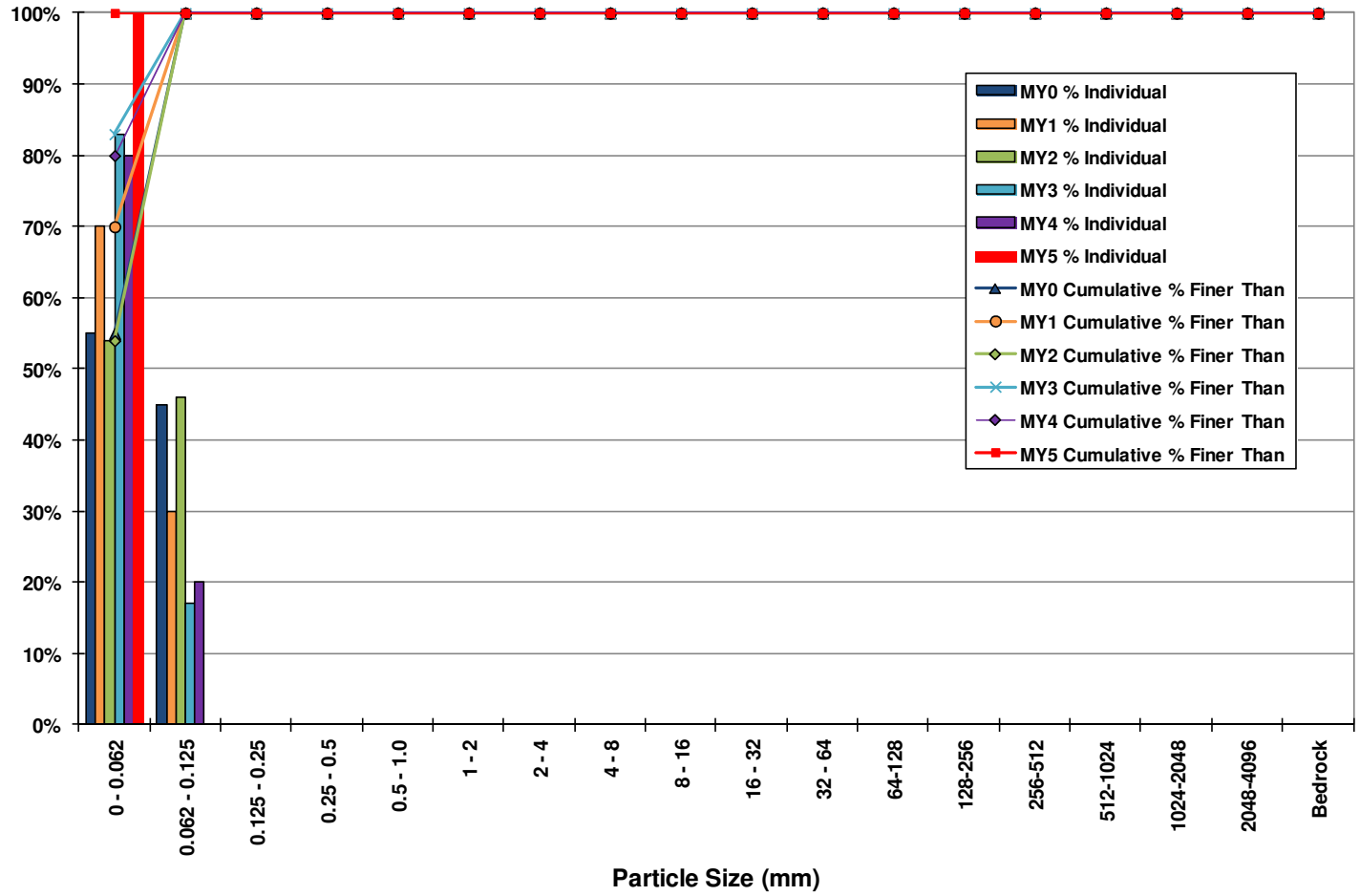
UT1 Lower – Cross Section 1 – Riffle
Pebble Count



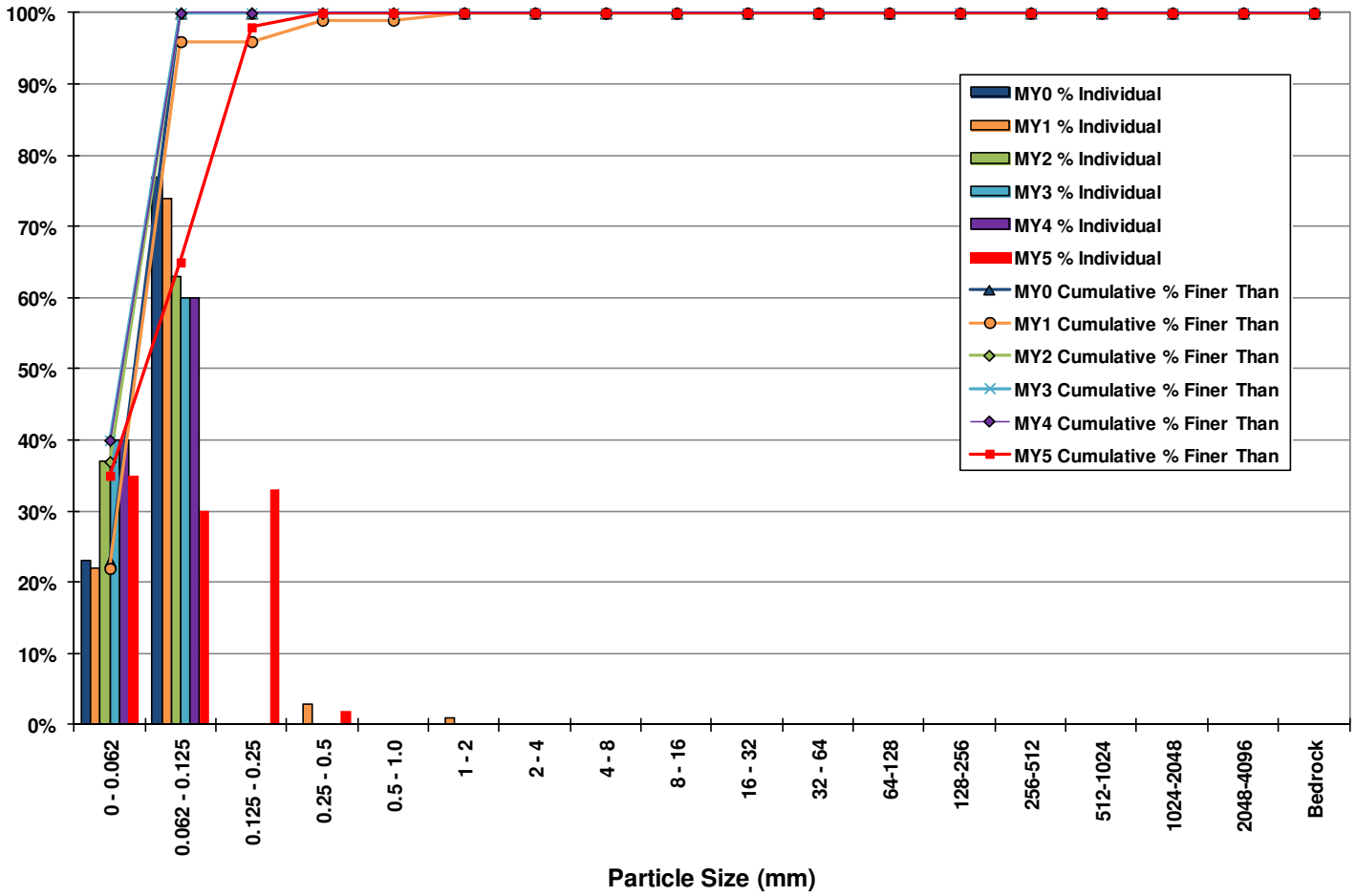
UT1 Lower – Cross Section 2 – Pool
Pebble Count



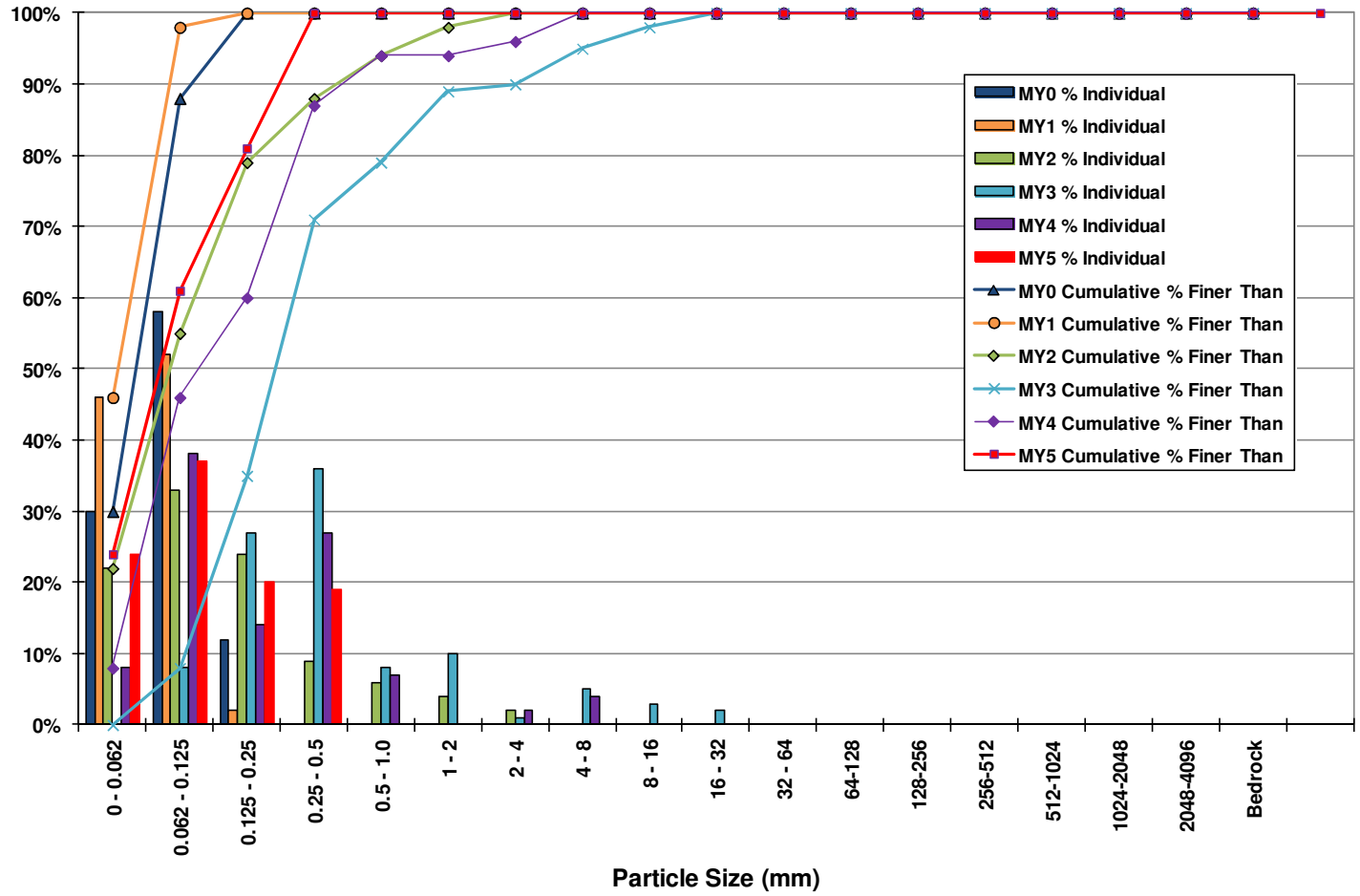
UT5 – Cross Section 1 – Pool
Pebble Count



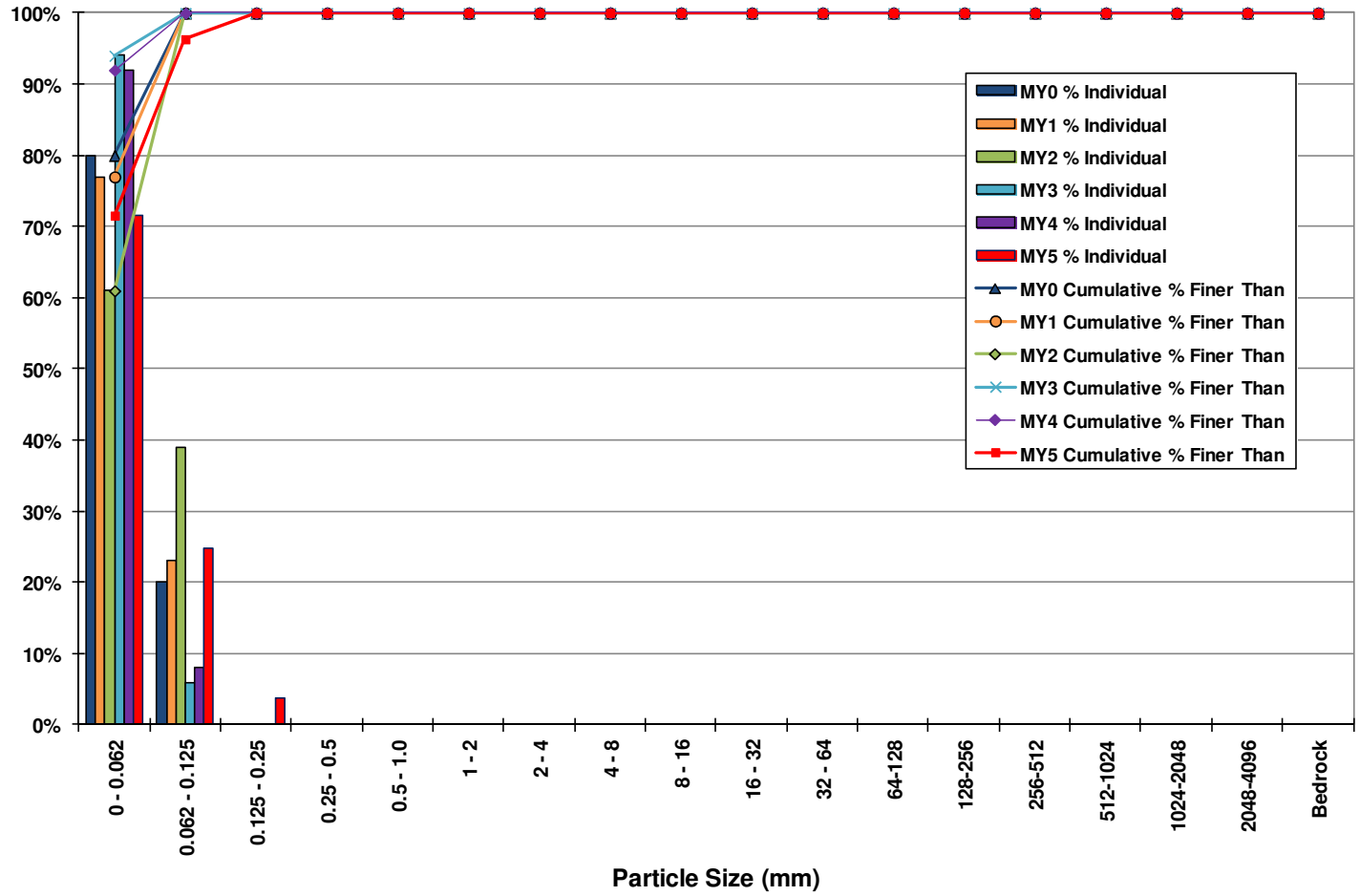
UT5 – Cross Section 2 – Riffle
Pebble Count



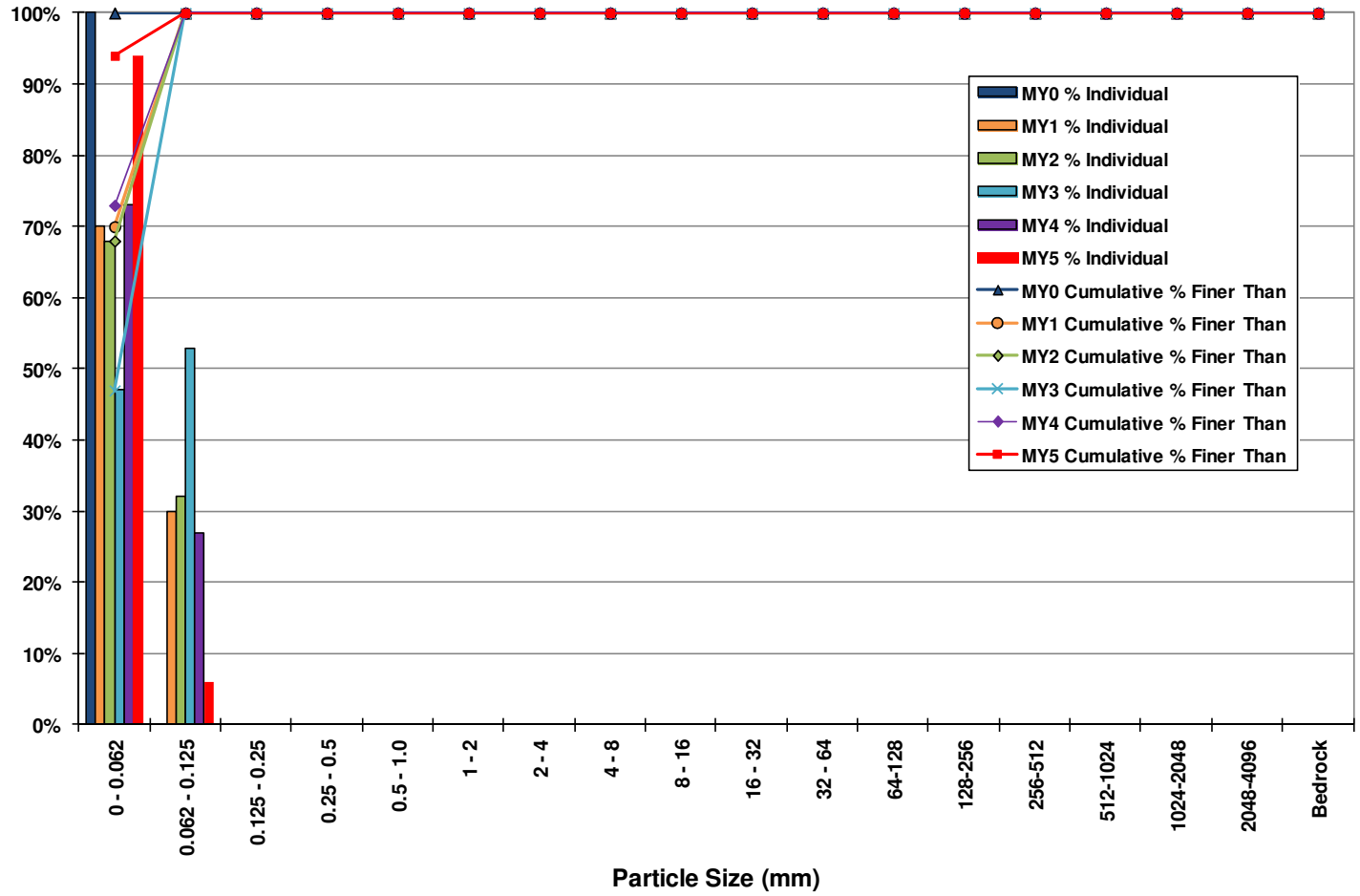
UT6 – Cross Section 1 – Riffle
Pebble Count



UT6 – Cross Section 2 – Pool
Pebble Count



UT6 – Cross Section 3 – Riffle
Pebble Count



APPENDIX C

2013 Morphologic Monitoring Parameters

Unnamed Tributary 1 – Upper Reach												
Parameter	**Cross Section 1 Pool**						**Cross Section 2 Riffle**					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
BF Width (ft)	9.2	9.3	9.5	9.6	9.2	8.5	6.0	5.8	5.8	5.6	5.8	5.6
Floodprone Width (ft)	23.4	24.1	23.7	23.8	23.8	23.8	21.0	21.5	20.5	20.3	20.6	20.0
BF Cross Sectional Area (ft^2)	9.0	8.7	8.8	9.0	8.7	8.6	4.2	4.2	3.9	3.5	3.6	3.4
BF Mean Depth (ft)	1.0	0.9	0.9	0.9	0.9	1.0	0.7	0.7	0.7	0.6	0.6	0.6
BF Max Depth (ft)	2.0	1.7	1.9	1.9	1.7	1.8	1.2	1.2	1.2	1.1	1.1	1.1
Width/Depth Ratio	9.3	9.9	10.3	10.3	9.9	8.4	8.6	8.0	8.5	8.9	9.3	9.1
Entrenchment Ratio	2.5	2.6	2.5	2.5	2.6	>2.8	3.5	3.7	3.6	3.6	3.5	3.6
Wetted Perimeter (ft)	10.3	10.2	10.5	10.8	10.2	9.5	6.6	6.4	6.3	6.1	6.3	6.0
Hydraulic Radius (ft)	0.9	0.9	0.8	0.8	0.8	0.9	0.6	0.7	0.6	0.6	0.6	0.6

Unnamed Tributary 1 – Lower Reach												
Parameter	**Cross Section 1 Riffle**						**Cross Section 2 Pool**					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
BF Width (ft)	5.5	6.2	6.4	6.5	6.0	5.7	15.7	15.0	16.7	17.2	17.3	16.9
Floodprone Width (ft)	>50.0	>50.0	>50.0	>50.0	>50.0	>50.0	>50.0	>50.0	>50.0	>50.0	>50.0	>50.0
BF Cross Sectional Area (ft^2)	3.1	3.1	3.1	3.0	3.0	2.7	13.2	13.2	13.3	12.9	13.0	13.5
BF Mean Depth (ft)	0.6	0.5	0.5	0.5	0.5	0.5	0.8	0.9	0.8	0.8	0.8	0.8
BF Max Depth (ft)	1.0	1.0	0.9	0.9	0.9	0.9	2.2	2.1	2.0	1.9	1.9	2.2
Width/Depth Ratio	9.9	12.2	12.9	14.3	12.0	11.8	18.7	17.0	21.0	22.8	23.0	21.2
Entrenchment Ratio	>9.0	>8.1	>7.9	>7.6	>8.3	>8.8	>3.2	>3.3	>3.0	>2.9	>2.9	>3.0
Wetted Perimeter (ft)	5.9	6.6	6.7	6.9	6.3	6.0	16.6	15.9	17.6	18.0	18.0	17.8
Hydraulic Radius (ft)	0.5	0.5	0.5	0.4	0.5	0.5	0.8	0.8	0.8	0.7	0.7	0.8

Unnamed Tributary 5												
Parameter	**Cross Section 1 Pool**						**Cross Section 2 Riffle**					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
BF Width (ft)	15.4	15.7	15.6	15.9	15.8	15.4	7.2	7.2	7.6	8.5	8.2	7.3
Floodprone Width (ft)	>50.0	>50.0	>50.0	>50.0	>50.0	>50.0	>60.0	>60.0	>60.0	>60.0	>60.0	>60.0
BF Cross Sectional Area (ft^2)	13.4	13.1	11.2	11.8	11.8	10.9	5.4	5.0	5.0	5.1	5.1	5.0
BF Mean Depth (ft)	0.9	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.7
BF Max Depth (ft)	2.1	2.1	1.7	1.7	1.7	1.6	1.2	1.2	1.2	1.2	1.2	1.3
Width/Depth Ratio	17.6	18.8	21.7	21.4	21.2	21.8	9.7	10.3	11.6	14.0	13.3	10.7
Entrenchment Ratio	>3.3	>3.2	>3.2	>3.1	>3.2	>3.2	>8.3	>8.4	>7.9	>7.1	>7.3	>8.2
Wetted Perimeter (ft)	16.2	16.5	16.3	16.6	16.7	16.3	7.6	7.6	8.1	8.9	8.6	7.7
Hydraulic Radius (ft)	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6

Unnamed Tributary 6																		
Parameter	**Cross Section 1 Riffle**						**Cross Section 2 Pool**						**Cross Section 3 Riffle**					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
BF Width (ft)	9.3	9.8	9.8	10.5	10.6	9.5	17.6	17.6	17.3	17.9	17.6	17.4	11.6	11.1	11.7	11.2	11.1	11.5
Floodprone Width (ft)	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
BF Cross Sectional Area(ft^2)	6.5	6.1	6.3	6.3	6.6	6.3	20.9	19.5	18.8	17.8	17.5	17.9	5.6	9.2	9.0	8.9	8.8	8.3
BF Mean Depth (ft)	0.7	0.6	0.6	0.6	0.6	0.7	1.2	1.1	1.1	1.0	1.0	1.0	0.7	0.8	0.8	0.8	0.8	0.7
BF Max Depth (ft)	1.2	1.2	1.4	1.5	1.5	1.4	3.0	2.5	2.4	2.2	2.2	2.4	1.4	1.6	1.7	1.7	1.8	1.7
Width/Depth Ratio	13.3	15.9	15.3	17.3	16.9	14.1	14.8	15.9	15.9	18.1	17.7	16.9	15.7	13.5	15.1	14.1	14.0	15.8
Entrenchment Ratio	>10.7	>10.2	>10.2	>9.6	>9.5	>10.6	>5.7	>5.7	>5.8	>5.6	>5.7	>5.7	>8.6	>9.0	>8.6	>8.9	>9.0	>8.7
Wetted Perimeter (ft)	9.7	10.3	10.4	11.1	11.2	10.2	19.0	18.8	18.5	19.1	19.1	18.7	12.1	11.6	12.2	11.8	11.8	12.4
Hydraulic Radius (ft)	0.7	0.6	0.6	0.6	0.6	0.6	1.1	1.0	1.0	0.9	0.9	1.0	0.7	0.8	0.7	0.8	0.7	0.7

Unnamed Tributary 1 – Upper Reach																		
Parameter	**Baseline**			**MY1**			**MY2**			**MY3**			**MY4**			**MY5**		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	18.2	31.2	21.4	18.2	31.2	21.4	18.2	31.2	21.4	18.2	31.2	21.4	18.2	31.2	21.4	18.2	31.2	21.4
Radius of Curvature (ft)	27.8	89.4	36.9	27.8	89.4	36.9	27.8	89.4	36.9	27.8	89.4	36.9	27.8	89.4	36.9	27.8	89.4	36.9
Meander Wavelength (ft)	30	54	38	30	54	38	30	54	38	30	54	38	30	54	38	30	54	38
Meander Width Ratio	3.57			3.69			3.69			3.82			3.69			3.82		
Profile																		
Riffle Length (ft)	7.82	33.04	17.06	4.68	20.84	10.08	7.37	43.77	19.01	7.66	43.23	16.90	9.92	39.68	18.35	9.57	35.70	19.71
Riffle Slope (ft/ft)	0.0134	0.0735	0.0317	0.0146	0.1044	0.0290	0.0176	0.1060	0.0331	0.0186	0.1002	0.0276	0.0151	0.0988	0.0287	0.0176	0.0771	0.0239
Pool Length (ft)	3.36	32.88	9.54	3.63	18.90	8.94	4.46	31.87	8.19	3.65	31.86	8.02	3.67	29.90	7.81	4.06	29.68	7.83
Pool Spacing (ft)	8.98	44.60	18.26	8.16	34.83	16.33	10.03	60.52	29.81	6.96	60.84	22.57	8.89	58.86	24.17	7.46	61.43	22.88
Additional Reach Parameters																		
Valley Length (ft)	369			369			369			369			369			369		
Channel Length (ft)	386			388			389			392			393			390		
Sinuosity	1.05			1.05			1.05			1.06			1.07			1.06		
Water Surface Slope (ft/ft)	0.0322			0.0328			0.0332			0.0328			0.0323			0.0333		
BF Slope (ft/ft)	0.0341			0.0340			0.0319			0.0326			0.0315			0.0324		
Rosgen Classification	B/C5			B/C6			B/C6			B/C5			B/C5			B/C5		

Unnamed Tributary 1 – Lower Reach																		
Parameter	**Baseline**			**MY1**			**MY2**			**MY3**			**MY4**			**MY5**		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	28.5	82.1	55.7	28.5	82.1	55.7	28.5	82.1	55.7	28.5	82.1	55.7	28.5	82.1	55.7	28.5	82.1	55.7
Radius of Curvature (ft)	18.2	26.3	21.9	18.2	26.3	21.9	18.2	26.3	21.9	18.2	26.3	21.9	18.2	26.3	21.9	18.2	26.3	21.9
Meander Wavelength (ft)	86	113	101	86	113	101	86	113	101	86	113	101	86	113	101	86	113	101
Meander Width Ratio	10.13			8.98			8.70			8.57			9.28			9.77		
Profile																		
Riffle Length (ft)	15.35	31.11	22.27	9.78	36.29	22.37	6.77	33.11	23.29	10.67	31.44	25.36	9.69	29.41	20.24	8.35	28.76	16.71
Riffle Slope (ft/ft)	0.0000	0.0350	0.0053	0.0003	0.0241	0.0050	0.0004	0.0311	0.0070	0.0002	0.0365	0.0061	0.0002	0.0321	0.0073	0.0014	0.0453	0.0090
Pool Length (ft)	8.19	41.82	31.80	4.17	36.32	25.79	6.40	40.79	26.21	5.83	40.07	26.10	6.18	37.87	25.95	5.29	42.80	28.08
Pool Spacing (ft)	27.09	70.09	57.33	28.99	78.41	58.27	26.48	69.18	56.72	27.39	67.83	55.71	23.13	70.98	56.18	20.13	70.16	58.22
Additional Reach Parameters																		
Valley Length (ft)	833			833			833			833			833			833		
Channel Length (ft)	1062			1063			1064			1067			1066			1058		
Sinuosity	1.27			1.28			1.28			1.28			1.28			1.27		
Water Surface Slope (ft/ft)	0.0062			0.0062			0.0060			0.0064			0.0060			0.0050		
BF Slope (ft/ft)	0.0067			0.0070			0.0061			0.0061			0.0061			0.0054		
Rosgen Classification	C6			C6			C6			C6			C6			C6		

Unnamed Tributary 5																		
Parameter	**Baseline**			**MY1**			**MY2**			**MY3**			**MY4**			**MY5**		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	28.3	55.5	41.4	28.3	55.5	41.4	28.3	55.5	41.4	28.3	55.5	41.4	28.3	55.5	41.4	28.3	55.5	41.4
Radius of Curvature (ft)	14.7	25.5	22.2	14.7	25.5	22.2	14.7	25.5	22.2	14.7	25.5	22.2	14.7	25.5	22.2	14.7	25.5	22.2
Meander Wavelength (ft)	77	105	88	77	105	88	77	105	88	77	105	88	77	105	88	77	105	88
Meander Width Ratio	5.75			5.75			5.45			4.87			5.05			5.67		
Profile																		
Riffle Length (ft)	13.64	22.74	17.96	16.19	24.41	21.24	9.29	25.23	18.17	7.57	27.26	17.11	7.98	25.70	16.85	9.47	23.13	18.61
Riffle Slope (ft/ft)	0.0005	0.0105	0.0058	0.0054	0.0129	0.0065	0.0015	0.0129	0.0063	0.0040	0.0078	0.0046	0.0022	0.0102	0.0060	0.0017	0.0130	.0066
Pool Length (ft)	7.57	30.38	21.59	5.16	26.03	20.24	6.71	36.46	18.50	6.63	30.05	14.69	6.64	29.72	16.93	6.05	27.17	15.96
Pool Spacing (ft)	34.70	53.09	45.90	27.25	51.85	45.48	23.39	56.50	44.70	25.35	52.73	47.06	29.26	54.50	44.45	21.55	49.74	45.58
Additional Reach Parameters																		
Valley Length (ft)	507			507			507			507			507			507		
Channel Length (ft)	578			583			581			584			583			582		
Sinuosity	1.14			1.15			1.15			1.15			1.15			1.15		
Water Surface Slope (ft/ft)	0.0027 – 0.0331			0.0031 – 0.0321			0.0034 – 0.0209			0.0043 – 0.0321			0.0042 – 0.0328			0.0043 – 0.0319		
BF Slope (ft/ft)	0.0019			0.0025			0.0023			0.0028			0.0027			0.0029		
Rosgen Classification	*C6			*C6			C5			C5			C5			C5		

*Low width/depth ratio C stream type.

Unnamed Tributary 6																		
Parameter	**Baseline**			**MY1**			**MY2**			**MY3**			**MY4**			**MY5**		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	30.6	60.7	48.1	31.8	60.9	48.4	29.5	60.0	47.3	29.5	60.0	47.3	29.5	60.0	47.3	29.5	60.0	47.3
Radius of Curvature (ft)	20.2	38.1	30.1	16.7	31.8	27.0	12.4	30.2	25.5	12.4	30.2	25.5	12.4	30.2	25.5	12.4	30.2	25.5
Meander Wavelength (ft)	111	126	117	109	127	116	105	138	117	105	138	117	105	138	117	105	138	117
Meander Width Ratio	4.15	5.17	4.66	4.36	4.93	4.65	4.04	4.83	4.43	4.22	4.50	4.36	4.26	4.46	4.36	4.11	4.98	4.55
Profile																		
Riffle Length (ft)	22.91	35.94	28.92	12.59	34.27	28.14	21.80	41.70	28.80	18.38	45.77	26.64	19.64	52.17	27.53	17.23	49.88	28.82
Riffle Slope (ft/ft)	0.0001	0.0173	0.0085	0.0006	0.0380	0.0030	0.0003	0.0153	0.0054	0.0003	0.0150	0.0039	0.0007	0.0111	0.0039	0.0016	0.0175	0.0050
Pool Length (ft)	3.84	38.32	26.58	3.19	36.78	25.57	5.92	35.10	16.56	3.97	31.99	14.46	3.29	30.23	9.58	3.79	29.93	11.93
Pool Spacing (ft)	8.24	74.02	59.15	11.70	77.07	61.97	6.80	76.16	55.53	5.84	85.65	50.87	6.61	87.53	48.73	4.75	94.10	56.60
Additional Reach Parameters																		
Valley Length (ft)	955			955			955			955			955			955		
Channel Length (ft)	1072			1094			1110			1117			1108			1101		
Sinuosity	1.12			1.15			1.16			1.17			1.16			1.15		
Water Surface Slope (ft/ft)	0.0066 – 0.0436			0.0070 – 0.0395			0.0072 – 0.0390			0.0065 – 0.0448			0.0066 – 0.0438			0.0067 – 0.0441		
BF Slope (ft/ft)	0.0089			0.0086			0.0066			0.0066			0.0067			0.0066		
Rosgen Classification	C6			C6			C6			C5			C5			C5		

APPENDIX D

2013 Site Photos

Unnamed Tributary 1 Permanent Photo Points

Unnamed Tributary 1 – Permanent Photo Point 1
Looking Downstream
January 8, 2013

Unnamed Tributary 1 – Permanent Photo Point 2
Looking Upstream
January 8, 2013

Unnamed Tributary 1 Permanent Photo Points

Unnamed Tributary 1 – Permanent Photo Point 3
Looking Upstream
January 8, 2013

Unnamed Tributary 1 – Permanent Photo Point 3
Looking Downstream
January 8, 2013

Unnamed Tributary 1 Permanent Photo Points

Unnamed Tributary 1 – Permanent Photo Point 4
Looking Upstream
January 8, 2013

Unnamed Tributary 1 – Permanent Photo Point 5
Looking Upstream
January 8, 2013

Unnamed Tributary 1 Permanent Photo Points

Unnamed Tributary 1 – Permanent Photo Point 5
Looking Downstream
January 8, 2013

Unnamed Tributary 1 – Permanent Photo Point 6
Looking 80 Degrees
January 8, 2013

Unnamed Tributary 1 Permanent Photo Points

Unnamed Tributary 1 – Permanent Photo Point 6
Looking 300 Degrees
January 8, 2013

Unnamed Tributary 1 – Permanent Photo Point 7
Looking Upstream
January 8, 2013

Unnamed Tributary 1 Permanent Photo Points

Unnamed Tributary 1 – Permanent Photo Point 8
Looking Upstream
January 8, 2013

Unnamed Tributary 1 – Permanent Photo Point 8
Looking Downstream
January 8, 2013

Unnamed Tributary 1 Permanent Photo Points

Unnamed Tributary 1 – Permanent Photo Point 9
Looking 220 Degrees
January 8, 2013

Unnamed Tributary 2 Permanent Photo Points

Unnamed Tributary 2 – Permanent Photo Point 1
Looking Downstream
January 8, 2013

Unnamed Tributary 2 – Permanent Photo Point 2
Looking Upstream
January 8, 2013

Unnamed Tributary 4 Permanent Photo Points

Unnamed Tributary 4 – Permanent Photo Point 1
Looking Downstream
January 8, 2013

Unnamed Tributary 4 – Permanent Photo Point 2
Looking Upstream
January 8, 2013

Unnamed Tributary 5 Permanent Photo Points

Unnamed Tributary 5 – Permanent Photo Point 1
Looking Upstream
January 8, 2013

Unnamed Tributary 5 – Permanent Photo Point 1
Looking Downstream
January 8, 2013

Unnamed Tributary 5 Permanent Photo Points

Unnamed Tributary 5 – Permanent Photo Point 2
Looking Upstream
January 8, 2013

Unnamed Tributary 5 – Permanent Photo Point 2
Looking Downstream
January 8, 2013

Unnamed Tributary 5 Permanent Photo Points

Unnamed Tributary 5 – Permanent Photo Point 3
Looking Upstream
January 8, 2013

Unnamed Tributary 5 – Permanent Photo Point 4
Looking Upstream
January 8, 2013

Unnamed Tributary 5 Permanent Photo Points

Unnamed Tributary 5 – Permanent Photo Point 4
Looking Downstream
January 8, 2013

Unnamed Tributary 5 – Permanent Photo Point 5
Looking 180 Degrees
January 8, 2013

Unnamed Tributary 5 Permanent Photo Points

Unnamed Tributary 5 – Permanent Photo Point 5
Looking 305 Degrees
January 8, 2013

Unnamed Tributary 6 Permanent Photo Points

Unnamed Tributary 6 – Permanent Photo Point 1
Looking 35 Degrees
January 8, 2013

Unnamed Tributary 6 – Permanent Photo Point 1
Looking Downstream
January 8, 2013

Unnamed Tributary 6 Permanent Photo Points

Unnamed Tributary 6 – Permanent Photo Point 2
Looking Upstream
January 8, 2013

Unnamed Tributary 6 – Permanent Photo Point 3
Looking Upstream
January 8, 2013

Unnamed Tributary 6 Permanent Photo Points

Unnamed Tributary 6 – Permanent Photo Point 4
Looking Downstream
January 8, 2013

Unnamed Tributary 6 – Permanent Photo Point 5
Looking Upstream
January 8, 2013

Unnamed Tributary 6 Permanent Photo Points

Unnamed Tributary 6 – Permanent Photo Point 5
Looking 310 Degrees
January 8, 2013

Unnamed Tributary 1 Vegetation Plots

UT1 – Vegetation Plot 1

UT1 – Vegetation Plot 2

Unnamed Tributary 1 Vegetation Plots

UT1 – Vegetation Plot 3

UT1 – Vegetation Plot 4

Unnamed Tributary 5 Vegetation Plots

UT5 – Vegetation Plot 1

UT5 – Vegetation Plot 2

Unnamed Tributary 6 Vegetation Plots

UT6 – Vegetation Plot 1

UT6 – Vegetation Plot 2

Unnamed Tributary 6 Vegetation Plots

UT6 – Vegetation Plot 3

UT6 – Vegetation Plot 4

Unnamed Tributary 6 Vegetation Plots

UT6 – Vegetation Plot 5

Unnamed Tributary 1 Representative Photos of Stream and Vegetation

SPA2 UT1 Sta. 105+50 – Pool Aggradation

Unnamed Tributary 5 Representative Photos of Stream and Vegetation

SPA7 UT5 Sta. 515+10 – Bank Scour

SPA8 UT5 Sta. 515+50 – Bank Scour

Unnamed Tributary 5 Representative Photos of Stream and Vegetation

SPA9 UT5 Sta. 515+80 – Grade Control Degradation

Unnamed Tributary 6 Representative Photos of Stream and Vegetation

SPA11 UT6 Sta. 601+30 – Riffle Bed Scour and Low Stem Desity

SPA12 UT6 Sta. 601+60 – Pool Aggradation and Low Stem Density

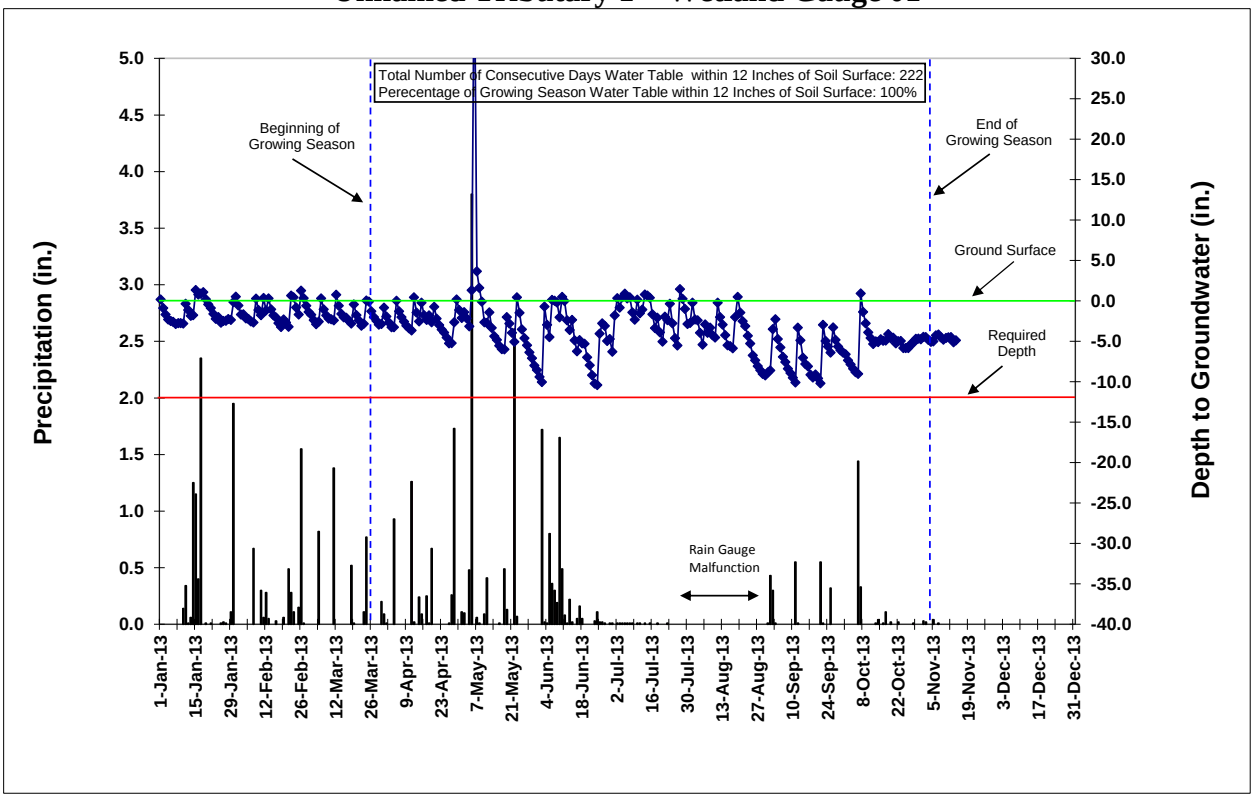
Unnamed Tributary 6 Representative Photos of Stream and Vegetation

UT6 – Isolated Area of Chinese privet *Ligustrum sinense* to be treated

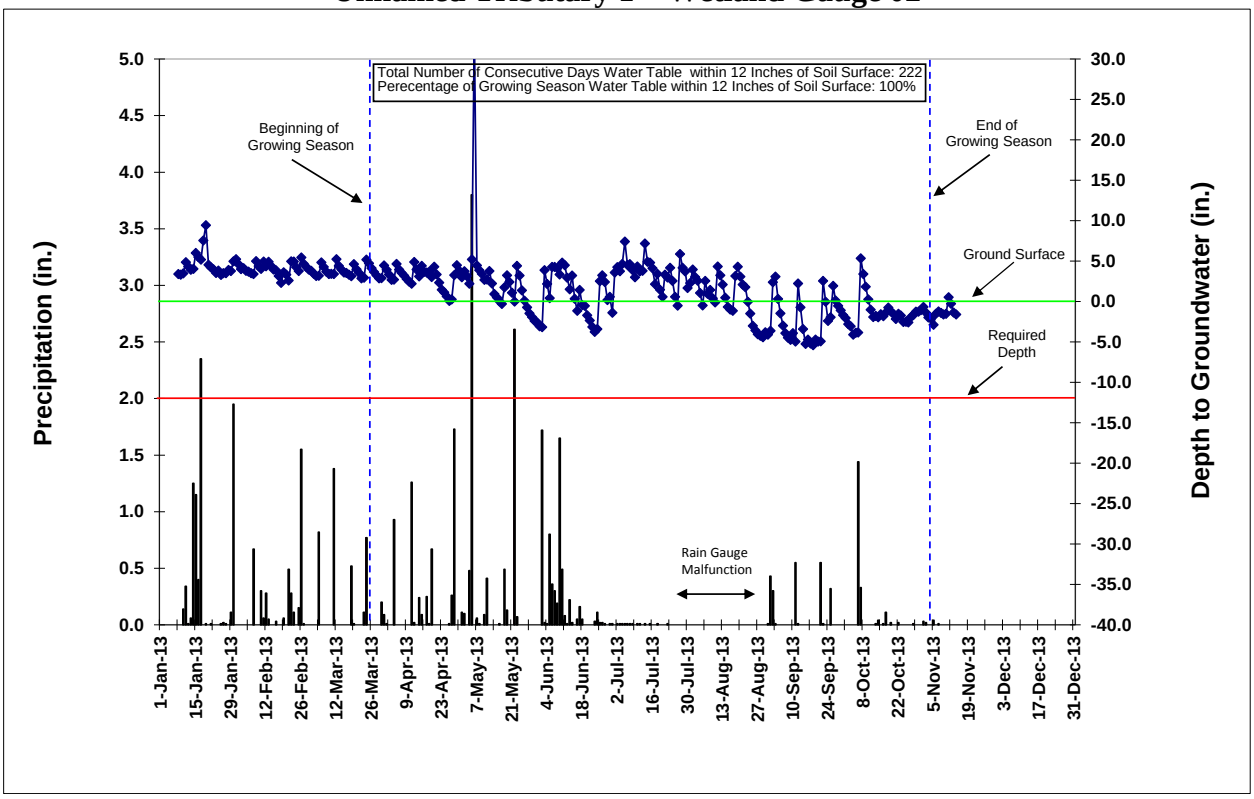
APPENDIX E

2013 Wetland Gauge Data

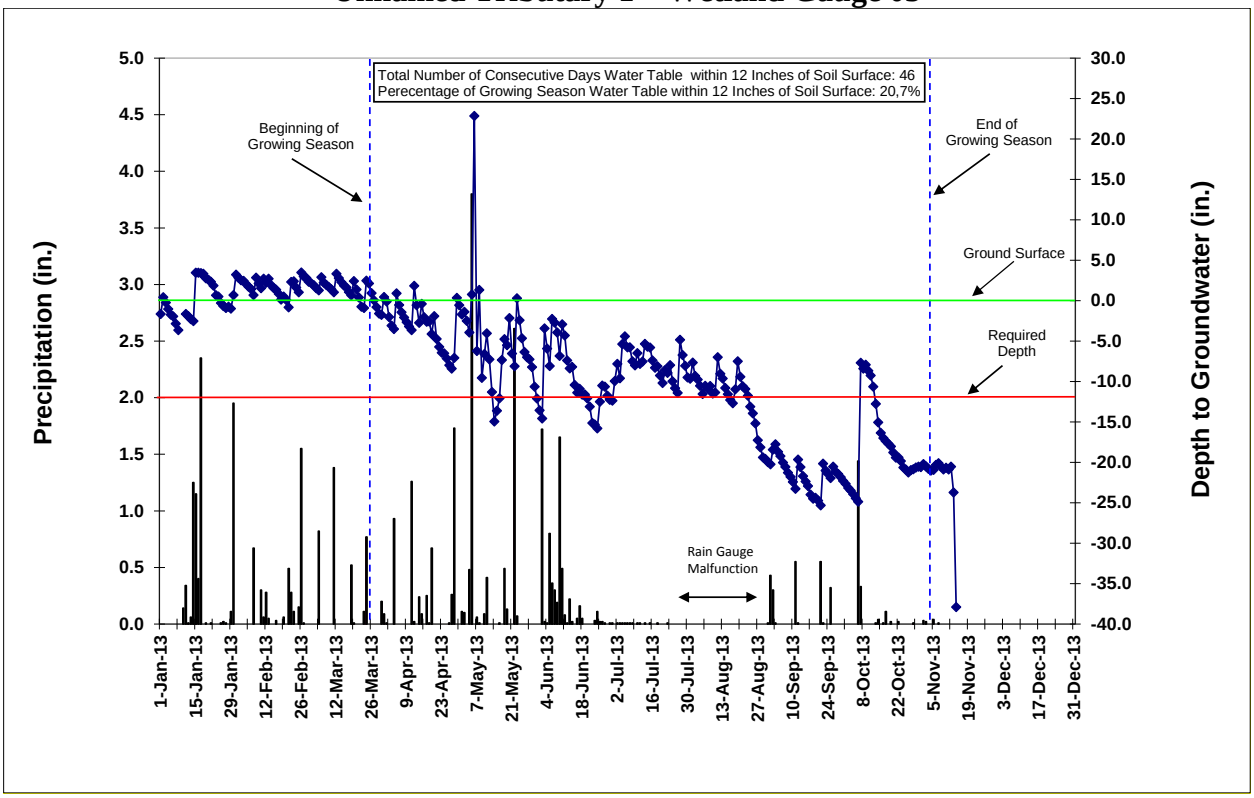
Unnamed Tributary 1 – Wetland Gauge 01



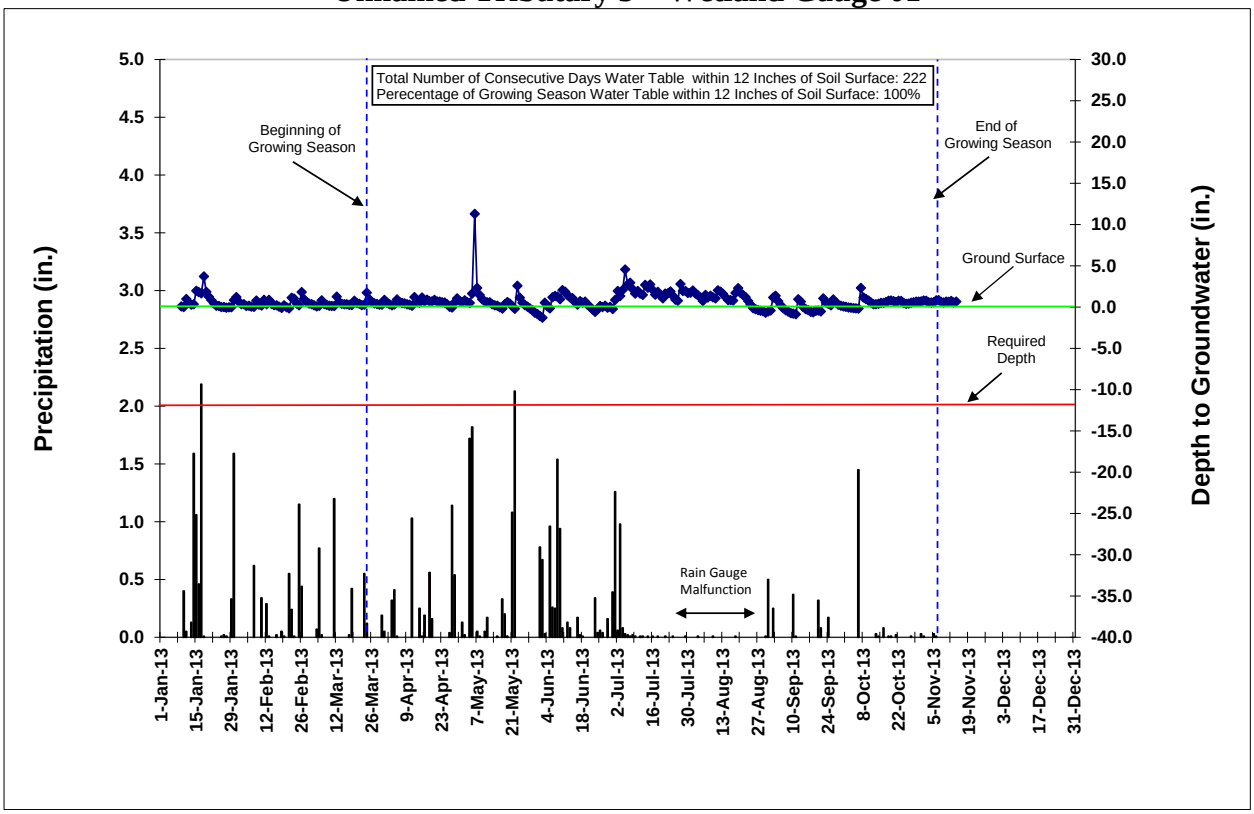
Unnamed Tributary 1 – Wetland Gauge 02



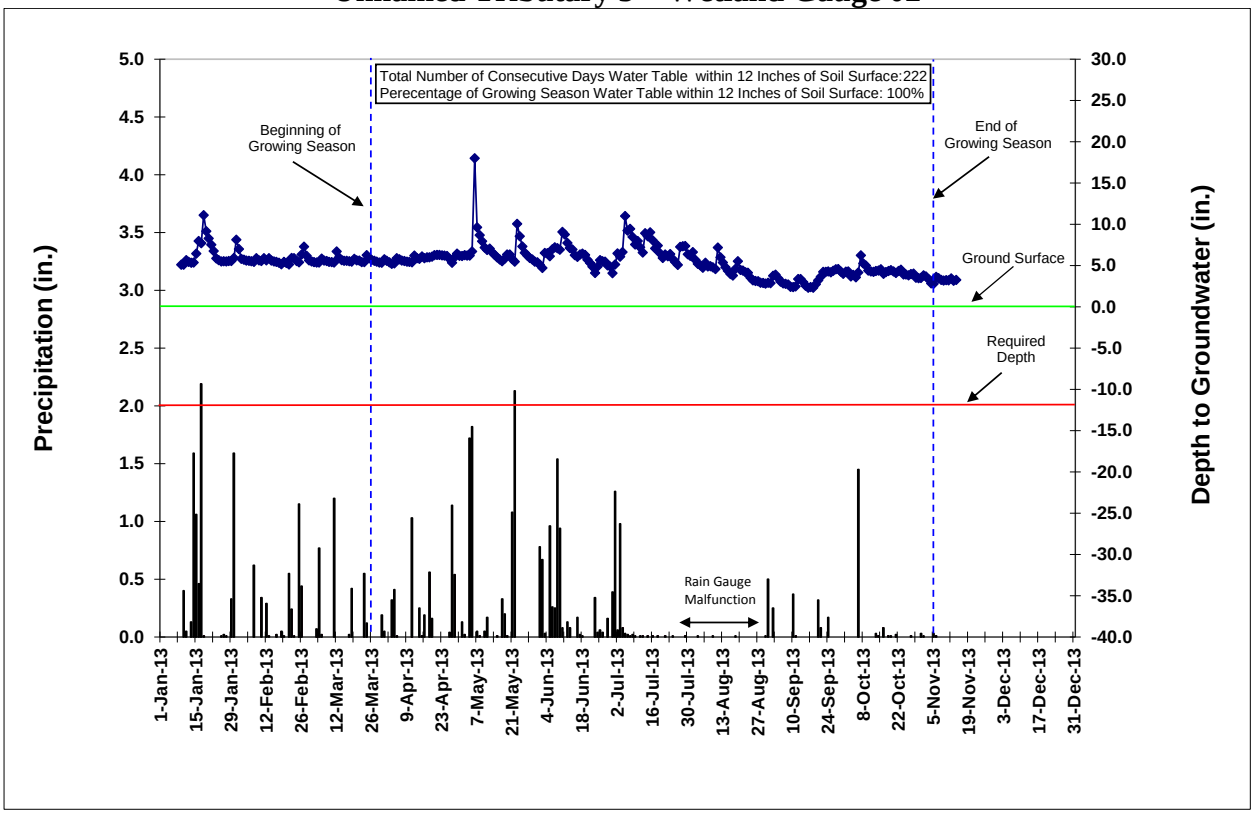
Unnamed Tributary 1 – Wetland Gauge 03



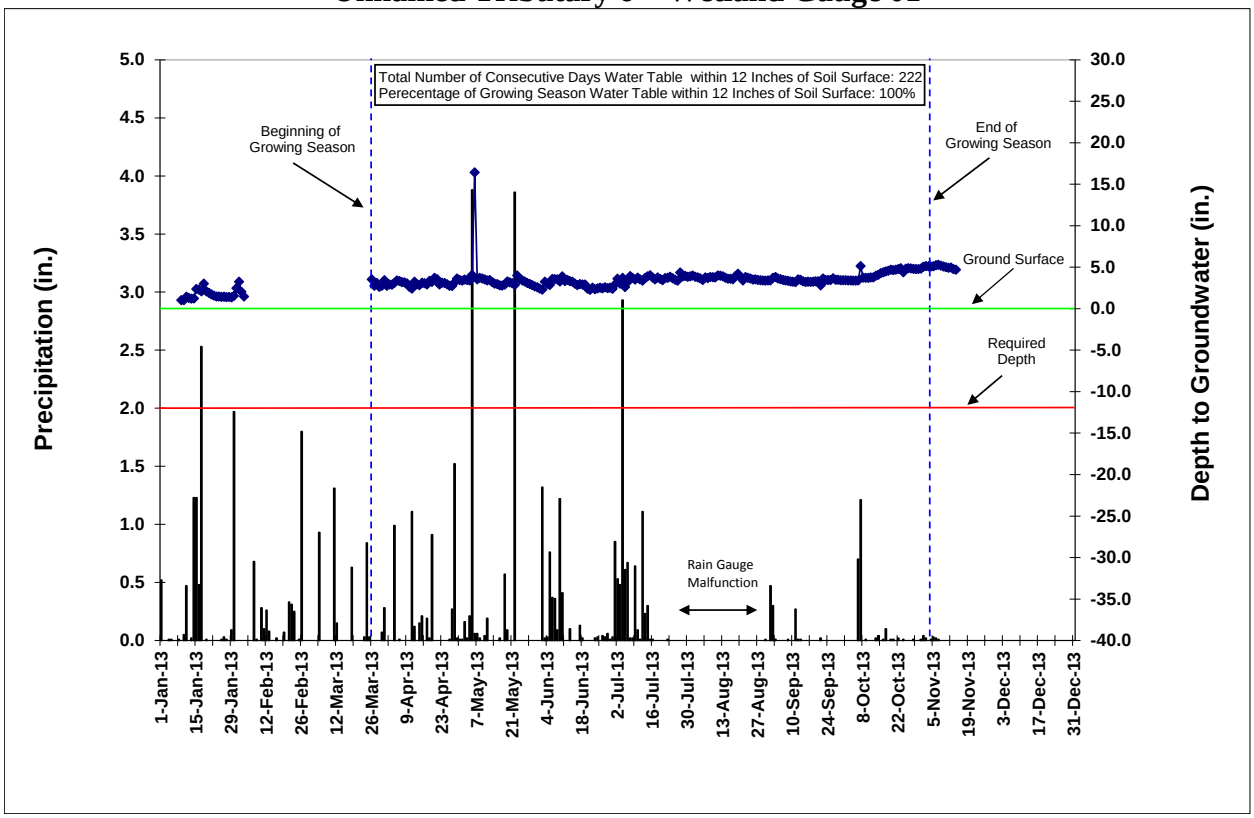
Unnamed Tributary 5 – Wetland Gauge 01



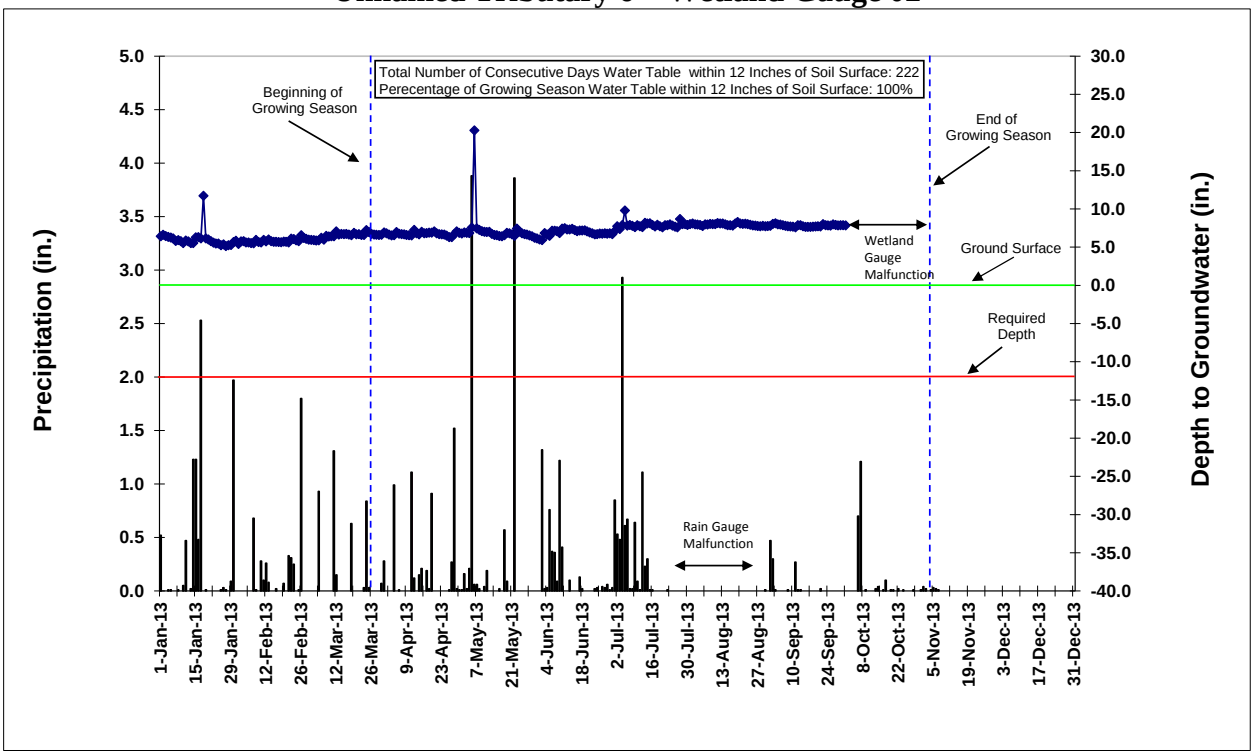
Unnamed Tributary 5 – Wetland Gauge 02



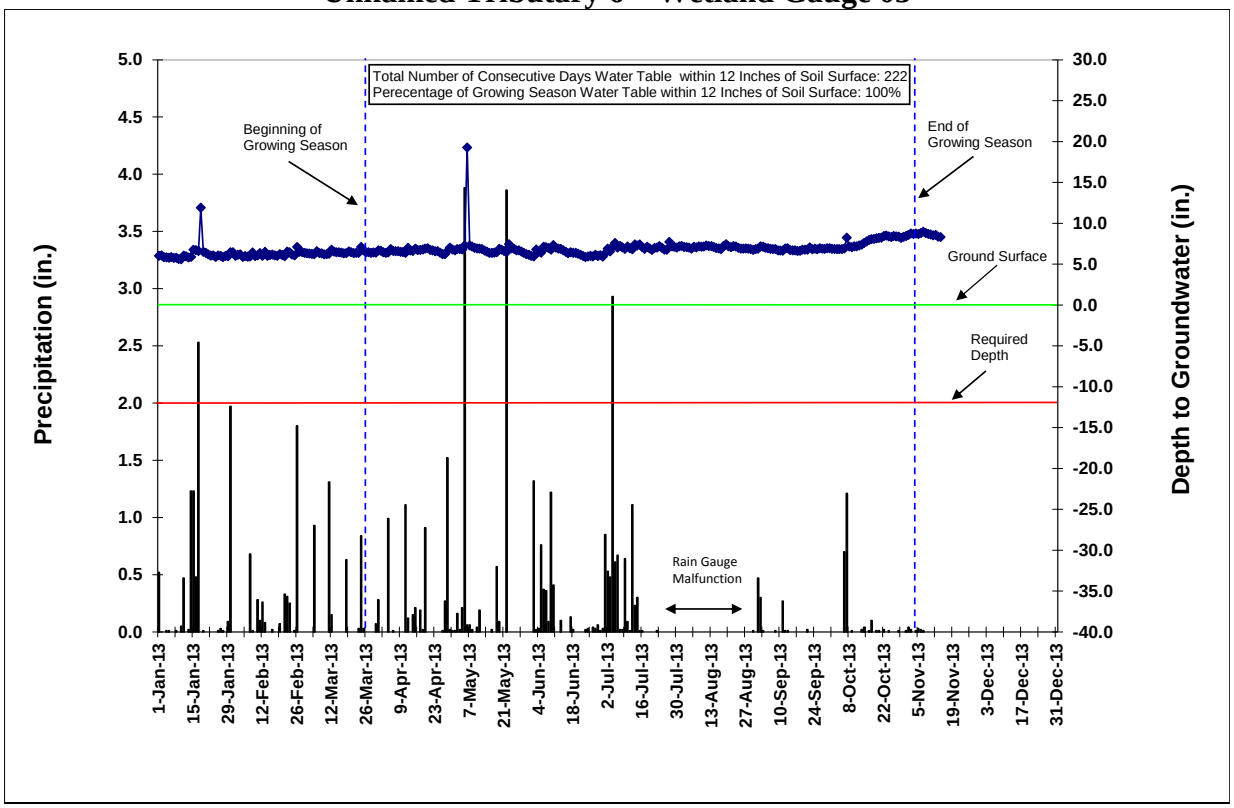
Unnamed Tributary 6 – Wetland Gauge 01



Unnamed Tributary 6 – Wetland Gauge 02



Unnamed Tributary 6 – Wetland Gauge 03



Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
01-Jan-2013	08:00:00	-2.26	Data gap	-1.66	Data gap	Data gap	Data gap	6.47	5.85
01-Jan-2013	20:00:00	0.18	Data gap	0.21	Data gap	Data gap	Data gap	6.42	6.02
02-Jan-2013	08:00:00	-0.15	Data gap	0.41	Data gap	Data gap	Data gap	6.77	6.3
02-Jan-2013	20:00:00	-0.89	Data gap	0.1	Data gap	Data gap	Data gap	6.63	6.07
03-Jan-2013	08:00:00	-1.4	Data gap	-0.23	Data gap	Data gap	Data gap	6.49	5.97
03-Jan-2013	20:00:00	-1.7	Data gap	-0.44	Data gap	Data gap	Data gap	6.45	5.85
04-Jan-2013	08:00:00	-2.13	Data gap	-1.03	Data gap	Data gap	Data gap	6.35	5.81
04-Jan-2013	20:00:00	-2.3	Data gap	-1	Data gap	Data gap	Data gap	6.36	5.83
05-Jan-2013	08:00:00	-2.58	Data gap	-1.74	Data gap	Data gap	Data gap	6.35	5.77
05-Jan-2013	20:00:00	-2.5	Data gap	-1.72	Data gap	Data gap	Data gap	6.27	5.79
06-Jan-2013	08:00:00	-2.5	Data gap	-1.94	Data gap	Data gap	Data gap	6.41	5.85
06-Jan-2013	20:00:00	-2.6	Data gap	-2.2	Data gap	Data gap	Data gap	6.15	5.86
07-Jan-2013	08:00:00	-2.8	Data gap	-2.84	Data gap	Data gap	Data gap	5.97	5.68
07-Jan-2013	20:00:00	-2.87	Data gap	-3.01	Data gap	Data gap	Data gap	5.82	5.74
08-Jan-2013	08:00:00	-3.1	Data gap	-3.64	Data gap	Data gap	Data gap	5.79	5.72
08-Jan-2013	20:00:00	-2.76	3.41	Data gap	0.11	5.17	1.01	5.92	5.63
09-Jan-2013	08:00:00	-2.82	3.33	Data gap	0.07	5.11	1.02	5.78	5.63
09-Jan-2013	20:00:00	-2.76	3.52	Data gap	0.07	5.12	1.03	5.65	5.65
10-Jan-2013	08:00:00	-2.86	3.5	Data gap	0	5.11	1.04	5.55	5.61
10-Jan-2013	20:00:00	-2.81	3.5	Data gap	0.04	5.09	1.03	5.56	5.71
11-Jan-2013	08:00:00	-0.61	4.88	-1.66	0.98	5.67	1.45	5.86	6.04
11-Jan-2013	20:00:00	-0.37	4.7	-1.93	0.79	5.57	1.42	5.9	6.14
12-Jan-2013	08:00:00	-1.14	4.35	-2.02	0.5	5.46	1.3	5.75	5.96
12-Jan-2013	20:00:00	-1.48	3.93	-2.3	0.42	5.39	1.27	5.66	5.96
13-Jan-2013	08:00:00	-1.84	4.05	-2.37	0.28	5.35	1.21	5.55	5.81
13-Jan-2013	20:00:00	-2.02	6.02	-2.54	0.29	5.31	1.19	5.53	5.95
14-Jan-2013	08:00:00	-1.77	5.52	2.07	0.35	5.37	1.24	5.54	5.88
14-Jan-2013	20:00:00	0.73	5.18	3.46	1.86	6.16	2.04	6.12	6.48
15-Jan-2013	08:00:00	1.34	7.56	3.81	1.97	6.45	2.37	6.28	6.75
15-Jan-2013	20:00:00	1.5	9.44	3.45	2.04	7.62	2.5	6.44	6.96
16-Jan-2013	08:00:00	0.79	4.56	3.09	1.82	7.99	2.29	6.33	6.71
16-Jan-2013	20:00:00	0.61	4.23	3.4	1.36	7.83	2.02	6.1	6.48
17-Jan-2013	08:00:00	0.88	3.99	14.41	1.65	7.72	2.1	6.14	6.61
17-Jan-2013	20:00:00	9.05	3.54	3.33	5.56	12.94	18.77	20.4	17.99
18-Jan-2013	08:00:00	1.08	3.83	3	3.7	11.11	3.03	11.72	11.91
18-Jan-2013	20:00:00	0.64	3.31	2.76	2.5	9.89	2.34	6.35	6.69
19-Jan-2013	08:00:00	0.19	3.53	2.67	1.84	9.16	2.1	6.15	6.49
19-Jan-2013	20:00:00	-0.11	3.51	2.57	1.58	8.81	2.06	6.13	6.46
20-Jan-2013	08:00:00	-0.43	3.92	2.51	1.23	8.3	1.92	6.01	6.36
20-Jan-2013	20:00:00	-0.63	3.79	2.34	1.01	7.99	1.86	5.88	6.26
21-Jan-2013	08:00:00	-0.9	4.97	2.25	0.83	7.54	1.74	5.79	6.2
21-Jan-2013	20:00:00	-1.13	5.24	1.85	0.68	7.28	1.74	5.75	6.16
22-Jan-2013	08:00:00	-1.6	4.64	1.6	0.44	6.78	1.58	5.59	6.04
22-Jan-2013	20:00:00	-1.68	4.03	0.67	0.33	6.5	1.58	5.53	5.99
23-Jan-2013	08:00:00	-2.22	4.14	0.97	0.17	5.87	1.48	5.47	6.05
23-Jan-2013	20:00:00	-1.69	3.8	0.5	0.26	5.85	1.6	5.51	6.15
24-Jan-2013	08:00:00	-2.02	3.7	0.42	0.13	5.66	1.46	5.47	5.89
24-Jan-2013	20:00:00	-2.33	3.53	-0.3	0.03	5.58	1.5	5.24	5.87
25-Jan-2013	08:00:00	-2.7	3.41	-0.12	0.01	5.52	1.41	5.25	6.05
25-Jan-2013	20:00:00	-2.1	5.02	-0.67	0.12	5.63	1.56	5.51	6.05
26-Jan-2013	08:00:00	-2.49	4.4	-0.16	-0.01	5.53	1.45	5.37	6
26-Jan-2013	20:00:00	-1.75	4.05	-0.91	0.13	5.66	1.7	5.3	6.01
27-Jan-2013	08:00:00	-2.47	4.95	-0.51	-0.08	5.51	1.39	5.16	5.86
27-Jan-2013	20:00:00	-2.2	4.36	-0.75	0.01	5.59	1.49	5.23	6.04
28-Jan-2013	08:00:00	-2.25	4.92	-0.76	-0.02	5.57	1.42	5.27	6.02
28-Jan-2013	20:00:00	-2.27	4.4	-0.99	0	5.59	1.45	5.33	6
29-Jan-2013	08:00:00	-2.36	3.98	-1.05	-0.03	5.56	1.36	5.3	5.97
29-Jan-2013	20:00:00	-2.34	3.86	0.68	0	5.53	2.23	5.33	5.97
30-Jan-2013	08:00:00	-0.15	3.16	4.41	0.84	5.94	1.55	5.67	6.46
30-Jan-2013	20:00:00	2.9	2.31	3.21	2.27	7.5	3.44	7.13	7.84
31-Jan-2013	08:00:00	0.51	3.63	2.95	1.22	8.15	2.48	5.85	6.46

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
31-Jan-2013	20:00:00	-0.04	3.34	2.84	0.91	7.53	2.16	5.61	6.43
01-Feb-2013	08:00:00	-0.57	2.61	2.77	0.62	7.02	3.26	5.44	6
01-Feb-2013	20:00:00	-1.11	4.99	2.52	0.48	6.43	4.01	5.72	6.19
02-Feb-2013	08:00:00	-1.68	4.95	2.61	0.34	5.82	2.03	5.76	6.15
02-Feb-2013	20:00:00	-1.37	4.26	2.44	0.38	5.81	2.88	5.8	6.16
03-Feb-2013	08:00:00	-1.65	3.78	2.35	0.34	5.73	1.47	5.78	6.18
03-Feb-2013	20:00:00	-1.9	5.45	2.06	0.24	5.68	6.51	5.7	6.07
04-Feb-2013	08:00:00	-2.18	4.7	2.01	0.14	5.61	10.92	5.61	5.87
04-Feb-2013	20:00:00	-2.22	4.29	1.73	0.2	5.61	9.95	5.63	6.08
05-Feb-2013	08:00:00	-2.26	3.98	1.67	0.16	5.6	9.7	5.63	5.98
05-Feb-2013	20:00:00	-2.35	3.81	1.44	0.17	5.56	11.12	5.59	6.01
06-Feb-2013	08:00:00	-2.53	3.43	1.09	0.05	5.53	15.99	5.53	5.92
06-Feb-2013	20:00:00	-2.6	3.18	0.69	0.08	5.49	10.81	5.53	6.02
07-Feb-2013	08:00:00	-2.67	3.21	2.95	0.02	5.46	6.9	5.52	5.93
07-Feb-2013	20:00:00	0.49	4.86	2.84	1.28	6.11	-0.86	6.03	6.49
08-Feb-2013	08:00:00	0.29	4.29	2.48	0.8	5.89	-2.1	5.95	6.43
08-Feb-2013	20:00:00	-0.39	4.72	2.13	0.45	5.73	11.15	5.76	6.17
09-Feb-2013	08:00:00	-1.12	4.4	1.87	0.3	5.64	14.3	5.67	5.99
09-Feb-2013	20:00:00	-1.48	4.14	1.55	0.26	5.58	10.25	5.61	6
10-Feb-2013	08:00:00	-1.78	4.05	1.9	0.19	5.55	5.65	5.62	6.07
10-Feb-2013	20:00:00	-1.77	4.54	2.71	0.63	5.7	9.74	5.72	6.07
11-Feb-2013	08:00:00	0.35	4.95	2.54	0.87	5.89	6.5	5.95	6.35
11-Feb-2013	20:00:00	-0.46	4.65	2.2	0.55	5.74	5.58	5.85	6.25
12-Feb-2013	08:00:00	-1.18	4.36	1.97	0.35	5.63	10.78	5.76	6.01
12-Feb-2013	20:00:00	-1.51	4.2	2.71	0.31	5.59	10.22	5.74	6.13
13-Feb-2013	08:00:00	0.31	4.92	2.39	0.86	5.89	8.92	6.02	6.49
13-Feb-2013	20:00:00	-0.32	4.7	1.92	0.6	5.74	10.03	5.9	6.35
14-Feb-2013	08:00:00	-1.06	4.4	1.84	0.37	5.62	12.63	5.78	6.02
14-Feb-2013	20:00:00	-1.43	4.21	1.57	0.33	5.57	11	5.73	6.13
15-Feb-2013	08:00:00	-1.8	3.98	1.6	0.25	5.52	16.18	5.7	6.11
15-Feb-2013	20:00:00	-1.88	4.11	1.36	0.24	5.47	12.25	5.7	6.08
16-Feb-2013	08:00:00	-2.06	3.86	1.25	0.21	5.45	9.36	5.7	6.16
16-Feb-2013	20:00:00	-2.15	3.64	0.86	0.19	5.45	10.21	5.73	6.11
17-Feb-2013	08:00:00	-2.75	3.16	0.87	0.06	5.36	15.29	5.67	6.06
17-Feb-2013	20:00:00	-2.52	3.06	0.13	0.05	5.35	12.32	5.65	6.01
18-Feb-2013	08:00:00	-3.22	2.31	0.48	-0.11	5.17	21.57	5.65	6.01
18-Feb-2013	20:00:00	-2.45	3.36	0.49	0.03	5.34	8.34	5.64	6.09
19-Feb-2013	08:00:00	-2.29	3.63	0.42	0.22	5.45	4.64	5.74	6.21
19-Feb-2013	20:00:00	-2.31	3.63	0.08	0.08	5.44	9.77	5.71	6.05
20-Feb-2013	08:00:00	-2.68	3.34	-0.14	-0.02	5.32	18.13	5.7	6.12
20-Feb-2013	20:00:00	-2.89	3.17	-0.84	-0.01	5.25	10.13	5.66	6.1
21-Feb-2013	08:00:00	-3.2	2.61	-0.77	-0.16	5.15	19.9	5.63	5.97
21-Feb-2013	20:00:00	-2.9	3.07	2.32	-0.14	5.16	9.9	5.64	5.92
22-Feb-2013	08:00:00	0.64	4.99	1.81	1.14	5.93	9.49	6.11	6.52
22-Feb-2013	20:00:00	-0.39	4.58	2.4	0.6	5.64	5.77	5.92	6.35
23-Feb-2013	08:00:00	0.44	4.95	1.92	1.04	5.9	6.31	6.08	6.45
23-Feb-2013	20:00:00	-0.18	4.61	1.61	0.64	5.68	-2.29	5.98	6.36
24-Feb-2013	08:00:00	-0.82	4.26	1.46	0.42	5.56	9.41	5.89	6.17
24-Feb-2013	20:00:00	-1.34	4.02	1.04	0.33	5.47	9.87	5.79	6.16
25-Feb-2013	08:00:00	-1.7	3.78	0.98	0.21	5.4	8.46	5.78	6.05
25-Feb-2013	20:00:00	-1.86	3.7	3.48	0.22	5.38	4.35	5.78	6.19
26-Feb-2013	08:00:00	1.25	5.45	3.29	1.82	6.35	5.31	6.56	7.1
26-Feb-2013	20:00:00	0.8	5.17	2.99	1.38	7.82	-0.74	6.5	6.88
27-Feb-2013	08:00:00	0.34	4.7	2.93	0.96	7.31	3.29	6.22	6.51
27-Feb-2013	20:00:00	-0.16	4.53	2.81	0.79	6.76	10.51	6.13	6.51
28-Feb-2013	08:00:00	-0.59	4.29	2.72	0.61	6.18	5.69	6.1	6.48
28-Feb-2013	20:00:00	-1.07	4.06	2.34	0.49	5.78	8	6.02	6.42

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
01-Mar-2013	08:00:00	-1.38	3.98	2.25	0.42	5.64	9.96	5.99	6.38
01-Mar-2013	20:00:00	-1.62	3.88	2.15	0.37	5.55	10.81	5.96	6.34
02-Mar-2013	08:00:00	-1.72	3.81	2.08	0.34	5.52	5.05	5.96	6.31
02-Mar-2013	20:00:00	-2.02	3.65	1.9	0.28	5.5	10	5.94	6.3
03-Mar-2013	08:00:00	-2.38	3.43	1.73	0.22	5.44	8.67	5.92	6.3
03-Mar-2013	20:00:00	-2.39	3.31	1.54	0.19	5.42	10.2	5.86	6.24
04-Mar-2013	08:00:00	-2.89	3.18	1.53	0.09	5.37	12.79	5.86	6.24
04-Mar-2013	20:00:00	-2.55	3.17	1.28	0.14	5.39	10.14	5.84	6.2
05-Mar-2013	08:00:00	-2.56	3.21	3.89	0.15	5.37	4.48	5.89	6.22
05-Mar-2013	20:00:00	1.63	6.32	2.9	1.92	6.55	-4.22	6.77	7.39
06-Mar-2013	08:00:00	0.3	4.86	2.47	0.82	5.84	2.71	6.24	6.57
06-Mar-2013	20:00:00	-0.49	4.54	2.22	0.53	5.7	11.12	6.04	6.47
07-Mar-2013	08:00:00	-1.04	4.29	2.17	0.37	5.61	9.26	5.99	6.34
07-Mar-2013	20:00:00	-1.38	4.03	1.94	0.35	5.64	10.11	6.48	6.26
08-Mar-2013	08:00:00	-1.8	3.71	1.91	0.26	5.55	14.86	6.49	6.31
08-Mar-2013	20:00:00	-1.88	3.76	1.68	0.23	5.52	10.09	6.45	6.19
09-Mar-2013	08:00:00	-2.2	3.42	1.67	0.15	5.45	12.44	6.41	6.2
09-Mar-2013	20:00:00	-2.17	3.49	1.4	0.19	5.45	10.09	6.44	6.24
10-Mar-2013	08:00:00	-2.28	3.43	1.36	0.14	5.42	6.03	6.42	6.23
10-Mar-2013	20:00:00	-2.38	3.34	1.03	0.14	5.41	10.13	6.39	6.2
11-Mar-2013	08:00:00	-2.4	3.41	2.26	0.14	5.37	-1.24	6.42	6.26
11-Mar-2013	20:00:00	-1.87	4.73	3.33	0.99	5.76	-0.72	6.72	6.54
12-Mar-2013	08:00:00	0.77	5.24	2.98	1.26	6.71	-0.13	7.07	6.75
12-Mar-2013	20:00:00	0	4.69	2.8	0.76	6.42	10.51	6.74	6.52
13-Mar-2013	08:00:00	-0.59	4.41	2.55	0.59	5.98	6.45	6.66	6.52
13-Mar-2013	20:00:00	-1.14	4.14	2.28	0.5	5.75	10.87	6.77	6.41
14-Mar-2013	08:00:00	-1.61	3.96	2.11	0.4	5.66	7.08	6.75	6.44
14-Mar-2013	20:00:00	-1.82	3.77	1.86	0.36	5.63	9.95	6.72	6.37
15-Mar-2013	08:00:00	-2.03	3.61	1.78	0.33	5.6	8.4	6.71	6.45
15-Mar-2013	20:00:00	-2.05	3.55	1.64	0.37	5.6	10.04	6.73	6.38
16-Mar-2013	08:00:00	-2.09	3.55	1.47	0.34	5.59	0.72	6.75	6.41
16-Mar-2013	20:00:00	-2.41	3.28	1.07	0.29	5.55	9.53	6.68	6.23
17-Mar-2013	08:00:00	-2.49	3.33	0.87	0.26	5.53	5.64	6.64	6.33
17-Mar-2013	20:00:00	-2.72	3.14	0.67	0.21	5.47	9.53	6.57	6.22
18-Mar-2013	08:00:00	-2.8	3.15	3.01	0.23	5.48	9.3	6.58	6.35
18-Mar-2013	20:00:00	0.72	4.97	2.41	1.53	6.26	6.77	7.22	6.96
19-Mar-2013	08:00:00	-0.43	4.64	1.87	0.77	5.83	3.88	6.88	6.55
19-Mar-2013	20:00:00	-1.36	4.25	1.39	0.53	5.69	9.82	6.72	6.35
20-Mar-2013	08:00:00	-1.77	4	1.09	0.47	5.64	6.42	6.67	6.45
20-Mar-2013	20:00:00	-2	3.8	0.4	0.49	5.63	10.28	6.71	6.43
21-Mar-2013	08:00:00	-2.42	3.56	-0.07	0.4	5.61	4.29	6.7	6.34
21-Mar-2013	20:00:00	-2.73	3.19	-0.74	0.33	5.52	8.57	6.61	6.27
22-Mar-2013	08:00:00	-3.06	2.88	-0.64	0.24	5.44	15.04	6.6	6.37
22-Mar-2013	20:00:00	-2.84	2.96	-0.9	0.29	5.44	12.46	6.58	6.27
23-Mar-2013	08:00:00	-2.82	2.97	-0.79	0.3	5.42	5.5	6.61	6.38
23-Mar-2013	20:00:00	-2.89	2.84	2.46	0.29	5.4	9.8	6.63	6.26
24-Mar-2013	08:00:00	0.04	5.19	2.33	1.74	6.27	6.53	7.25	7.09
24-Mar-2013	20:00:00	0.13	4.91	2.12	1.06	5.94	6.24	7.09	6.83
25-Mar-2013	08:00:00	-0.09	4.73	1.31	0.94	5.91	9.74	6.99	6.67
25-Mar-2013	20:00:00	-0.86	4.4	0.93	0.7	5.77	4.59	6.83	6.49
26-Mar-2013	08:00:00	-1.3	4.14	0.42	0.59	5.68	3.54	6.75	6.46
26-Mar-2013	20:00:00	-1.79	3.83	0.04	0.51	5.61	3.39	6.66	6.43
27-Mar-2013	08:00:00	-2	3.68	-0.25	0.46	5.58	2.75	6.65	6.44
27-Mar-2013	20:00:00	-2.35	3.36	-0.81	0.43	5.53	3.13	6.63	6.44
28-Mar-2013	08:00:00	-2.47	3.24	-1.04	0.36	5.48	3.09	6.62	6.37
28-Mar-2013	20:00:00	-2.81	2.93	-1.61	0.35	5.41	2.77	6.57	6.32
29-Mar-2013	08:00:00	-2.93	2.88	-1.45	0.29	5.38	2.64	6.59	6.42
29-Mar-2013	20:00:00	-2.97	2.76	-1.77	0.3	5.36	3.1	6.59	6.36
30-Mar-2013	08:00:00	-2.85	2.9	-1.43	0.3	5.34	2.77	6.63	6.4
30-Mar-2013	20:00:00	-3.05	2.62	0.46	0.29	5.35	2.83	6.63	6.43

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
31-Mar-2013	08:00:00	-0.84	4.48	0.56	0.87	5.76	3.43	6.92	6.69
31-Mar-2013	20:00:00	-1.36	4.23	-0.12	0.75	5.73	3.06	6.93	6.67
01-Apr-2013	08:00:00	-1.94	3.93	-0.75	0.53	5.6	2.77	6.83	6.62
01-Apr-2013	20:00:00	-2.37	3.64	-2.03	0.48	5.49	3.14	6.71	6.43
02-Apr-2013	08:00:00	-2.67	3.36	-2.26	0.35	5.41	2.93	6.66	6.44
02-Apr-2013	20:00:00	-3.1	2.87	-3.1	0.31	5.32	3.06	6.57	6.37
03-Apr-2013	08:00:00	-3.25	2.68	-3.25	0.22	5.23	2.89	6.55	6.36
03-Apr-2013	20:00:00	-3.49	2.24	-3.52	0.17	5.15	2.97	6.49	6.24
04-Apr-2013	08:00:00	-3.26	2.71	1.77	0.32	5.26	3.11	6.58	6.43
04-Apr-2013	20:00:00	0.82	5.33	0.9	1.61	6.26	3.61	7.34	7.22
05-Apr-2013	08:00:00	0.01	4.65	0.1	0.92	5.9	3.4	7	6.83
05-Apr-2013	20:00:00	-0.73	4.32	-0.54	0.73	5.81	2.82	6.83	6.54
06-Apr-2013	08:00:00	-1.3	3.98	-0.93	0.6	5.76	3.32	6.77	6.6
06-Apr-2013	20:00:00	-1.73	3.72	-1.45	0.58	5.69	2.78	6.73	6.52
07-Apr-2013	08:00:00	-2.02	3.57	-1.67	0.51	5.62	3.21	6.7	6.57
07-Apr-2013	20:00:00	-2.37	3.3	-2.08	0.49	5.6	2.68	6.67	6.52
08-Apr-2013	08:00:00	-2.56	3.23	-2.21	0.45	5.55	3.17	6.67	6.58
08-Apr-2013	20:00:00	-2.97	2.84	-2.66	0.41	5.48	2.62	6.6	6.4
09-Apr-2013	08:00:00	-3.06	2.81	-2.8	0.35	5.48	3.05	6.61	6.51
09-Apr-2013	20:00:00	-3.43	2.34	-3.2	0.32	5.43	2.95	6.55	6.34
10-Apr-2013	08:00:00	-3.4	2.49	-3.26	0.28	5.45	2.64	6.58	6.47
10-Apr-2013	20:00:00	-3.78	1.91	-3.64	0.22	5.38	2.86	6.52	6.36
11-Apr-2013	08:00:00	-3.66	2.21	-3.98	0.16	5.41	2.42	6.55	6.36
11-Apr-2013	20:00:00	-3.94	1.85	1.82	0.14	5.34	2.75	6.57	6.36
12-Apr-2013	08:00:00	0.43	4.91	0.24	1.21	6.22	3.25	7.28	7
12-Apr-2013	20:00:00	-0.67	4.33	-0.57	0.76	5.97	3.29	6.89	6.56
13-Apr-2013	08:00:00	-1.46	3.96	-1.79	0.65	5.89	2.94	6.81	6.66
13-Apr-2013	20:00:00	-2.28	3.38	-2.73	0.58	5.81	3.23	6.68	6.46
14-Apr-2013	08:00:00	-2.53	3.12	-3.06	0.54	5.82	2.84	6.67	6.61
14-Apr-2013	20:00:00	-2.86	2.71	-0.39	0.57	5.79	3.36	6.69	6.43
15-Apr-2013	08:00:00	-0.22	4.41	-1.36	1.15	6.12	3.12	7.02	6.88
15-Apr-2013	20:00:00	-1.27	3.93	-2.04	0.77	5.94	3.53	6.87	6.7
16-Apr-2013	08:00:00	-1.78	3.68	-2.84	0.69	5.9	3.08	6.83	6.72
16-Apr-2013	20:00:00	-2.62	3.17	-2.6	0.64	5.83	3.32	6.74	6.6
17-Apr-2013	08:00:00	-2.35	3.61	-1.35	0.89	6.01	2.91	6.86	6.73
17-Apr-2013	20:00:00	-1.2	4	-2.57	0.85	6.01	3.43	6.92	6.77
18-Apr-2013	08:00:00	-1.79	3.71	-3.63	0.72	6.02	3.35	6.91	6.79
18-Apr-2013	20:00:00	-2.75	3.15	-4.13	0.65	5.95	3.29	6.83	6.67
19-Apr-2013	08:00:00	-2.66	3.03	-0.04	0.68	6.09	3.23	6.91	6.88
19-Apr-2013	20:00:00	0.35	4.69	-1.92	1.29	6.39	3.7	7.37	7.1
20-Apr-2013	08:00:00	-0.72	4.31	-3.42	0.86	6.27	3.71	7.06	6.93
20-Apr-2013	20:00:00	-1.91	3.73	-4.74	0.7	6.21	3.02	6.86	6.67
21-Apr-2013	08:00:00	-2.2	3.36	-5.22	0.68	6.29	3.56	6.82	6.73
21-Apr-2013	20:00:00	-2.98	2.61	-5.72	0.65	6.21	2.87	6.73	6.61
22-Apr-2013	08:00:00	-2.98	2.34	-5.87	0.67	6.29	2.92	6.72	6.69
22-Apr-2013	20:00:00	-3.75	1.42	-6.44	0.61	6.18	3.17	6.7	6.51
23-Apr-2013	08:00:00	-3.55	1.48	-6.4	0.58	6.24	3.13	6.68	6.57
23-Apr-2013	20:00:00	-4.31	0.74	-6.52	0.55	6.19	3.08	6.63	6.51
24-Apr-2013	08:00:00	-3.93	1.15	-6.76	0.55	6.21	3.11	6.65	6.57
24-Apr-2013	20:00:00	-4.77	0.38	-7.17	0.43	6.17	2.99	6.59	6.42
25-Apr-2013	08:00:00	-4.54	0.65	-7.64	0.33	6.16	2.94	6.52	6.41
25-Apr-2013	20:00:00	-5.78	-0.64	-7.97	0.1	5.98	2.77	6.35	6.16
26-Apr-2013	08:00:00	-5.26	0.08	-8.45	0.03	5.82	2.77	6.33	6.23
26-Apr-2013	20:00:00	-6.23	-0.85	-8.41	-0.09	5.48	2.69	6.23	6.18
27-Apr-2013	08:00:00	-5.23	0.28	-6.7	-0.06	5.35	2.73	6.31	6.22
27-Apr-2013	20:00:00	-3.62	2.84	-7.09	0.51	5.78	3.02	6.59	6.55
28-Apr-2013	08:00:00	-2.64	3.29	1.38	0.57	5.98	3.18	6.72	6.61
28-Apr-2013	20:00:00	1.64	5.34	0.34	1.69	6.68	4.21	7.51	7.46
29-Apr-2013	08:00:00	0.18	4.5	-0.29	1.06	6.45	3.65	7.07	7.01
29-Apr-2013	20:00:00	-0.73	4.18	-0.57	0.78	6.22	3.44	6.93	6.78

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
30-Apr-2013	08:00:00	-1.14	3.83	-1.26	0.73	6.18	3.45	6.89	6.78
30-Apr-2013	20:00:00	-2.02	3.26	-1.7	0.62	6.13	3.36	6.81	6.69
01-May-2013	08:00:00	-2.11	3.01	-2.49	0.6	6.16	3.37	6.79	6.68
01-May-2013	20:00:00	-2.93	2.5	-1.39	0.52	6.12	3.37	6.75	6.68
02-May-2013	08:00:00	-1.39	3.75	-1.98	0.82	6.26	3.5	6.92	6.84
02-May-2013	20:00:00	-1.93	3.4	-2.49	0.64	6.18	3.48	6.89	6.8
03-May-2013	08:00:00	-2.16	3.17	-3.32	0.61	6.22	3.45	6.89	6.83
03-May-2013	20:00:00	-3.23	2.57	-3.93	0.47	6.19	3.42	6.87	6.76
04-May-2013	08:00:00	-3.14	2.22	-4.31	0.49	6.23	3.4	6.86	6.78
04-May-2013	20:00:00	-3.76	1.69	0.78	0.41	6.24	3.34	6.9	6.76
05-May-2013	08:00:00	1.31	5.22	4.22	1.63	6.72	4.07	7.58	7.29
05-May-2013	20:00:00	3.85	25.83	22.85	2.4	9.46	4.61	8.01	7.91
06-May-2013	08:00:00	44.32	34.02	10.11	11.3	18.02	16.44	20.29	19.27
06-May-2013	20:00:00	8.74	5.33	-6.23	3.18	10.5	4.14	7.68	7.41
07-May-2013	08:00:00	3.65	4.47	5.18	2.31	9.64	3.54	7.45	7.27
07-May-2013	20:00:00	4.08	4.06	1.34	1.74	9.06	3.74	7.3	7.17
08-May-2013	08:00:00	1.61	3.89	-1.43	1.45	8.7	3.73	7.27	7.15
08-May-2013	20:00:00	1.84	3.61	-9.54	1.14	8.32	3.64	7.19	7.04
09-May-2013	08:00:00	-0.1	3.45	5.32	0.96	7.95	3.65	7.11	6.99
09-May-2013	20:00:00	-2.98	2.69	-6.61	0.7	7.52	3.47	7	6.85
10-May-2013	08:00:00	-2.65	2.7	1.29	0.68	7.19	3.54	7.01	6.92
10-May-2013	20:00:00	-3.98	1.67	-4.04	0.5	6.89	3.37	6.92	6.96
11-May-2013	08:00:00	-2.74	2.74	6.72	0.58	6.9	3.41	6.99	6.9
11-May-2013	20:00:00	-0.33	4.24	-7.25	0.81	6.91	3.52	7.1	6.95
12-May-2013	08:00:00	-1.42	3.78	2.2	0.59	7.05	3.45	7.02	6.83
12-May-2013	20:00:00	-3.4	2.63	-11.31	0.33	6.83	3.23	6.79	6.66
13-May-2013	08:00:00	-3.35	2.25	0.26	0.33	6.62	3.19	6.74	6.65
13-May-2013	20:00:00	-4.9	0.5	-14.96	0.14	6.41	3.03	6.62	6.42
14-May-2013	08:00:00	-4.37	0.93	-4.16	0.21	6.29	3.03	6.6	6.52
14-May-2013	20:00:00	-5.56	-0.48	-13.62	0.06	6.13	2.9	6.53	6.4
15-May-2013	08:00:00	-4.82	0.52	-5.95	0.15	6.01	2.97	6.57	6.38
15-May-2013	20:00:00	-6.49	-1.24	-12.09	-0.12	5.82	2.77	6.44	6.31
16-May-2013	08:00:00	-5.55	0.03	Data gap	-0.03	5.75	2.81	6.47	6.37
16-May-2013	20:00:00	-7.12	-1.39	0.45	-0.3	5.55	2.75	6.41	6.36
17-May-2013	08:00:00	-5.97	-0.28	-7.33	-0.18	5.53	2.8	6.44	6.39
17-May-2013	20:00:00	-7.68	-2.14	-6.02	-0.49	5.29	2.68	6.32	6.28
18-May-2013	08:00:00	-6.01	1.76	-4.75	0.34	5.85	2.89	6.58	6.46
18-May-2013	20:00:00	-1.51	3.7	-6.29	0.72	6.25	3.35	6.89	6.9
19-May-2013	08:00:00	-2	3.26	-5.51	0.6	6.34	3.27	6.88	6.87
19-May-2013	20:00:00	-2.57	2.77	-3.47	0.48	6.35	3.22	6.85	6.86
20-May-2013	08:00:00	-2.8	2.44	-2.16	0.41	6.35	3.18	6.82	6.75
20-May-2013	20:00:00	-4.36	1.18	1.46	0.13	6.11	3.09	6.68	6.62
21-May-2013	08:00:00	-3.94	1.09	-6.55	0.09	5.79	3.07	6.69	6.61
21-May-2013	20:00:00	-6.01	-0.75	-7.44	-0.25	5.55	2.86	6.53	6.52
22-May-2013	08:00:00	-5.06	0.02	-8.11	-0.22	5.47	2.86	6.5	6.48
22-May-2013	20:00:00	2.25	5.21	1.44	3.24	10.63	5.79	8.64	8.68
23-May-2013	08:00:00	0.43	4.42	0.28	2.58	10.06	4	7.44	7.42
23-May-2013	20:00:00	-0.64	3.75	-1.19	1.64	9.14	3.64	7.12	7.07
24-May-2013	08:00:00	-1.48	3.23	-2.43	1.12	8.56	3.56	7.04	6.95
24-May-2013	20:00:00	-3.6	1.65	-3.89	0.65	7.89	3.36	6.81	6.78
25-May-2013	08:00:00	-3.52	1.39	-4.67	0.52	7.32	3.42	6.83	6.87
25-May-2013	20:00:00	-5.47	-0.74	-5.97	0.22	6.91	3.22	6.68	6.67
26-May-2013	08:00:00	-4.62	0.12	-6.36	0.24	6.57	3.28	6.71	6.68
26-May-2013	20:00:00	-6.6	-1.97	-6.8	-0.01	6.45	3.09	6.62	6.58
27-May-2013	08:00:00	-5.48	-0.72	-7.01	0.06	6.21	3.11	6.64	6.67
27-May-2013	20:00:00	-7.64	-3.07	-7.07	-0.26	6.16	2.98	6.5	6.53
28-May-2013	08:00:00	-6.36	-1.45	-7.27	-0.16	5.92	2.97	6.53	6.54
28-May-2013	20:00:00	-8.43	-3.91	-7.88	-0.52	5.87	2.79	6.37	6.36
29-May-2013	08:00:00	-7.1	-1.91	-8.21	-0.37	5.75	2.85	6.42	6.38
29-May-2013	20:00:00	-9.25	-4.72	-10.76	-0.82	5.68	2.64	6.25	6.22

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
30-May-2013	08:00:00	-7.98	-2.4	-10.65	-0.68	5.48	2.69	6.24	6.23
30-May-2013	20:00:00	-10.05	-4.92	-12.46	-1.04	5.43	2.5	6.14	6.08
31-May-2013	08:00:00	-8.56	-2.55	-12.11	-0.84	5.39	2.57	6.14	6.15
31-May-2013	20:00:00	-10.85	-5.76	-13.95	-1.35	5.2	2.35	5.98	5.95
01-Jun-2013	08:00:00	-9.39	-3.04	-13.57	-1.09	5.12	2.42	6.02	6
01-Jun-2013	20:00:00	-11.66	-6.16	-15.58	-1.6	4.78	2.19	5.83	5.75
02-Jun-2013	08:00:00	-10.03	-3.17	-14.58	-1.28	4.73	2.29	5.93	5.94
02-Jun-2013	20:00:00	0.48	4.58	-1.1	1.28	7.03	3.62	7.18	7.13
03-Jun-2013	08:00:00	-0.7	3.89	-3.43	0.52	6.53	3.26	6.84	6.79
03-Jun-2013	20:00:00	-2.64	2.78	-5.35	-0.02	6.36	2.97	6.61	6.52
04-Jun-2013	08:00:00	-2.97	2.18	-5.93	0.07	6.5	3	6.65	6.5
04-Jun-2013	20:00:00	-4.82	0.4	-7.58	-0.24	6.35	2.83	6.5	6.37
05-Jun-2013	08:00:00	-4.47	0.44	-8.08	-0.16	6.13	2.86	6.48	6.41
05-Jun-2013	20:00:00	-5.64	-0.66	-8.49	-0.34	5.91	2.75	6.42	6.24
06-Jun-2013	08:00:00	0.12	4.3	-2.26	1.19	6.97	3.58	7.16	7.13
06-Jun-2013	20:00:00	-1.02	3.83	-3.97	0.82	6.96	3.28	6.94	6.86
07-Jun-2013	08:00:00	0.02	4.3	-2.71	1.35	7.22	3.56	7.15	7.06
07-Jun-2013	20:00:00	-1.33	3.66	-4.48	0.93	7.13	3.39	6.96	6.77
08-Jun-2013	08:00:00	-0.19	4.16	-3.94	1.26	7.11	3.54	7.09	6.96
08-Jun-2013	20:00:00	-1.28	3.81	-5	0.97	6.91	3.31	6.91	6.75
09-Jun-2013	08:00:00	-2.03	3.36	-6.85	0.94	6.93	3.27	6.85	6.75
09-Jun-2013	20:00:00	0.86	5.19	-1.97	2.33	9.35	4.37	11.63	11.17
10-Jun-2013	08:00:00	0.48	4.83	-2.94	2.06	9.1	3.91	7.44	7.34
10-Jun-2013	20:00:00	0.47	4.77	-3.42	2.02	9.11	3.41	7.55	7.06
11-Jun-2013	08:00:00	-0.01	4.5	-4.3	1.87	8.78	3.32	7.49	7.02
11-Jun-2013	20:00:00	-2.27	3.45	-6.43	1.42	8.17	3.44	7.26	6.83
12-Jun-2013	08:00:00	-2.42	2.97	-7.4	1.45	7.75	3.45	7.32	6.9
12-Jun-2013	20:00:00	-4.46	1.4	-8.15	1.11	7.43	3.28	7.24	6.74
13-Jun-2013	08:00:00	-3.6	1.53	-8.38	1.15	7.14	3.32	7.33	6.87
13-Jun-2013	20:00:00	-1.29	3.9	-6.15	1.23	7.23	3.26	7.38	6.79
14-Jun-2013	08:00:00	-2.36	3.23	-8.2	1.07	6.96	3.25	7.41	6.68
14-Jun-2013	20:00:00	-5.45	0.34	-9.31	0.55	6.45	2.98	7.21	6.44
15-Jun-2013	08:00:00	-4.87	0.35	-10.44	0.59	6.28	3.01	7.24	6.5
15-Jun-2013	20:00:00	-7.44	-2.47	-11.14	0.17	6.04	2.81	7.06	6.35
16-Jun-2013	08:00:00	-6.24	-1.13	-11.39	0.3	6.05	2.85	7.1	6.31
16-Jun-2013	20:00:00	-9.16	-4.19	-11.71	-0.22	5.79	2.68	6.94	6.16
17-Jun-2013	08:00:00	-4.86	1.45	-10.9	0.7	6.36	2.96	7.18	6.44
17-Jun-2013	20:00:00	-5.98	-0.83	-11.33	0.36	6.5	2.84	7.12	6.31
18-Jun-2013	08:00:00	-5.25	-0.41	-11.63	0.53	6.46	2.93	7.17	6.37
18-Jun-2013	20:00:00	-5.54	-0.91	-11.35	0.58	6.47	2.9	7.17	6.35
19-Jun-2013	08:00:00	-5.31	-0.53	-11.61	0.65	6.3	2.91	7.2	6.38
19-Jun-2013	20:00:00	-8.31	-3.4	-12.22	0.17	5.87	2.76	7.06	6.26
20-Jun-2013	08:00:00	-6.99	-1.69	-12.08	0.27	5.73	2.43	7.08	6.27
20-Jun-2013	20:00:00	-9.35	-4.63	-13.8	-0.15	5.42	2.2	6.92	6.07
21-Jun-2013	08:00:00	-7.96	-2.33	-13.11	0.02	5.32	2.26	6.94	6.14
21-Jun-2013	20:00:00	-10.59	-5.65	-15.38	-0.5	5.01	2.46	6.79	5.98
22-Jun-2013	08:00:00	-9.18	-3.14	-15.14	-0.29	4.87	2.52	6.82	5.98
22-Jun-2013	20:00:00	-11.78	-6.54	-16.08	-0.87	4.47	2.32	6.65	5.77
23-Jun-2013	08:00:00	-10.23	-3.74	-15.32	-0.57	4.12	2.36	6.68	5.86
23-Jun-2013	20:00:00	-12.24	-6.18	-16.61	-0.33	4.21	2.2	6.65	5.84
24-Jun-2013	08:00:00	-10.42	-3.41	-15.79	-0.3	4.87	2.44	6.72	5.93
24-Jun-2013	20:00:00	-3.38	3.65	-11.31	0.01	5.45	2.4	6.75	5.97
25-Jun-2013	08:00:00	-4.06	2.53	-12.49	0.13	5.66	2.54	6.8	6.01
25-Jun-2013	20:00:00	-1.45	3.87	-9.63	-0.15	5.49	2.37	6.7	5.97
26-Jun-2013	08:00:00	-2.79	3.26	-10.51	0.01	5.53	2.45	6.76	5.93
26-Jun-2013	20:00:00	-3.12	2.76	-10.45	-0.11	5.35	2.39	6.74	6.01
27-Jun-2013	08:00:00	-3.11	2.43	-10.64	0.15	5.48	2.58	6.82	6.13
27-Jun-2013	20:00:00	-5.56	0.17	-11.3	-0.27	5.23	2.39	6.72	5.9
28-Jun-2013	08:00:00	-4.97	0.2	-11.76	-0.08	5.04	2.49	6.77	5.98
28-Jun-2013	20:00:00	-7.1	-1.59	-11.9	-0.49	4.86	2.4	6.69	5.83

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
29-Jun-2013	08:00:00	-4.73	0.59	-12.27	0.04	4.89	2.52	6.83	6.09
29-Jun-2013	20:00:00	-7.39	-2.39	-12.09	-0.44	4.52	2.39	6.7	5.87
30-Jun-2013	08:00:00	-6.28	-1.38	-12.38	-0.24	4.08	2.4	6.72	5.91
30-Jun-2013	20:00:00	-8.9	-3.73	-14.66	-0.83	3.5	2.22	6.58	5.7
01-Jul-2013	08:00:00	-1.79	3.6	-9.95	0.87	5.13	2.95	7.13	6.31
01-Jul-2013	20:00:00	-4.45	1.74	-12.19	0.27	5.15	2.7	7.01	6.1
02-Jul-2013	08:00:00	0.32	4.27	-7.83	1.95	6.48	3.61	7.75	6.9
02-Jul-2013	20:00:00	-0.2	4.09	-8.56	1.55	6.14	3.28	7.52	6.63
03-Jul-2013	08:00:00	-0.85	3.76	-9.61	1.35	6.08	3.01	7.38	6.55
03-Jul-2013	20:00:00	-0.17	4.51	-6.05	2.22	6.59	3.25	7.79	7.01
04-Jul-2013	08:00:00	0.43	4.66	-5.38	2.07	6.64	3.71	7.92	7.16
04-Jul-2013	20:00:00	2.55	10.24	-2.21	4.58	10.98	4.59	9.88	8.96
05-Jul-2013	08:00:00	0.89	7.43	-4.43	4.56	11	2.61	9.81	7.59
05-Jul-2013	20:00:00	0.89	5.37	-4.96	3.44	9.92	7.38	8.23	7.38
06-Jul-2013	08:00:00	0.3	4.54	-5.77	2.75	9.25	3.2	7.82	7.03
06-Jul-2013	20:00:00	1.62	5.47	-4.59	3.43	9.87	7.79	8.31	7.53
07-Jul-2013	08:00:00	0.44	4.63	-5.77	2.96	9.46	3.93	7.92	7.23
07-Jul-2013	20:00:00	-1.06	4.23	-7.34	2.38	8.9	3.73	7.74	7.02
08-Jul-2013	08:00:00	-1.43	3.92	-7.49	2.15	8.49	3.72	7.79	7.04
08-Jul-2013	20:00:00	-3.58	2.44	-8.42	1.64	7.94	3.46	7.6	6.84
09-Jul-2013	08:00:00	-2.34	3	-8.02	1.63	7.56	3.5	7.64	6.86
09-Jul-2013	20:00:00	-4.78	0.86	-9.25	1.16	7	3.25	7.47	6.65
10-Jul-2013	08:00:00	0.14	4.33	-6.48	1.96	7.97	3.75	7.88	7.15
10-Jul-2013	20:00:00	-1.28	3.99	-7.48	1.72	7.56	3.56	7.74	7.05
11-Jul-2013	08:00:00	-1.52	3.75	-7.82	1.63	7.23	3.53	7.73	6.93
11-Jul-2013	20:00:00	-2.66	2.97	-8.2	1.43	6.97	3.42	7.64	6.87
12-Jul-2013	08:00:00	-1.08	3.82	-7.52	1.48	6.58	3.39	7.63	6.82
12-Jul-2013	20:00:00	-1.88	3.17	-7.89	1.86	7	3.82	7.97	7.1
13-Jul-2013	08:00:00	0.78	7.2	-5.34	2.68	8.94	3.73	8.19	7.4
13-Jul-2013	20:00:00	0.46	5.56	-6.38	2.25	8.52	3.38	7.96	7.19
14-Jul-2013	08:00:00	0.65	4.94	-5.69	2.34	8.56	3.91	8.09	7.28
14-Jul-2013	20:00:00	0.42	5.19	-5.43	2.56	9.23	3.86	8.19	7.1
15-Jul-2013	08:00:00	0.39	4.82	-5.8	2.74	9.04	4.03	8.12	7.41
15-Jul-2013	20:00:00	-1.29	4.52	-7.07	2.25	8.51	3.81	7.93	7.13
16-Jul-2013	08:00:00	-1.67	4.12	-7.39	2.05	8.06	3.75	7.9	7.07
16-Jul-2013	20:00:00	-3.84	2.5	-8.35	1.58	7.51	3.54	7.7	6.83
17-Jul-2013	08:00:00	-3.36	2.15	-8.31	1.51	7.1	3.55	7.72	6.87
17-Jul-2013	20:00:00	-1.58	3.72	-7.05	2.13	7.77	4.15	8.19	7.37
18-Jul-2013	08:00:00	-2.1	3.43	-8.11	1.84	7.44	3.76	7.93	7.11
18-Jul-2013	20:00:00	-4.4	1.42	-8.9	1.44	6.92	3.56	7.74	6.89
19-Jul-2013	08:00:00	-3.91	1.46	-9.27	1.41	6.48	3.58	7.74	6.92
19-Jul-2013	20:00:00	-6.16	-0.29	-9.96	0.96	6.23	3.41	7.61	6.77
20-Jul-2013	08:00:00	-5.05	0.59	-10.2	1.06	5.93	3.44	7.61	6.74
20-Jul-2013	20:00:00	-0.98	3.79	-7.65	1.85	6.47	3.86	8.03	7.18
21-Jul-2013	08:00:00	-1.96	3.34	-8.6	1.64	6.34	3.7	7.87	7
21-Jul-2013	20:00:00	-1.9	3.44	-8.42	1.74	6.33	3.77	7.96	7.07
22-Jul-2013	08:00:00	-2.38	2.99	-8.95	1.65	6.13	3.71	7.87	7.03
22-Jul-2013	20:00:00	-2.08	3.34	-8.92	1.53	6.19	3.69	7.85	7.09
23-Jul-2013	08:00:00	-0.37	4.17	-7.99	1.89	6.41	3.86	7.98	7.19
23-Jul-2013	20:00:00	-2.68	3.13	-9.51	1.41	6.06	3.67	7.8	7.02
24-Jul-2013	08:00:00	-2.77	2.57	-9.98	1.36	5.79	3.66	7.82	6.99
24-Jul-2013	20:00:00	-5.35	0.22	-10.58	0.83	5.69	3.41	7.66	6.82
25-Jul-2013	08:00:00	-4.61	0.59	-10.82	0.9	5.42	3.48	7.68	6.77
25-Jul-2013	20:00:00	-6.67	-1.43	-11.31	0.6	5.25	3.35	7.59	6.72
26-Jul-2013	08:00:00	-5.52	-0.51	-11.41	0.76	5.1	3.39	7.61	6.75
26-Jul-2013	20:00:00	-7.65	-2.61	-11.86	0.42	5.05	3.22	7.48	6.62
27-Jul-2013	08:00:00	1.46	5.89	-4.84	2.8	7.28	4.36	8.69	7.72
27-Jul-2013	20:00:00	0.78	4.94	-5.59	2.29	7.74	3.82	8.23	7.26
28-Jul-2013	08:00:00	0.26	4.17	-6.73	1.94	7.36	3.9	8.01	7.18
28-Jul-2013	20:00:00	-0.06	3.95	-7.06	2.21	7.93	4.16	8.19	7.31

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
29-Jul-2013	08:00:00	-0.99	3.72	-8.07	1.94	7.38	3.95	8.02	7.12
29-Jul-2013	20:00:00	-2.97	2.43	-9	1.61	6.84	3.78	7.88	6.93
30-Jul-2013	08:00:00	-2.85	1.69	-9.5	1.71	6.38	3.86	7.92	7.03
30-Jul-2013	20:00:00	-4.4	0.7	-10.12	1.44	6.17	3.76	7.87	7.01
31-Jul-2013	08:00:00	-2.72	2.29	-9.67	1.74	6.18	3.91	8.02	7.17
31-Jul-2013	20:00:00	0.03	3.81	-7.46	2.08	6.59	4.02	8.12	7.32
01-Aug-2013	08:00:00	-0.22	3.97	-7.66	1.99	6.64	3.99	8.1	7.23
01-Aug-2013	20:00:00	-1.91	3.32	-8.88	1.59	6.16	3.81	7.98	7.02
02-Aug-2013	08:00:00	-2.29	3.04	-9.32	1.63	5.69	3.84	7.99	7.09
02-Aug-2013	20:00:00	-4.13	1.41	-10.14	1.25	5.31	3.68	7.89	6.97
03-Aug-2013	08:00:00	-2.4	2.59	-9.76	1.45	5.23	3.77	7.97	7.07
03-Aug-2013	20:00:00	-4.52	0.95	-10.26	1.11	5.28	3.6	7.85	7.01
04-Aug-2013	08:00:00	-3.96	1.06	-10.53	1.17	5.04	3.67	7.91	7.02
04-Aug-2013	20:00:00	-6.49	-1.45	-11.37	0.64	4.92	3.46	7.74	6.82
05-Aug-2013	08:00:00	-5.41	-0.47	-11.55	0.75	4.75	3.46	7.78	6.89
05-Aug-2013	20:00:00	-7.44	-2.39	-11.78	0.5	5.07	3.42	7.73	6.8
06-Aug-2013	08:00:00	-2.91	2.55	-10.53	1.47	5.36	3.77	8	7.12
06-Aug-2013	20:00:00	-4.3	0.96	-11	1.16	5.19	3.64	7.91	7.03
07-Aug-2013	08:00:00	-3.94	0.96	-10.88	1.16	4.9	3.69	7.96	7.04
07-Aug-2013	20:00:00	-3.39	1.63	-10.67	1.3	5.03	3.79	8.04	7.2
08-Aug-2013	08:00:00	-3.32	1.45	-10.57	1.36	4.92	3.82	8.05	7.18
08-Aug-2013	20:00:00	-4.75	0.01	-11.26	1.14	5.04	3.76	8.01	7.16
09-Aug-2013	08:00:00	-4.24	0.4	-11.5	1.19	4.8	3.79	8.02	7.13
09-Aug-2013	20:00:00	-5.07	-0.14	-11.25	0.95	4.78	3.76	7.96	6.98
10-Aug-2013	08:00:00	-4.54	-0.1	-11.37	1.06	4.58	3.77	8.01	7.14
10-Aug-2013	20:00:00	0.64	5.29	-5.71	2.35	8.04	4.31	8.36	7.5
11-Aug-2013	08:00:00	-0.24	4.35	-7.01	2.04	7.2	4.01	8.16	7.28
11-Aug-2013	20:00:00	-1.56	3.6	-8.23	1.8	6.49	3.88	8.06	7.25
12-Aug-2013	08:00:00	-2	3.24	-9.04	1.86	6.02	3.98	8.09	7.19
12-Aug-2013	20:00:00	-3.18	2.33	-9.51	1.6	5.75	3.86	8.04	7.14
13-Aug-2013	08:00:00	-2.95	2.12	-9.62	1.6	5.37	3.9	8.1	7.2
13-Aug-2013	20:00:00	-4.88	0.27	-10.43	1.23	5.08	3.74	7.98	7.13
14-Aug-2013	08:00:00	-4.25	0.49	-10.79	1.2	4.8	3.75	7.98	7.1
14-Aug-2013	20:00:00	-6.38	-1.52	-11.43	0.78	4.65	3.63	7.86	6.95
15-Aug-2013	08:00:00	-5.5	-0.65	-11.57	0.85	4.37	3.62	7.88	6.96
15-Aug-2013	20:00:00	-6.51	-1.81	-11.89	0.68	4.18	3.58	7.85	6.91
16-Aug-2013	08:00:00	-5.61	-0.98	-12.29	0.84	3.99	3.61	7.87	6.91
16-Aug-2013	20:00:00	-7.21	-3.11	-12.75	0.59	4.04	3.48	7.78	6.79
17-Aug-2013	08:00:00	-5.87	-1.14	-12.68	0.78	3.81	3.55	7.82	6.83
17-Aug-2013	20:00:00	-5.22	0.12	-12.26	1.11	4.32	3.63	7.96	6.98
18-Aug-2013	08:00:00	-2	3.16	-10.95	1.71	4.62	3.93	8.11	7.22
18-Aug-2013	20:00:00	-2.93	2.3	-11.19	1.42	4.45	3.83	8.02	7.07
19-Aug-2013	08:00:00	0.49	4.31	-7.51	2.3	5.53	4.21	8.31	7.44
19-Aug-2013	20:00:00	-0.78	3.02	-9	1.84	4.89	3.9	8.11	7.19
20-Aug-2013	08:00:00	-1.45	3.09	-9.43	1.72	4.48	3.86	8.09	7.17
20-Aug-2013	20:00:00	-2.47	2.59	-10.3	1.5	4.47	3.52	8.01	7.13
21-Aug-2013	08:00:00	-2.51	2.12	-10.58	1.44	4.39	3.4	8.06	7.08
21-Aug-2013	20:00:00	-3.15	1.95	-10.59	1.24	4.4	3.83	8.05	7.12
22-Aug-2013	08:00:00	-3.12	1.8	-10.93	1.2	4.18	3.81	8.08	7.2
22-Aug-2013	20:00:00	-4.91	-0.37	-11.52	0.71	4.21	3.71	8.21	7.03
23-Aug-2013	08:00:00	-4.33	-0.01	-11.77	0.75	4.15	3.72	8.02	7.15
23-Aug-2013	20:00:00	-6.03	-2.15	-12.45	0.29	3.94	3.61	7.93	6.98
24-Aug-2013	08:00:00	-5.28	-1.49	-13.11	0.3	3.53	3.65	7.94	7
24-Aug-2013	20:00:00	-7.56	-4.48	-13.65	-0.26	3.22	3.5	7.81	6.83
25-Aug-2013	08:00:00	-6.74	-3.01	-13.95	-0.14	3.23	3.5	7.84	6.9
25-Aug-2013	20:00:00	-8.49	-5.45	-13.71	-0.45	3.22	3.48	7.78	6.82
26-Aug-2013	08:00:00	-7.36	-3.55	-15.18	-0.25	3.14	3.53	7.82	6.9
26-Aug-2013	20:00:00	-9.25	-6.15	-17.53	-0.66	3.09	3.42	7.71	6.79
27-Aug-2013	08:00:00	-8.08	-4.04	-17.25	-0.38	3.11	3.47	7.77	6.91
27-Aug-2013	20:00:00	-9.91	-6.49	-18.55	-0.72	3	3.37	7.7	6.82

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
28-Aug-2013	08:00:00	-8.58	-4.21	-18.15	-0.44	2.94	3.43	7.74	6.9
28-Aug-2013	20:00:00	-10.41	-6.79	-19.77	-0.8	2.93	3.34	7.72	6.8
29-Aug-2013	08:00:00	-9.04	-4.42	-19.4	-0.51	2.91	3.42	7.79	6.85
29-Aug-2013	20:00:00	-11.27	-7.48	-21.02	-1.14	2.75	3.24	7.63	6.63
30-Aug-2013	08:00:00	-9.21	-3.8	-19.57	-0.69	2.82	3.38	7.74	6.74
30-Aug-2013	20:00:00	-9.97	-5.67	-20.36	-0.86	2.9	3.33	7.74	6.75
31-Aug-2013	08:00:00	-8.85	-4.09	-19.97	-0.52	2.93	3.42	7.78	6.84
31-Aug-2013	20:00:00	-9.7	-5.12	-20.73	-0.75	2.88	3.37	7.73	6.74
01-Sep-2013	08:00:00	-8.6	-3.61	-20.23	-0.43	2.88	3.4	7.8	6.89
01-Sep-2013	20:00:00	-2.22	3.04	-17.33	1.5	4.35	3.86	8.18	7.21
02-Sep-2013	08:00:00	-3.49	2.4	-18.44	1.15	3.77	3.71	8.06	7.17
02-Sep-2013	20:00:00	-5.14	0.51	-19.06	0.75	3.89	3.62	7.97	7
03-Sep-2013	08:00:00	-2.27	3.09	-17.76	1.37	3.91	3.83	8.12	7.13
03-Sep-2013	20:00:00	-4.69	0.88	-18.87	0.84	3.56	3.66	7.99	6.9
04-Sep-2013	08:00:00	-4.72	0.32	-18.7	0.7	3.49	3.64	7.99	7
04-Sep-2013	20:00:00	-6.32	-1.81	-19.58	0.27	3.28	3.52	7.91	6.89
05-Sep-2013	08:00:00	-5.75	-1.46	-19.23	0.25	3.06	3.56	7.95	6.95
05-Sep-2013	20:00:00	-7.47	-3.83	-20.34	-0.18	3	3.46	7.85	6.79
06-Sep-2013	08:00:00	-6.93	-2.98	-20.02	-0.15	2.85	3.46	7.87	6.87
06-Sep-2013	20:00:00	-8.47	-5.58	-21.12	-0.55	2.88	3.36	7.76	6.76
07-Sep-2013	08:00:00	-7.56	-3.91	-20.57	-0.4	2.81	3.41	7.81	6.84
07-Sep-2013	20:00:00	-9.28	-6.33	-21.82	-0.81	2.77	3.31	7.71	6.69
08-Sep-2013	08:00:00	-8.38	-4.46	-21.28	-0.55	2.71	3.36	7.75	6.84
08-Sep-2013	20:00:00	-10.01	-6.61	-22.45	-0.97	2.6	3.26	7.66	6.66
09-Sep-2013	08:00:00	-8.93	-4.73	-21.78	-0.73	2.44	3.29	7.71	6.67
09-Sep-2013	20:00:00	-10.71	-6.05	-23.13	-1.09	2.37	3.19	7.62	6.61
10-Sep-2013	08:00:00	-9.52	-3.91	-22.43	-0.8	2.39	3.25	7.69	6.65
10-Sep-2013	20:00:00	-11.33	-6.94	-23.98	-1.23	2.36	3.14	7.58	6.51
11-Sep-2013	08:00:00	-10.1	-4.95	-23.27	-0.87	2.47	3.19	7.61	6.62
11-Sep-2013	20:00:00	-1.69	3.05	-18.58	1.17	3.75	3.5	7.9	6.93
12-Sep-2013	08:00:00	-3.3	2.24	-19.66	0.96	3.37	3.54	7.89	6.92
12-Sep-2013	20:00:00	-4.84	0.16	-20.52	0.67	3.42	3.45	7.85	6.84
13-Sep-2013	08:00:00	-4.88	-0.72	-20.6	0.67	3.38	3.48	7.88	6.95
13-Sep-2013	20:00:00	-7.28	-3.96	-22.16	0.09	3.32	2.86	7.74	6.7
14-Sep-2013	08:00:00	-7.03	-3.4	-21.71	0	3.01	3.31	7.73	6.71
14-Sep-2013	20:00:00	-8.4	-5.66	-22.92	-0.33	2.86	3.21	7.65	6.56
15-Sep-2013	08:00:00	-7.8	-5.24	-22.36	-0.27	2.55	3.24	7.67	6.69
15-Sep-2013	20:00:00	-9	-6.28	-23.51	-0.54	2.55	3.19	7.63	6.57
16-Sep-2013	08:00:00	-8.09	-4.71	-22.94	-0.38	2.33	3.26	7.67	6.67
16-Sep-2013	20:00:00	-9.92	-8.04	-24.48	-0.73	2.4	3.17	7.61	6.52
17-Sep-2013	08:00:00	-9.13	-5.18	-23.98	-0.59	2.41	3.24	7.65	6.61
17-Sep-2013	20:00:00	-10.41	-7	-25.07	-0.83	2.19	3.19	7.61	6.57
18-Sep-2013	08:00:00	-9.48	-5.39	-24.49	-0.64	2.33	3.26	7.68	6.63
18-Sep-2013	20:00:00	-10.31	-6.15	-25.16	-0.72	2.3	3.25	7.66	6.67
19-Sep-2013	08:00:00	-9.12	-4.69	-24.39	-0.44	2.74	3.31	7.71	6.76
19-Sep-2013	20:00:00	-10.78	-6.96	-25.66	-0.73	3.03	3.25	7.66	6.66
20-Sep-2013	08:00:00	-9.59	-4.94	-24.74	-0.42	3.23	3.3	7.73	6.76
20-Sep-2013	20:00:00	-11.46	-7.33	-26.26	-0.84	3.28	3.19	7.67	6.68
21-Sep-2013	08:00:00	-10.2	-4.91	-25.32	-0.52	3.66	2.82	7.72	6.76
21-Sep-2013	20:00:00	-1.46	3.66	-17.82	1.51	4.84	3.86	8.23	7.35
22-Sep-2013	08:00:00	-2.96	2.55	-20.15	1.05	4.24	3.65	8.02	7.04
22-Sep-2013	20:00:00	-4.64	0.93	-21.08	0.62	4.29	3.47	7.88	6.86
23-Sep-2013	08:00:00	-4.97	-0.03	-21.02	0.55	4.25	3.47	7.87	6.82
23-Sep-2013	20:00:00	-6	-1.84	-21.79	0.34	4.06	3.42	7.81	6.82
24-Sep-2013	08:00:00	-5.64	-2.38	-21.44	0.4	4.29	3.46	7.86	6.88
24-Sep-2013	20:00:00	-6.97	-3.29	-22.44	0.12	4.3	3.36	7.81	6.81
25-Sep-2013	08:00:00	-6.41	-1.94	-21.94	0.21	4.2	3.46	7.82	6.81
25-Sep-2013	20:00:00	-2.66	2.64	-20	1.08	4.39	3.71	8.07	7.07
26-Sep-2013	08:00:00	-3.29	1.95	-20.54	0.92	4.38	3.67	7.99	6.95
26-Sep-2013	20:00:00	-4.86	0.29	-21.33	0.63	4.58	3.56	7.9	6.86

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
27-Sep-2013	08:00:00	-4.83	0.14	-21.15	0.56	4.56	3.49	7.9	6.89
27-Sep-2013	20:00:00	-6.21	-1.05	-21.88	0.27	4.48	3.45	7.84	6.79
28-Sep-2013	08:00:00	-5.65	-0.53	-21.45	0.29	4.58	3.48	7.86	6.86
28-Sep-2013	20:00:00	-6.91	-1.82	-22.24	0.06	4.25	3.44	7.84	6.83
29-Sep-2013	08:00:00	-6.11	-1.09	-21.83	0.17	4.28	3.44	7.89	6.93
29-Sep-2013	20:00:00	-7.37	-2.5	-22.72	-0.07	4.18	3.42	7.83	6.84
30-Sep-2013	08:00:00	-6.41	-1.66	-22.28	0.07	4.02	3.44	7.87	6.94
30-Sep-2013	20:00:00	-7.37	-2.6	-23.01	-0.1	4.13	3.4	7.82	6.8
01-Oct-2013	08:00:00	-6.61	-2.03	-22.67	0.02	4.28	3.43	7.84	6.87
01-Oct-2013	20:00:00	-8.24	-3.62	-23.69	-0.19	3.99	3.38	Data gap	6.8
02-Oct-2013	08:00:00	-7.35	-2.79	-23.18	-0.06	4.29	3.41	Data gap	6.83
02-Oct-2013	20:00:00	-8.73	-4.14	-24.07	-0.22	3.27	3.37	Data gap	6.8
03-Oct-2013	08:00:00	-7.86	-3.06	-23.48	-0.08	3.69	3.41	Data gap	6.83
03-Oct-2013	20:00:00	-9.28	-4.72	-24.56	-0.3	3.75	3.36	Data gap	6.81
04-Oct-2013	08:00:00	-8.39	-4.1	-23.94	-0.12	3.88	3.39	Data gap	6.85
04-Oct-2013	20:00:00	-9.81	-5.23	-25.06	-0.34	3.89	3.33	Data gap	6.76
05-Oct-2013	08:00:00	-8.83	-3.85	-24.44	-0.15	3.59	3.38	Data gap	6.85
05-Oct-2013	20:00:00	-10.08	-5.27	-25.52	-0.36	3.93	3.34	Data gap	6.81
06-Oct-2013	08:00:00	-9.03	-3.81	-24.86	-0.18	4.17	3.4	Data gap	6.91
06-Oct-2013	20:00:00	-10.27	-5.37	-25.86	-0.37	4.18	3.4	Data gap	6.91
07-Oct-2013	08:00:00	0.91	5.34	-7.7	2.33	6.25	5.13	Data gap	8.24
07-Oct-2013	20:00:00	-0.38	4.1	-9.15	1.4	5.33	3.88	Data gap	7.25
08-Oct-2013	08:00:00	-1.37	3.41	-8.42	1.16	5.27	3.75	Data gap	7.14
08-Oct-2013	20:00:00	-2.37	1.15	-7.96	0.99	5.12	3.71	Data gap	7.01
09-Oct-2013	08:00:00	-2.79	1.84	-7.94	0.98	5.01	3.72	Data gap	7.07
09-Oct-2013	20:00:00	-3.73	0.51	-8.07	0.82	4.88	3.66	Data gap	7.12
10-Oct-2013	08:00:00	-3.89	0.28	-8.68	0.79	4.39	3.71	Data gap	7.18
10-Oct-2013	20:00:00	-4.75	-0.79	-8.74	0.61	4.47	3.7	Data gap	7.16
11-Oct-2013	08:00:00	-4.6	-1	-9.25	0.55	4.29	3.78	Data gap	7.18
11-Oct-2013	20:00:00	-5.69	-2.31	-9.89	0.32	4.32	3.73	Data gap	7.23
12-Oct-2013	08:00:00	-5.34	-1.92	-10.64	0.34	4.25	3.77	Data gap	7.27
12-Oct-2013	20:00:00	-5.45	-2.24	-11.63	0.33	4.4	3.85	Data gap	7.33
13-Oct-2013	08:00:00	-5.02	-1.78	-12.78	0.35	4.34	3.97	Data gap	7.39
13-Oct-2013	20:00:00	-5.65	-2.58	-14.75	0.31	4.34	4.01	Data gap	7.53
14-Oct-2013	08:00:00	-5.09	-1.93	-15.05	0.39	4.41	4.09	Data gap	7.59
14-Oct-2013	20:00:00	-4.88	-1.65	-16.01	0.49	4.55	4.21	Data gap	7.71
15-Oct-2013	08:00:00	-4.75	-1.55	-16.35	0.5	4.55	4.29	Data gap	7.78
15-Oct-2013	20:00:00	-5.36	-2.35	-16.8	0.43	4.58	4.31	Data gap	7.86
16-Oct-2013	08:00:00	-4.94	-1.79	-17.01	0.5	4.01	4.39	Data gap	7.96
16-Oct-2013	20:00:00	-5.65	-2.68	-17.55	0.43	4.11	4.38	Data gap	7.97
17-Oct-2013	08:00:00	-4.92	-1.38	-17.36	0.6	4.22	4.5	Data gap	8.05
17-Oct-2013	20:00:00	-3.86	0.01	-17.13	0.8	4.29	4.58	Data gap	8.1
18-Oct-2013	08:00:00	-4.11	-0.74	-17.68	0.76	4.34	4.58	Data gap	8.09
18-Oct-2013	20:00:00	-5.01	-1.77	-18	0.71	4.42	4.53	Data gap	8.09
19-Oct-2013	08:00:00	-4.62	-1.22	-18.03	0.79	4.46	4.69	Data gap	8.15
19-Oct-2013	20:00:00	-4.46	-1.4	-18.29	0.8	4.55	4.65	Data gap	8.18
20-Oct-2013	08:00:00	-4.56	-1.52	-18.77	0.7	4.29	4.66	Data gap	8.2
20-Oct-2013	20:00:00	-5.38	-2.49	-19.16	0.61	4.17	4.65	Data gap	8.16
21-Oct-2013	08:00:00	-5.25	-2.14	-19.41	0.61	4.1	4.69	Data gap	8.24
21-Oct-2013	20:00:00	-5.47	-2.48	-19.48	0.62	4.26	4.72	Data gap	8.25
22-Oct-2013	08:00:00	-4.98	-1.52	-19.38	0.76	4.36	4.78	Data gap	8.44
22-Oct-2013	20:00:00	-5.3	-2.02	-19.57	0.71	4.52	4.82	Data gap	8.39
23-Oct-2013	08:00:00	-4.97	-1.73	-19.83	0.73	4.51	4.89	Data gap	8.49
23-Oct-2013	20:00:00	-5.96	-3.16	-20.48	0.53	3.81	4.51	Data gap	8.33
24-Oct-2013	08:00:00	-5.84	-2.51	-20.63	0.49	3.92	4.39	Data gap	8.4
24-Oct-2013	20:00:00	-6.04	-2.86	-20.65	0.47	3.95	4.81	Data gap	8.35
25-Oct-2013	08:00:00	-5.85	-2.49	-20.91	0.39	3.93	4.82	Data gap	8.31
25-Oct-2013	20:00:00	-6.11	-2.94	-21.12	0.4	3.95	4.5	Data gap	8.38
26-Oct-2013	08:00:00	-5.83	-2.56	-21.25	0.42	3.82	4.87	Data gap	8.43

Date	Time	Wetland Gauge Number and Water Level (inches)							
dd-mmm-yyyy	hh:mm:ss	UT1 - 01	UT1 - 02	UT1 - 03	UT5 - 01	UT5 - 02	UT6 - 01	UT6 - 02	UT6 - 03
26-Oct-2013	20:00:00	-5.57	-2.19	-20.85	0.57	3.95	4.88	Data gap	8.43
27-Oct-2013	08:00:00	-5.33	-1.9	-20.97	0.54	3.99	4.85	Data gap	8.39
27-Oct-2013	20:00:00	-5.31	-2.1	-20.91	0.61	4.08	4.84	Data gap	8.4
28-Oct-2013	08:00:00	-5.2	-1.66	-20.85	0.59	4.04	4.81	Data gap	8.35
28-Oct-2013	20:00:00	-4.76	-1.25	-20.56	0.69	4.2	4.66	Data gap	8.23
29-Oct-2013	08:00:00	-4.69	-1.23	-20.63	0.66	3.53	4.78	Data gap	8.21
29-Oct-2013	20:00:00	-4.75	-1.53	-20.67	0.7	3.48	4.71	Data gap	8.32
30-Oct-2013	08:00:00	-4.67	-1.23	-20.54	0.65	3.48	4.79	Data gap	8.33
30-Oct-2013	20:00:00	-4.67	-1.62	-20.63	0.64	3.55	4.76	Data gap	8.32
31-Oct-2013	08:00:00	-4.75	-1.07	-20.59	0.68	3.5	4.84	Data gap	8.43
31-Oct-2013	20:00:00	-4.49	-0.86	-20.3	0.79	3.59	4.95	Data gap	8.69
01-Nov-2013	08:00:00	-4.45	-0.65	-20.22	0.78	3.82	5.06	Data gap	8.58
01-Nov-2013	20:00:00	-4.11	-1.14	-20.14	0.88	4.2	5.11	Data gap	8.7
02-Nov-2013	08:00:00	-4.48	-1.37	-20.51	0.77	3.69	5.15	Data gap	8.74
02-Nov-2013	20:00:00	-4.41	-1.77	-20.57	0.73	3.71	5.1	Data gap	8.67
03-Nov-2013	08:00:00	-4.82	-1.96	-20.81	0.58	3.35	5.12	Data gap	8.68
03-Nov-2013	20:00:00	-4.8	-2.15	-20.78	0.6	3.06	5.15	Data gap	8.71
04-Nov-2013	08:00:00	-5.08	-2.11	-21	0.55	2.85	5.1	Data gap	8.75
04-Nov-2013	20:00:00	-4.84	-2.79	-20.85	0.62	2.87	5.05	Data gap	8.68
05-Nov-2013	08:00:00	-5.01	-2.87	-20.94	0.58	2.79	5.11	Data gap	8.66
05-Nov-2013	20:00:00	-4.85	-2.47	-20.77	0.71	3.06	5.13	Data gap	8.76
06-Nov-2013	08:00:00	-4.28	-1.5	-20.31	0.82	3.65	5.25	Data gap	8.81
06-Nov-2013	20:00:00	-4.05	-1.15	-20.15	0.87	3.63	5.24	Data gap	8.92
07-Nov-2013	08:00:00	-4.15	-1.22	-20.11	0.83	3.48	5.29	Data gap	8.96
07-Nov-2013	20:00:00	-4.18	-1.71	-20.3	0.76	3.48	5.2	Data gap	8.89
08-Nov-2013	08:00:00	-4.52	-1.39	-20.54	0.64	3.28	5.2	Data gap	8.81
08-Nov-2013	20:00:00	-4.58	-2.28	-20.68	0.63	3.28	5.13	Data gap	8.75
09-Nov-2013	08:00:00	-4.79	-1.6	-20.88	0.56	3.18	5.1	Data gap	8.69
09-Nov-2013	20:00:00	-4.43	-1.43	-20.49	0.66	3.42	5.03	Data gap	8.58
10-Nov-2013	08:00:00	-4.6	-1.51	-20.68	0.66	3.25	5.01	Data gap	8.61
10-Nov-2013	20:00:00	-4.19	1.79	-20.5	0.72	3.34	4.97	Data gap	8.58
11-Nov-2013	08:00:00	-4.52	0.53	-20.87	0.62	3.21	4.93	Data gap	8.51
11-Nov-2013	20:00:00	-4.28	-0.08	-20.52	0.74	3.5	4.93	Data gap	8.58
12-Nov-2013	08:00:00	-4.48	-0.27	-20.53	0.75	3.45	4.96	Data gap	8.57
12-Nov-2013	20:00:00	-4.54	-0.89	-20.74	0.65	3.32	4.83	Data gap	8.44
13-Nov-2013	08:00:00	-5.13	-1.36	-23.73	0.55	3.16	4.78	Data gap	8.36
13-Nov-2013	20:00:00	-4.64	-1.17	-20.93	0.72	3.34	4.71	Data gap	8.37
14-Nov-2013	08:00:00	-4.88	-1.6	-37.91	0.66	3.26	4.71	Data gap	8.31

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
1/1/2013						0.52	0.33
1/2/2013							0.04
1/3/2013							
1/4/2013						0.01	0.01
1/5/2013						0.01	
1/6/2013							
1/7/2013							
1/8/2013						0.01	
1/9/2013							
1/10/2013				0.14	0.4	0.05	
1/11/2013				0.34	0.05	0.47	
1/12/2013				0.01			
1/13/2013				0.06	0.13	0.02	1
1/14/2013				1.25	1.59	1.23	1
1/15/2013				1.15	1.06	1.23	1.21
1/16/2013				0.4	0.46	0.48	0.43
1/17/2013				2.35	2.19	2.53	2.51
1/18/2013					0.01		
1/19/2013				0.01		0.01	
1/20/2013							
1/21/2013				0.01			
1/22/2013							0.03
1/23/2013							
1/24/2013							
1/25/2013				0.01	0.01	0.01	
1/26/2013				0.02	0.02	0.03	
1/27/2013				0.01	0.01	0.01	
1/28/2013							
1/29/2013				0.11	0.33	0.09	0.03
1/30/2013				1.95	1.59	1.97	1.68

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
1/31/2013							
2/1/2013							
2/2/2013							
2/3/2013							
2/4/2013							
2/5/2013							
2/6/2013							
2/7/2013				0.67	0.62	0.68	0.62
2/8/2013						0.01	
2/9/2013							
2/10/2013				0.3	0.34	0.28	0.23
2/11/2013				0.06		0.1	
2/12/2013				0.28	0.29	0.26	0.02
2/13/2013				0.05	0.01	0.08	0.21
2/14/2013							
2/15/2013							
2/16/2013				0.03	0.02	0.02	0.01
2/17/2013							
2/18/2013					0.05		
2/19/2013				0.06	0.01	0.07	0.05
2/20/2013							
2/21/2013				0.49	0.55	0.33	0.13
2/22/2013				0.28	0.24	0.31	0.35
2/23/2013				0.11	0.01	0.25	0.2
2/24/2013							
2/25/2013				0.15	1.15	0.01	0.44
2/26/2013				1.55	0.44	1.8	0.98
2/27/2013				0.01			
2/28/2013							
3/1/2013							

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
3/2/2013							
3/3/2013							
3/4/2013					0.07		
3/5/2013				0.82	0.77	0.93	
3/6/2013					0.02		0.74
3/7/2013							
3/8/2013							
3/9/2013							
3/10/2013							
3/11/2013				1.38	1.2	1.31	
3/12/2013						0.15	1.2
3/13/2013							
3/14/2013							
3/15/2013							
3/16/2013							
3/17/2013					0.02		
3/18/2013				0.52	0.42	0.63	0.01
3/19/2013				0.01			0.33
3/20/2013							
3/21/2013							
3/22/2013							
3/23/2013				0.11	0.55	0.03	
3/24/2013				0.77	0.12	0.84	0.62
3/25/2013						0.03	0.06
3/26/2013							
3/27/2013							
3/28/2013							
3/29/2013							
3/30/2013				0.2	0.19	0.07	
3/31/2013				0.09	0.05	0.28	0.22

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
4/1/2013				0.01			
4/2/2013							
4/3/2013					0.32		0.01
4/4/2013				0.93	0.41	0.99	0.88
4/5/2013					0.01		
4/6/2013						0.01	
4/7/2013							
4/8/2013							
4/9/2013							
4/10/2013							
4/11/2013				1.26	1.03	1.11	1.12
4/12/2013				0.02		0.12	
4/13/2013							
4/14/2013				0.24	0.25	0.15	0.24
4/15/2013				0.09	0.01	0.21	0.02
4/16/2013					0.19		0.12
4/17/2013				0.25		0.19	0.14
4/18/2013				0.01	0.56	0.02	0.01
4/19/2013				0.67	0.16	0.91	0.56
4/20/2013							
4/21/2013							
4/22/2013							
4/23/2013							
4/24/2013							
4/25/2013							
4/26/2013				0.01	0.04	0.01	0.02
4/27/2013				0.26	1.14	0.27	0.23
4/28/2013				1.73	0.54	1.52	1.18
4/29/2013						0.02	0.03
4/30/2013						0.01	

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
5/1/2013				0.11	0.13	0.01	
5/2/2013				0.1	0.02	0.16	0.11
5/3/2013						0.02	0.02
5/4/2013				0.48	1.72	0.21	
5/5/2013				3.8	1.82	3.88	0.74
5/6/2013						0.06	3.13
5/7/2013				0.06	0.05	0.06	0.01
5/8/2013				0.01	0.01	0.02	0.05
5/9/2013							
5/10/2013				0.09	0.05	0.04	
5/11/2013				0.41	0.17	0.19	0.02
5/12/2013							0.43
5/13/2013	>4.0	>4.0	>4.0				
5/14/2013							
5/15/2013					0.01		
5/16/2013				0.01		0.02	
5/17/2013					0.33		
5/18/2013				0.49	0.2	0.57	
5/19/2013				0.13	0.01	0.09	0.62
5/20/2013							0.03
5/21/2013					1.08		0.05
5/22/2013				2.61	2.13	3.86	
5/23/2013				0.07			1.76
5/24/2013							
5/25/2013							
5/26/2013							
5/27/2013							
5/28/2013							
5/29/2013							
5/30/2013							

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
5/31/2013							
6/1/2013					0.78		
6/2/2013				1.72	0.67	1.32	1.05
6/3/2013				0.02	0.03	0.02	
6/4/2013				0.01		0.03	0.02
6/5/2013				0.8	0.96	0.76	0.09
6/6/2013				0.36	0.26	0.37	0.29
6/7/2013				0.3	0.25	0.36	
6/8/2013				0.19	1.54	0.09	
6/9/2013				1.65	0.94	1.22	2
6/10/2013				0.49	0.08	0.41	0.32
6/11/2013				0.08			0.06
6/12/2013				0.01	0.13		
6/13/2013				0.22	0.08	0.1	
6/14/2013				0.02			
6/15/2013							
6/16/2013				0.05	0.17		
6/17/2013				0.16	0.02	0.13	0.1
6/18/2013				0.05	0.01	0.02	0.22
6/19/2013							
6/20/2013							
6/21/2013							
6/22/2013							
6/23/2013				0.03	0.34	0.02	
6/24/2013				0.11	0.04	0.03	0.57
6/25/2013				0.02	0.06		0.23
6/26/2013				0.02	0.04	0.04	0.83
6/27/2013				0.01		0.03	
6/28/2013					0.16	0.06	
6/29/2013				0.01		0.01	0.11

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
6/30/2013				0.01	0.39	0.03	
7/1/2013					1.26	0.85	0.8
7/2/2013				0.01	0.06	0.53	0.64
7/3/2013				0.01	0.98	0.48	0.81
7/4/2013				0.01	0.08	2.93	2.9
7/5/2013				0.01	0.03	0.61	0.58
7/6/2013				0.01	0.02	0.67	0.46
7/7/2013				0.01	0.01	0.02	0.01
7/8/2013				0.01	0.02	0.02	0.08
7/9/2013					0.01	0.64	1.59
7/10/2013				0.01		0.09	0.07
7/11/2013				0.01	0.01	0.01	
7/12/2013					0.01	1.11	2.93
7/13/2013				0.01		0.23	
7/14/2013					0.01	0.3	1.08
7/15/2013				0.01		0.01	
7/16/2013					0.01	0.01	
7/17/2013							0.55
7/18/2013				0.01	0.01		0.01
7/19/2013							
7/20/2013							0.57
7/21/2013					0.01		0.65
7/22/2013				0.01		0.01	0.87
7/23/2013							
7/24/2013					0.01		
7/25/2013							
7/26/2013							
7/27/2013							2.41
7/28/2013							
7/29/2013					0.01		

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
7/30/2013							
7/31/2013							0.21
8/1/2013							0.5
8/2/2013							
8/3/2013					0.01		0.12
8/4/2013							
8/5/2013							0.01
8/6/2013							
8/7/2013							0.1
8/8/2013							0.01
8/9/2013					0.01		0.61
8/10/2013							0.87
8/11/2013							
8/12/2013							0.25
8/13/2013							
8/14/2013							
8/15/2013							
8/16/2013							
8/17/2013							0.02
8/18/2013					0.01		0.14
8/19/2013							0.45
8/20/2013							
8/21/2013							0.01
8/22/2013							
8/23/2013							
8/24/2013							
8/25/2013							
8/26/2013							
8/27/2013							
8/28/2013							

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
8/29/2013							
8/30/2013					0.01	0.01	0.19
8/31/2013				0.01	0.5		
9/1/2013				0.43		0.47	0.32
9/2/2013				0.3	0.25	0.3	0.44
9/3/2013				0.01		0.01	0.23
9/4/2013							
9/5/2013							
9/6/2013							
9/7/2013							
9/8/2013						0.01	
9/9/2013							
9/10/2013					0.37		
9/11/2013				0.55	0.01	0.27	
9/12/2013				0.01		0.01	
9/13/2013						0.01	0.02
9/14/2013							
9/15/2013							
9/16/2013							
9/17/2013							
9/18/2013							
9/19/2013							
9/20/2013					0.32		
9/21/2013				0.55	0.08	0.02	
9/22/2013				0.01			0.75
9/23/2013							
9/24/2013					0.17		
9/25/2013				0.32			
9/26/2013							0.27
9/27/2013							

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
9/28/2013							
9/29/2013							
9/30/2013							
10/1/2013							
10/2/2013							
10/3/2013							
10/4/2013							
10/5/2013							
10/6/2013				1.44	1.45	0.7	1.65
10/7/2013				0.33		1.21	1.6
10/8/2013							0.01
10/9/2013						0.01	
10/10/2013							
10/11/2013							
10/12/2013							
10/13/2013				0.01	0.03	0.02	0.02
10/14/2013				0.04	0.01	0.04	
10/15/2013							0.03
10/16/2013				0.01	0.08	0.01	0.11
10/17/2013				0.11		0.1	0.05
10/18/2013					0.01		0.01
10/19/2013				0.02	0.01	0.01	0.01
10/20/2013						0.01	
10/21/2013					0.02		0.01
10/22/2013				0.02		0.02	
10/23/2013							0.01
10/24/2013						0.01	
10/25/2013							
10/26/2013							
10/27/2013					0.01		

Rainfall and Crest Gauge Data							
	Crest Gauges (Feet above Bankfull)			On-Site Auto Rain Gauges			Weather Station
Date	UT1	UT5	UT6	UT1 (in)	UT5 (in)	UT6 (in)	Bridgwater (in)
10/28/2013				0.01		0.01	
10/29/2013							
10/30/2013							
10/31/2013					0.03	0.01	
11/1/2013				0.03	0.01	0.04	0.01
11/2/2013				0.02		0.02	0.07
11/3/2013							
11/4/2013						0.01	
11/5/2013				0.04	0.03	0.03	
11/6/2013					0.01	0.02	
11/7/2013				0.01		0.01	
11/8/2013							
11/9/2013							
11/10/2013							
11/11/2013							
11/12/2013							
11/13/2013							
11/14/2013							
11/15/2013							
11/16/2013							
11/17/2013							
11/18/2013							
11/19/2013							
11/20/2013							
11/21/2013							
11/22/2013							
11/23/2013							
11/24/2013							
11/25/2013							
11/26/2013							

APPENDIX F

Invasive Exotic Vegetation Control at North Muddy Creek Stream Restoration Site Progress Report

Invasive Exotic Vegetation Control at the North Muddy Creek Stream Restoration Site
IPO NC-02-2011
Year 5: October 31st, 2013
Final Report

Purpose

The North Muddy Creek Stream Restoration Site was treated for invasive exotic plants to eliminate competition of non-native plants within riparian easement areas. A comprehensive inventory of invasive exotic plants occurring within the easement was performed in 2010. Initial treatments occurred in the summer and fall of 2011 with follow-up treatments occurring in 2012 and final treatments ending in late fall of 2013. This Progress Report provides a summary of management activities occurring in 2013 as well as the status of invasive exotic plant populations on-site.

Site Conditions

Approximately 3.3 acres of invasive exotic plant infestations were inventoried at North Muddy Creek. In 2011, approximately 3.2 acres were treated across all project areas. In 2012 and 2013, follow-up treatments occurred along UT-1, UT-5, and UT-6, totaling 2.5 acres. Target species included:

- Privet (*Ligustrum sinense*)
- Multiflora Rose (*Rosa multiflora*)
- Japanese Honeysuckle (*Lonicera japonica*)
- Kudzu (*Pueraria montana var. lobata*)

Summary of Control Activities

In 2013, three separate control events were held at the North Muddy Creek Stream Restoration Site. The first, occurring on March 1st, targeted semi-evergreen species such as Privet and Japanese honeysuckle with foliar applications of 5% triclopyr solution (Garlon 3A + water) with surfactant (LI-700) at UT-1 and UT-6; late winter/early spring foliar treatments allow for decreased non-target damage to native deciduous species. Also, large stems of privet were treated using basal bark applications of a 25% triclopyr solution (Garlon 4 Ultra) in a non-petroleum distillate oil (ArborChem NPD oil).

A second control event was held on September 24th; this day focused on retreatments of infestations at UT-1 and UT-6. The treatment consisted of a basal bark applications using a 25% solution of Garlon 4 Ultra to privet or rose stems that were missed during or resprouting after initial control. Also, the same basal solution was applied to exposed Japanese honeysuckle root crowns co-occurring within and around privet infestations. Foliar treatments were also applied to scattered privet stems and mats of honeysuckle. Furthermore, climbing honeysuckle vines were targeted to reduce overburden on host trees. A new chemical that selects for leguminous and composite plants was used on kudzu infestations occurring at the top of UT-1; a 0.8% solution of clopyralid (Transline) in water with a surfactant was applied to all visible kudzu leaves and green stems. Throughout the control efforts, observations were made as to the efficacy of treatments and the persistence of existing and proliferation of new invasive exotic plant infestations.

The third and final treatment of 2013 occurred on October 16th. The kudzu treatments performed in September along UT-1 were monitored to determine clopyralid efficacy – the chemical was highly effective, causing nearly 100% defoliation and stem death in kudzu without harming surrounding non-target vegetation. It is likely that the kudzu within the easement has been effectively controlled, but there are extensive infestations occurring just outside of the easement fencing. Efforts were also focused on treating matted infestations of honeysuckle occurring within the UT-5 easement. These infestations were treated with a 5% foliar solution of Garlon 3A, where absence of surface water permitted, and in areas of inundation or high water table, a 5% solution of Rodeo, an aquatic-safe glyphosate formulation, was used

to treat honeysuckle leaves. Also, any remaining climbing vines were clipped and painted with a 25% solution of Garlon 3A in order to reduce overburden on host trees.

All herbicide applications were applied and/or supervised by certified NCDA&CS Pesticide Applicator License #026-29539. Table 1 summarizes the reaches treated, application method employed, herbicide volume used, herbicide concentrations used, and other relevant information occurring in 2013.

Recommendations

Even though treatments have been quite effective at stopping invasive exotic seed formation and limiting vegetative reproduction by existing plants, factors such as seed banking, root propagation, recruitment, and other means of latent proliferation may occur in future years. Also, infestations of invasive exotic plants currently exist in varying abundance on the lands peripheral to the easement area; these populations will almost certainly continue to volunteer invasive exotic recruits into the easement. We recommend that invasive populations be visually assessed on an annual basis and subsequent management practices be employed as necessary in order to protect the natural resources preserved within the easement area.

Table 1: Treatment Records (2013)

Date	Start/End Time	Reaches	Description Notes	Target Species	Type of Treatment	Herbicide	Concentration (%)	Volume Herbicide Concentrate Used (oz)	Volume Mixture Used (gal)	Weather	Temperature (°F)	Wind Speed (mph)	Notes
3/1/2013	9:00-4:00	UT-1	All sections of UT-1;	Privet, Honeysuckle, Multiflora Rose, Kudzu (dormant)	foliar	Rodeo	4%	120	30	partly cloudy	56	5	foliar treated honeysuckle along entire reach, didn't finish entire wetland; cut kudzu vines;
3/1/2013	9:00-4:00	UT-1	All sections of UT-1;	Privet, Multiflora Rose	basal bark	Garlon 4Ultra	20%	80	2.5	partly cloudy	56	5	basal bark treatment on spot occurrences of LISI and ROMU, large privet infestation at reach's end;
3/1/2013	9:00-4:00	UT-1	All sections of UT-1;	Privet, Honeysuckle, Multiflora Rose, Kudzu (dormant)	cut stump	Garlon 3A	50%	6	0.2	partly cloudy	56	5	cut stump on climbing LOJA out of foliar reach, cut stem on several outlying LISI/ROMU that were easily accessible; cut multiple PUMO vines (despite dormancy) so resprouting is at ground level, not in canopy;
9/24/2013	9:00-1:00	UT-1	Upstream section UT-1;	Kudzu	foliar	clopyralid	0.80%	6	6	sunny, cool	72	2	new chemical-can treat over top of deciduous plants (as long as they're not in legume/composite family); treated all kudzu inside of easement, some around the edges;
			Upper-mid-lower UT-1	Privet, honeysuckle, multiflora rose;	foliar	Garlon 3A	5%	80	20	sunny, cool	72	2	foliar all UT-1 privet resprouts, honeysuckle mats, and rose with leaves remaining;
9/24/2013	1:00-5:00	UT-6	North and East sides UT-6;	Privet, Japanese Honeysuckle;	basal bark	Garlon 4Ultra	25%	32	1	sunny, cool	72	2	basal on applicable privet, rose, and LOJA crowns
10/16/2013	2:00-5:00	UT-5	All of UT-5	Japanese honeysuckle, privet, multiflora rose	foliar	Garlon 3A	5%	120	30	overcast, sunny	78	4	foliar on mats of LOJA; cut large climbing LOJA; foliar on any incidental privet encountered;
10/16/2013	2:00-5:00	UT-1	Monitor UT-1 (all, including kudzu)	Privet, honeysuckle, rose	foliar	Garlon 3A	5%	42	10	overcast, sunny	78	4	resprouts of privet, few kudzu leaves left to spray; rose on RBD below Gary's house; privet/rose/honeysuckle along large wetland;
						Rodeo	5%	4	5	overcast, sunny	78	4	sprayed anything in wetland/seepy/saturated soil areas with aquatic safe herbicide;