FINAL
ANNUAL MONITORING REPORT
YEAR 5 (2013)
McCAIN STREAM RESTORTION SITE
RANDOLPH COUNTY, NORTH CAROLINA
(EEP Project No. 443, Contract No. 004807)
Construction Completed March 2009

Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina

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Prepared by:
Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603

Axiom Environmental, Inc.

Ecosystem Enhancement PROGRAM

October 2013

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Appendices

1.0 EXECUTIVE SUMMARY

The North Carolina Ecosystem Enhancement Program (NCEEP) has completed stream restoration at the McCain Stream Restoration Site (hereafter referred to as the "Site") to assist in fulfilling stream mitigation goals in the area. Site activities consisted of restoration of 2470 linear feet of stream; however, 53 linear feet of channel is located within a power line utility right-of-way and has therefore been excluded from credit assets, resulting in 2417 stream mitigation units. This report (compiled based on NCEEP's *Procedural Guidance and Content Requirements for EEP Monitoring Reports* Version 1.4 dated 11/7/11) summarizes data for year 5 (2013) monitoring.

The Site is located one mile southeast of the intersection of Lake Lucas Road (SR 1518) and Spero Road (SR 1504) in Sophia, Randolph County, North Carolina. The Site will be protected by a permanent conservation easement held by the State of North Carolina and is contained within a parcel owned by Ms. Sigrid N. McCain. The project reach is located within United States Geological Society (USGS) Hydrologic Unit 03040103050050 (Yadkin River Basin), in a non-targeted portion of the North Carolina Division of Water Quality (NCDWQ) Sub-basin 03-07-09.

The drainage area at the Site outfall is 0.88 square miles. The contributing drainage area consists of: forest (67%), agriculture (16%), rangeland (12%), and urban (4%) land use/land cover.

Prior to construction, the Site was characterized by an active farm with a portion of the property dedicated to pasture and livestock grazing. Primary land uses on the property include rangeland, agriculture (small grain), and hardwood forest. Site streams were characterized by entrenched, narrow, deep, step-pool channels with low to moderate sinuosity. The project was initiated by NCDOT in April 2003 and was transferred to EEP prior to restoration planning. Project construction was completed in March 2009. The project restored 2470 linear feet of stream using Priority 2 restoration by constructing a new meandering channel within and excavated floodplain bench (of that 53 linear feet of channel is located within a power line utility right-of-way and has therefore been excluded from credit assets). Site activities provide 2417 Stream Mitigation Units.

Project Goals:

- Restore stable stream channel morphology that is capable of moving flows and sediment provided by its watershed.
- Restore riparian buffer habitat and functions.
- Improve water quality to the receiving watershed by reducing bank erosion and bed degradation.
- Improve aquatic habitat.

Project Objectives:

- Build an appropriate C4 channel with stable channel dimensions.
- Plant a functional Bottomland Hardwood Forest community to create an effective riparian buffer.
- Exclude livestock from the riparian areas.

Seven vegetation monitoring plots were monitored on September 9, 2013 for monitoring year 5 (2013). Vegetation success criteria dictate an average density of 320 stems per acre must be surviving in the first three monitoring years. Subsequently, 288 stems per acre must be surviving in year 4 and 260 stems per acre in year 5. Stem counts will be based on an average of the evaluated vegetation plots. Based on the number of stems counted, average densities were measured at 358 planted stems per acre (excluding

livestakes) surviving in year 5 (2013). The dominant planted species identified at the Site included river birch (*Betula nigra*), silky dogwood (*Cornus amomum*), green ash (*Fraxinus pennsylvanica*), American sycamore (*Platanus occidentalis*), and willow oak (*Quercus phellos*). Six of the seven individual plots met success criteria based on planted stems alone. Plot 7 was below success criteria based on planted stems alone; however, when including naturally recruited stems of box elder (*Acer negundo*), green ash, tulip poplar (*Liriodendron tulipifera*), and American sycamore plot 7 was well-above 260 stems per acre. For additional information relating to vegetation, see Appendix C.

The dominant herbaceous vegetation throughout the Site is mainly comprised of planted grasses such as fescue (*Festuca* sp.) and naturally recruited Japanese stiltgrass (*Microstegium vimineum*). Although fescue occurs throughout the Site, the northernmost end of the Site is characterized by dense fescue resulting in planted stem mortality and minimal growth of remaining planted trees; the extent of this area is illustrated on Figure 2A (Appendix B). Additional vegetation areas of concern include three small Japanese stiltgrass populations on stream banks located at stations 13+00, 17+50, and 22+10. On the right bank of the southernmost end of the Site, a small population of Chinese privet (*Ligustrum sinense*) has established; however, the area is small enough to not be problematic at this time. In addition, there are several large populations of multiflora rose (*Rosa multiflora*) within the easement that do not appear to pose a threat to planted tree growth at this time.

Success criteria for stream restoration will be assessed using measurements of stream dimension, pattern, and profile; site photographs; visual assessments; and vegetation sampling. Stream success criteria are based on significant changes in channel morphology between baseline measurements and the present monitoring year.

Stream areas of concern include areas of minor bank erosion/scour in the upstream 300 linear feet of the Site (Reach 1). Stream areas of concern do not appear to be worsening and no immediate maintenance actions are recommended at this time. Many areas considered areas of concern during previous monitoring years have recovered and vegetation has established. Current stream areas of concern are depicted on Figures 2A-2B (Appendix B) and include the following.

Map Label*	Station	Notes
SAC-1	10+00	Area of poor vegetation along eroded, undercut, outer bend at beginning of restoration reach
SAC-3	12+90	Eroded outer bend lacking deep-rooted vegetation with some scour in pool
SAC-6	26+50	Minor erosion and poor vegetation development

*Map labels on Figures 2A-2B, Appendix B

Success criteria for stream restoration will include documentation of two bankfull channel events during the monitoring period. In the event that less than two bankfull events occur during the first five years, monitoring will continue until the second event is documented. In addition, bankfull events must occur during separate monitoring years. A crest gauge is located within the Site to assist with documentation of bankfull events (Figures 2-2A, Appendix B). Three bankfull events were documented during the year 5 (2013) monitoring season. A total of five bankfull events have been documented to occur during the five year monitoring period; in addition, bankfull events occurred in separate monitoring years (2009, 2010, and 2013).

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in tables and figures within this report's appendices. Narrative background and supporting information formerly found in these reports

can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on NCEEPs website. All raw data supporting the tables and figures in the appendices is available from NCEEP upon request.

2.0 METHODOLOGY

2.1 Vegetation Assessment

Seven vegetation plots were established and marked after construction with half inch metal conduit demarking the corners with a five-foot, three-quarter inch PVC at the origin. The plots are 10 meters square and are located randomly within the Site. These plots were surveyed on September 9, 2013 for the year 5 (2013) monitoring season using the *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008) (http://cvs.bio.unc.edu/methods.htm); results are included in Appendix C. The taxonomic standard for vegetation used for this document was *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* (Weakley 2007).

2.2 Stream Assessment

Annual stream monitoring was conducted for 2550-linear feet of channel. Six permanent cross-sections (four in riffles and two in pools) were established and will be used to evaluate stream dimension; locations are depicted on Figures 2A-2B (Appendix B). Cross-sections are permanently monumented with half inch rebar at each end point. Cross-sections were surveyed to provide a detailed measurement of the stream and banks including points on the adjacent floodplain, top of bank, bankfull, breaks in slope, edge of water, and thalweg. Data will be used to calculate width-depth ratios, entrenchment ratios, and bank-height ratios for each cross-section. Photographs were taken and pebble counts were conducted at each permanent cross-section location annually. Thirteen permanent photo points were established throughout the restoration reach; locations are depicted on Figures 2A-2B (Appendix B). In addition, visual stream morphology stability assessments were completed in each of the monitoring reaches to assess the channel bed, banks, and in-stream structures (Tables 5A-5B, Appendix B).

3.0 REFERENCES

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

Weakley, Alan S. 2007. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas (online). Available: http://www.herbarium.unc.edu/WeakleysFlora.pdf [February 1, 2008]. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.

Weather Underground. 2013. Station at Asheboro Airport, North Carolina. (online). Available: http://www.wunderground.com/history/airport/KHBI/2013/2/1/CustomHistory.html?dayend=6&monthend=6&yearend=2013&req_city=NA&req_state=NA&req_statename=NA [September 16, 2013]. Weather Underground.

APPENDIX A

PROJECT VICINITY MAP AND BACKGROUND TABLES

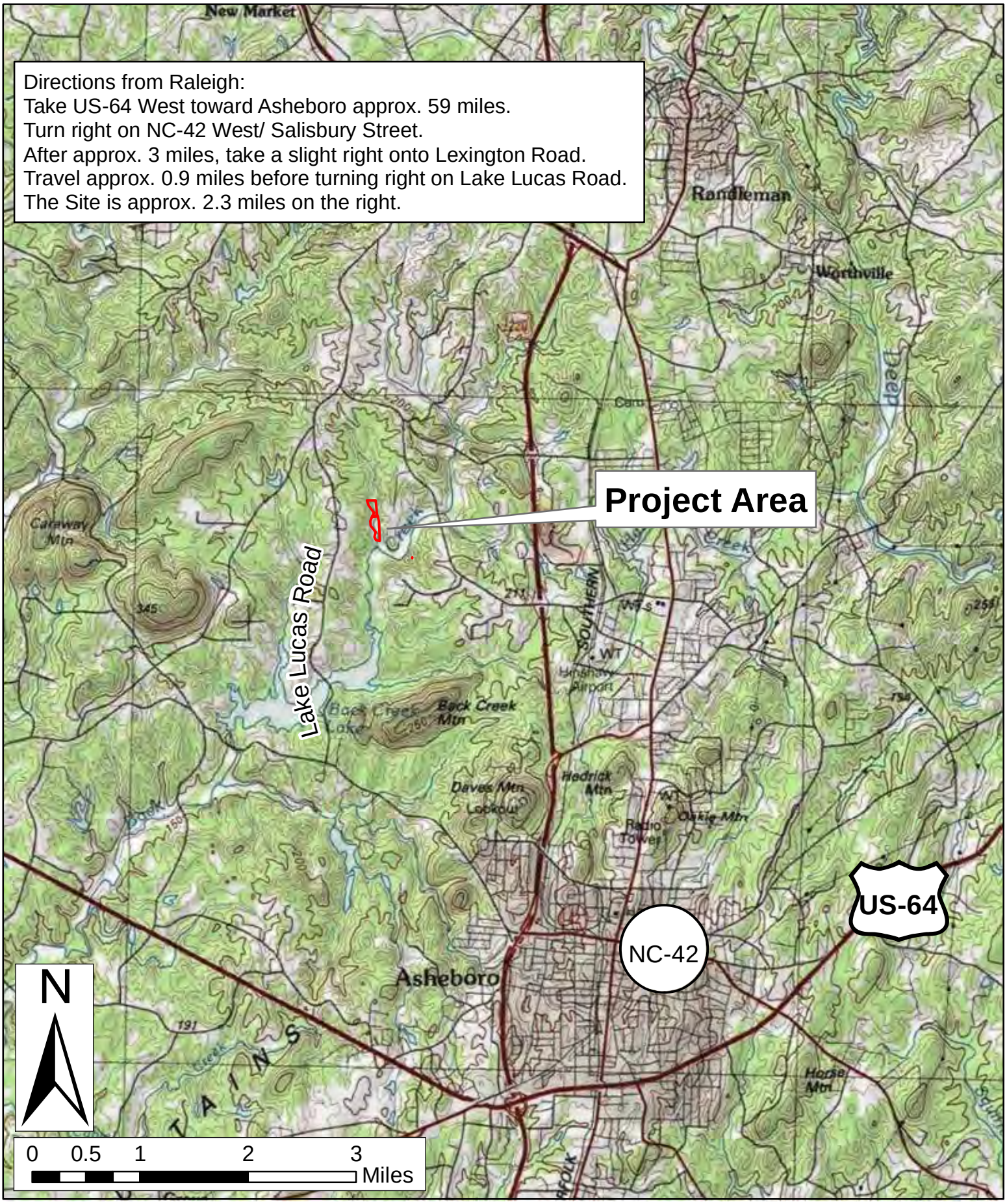
Figure 1. Site Location Map

Table 1. Project Components and Mitigation Credits

Table 2. Project Activity and Reporting History

Table 3. Project Contacts Table

Table 4. Project Attributes Table



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SITE LOCATION MAP
McCAIN STREAM RESTORATION
EEP PROJECT NUMBER 443
Randolph County, North Carolina

Dwn. by. KRJ	FIGURE
Date: Oct. 2012	1
Project: 12-004.14	

Table 1. Project Components and Mitigation Credits
McCain Stream Restoration Site (EEP Project Number 443)

Mitigation Credits							
	Stream		Riparian Wetland		Buffer		
Type	Restoration	Restoration Equivalent	Restoration	Restoration Equivalent			
Totals	2417	--	--	--	--		
Projects Components							
Project Component/ Reach ID	Station Range	Existing Linear Footage/ Acreage	Priority Approach	Restoration/ Restoration Equivalent	Restoration Linear Footage/ Acreage	Mitigation Ratio	Comment
Reach 1	10+00–12+86	490	P2	Restoration	286	1:1	Priority 2 stream restoration.
Reach 2	12+87-34+70	1955	P2	Restoration	2131*	1:1	Priority 2 stream restoration.

Component Summation			
Restoration Level	Stream (linear footage)	Riparian Wetland (acres)	Buffer (square footage)
Restoration	2417	--	--
			--
Totals	2417	--	--
Mitigation Units	2417 SMUs	--	--

*Site activities restored 2183 linear feet of Reach 2; however, 53 linear feet of this reach are located within a power line utility right-of-way have been excluded from credit asset calculations.

Table 2. Project Activity and Reporting History
McCain Stream Restoration Site (EEP Project Number 443)

Elapsed Time Since Grading Complete: 4 years 7 months
Elapsed Time Since Planting Complete: 4 years 7 months
Number of Reporting Years: 5

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Project Initiated by NCDOT		April 2003
Restoration Plan	2003/2004	June 2005
Final Design – Construction Plans		May 2006
Construction Complete		March 2009
Temporary S&E mix applied to entire project area		March 2009
Permanent seed mix applied to entire project area		March 2009
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	May 2009	July 2009
Year 1 Monitoring (2009)	October 2009	December 2009
Year 2 Monitoring (2010)	November 2010	November 2010
Year 3 Monitoring (2011)	August 2011	November 2011
Year 4 Monitoring (2012)	October 2012	November 2012
Year 5 Monitoring (2013)	September 2013	October 2013

Table 3. Project Contacts Table
McCain Stream Restoration Site (EEP Project Number 443)

Designer	KCI Associates of NC Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Adam Spiller (919) 783-9214
Construction, Planting, and Seeding Contractor	Carolina Environmental Contracting, Inc. PO Box 1905 Mount Airy, NC 27030 Stephen James (336) 320-3849
Survey Contractor	Unknown
Seed Mix Source	Unknown
Baseline Data Collection and Years 1-3 Monitoring Performers	Ward Consulting Engineers, P.C. 8368 Six Forks Road Suite 104 Raleigh, NC 27615-5083 Becky Ward 919-870-0526
Years 4-5 Monitoring Performers	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693

Table 4. Project Attributes Table
McCain Stream Restoration Site (EEP Project Number 443)

Project Information		
Project Name	McCain Stream Restoration Site	
Project County	Randolph County, North Carolina	
Project Area	13.34 acres	
Project Coordinates (NAD83/WGS84)	734162.6573, 1746572.2892	
Project Watershed Summary Information		
Physiographic Region	Piedmont	
Ecoregion	Carolina Slate Belt	
Project River Basin	Yadkin	
USGS 8-digit HUC	03040103	
USGS 14-digit HUC	03040103050050	
NCDWQ Subbasin	03-07-09	
Project Drainage Area	0.88 square miles	
Project Drainage Area Impervious Surface	2%	
Watershed Type	Rural	
Reach Summary Information		
Parameters	**Reach 1**	**Reach 2**
Restored/Enhanced Length	286 linear feet	2184 linear feet
Drainage Area	0.88 sq. mi.	0.88 sq. mi.
NCDWQ Index Number	13-2-3-3-(0.3) (UT to Back Creek)	
NCDWQ Classification	C	
Valley Type/Morphological Description	V/B4c	V/C4
Dominant Soil Series	Dogue Sandy Loam	
Drainage Class	Moderately Well Drained	
Soil Hydric Status	Nonhydric	
Slope	0.0066	
FEMA Classification	Zone C	
Native Vegetation Community	Bottomland Hardwood Forest	
Percent Composition of Exotic Invasives	>5	
Regulatory Considerations		
Regulation	**Applicable**	
Waters of the U.S. –Sections 404 and 401	Yes-Received Appropriate Permits	
Endangered Species Act	No	
Historic Preservation Act	No	
CZMA/CAMA	No	
FEMA Floodplain Compliance	Unknown	
Essential Fisheries Habitat	No	

APPENDIX B

VISUAL ASSESSMENT DATA

Figures 2 and 2A-2B. Monitoring Plan View

Tables 5A-5B. Visual Stream Morphology Stability Assessment Tables

Table 6. Vegetation Condition Assessment Table

Fixed-Station Photos

Vegetation Monitoring Plot Photos

Fig. 2A

Fig. 2B

Legend

- Easement Boundary
- Stream
- In-Stream Structures
- Cross Sections
- CVS Monitoring Plots
- Crest Gauge
- Photo Points

Stream Areas of Concern

- Undercut
- Scoured/Eroded

Vegetation Areas of Concern

- Fescue and Low Stem counts
- Microstegium vimineum
- Privet

0 125 250 500 750 Feet

N

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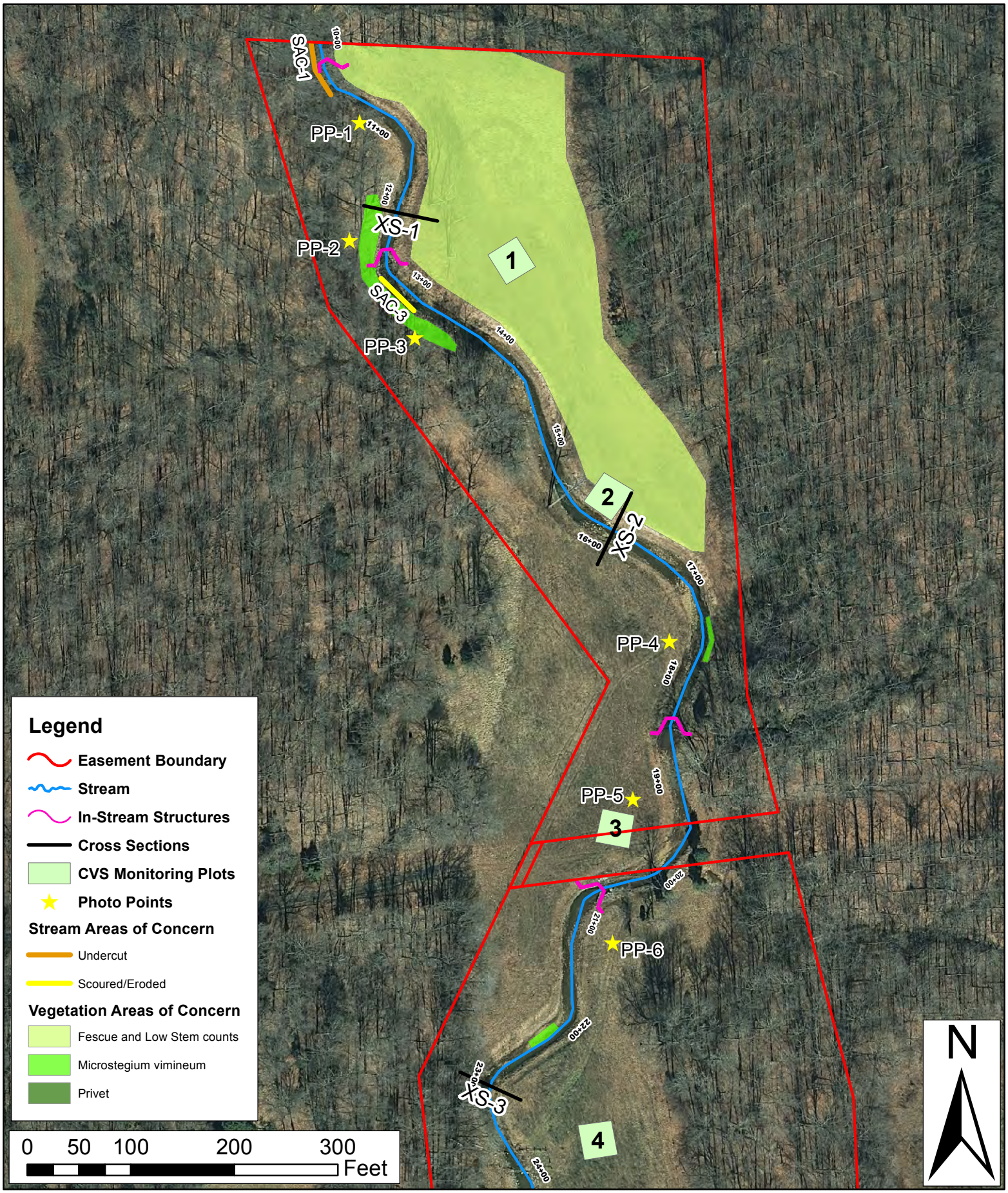
CURRENT CONDITIONS PLAN VIEW
McCAIN STREAM RESTORATION
EEP PROJECT NUMBER 443
Randolph County, North Carolina

Dwn. by.	KRJ/CLF
Date:	Sept 2013
Project:	12-004.14

FIGURE 2



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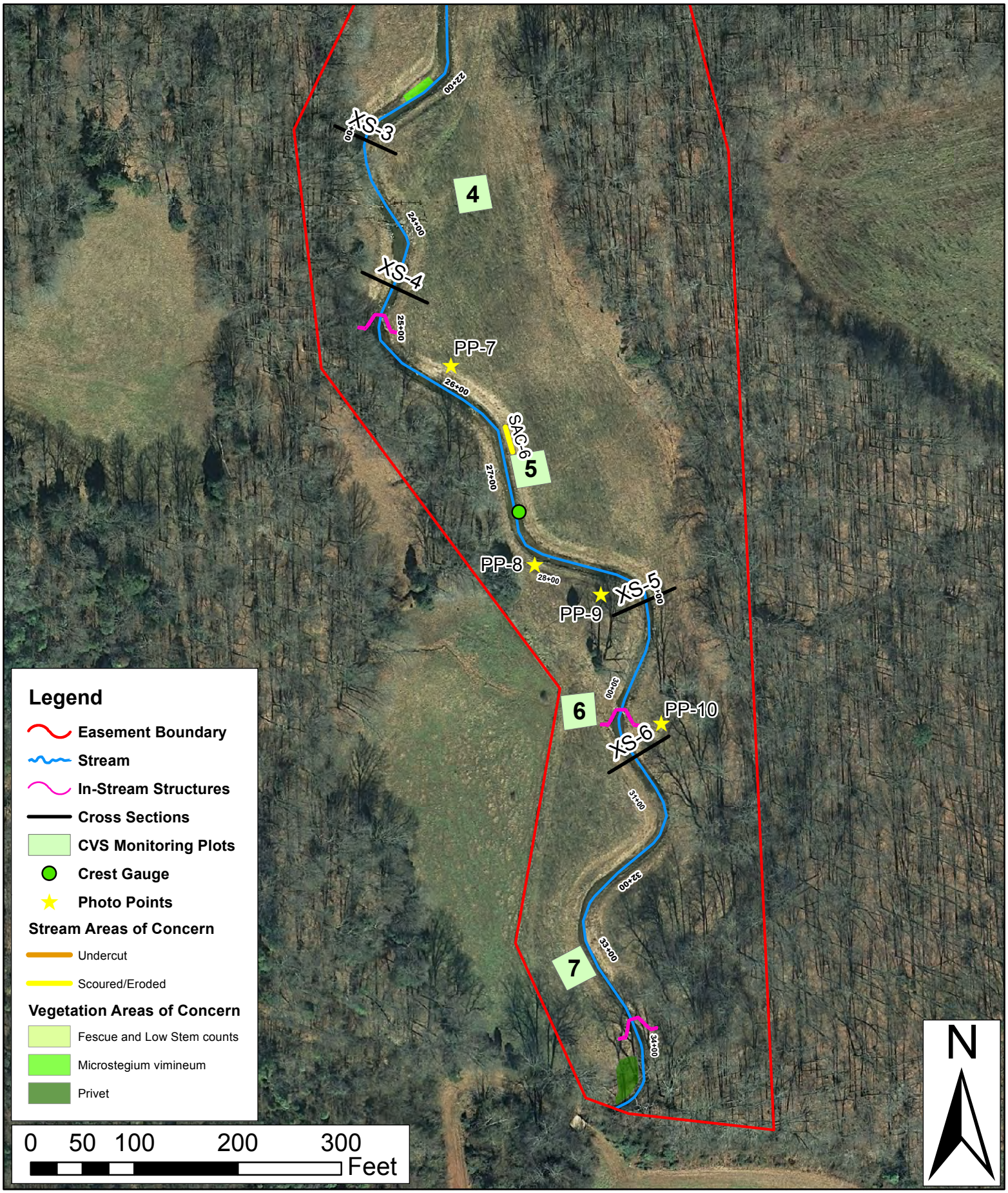
CURRENT CONDITIONS PLAN VIEW
McCAIN STREAM RESTORATION
EEP PROJECT NUMBER 443
Randolph County, North Carolina

Dwn. by.	KRJ/CLF
Date:	Sept 2013
Project:	12-004.14

FIGURE
2A



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CURRENT CONDITIONS PLAN VIEW
McCAIN STREAM RESTORATION
EEP PROJECT NUMBER 443
Randolph County, North Carolina

Dwn. by.	KRJ/CLF
Date:	Sept 2013
Project:	12-004.14

FIGURE
2B

Table 5A **Visual Stream Morphology Stability Assessment**
Reach ID **Reach 1**
Assessed Length **286**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)					100%			
		2. Degradation - Evidence of downcutting			1	30	90%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	2	2			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	3	3			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	3	3			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	3	3			100%			
		2. Thalweg centering at downstream of meander (Glide)	2	2			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion					100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			1	50	91%			91%
	3. Mass Wasting	Bank slumping, calving, or collapse					100%			100%
				Totals	1	50	91%	0	0	91%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	2	2			100%			

Table 5B **Visual Stream Morphology Stability Assessment**
Reach ID **Reach 2**
Assessed Length **2184**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			1	30	99%			
		2. Degradation - Evidence of downcutting			1	125	94%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	16	17			94%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	16	18			89%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	18	18			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	15	17			88%			
		2. Thalweg centering at downstream of meander (Glide)	16	17			94%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion					100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.					100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse					100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	5	6			83%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	6	6			100%			

McCain Property

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **7.98**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas		<0.1 acres	N/A	0	0.00	0.0%
2. Low Stem Density Areas	Low woody stem densities based on visual observations.	0.1 acres	Light Green	1	1.41	17.7%
			Total	1	1.41	17.7%
3. Areas of Poor Growth Rates or Vigor	Woody stems are small given the monitoring year. These areas are included in the "Low Stem Density Areas" and are therefore not shown separately.	0.25 acres	N/A	0	0.00	0.0%
			Cumulative Total	1	1.41	17.7%

Easement Acreage[2] **13.34**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Microstegium, tall fescue, multiflora rose, Chinese privet	1000 SF	Bright Green/Dark Green	4	0.10	0.7%
5. Easement Encroachment Areas[3]		none	NA	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

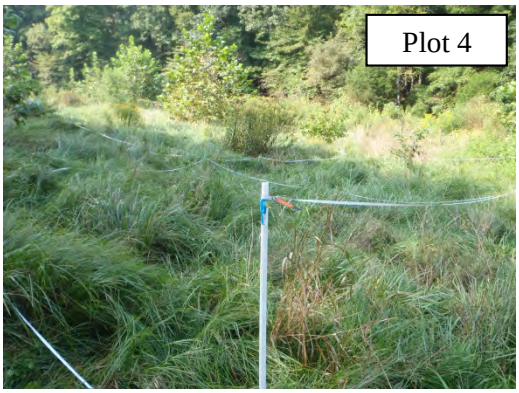
3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

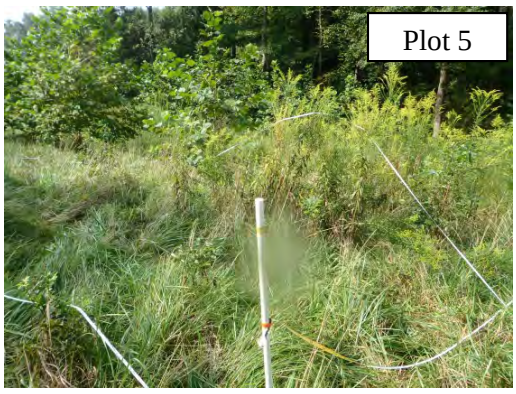
4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by EEP such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

McCain
Fixed-Station Photographs
Taken September 2013

McCain Stream
Fixed-Station Photographs
Taken September 2013
(continued)

McCain Stream
Vegetation Monitoring Plot Photographs
Taken September 2013





APPENDIX C

VEGETATION PLOT DATA

Table 7. Vegetation Plot Criteria Attainment

Table 8. CVS Vegetation Plot Metadata

Table 9. Total and Planted Stems by Plot and Species

Table 7. Vegetation Plot Criteria Attainment
McCain Creek Restoration Site (EEP Project Number 443)

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	86%
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	No*	

*Based on planted stems alone, this plot doesn't meet success criteria; however, when including naturally recruited stems of box elder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), tulip poplar (*Liriodendron tulipifera*), and American sycamore (*Platanus occidentalis*) plot 7 was well-above 260 stems per acre.

Table 8. CVS Vegetation Plot Metadata

Report Prepared By	Corri Faquin	
Date Prepared		9/16/2013 15:09
database name	Axiom-EEP-2013-A-v2.3.1.mdb	
database location	\\AE-SBS\RedirectedFolders\pperkinson\Desktop	
computer name	PHILLIP-PC	
file size		65798144
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------		
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.	
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.	
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.	
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).	
Vigor	Frequency distribution of vigor classes for stems for all plots.	
Vigor by Spp	Frequency distribution of vigor classes listed by species.	
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.	
Damage by Spp	Damage values tallied by type for each species.	
Damage by Plot	Damage values tallied by type for each plot.	
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.	
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.	
PROJECT SUMMARY----------		
Project Code		443
project Name	McCain	
Description	Stream restoration site located in the Yadkin River Basin	
River Basin	Yadkin-Pee Dee	
length(ft)		2450
stream-to-edge width (ft)		50
area (sq m)		22758.94
Required Plots (calculated)		7
Sampled Plots		7

Table 9. Total Planted and Natural Recruits Stems by Plot and Species
EEP Project Code 443. Project Name: McCain

			Current Plot Data (MY5 2013)																				
			E443-A-0001			E443-A-0002			E443-A-0003			E443-A-0004			E443-A-0005			E443-A-0006			E443-A-0007		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree																					4
Acer rubrum	red maple	Tree																					
Betula nigra	river birch	Tree	2	2	2	1	1	1	6	6	6	2	2	2	1	1	1	4	4	4	1	1	1
Carya	hickory	Tree															1						
Cercis canadensis	eastern redbud	Tree							1	1	1												
Cornus amomum	silky dogwood	Shrub					8	8	1	1	1					3	3	1	1	1	1	5	5
Diospyros virginiana	common persimmon	Tree				1	1	1				1	1	1	2	2	2						
Fraxinus pennsylvanica	green ash	Tree				4	4	7	1	1	1	3	3	4	3	3	3	1	1	1	1	1	12
Juglans nigra	black walnut	Tree			1			1															
Juniperus virginiana	eastern redcedar	Tree						1															
Liquidambar styraciflua	sweetgum	Tree									1						17						7
Liriodendron tulipifera	tuliptree	Tree							3	3	3	1	1	1							1	1	2
Pinus taeda	loblolly pine	Tree						1															
Platanus occidentalis	American sycamore	Tree				1	1	1	4	4	4				1	1	1	1	1	1	1	1	2
Quercus	oak	Tree																					
Quercus falcata	southern red oak	Tree										1	1	1									
Quercus pagoda	cherrybark oak	Tree							2	2	2												
Quercus phellos	willow oak	Tree	5	5	5							1	1	1	1	1	1	1	1	1			
Rosa multiflora	multiflora rose	Exotic																					
Salix nigra	black willow	Tree					6	6								1	1						
Salix sericea	silky willow	Shrub					1	1								4	4					3	3
Sambucus	elderberry	Shrub																					
Unknown		Shrub or Tree																					
	Stem count		7	7	8	7	22	28	18	18	19	9	9	10	8	16	34	8	8	8	5	12	36
	size (ares)		1			1			1			1			1			1			1		
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02		
	Species count		2	2	3	4	7	10	7	7	8	6	6	6	5	8	10	5	5	5	5	6	8
	Stems per ACRE		283.3	283.3	323.7	283.3	890.3	1133	728.4	728.4	768.9	364.2	364.2	404.7	323.7	647.5	1376	323.7	323.7	323.7	202.3	485.6	1457

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

Table 9. Total Planted and Natural Recruits Stems by Plot and Species (cont'd)
EEP Project Code 443. Project Name: McCain

			Annual Means																	
			MY5 (2013)			MY4 (2012)			MY3 (2011)			MY2 (2010)			MY1 (2009)			MY0 (2009)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree			4						5									
Acer rubrum	red maple	Tree						17												
Betula nigra	river birch	Tree	17	17	17	18	18	18	18	18	18	18	18	18	19	19	19	20	20	20
Carya	hickory	Tree			1															
Cercis canadensis	eastern redbud	Tree	1	1	1	1	1	1												
Cornus amomum	silky dogwood	Shrub	3	18	18	3	18	18	3	18	18	3	18	18	5	20	20	5	26	26
Diospyros virginiana	common persimmon	Tree	4	4	4	4	4	4			5									
Fraxinus pennsylvanica	green ash	Tree	13	13	28	12	12	13	4	4	27	4	4	4	4	4	4	4	4	4
Juglans nigra	black walnut	Tree			2															
Juniperus virginiana	eastern redcedar	Tree			1															
Liquidambar styraciflua	sweetgum	Tree			25			17			9									
Liriodendron tulipifera	tuliptree	Tree	5	5	6	5	5	5	5	5	6	5	5	5	6	6	6	6	6	6
Pinus taeda	loblolly pine	Tree			1															
Platanus occidentalis	American sycamore	Tree	8	8	9	8	8	8	9	9	9	9	9	9	9	9	9	9	9	9
Quercus	oak	Tree																7	7	7
Quercus falcata	southern red oak	Tree	1	1	1	1	1	1	2	2	2	3	3	3	3	3	3	4	4	4
Quercus pagoda	cherrybark oak	Tree	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1			
Quercus phellos	willow oak	Tree	8	8	8	8	8	8	7	7	7	6	6	6	7	7	7	2	2	2
Rosa multiflora	multiflora rose	Exotic									1									
Salix nigra	black willow	Tree		7	7		7	7		8	8		7	7		9	9		9	9
Salix sericea	silky willow	Shrub		8	8		8	8		8	8		8	8		8	8		8	8
Sambucus	elderberry	Shrub																	1	1
Unknown		Shrub or Tree																1	2	2
		Stem count	62	92	143	62	92	127	50	81	125	49	79	79	54	86	86	58	98	98
		size (ares)	7			7			7			7			7			7		
		size (ACRES)	0.17			0.17			0.17			0.17			0.17			0.17		
		Species count	10	12	18	10	12	14	8	10	14	8	10	10	8	10	10	9	12	12
		Stems per ACRE	358.4	531.9	826.7	358.4	531.9	734.2	289.1	468.3	722.7	283.3	456.7	456.7	312.2	497.2	497.2	335.3	566.6	566.6

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

APPENDIX D

STREAM SURVEY DATA

Cross-section Plots

Longitudinal Profile Plot

Substrate Plots

Tables 10a-b. Baseline Stream Data Summary

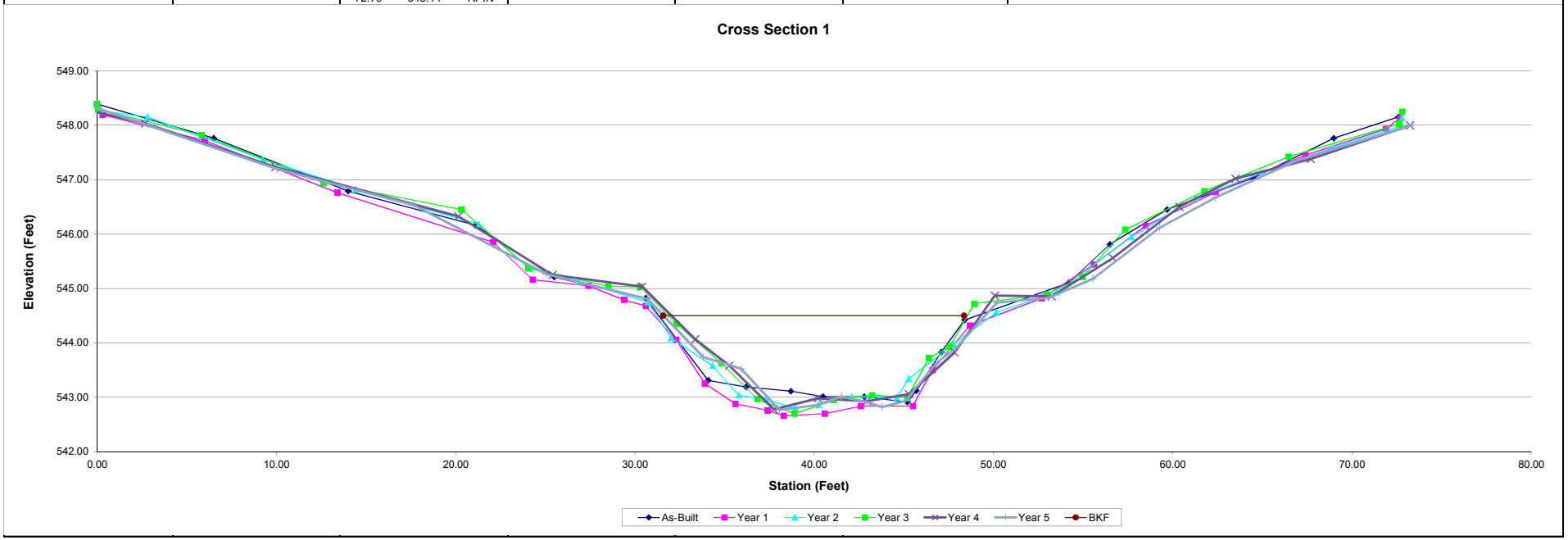
Tables 11a-b. Monitoring Data

Project:	McCain Property
Cross Section:	Cross Section 1
Feature	Riffle Reach 1
Station:	12+11.30
Date:	5/30/13
Crew:	PP, KJ

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	18.6	20.8	18.7	17.8	18.1	19.0
W (BKF)	16.9	17.2	18.1	16.2	16.7	15.2
Max d	1.5	1.6	1.6	1.7	1.6	1.7
Mean d	1.1	1.2	1.0	1.1	1.1	1.3
W/D	15.4	14.2	17.5	14.8	15.5	12.2

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-2012			MY05-2013		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	548.39	LPIN		548.39	LPIN		548.39	LPIN		548.39	LPIN	-0.30	548.26	LPIN		548.32	LPIN
6.50	547.76		0.30	548.19		0.10	548.26		0.05	548.29		2.67	548.03		10.05	547.20	
14.00	546.79		6.00	547.72		2.80	548.15		5.83	547.82		9.95	547.23		17.64	546.53	
21.10	546.16		13.40	546.76		9.25	547.37		12.62	546.94		20.17	546.32		25.07	545.27	TOBL BKFL
25.50	545.21		22.10	545.85		14.42	546.82		20.31	546.45		25.41	545.25	TOBL BKFL	30.71	544.80	
30.60	544.82	TOBL BKFL	24.30	545.16		21.29	546.18		24.04	545.38		30.41	545.03		33.82	543.74	
34.10	543.31		27.40	545.05		24.14	545.36		28.52	545.04		33.37	544.06		35.93	543.52	
36.20	543.19		29.40	544.79		26.88	545.13		30.27	545.03	TOBL BKFL	35.27	543.58		38.07	542.77	
38.70	543.11		30.60	544.68	TOBL BKFL	30.72	544.75	TOBL BKFL	32.31	544.35		37.75	542.78	TW	40.20	542.86	
40.50	543.01		32.30	544.06		32.01	544.09		34.81	543.63		40.22	542.98		41.52	543.01	
42.80	543.01		33.90	543.25		34.33	543.58		36.83	542.97	TOE L	42.95	542.93		42.92	542.91	
45.20	542.91	TW	35.60	542.88		35.79	543.04	TOE L	38.90	542.70	TW	45.29	543.06		43.80	542.82	TW
45.70	543.12		37.40	542.76		37.32	542.96		41.08	542.95		47.83	543.82		45.08	542.93	
47.10	543.83		38.30	542.66	TW	38.96	542.80	TW	43.22	543.04		50.09	544.87	TOBR BKFR	46.81	543.63	
48.40	544.42	TOBR BKFR	40.60	542.70		40.26	542.86		45.19	542.99	TOE R	53.26	544.85		47.91	543.90	
54.20	545.10		42.60	542.84		42.10	543.01		46.40	543.72		56.66	545.56		50.20	544.74	TOBR BKFR
56.50	545.81		45.50	542.84		44.62	543.00	TOE R	47.56	543.93		60.38	546.50		53.12	544.83	
59.70	546.45		46.60	543.50		45.27	543.34		48.93	544.72	TOBR BKFR	63.50	547.02		55.56	545.17	
64.50	547.03		48.70	544.32	TOBR BKFR	47.77	543.97		52.94	544.89		67.70	547.38		59.29	546.12	
69.00	547.76		52.70	544.82		50.16	544.56	TOBR BKFR	54.97	545.21		73.25	548.00	RPIN	62.41	546.67	
72.60	548.15	RPIN	55.60	545.44		53.54	544.93		57.36	546.08					66.97	547.35	
			58.50	546.15		57.71	545.95		61.77	546.79					73.37	548.00	RPIN
			62.40	546.77		61.30	546.66		66.47	547.42							
			67.40	547.45		65.01	547.13		72.63	548.02							
			71.90	547.93		68.96	547.59		72.79	548.25	RPIN						
			72.70	548.13	RPIN	72.76	547.99										
						72.79	548.14	RPIN									

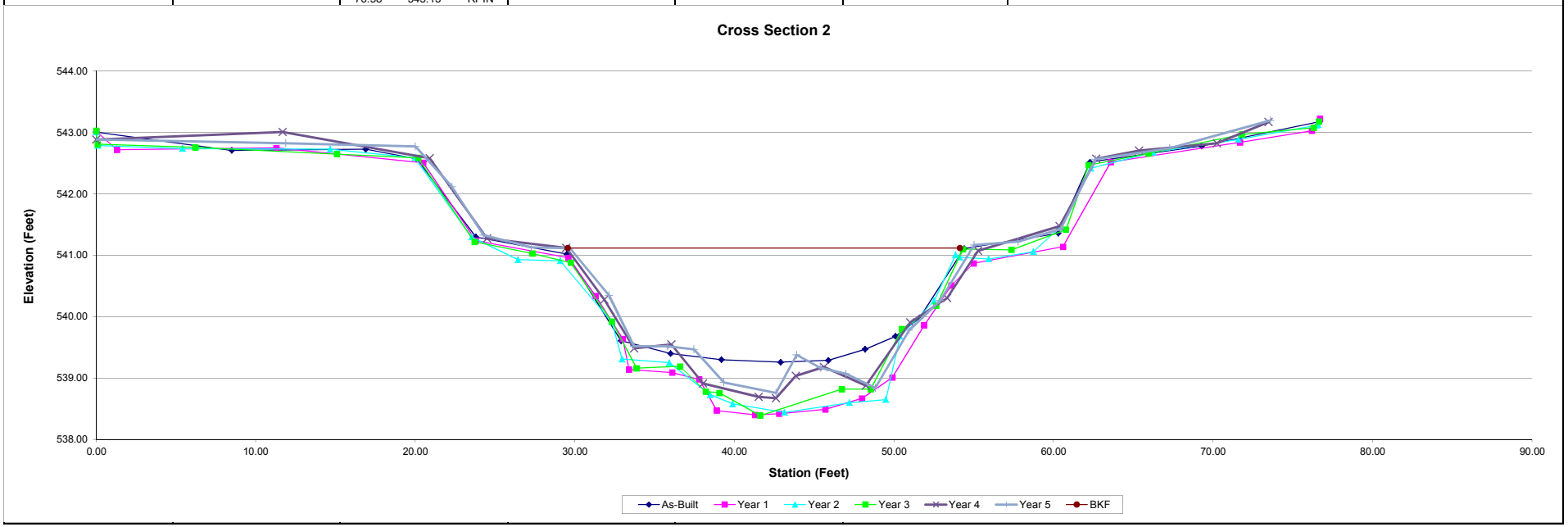


Project:	McCain Property
Cross Section:	Cross Section 2
Feature	Riffle Reach 2
Station:	16+25.07
Date:	5/30/13
Crew:	PP, KJ

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	33.7	42.7	44.4	43.3	38.3	39.3
W (BKF)	24.6	25.2	28.0	26.3	25.3	25.2
Max d	1.8	2.5	2.6	2.6	2.3	2.4
Mean d	1.4	1.7	1.6	1.6	1.5	1.6
W/D	18.0	14.9	17.6	16.0	16.7	16.2

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-2012			MY05-2013		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	543.01	LPIN		543.02	LPIN		543.01	LPIN		543.03	LPIN		542.89	LPIN	-0.50	542.89	LPIN
8.50	542.71		1.30	542.72		0.10	542.79		0.09	542.81		11.68	543.01		11.89	542.83	
16.90	542.73		11.30	542.75		5.41	542.74		6.21	542.76		20.91	542.58		20.00	542.77	
20.10	542.57		20.50	542.51		14.66	542.73		15.09	542.65		24.51	541.28		22.30	542.12	
23.80	541.30		23.80	541.24		19.98	542.59		20.18	542.59		29.46	541.12		24.28	541.33	
29.50	541.02	TOBL BKFL	29.60	540.96	TOBL BKFL	23.53	541.30		23.71	541.22		31.85	540.28	TOBL BKFL	27.28	541.13	
32.90	539.61		31.30	540.34		26.44	540.93		27.35	541.03		33.72	539.49		29.70	541.12	
36.00	539.40		33.00	539.64		29.09	540.91	TOBL BKFL	29.74	540.88	TOBL BKFL	36.05	539.55		32.15	540.35	TOBL BKFL
39.20	539.30		33.40	539.14		32.32	539.92		32.33	539.92		38.05	538.91		33.70	539.52	
42.90	539.26	TW	36.10	539.09		32.96	539.31		33.87	539.16	TOE L	41.53	538.69		35.82	539.52	
45.90	539.29		37.80	538.98		35.92	539.25		36.59	539.19		42.61	538.67		37.47	539.47	
48.20	539.47		38.90	538.47		38.49	538.73	TOE L	38.21	538.78		43.86	539.04	TW	39.34	538.93	
50.10	539.68		41.30	538.40	TW	39.90	538.58		39.07	538.76		45.61	539.18		42.61	538.76	TW
51.60	539.98	TOBR BKFR	42.80	538.42		43.14	538.44	TW	41.63	538.39	TW	48.25	538.88		43.90	539.38	
54.40	541.11		45.70	538.49		47.21	538.60		46.73	538.82		51.02	539.91		45.38	539.17	
60.30	541.36		48.00	538.67		49.50	538.65	TOE R	48.55	538.82	TOE R	53.34	540.31		47.00	539.07	
62.30	542.52		49.90	539.01		50.39	539.68		50.50	539.80		55.28	541.08	TOBR BKFR	48.83	538.84	
69.30	542.78		51.90	539.86		52.52	540.26		52.65	540.18		60.39	541.48		50.96	539.78	
76.70	543.18	RPIN	53.60	540.51		53.87	541.01		54.33	541.10	TOBR BKFR	62.69	542.58		52.90	540.26	
			55.00	540.87	TOBR BKFR	54.13	540.97	TOBR BKFR	57.37	541.09		65.37	542.70		55.04	541.17	TOBR BKFR
			60.60	541.14		55.94	540.94		60.79	541.42		70.25	542.83		57.79	541.22	
			63.60	542.52		58.75	541.06		62.20	542.47		73.48	543.17	RPIN	60.47	541.43	
			71.70	542.84		60.44	541.46		65.96	542.66					62.65	542.57	
			76.20	543.03		62.34	542.42		71.83	542.97					67.28	542.75	
			76.70	543.23	RPIN	66.25	542.68		76.31	543.08					73.59	543.20	RPIN
						71.59	542.89		76.64	543.18	RPIN						
						76.49	543.12										
						76.58	543.13	RPIN									

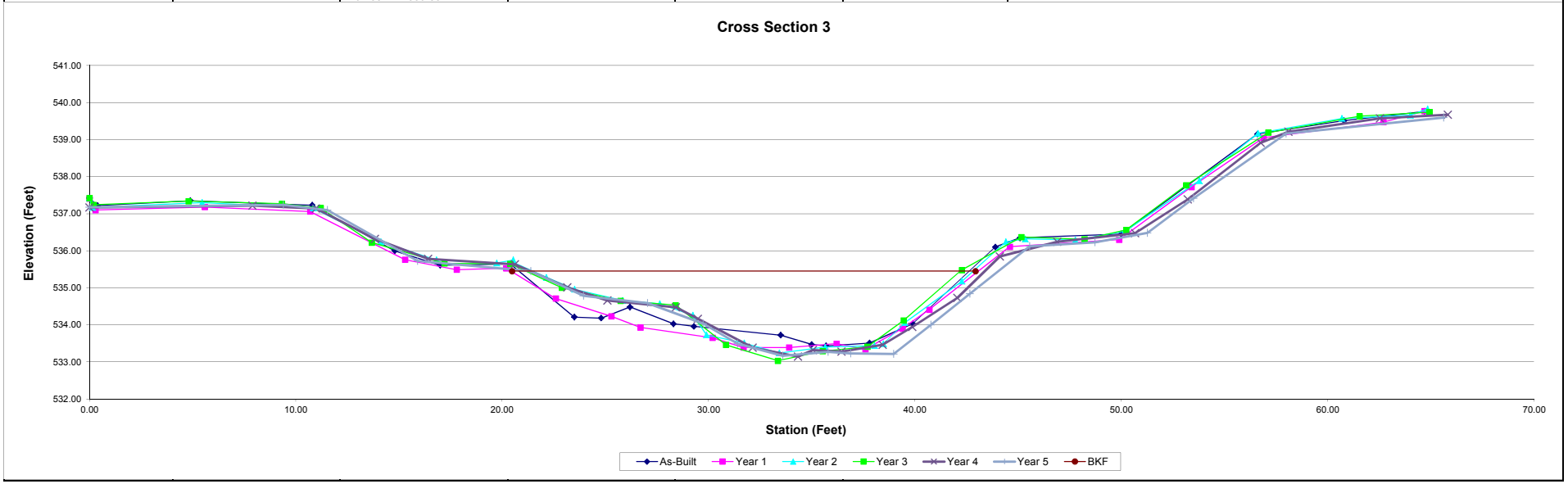


Project:	McCain Property
Cross Section:	Cross Section 3
Feature	Pool Reach 2
Station:	23+45.75
Date:	5/30/13
Crew:	PP, KJ

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	33.6	34.1	30.8	30.7	32.5	31.4
W (BKF)	22.6	23.0	22.3	22.1	22.9	22.7
Max d	2.2	2.2	2.4	2.6	2.5	2.3
Mean d	1.5	1.5	1.4	1.4	1.4	1.4
W/D	-	-	-	-	-	-

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-2012			MY05-2013		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	537.42	LPIN		537.41	LPIN		537.42	LPIN		537.42	LPIN		537.17	LPIN		537.17	LPIN
0.40	537.22		0.30	537.10		0.16	537.17		0.21	537.24		7.91	537.22		9.40	537.24	
4.90	537.35		5.60	537.18		5.47	537.30		4.81	537.34		10.98	537.14		11.53	537.10	
10.80	537.23		10.70	537.06		10.85	537.15		9.33	537.27		13.84	536.32		15.90	535.72	
14.80	536.00		15.30	535.76	TOBL BKFL	14.13	536.24		11.21	537.15		16.41	535.78		21.40	535.45	TOBL BKFL
17.00	535.61		17.80	535.49		16.82	535.75		13.68	536.22		20.63	535.63	TOBL BKFL	23.95	534.79	
20.40	535.64	TOBL BKFL	20.20	535.53		19.75	535.67		17.21	535.66		23.16	535.01		27.04	534.59	
23.50	534.21		22.60	534.71		20.55	535.75		20.39	535.65	TOBL BKFL	25.11	534.66		29.74	534.04	
24.80	534.18		25.30	534.23		20.59	535.67	TOBL BKFL	22.90	535.00		28.42	534.48		31.41	533.49	
26.20	534.48		26.70	533.93		22.15	535.28		25.74	534.65		29.48	534.16		33.60	533.16	
28.30	534.03		30.20	533.65		23.51	534.96		28.41	534.53		32.14	533.38		35.79	533.27	
29.30	533.96		31.70	533.39		25.84	534.66		30.85	533.46	TOE L	34.34	533.14	TW	36.90	533.23	TW
33.50	533.72		33.90	533.39		27.64	534.57		33.36	533.03	TW	35.07	533.32		38.98	533.22	
35.00	533.47		36.20	533.49		29.25	534.26		35.53	533.29		36.44	533.28		40.78	534.00	
35.70	533.43	TW	37.60	533.34	TW	29.91	533.73	TOE L	37.70	533.41	TOE R	38.43	533.46		42.67	534.84	
37.80	533.51		39.40	533.90		31.73	533.51		39.46	534.12		39.88	533.94		45.56	536.12	
39.90	534.03		40.70	534.41		33.44	533.24	TW	42.27	535.48		42.06	534.73		48.72	536.23	
43.90	536.10	TOBR BKFR	44.60	536.11	TOBR BKFR	35.66	533.40		45.16	536.37	TOBR BKFR	44.12	535.84		51.27	536.48	TOBR BKFR
45.10	536.35		49.90	536.30		38.05	533.44		48.22	536.31		46.90	536.24		53.50	537.41	
50.00	536.45		53.40	537.72		38.48	533.49	TOE R	50.24	536.56		50.68	536.47	TOBR BKFR	57.99	539.16	
56.60	539.15		56.90	539.05		39.52	534.06		53.15	537.77		53.23	537.38		65.62	539.59	RPIN
60.80	539.51		62.70	539.47		42.28	535.18		57.12	539.19		56.76	538.91				
64.70	539.76	RPIN	64.70	539.77	RPIN	44.41	536.24	TOBR BKFR	61.55	539.63		58.11	539.21				
						45.35	536.32		64.93	539.74		62.53	539.57				
						47.78	536.29		64.94	539.74	RPIN	65.83	539.67	RPIN			
						50.18	536.53										
						53.78	537.89										
						56.63	539.17										
						60.69	539.57										
						64.01	539.66										
						64.85	539.83	RPIN									

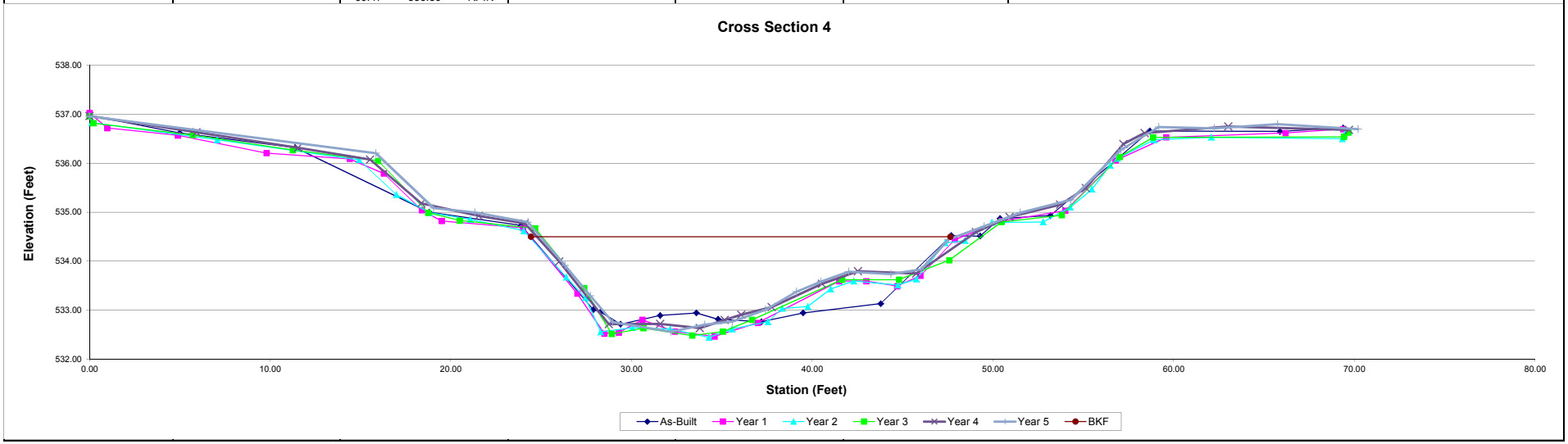


Project:	McCain Property
Cross Section:	Cross Section 4
Feature	Riffle Reach 2
Station:	25+05.32
Date:	5/30/13
Crew:	PP, KJ

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	30.5	29.7	31.3	30.3	27.6	27.0
W (BKF)	23.3	23.4	24.4	24.3	23.9	23.0
Max d	1.8	2.0	2.1	2.0	1.9	1.9
Mean d	1.3	1.3	1.3	1.2	1.2	1.2
W/D	17.4	18.4	19.1	19.5	20.8	19.6

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-2012			MY05-2013		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	536.98	LPIN		537.03	LPIN		536.96	LPIN		536.96	LPIN		536.96	LPIN		536.96	LPIN
5.00	536.62		1.00	536.72		0.14	536.83		0.23	536.82		5.93	536.63		15.86	536.20	
11.40	536.32		4.90	536.57		7.07	536.48		5.72	536.58		11.54	536.32		19.05	535.08	
18.80	535.00		9.80	536.21		14.93	536.07		11.25	536.27		15.54	536.08		21.33	534.99	
23.90	534.73	TOBL BKFL	14.40	536.09		16.99	535.36		15.98	536.05		18.37	535.18		24.28	534.80	TOBL BKFL
27.90	533.01		16.30	535.79		18.84	534.99		18.75	534.99		21.55	534.92		26.32	533.91	
28.30	532.96		18.40	535.04		21.09	534.85		20.51	534.83		24.11	534.77	TOBL BKFL	27.73	533.29	
29.40	532.71	TW	19.50	534.82		24.04	534.62	TOBL BKFL	24.67	534.67	TOBL BKFL	26.00	533.99		28.97	532.75	
31.60	532.89		24.00	534.68	TOBL BKFL	26.40	533.67		27.38	533.45		28.74	532.71		32.19	532.56	TW
33.60	532.94		27.00	533.34		27.45	533.25		28.91	532.51		31.59	532.72		34.06	532.70	
34.80	532.81		28.50	532.52		28.30	532.55	TOE L	30.66	532.63		33.78	532.63	TW	35.58	532.76	
37.20	532.76		29.30	532.54		30.05	532.64		33.36	532.48	TW	35.17	532.80		37.42	533.01	
39.50	532.94		30.60	532.80		32.15	532.61		35.06	532.56		36.08	532.90		39.15	533.38	
43.80	533.13		32.40	532.56		34.29	532.44	TW	36.68	532.80	TOE R	37.76	533.06		40.49	533.58	
47.70	534.52		34.60	532.46	TW	35.57	532.61		41.65	533.62		40.54	533.54		42.04	533.78	
49.30	534.51	TOBR BKFR	37.00	532.74		37.56	532.76	TOE R	44.80	533.62		42.54	533.79		44.36	533.73	
50.40	534.87		41.50	533.59		38.34	533.03		47.59	534.02		45.76	533.75		46.03	533.83	
53.20	534.93		43.00	533.59		39.76	533.07		50.48	534.80	TOBR BKFR	49.07	534.59		47.55	534.44	
58.70	536.66		44.70	533.49		41.03	533.43		53.81	534.94		50.93	534.90	TOBR BKFR	49.52	534.71	
65.90	536.65		46.00	533.70		42.30	533.59		57.03	536.13		53.73	535.16		51.53	534.99	TOBR BKFR
69.40	536.72	RPIN	47.90	534.44	TOBR BKFR	44.75	533.51		58.87	536.53		55.15	535.49		54.33	535.25	
			50.50	534.82		45.77	533.63		69.44	536.54		57.23	536.39		57.09	536.27	
			54.00	535.03		47.37	534.37		69.69	536.63	RPIN	58.41	536.62		59.18	536.74	
			56.80	536.06		48.46	534.42					63.04	536.75		62.26	536.71	
			59.60	536.53		49.95	534.79	TOBR BKFR				69.71	536.68	RPIN	65.76	536.80	
			66.20	536.62		52.78	534.80								70.22	536.70	RPIN
			69.40	536.70	RPIN	54.29	535.10										
						55.49	535.47										
						56.50	535.96										
						56.90	536.10										
						58.93	536.48										
						62.10	536.53										
						69.35	536.50										
						69.47	536.59	RPIN									

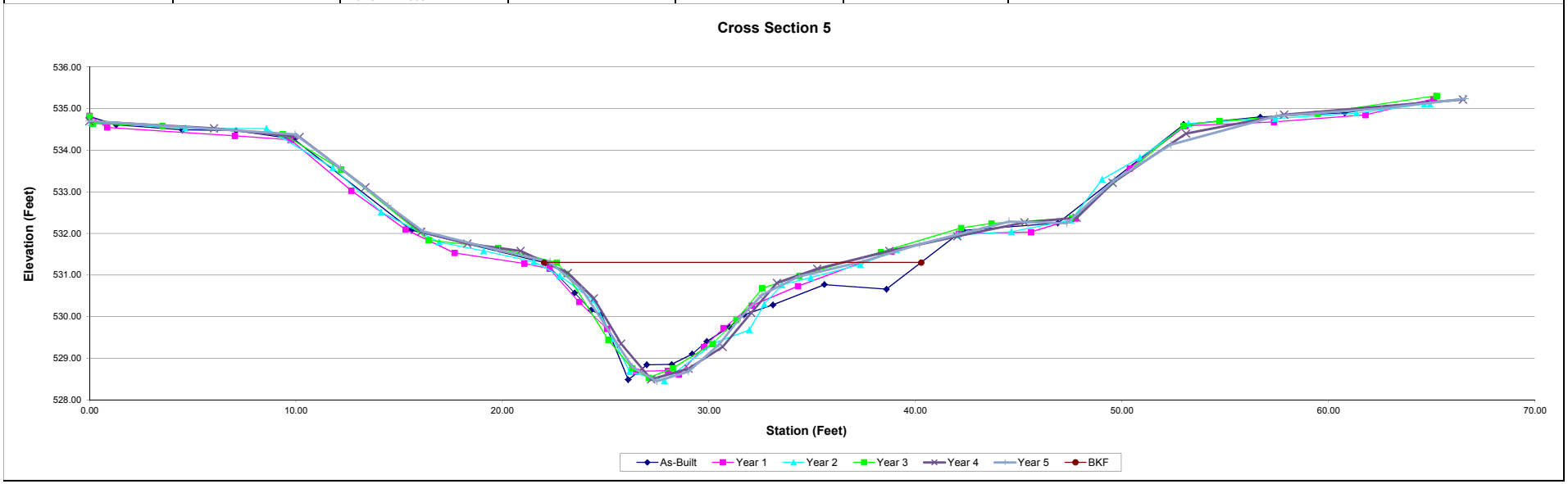


Project:	McCain Property
Cross Section:	Cross Section 5
Feature	Pool Reach 2
Station:	29+60.52
Date:	5/30/13
Crew:	PP, KJ

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	22.2	17.8	20.5	18.7	18.8	19.6
W (BKF)	18.1	14.3	16.0	14.0	14.4	15.0
Max d	2.8	2.5	2.8	2.8	2.8	2.9
Mean d	1.2	1.2	1.3	1.3	1.3	1.3
W/D	-	-	-	-	-	-

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-2012			MY05-2013		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	534.81	LPIN		534.83	LPIN		534.81	LPIN		534.81	LPIN		534.70	LPIN		534.70	LPIN
1.30	534.61		0.85	534.55		0.10	534.66		0.16	534.64		6.04	534.52		6.15	534.51	
4.50	534.49		7.04	534.34		4.64	534.53		3.54	534.58		10.18	534.32		9.97	534.38	
7.10	534.47		9.74	534.25		8.58	534.52		9.37	534.39		13.37	533.11		12.16	533.57	
9.90	534.27		12.69	533.03		11.79	533.58		12.19	533.54		16.07	532.04		14.45	532.67	
15.60	532.08		15.31	532.09		14.13	532.51		16.43	531.84		18.30	531.75		16.17	532.05	
22.10	531.29	TOBL BKFL	17.68	531.53		16.94	531.79		19.79	531.65	TOBL BKFL	20.89	531.58	TOBL BKFL	19.87	531.59	TOBL BKFL
23.50	530.57		21.06	531.28	TOBL BKFL	19.09	531.58		22.63	531.30		23.18	531.05		22.30	531.31	
24.30	530.15		22.28	531.15		21.52	531.32	TOBL BKFL	23.11	531.03		24.43	530.44		23.85	530.66	
24.80	530.05		23.71	530.35		22.78	530.98		25.13	529.44	TOE L	25.75	529.35		26.30	528.79	
26.10	528.48	TW	25.07	529.71		24.38	530.40		26.28	528.76		27.22	528.49	TW	27.47	528.45	TW
27.00	528.84		26.46	528.68		25.37	529.46	TOE L	27.09	528.53	TW	29.02	528.75		29.02	528.68	
28.20	528.85		28.01	528.70		26.16	528.67		28.25	528.76		30.66	529.27		30.49	529.32	
29.20	529.10		28.55	528.61	TW	27.85	528.46	TW	30.17	529.34		32.05	530.09		31.53	529.98	
29.90	529.40		29.77	529.27		30.26	529.36		31.33	529.92	TOE R	33.29	530.81		32.57	530.52	
31.00	529.75		30.71	529.72		31.96	529.68	TOE R	32.59	530.68		35.25	531.15		34.39	530.96	
31.70	530.04		32.08	530.26		32.69	530.30		34.37	530.98		38.74	531.57		37.46	531.33	
33.10	530.28		34.31	530.73		33.54	530.76		38.32	531.55		42.03	531.93	TOBR BKFR	40.20	531.74	TOBR BKFR
35.60	530.77		38.84	531.56	TOBR BKFR	34.93	530.94		42.21	532.13	TOBR BKFR	45.28	532.26		44.54	532.28	
38.60	530.66		42.10	531.99		37.34	531.25		43.68	532.24		47.81	532.38		47.34	532.25	
42.30	532.07	TOBR BKFR	45.60	532.03		39.09	531.60		47.59	532.37		49.55	533.22		49.66	533.29	
46.90	532.25		47.75	532.36		42.04	531.96		52.99	534.59		53.11	534.40		52.39	534.13	
53.00	534.62		50.39	533.56		44.65	532.04		54.72	534.70		57.85	534.86		57.49	534.83	
56.70	534.80		53.09	534.59		47.54	532.32	TOBR BKFR	59.47	534.88		66.52	535.22	RPIN	62.58	535.01	
60.80	534.90		57.36	534.68		49.05	533.30		65.23	535.31					66.62	535.24	RPIN
65.10	535.20	RPIN	61.80	534.85		50.87	533.82		65.25	535.30	RPIN						
			65.09	535.23	RPIN	53.22	534.64										
						57.43	534.76										
						61.37	534.89										
						64.64	535.11										
						64.92	535.11	RPIN									

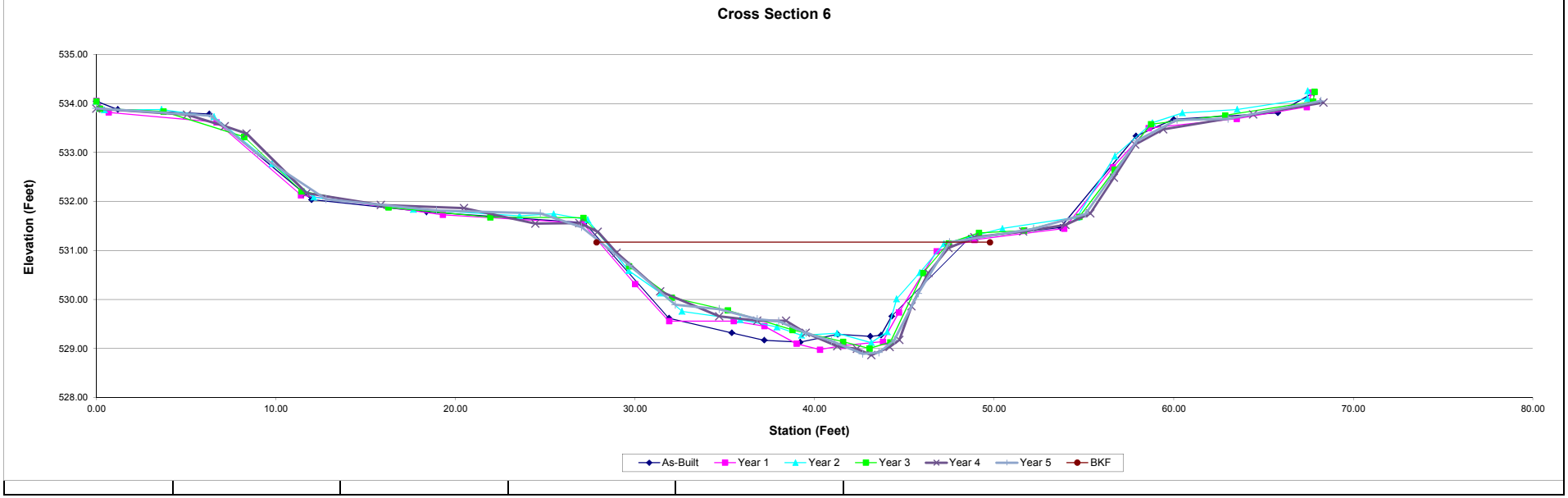


Project:	McCain Property
Cross Section:	Cross Section 6
Feature	Riffle Reach 2
Station:	31+23.66
Date:	5/30/13
Crew:	PP, KJ

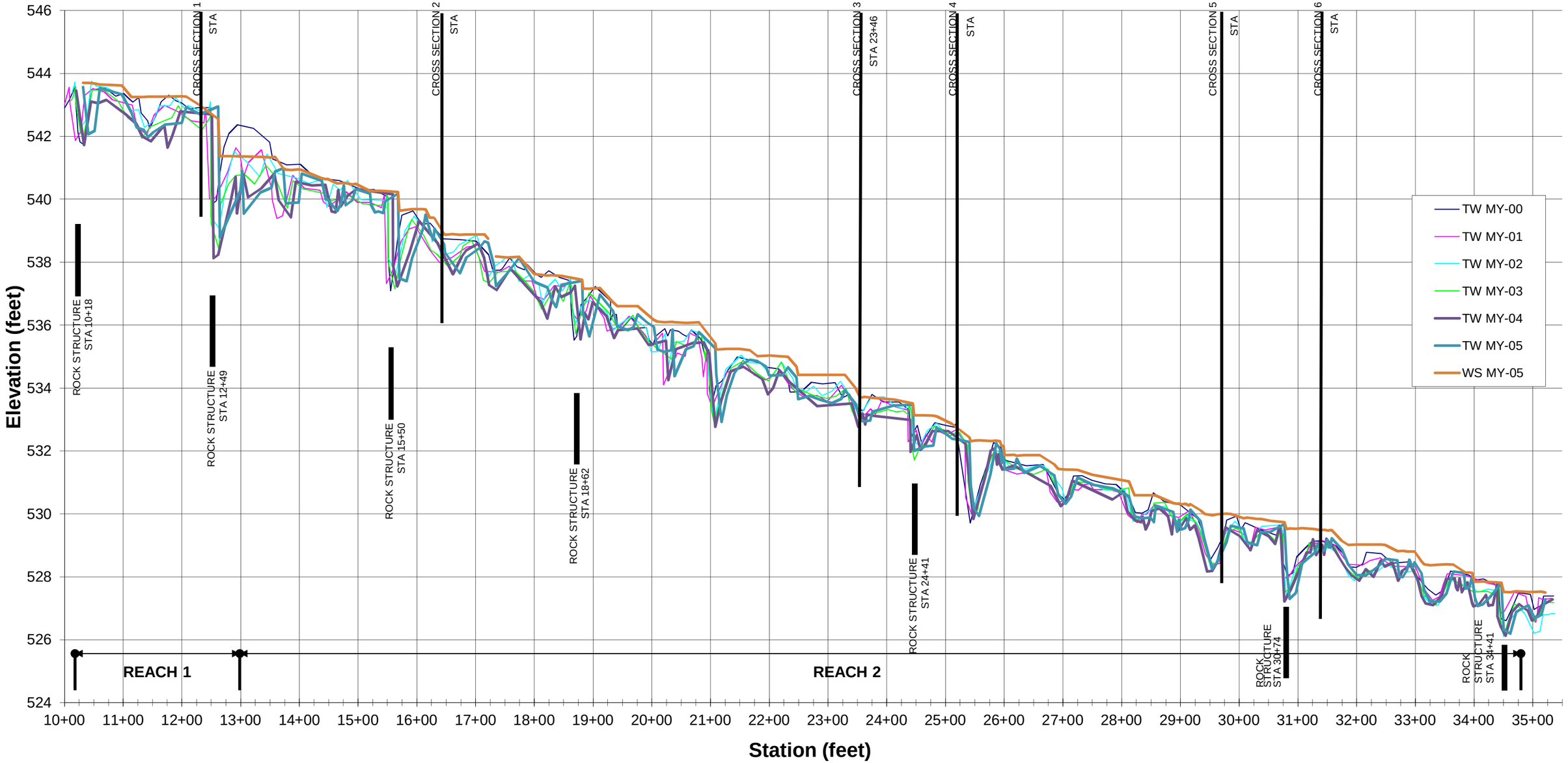
Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	30.8	25.2	27.8	28.1	29.6	26.8
W (BKF)	20.6	18.4	20.8	20.6	21.4	19.4
Max d	2.1	2.0	2.2	2.3	2.4	2.3
Mean d	1.5	1.4	1.3	1.4	1.4	1.4
W/D	13.8	13.4	15.5	15.1	15.5	14.1

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-2012			MY05-2013		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	534.05	LPIN		534.06	LPIN		534.05	LPIN		534.05	LPIN		533.90	LPIN		533.90	LPIN
1.20	533.88		0.70	533.82		0.46	533.87		0.21	533.90		5.06	533.78		6.39	533.75	
6.30	533.79		6.70	533.62		3.65	533.88		3.74	533.84		7.16	533.54		9.00	532.97	
12.00	532.04		11.40	532.13		6.56	533.73		8.24	533.32		8.37	533.39		12.80	532.05	
18.40	531.79		19.30	531.73		9.79	532.77		11.43	532.21		11.72	532.17		18.95	531.82	
27.20	531.57	TOBL BKFL	27.10	531.56	TOBL BKFL	12.11	532.09		16.28	531.88		15.86	531.93		24.74	531.76	
31.90	529.62		30.00	530.32		17.67	531.84		21.94	531.68		20.48	531.87		27.03	531.48	TOBL BKFL
35.40	529.32		31.90	529.56		23.58	531.71		27.12	531.67	TOBL BKFL	24.45	531.55		29.69	530.70	
37.20	529.17		35.50	529.56		25.48	531.75		29.67	530.68		26.92	531.56		32.25	529.89	
39.20	529.13	TW	37.20	529.46		27.37	531.63	TOBL BKFL	32.05	530.04		27.93	531.39	TOBL BKFL	34.69	529.80	
41.30	529.29		39.00	529.10		29.66	530.59		35.18	529.78		28.98	530.95		36.82	529.60	
43.10	529.25		40.30	528.98	TW	31.44	530.13		38.76	529.38	TOE L	31.40	530.17		38.00	529.56	
43.70	529.27		41.60	529.06		32.62	529.76		41.58	529.14		34.69	529.66		39.55	529.32	
44.30	529.66		43.80	529.14		35.86	529.59	TOE L	43.06	529.00	TW	36.81	529.57		40.94	529.16	
48.60	531.25	TOBR BKFR	44.70	529.74		37.90	529.44		44.22	529.13	TOE R	38.41	529.57		42.69	528.89	TW
53.70	531.47		46.80	530.99		39.28	529.27		46.05	530.54		39.51	529.32		43.58	528.92	
57.90	533.34		48.90	531.22	TOBR BKFR	41.25	529.31		47.47	531.15		41.26	529.05		44.44	529.17	
60.00	533.68		53.90	531.45		43.16	529.12	TW	49.15	531.36	TOBR BKFR	42.37	528.99		45.77	530.12	
65.80	533.81		56.60	532.70		44.05	529.34	TOE R	51.66	531.41		43.16	528.86	TW	47.52	531.17	TOBR BKFR
67.80	534.22	RPIN	58.60	533.50		44.57	530.01		54.75	531.69		44.18	529.03		52.20	531.44	
			63.50	533.69		45.87	530.55		56.72	532.65		44.73	529.17		55.08	531.74	
			67.40	533.93		47.21	531.14		58.73	533.58		45.40	529.86		57.94	533.24	
			67.70	534.23	RPIN	50.46	531.45	TOBR BKFR	62.86	533.76		46.34	530.54		60.20	533.66	
						54.62	531.68		67.76	534.04		47.46	531.05		63.03	533.69	
						56.73	532.93		67.85	534.24	RPIN	48.90	531.27	TOBR BKFR	68.19	534.05	TOBR BKFR
						58.82	533.61					51.61	531.39				
						60.49	533.81					53.98	531.52				
						63.53	533.88					55.35	531.76				
						67.45	534.10					56.67	532.49				

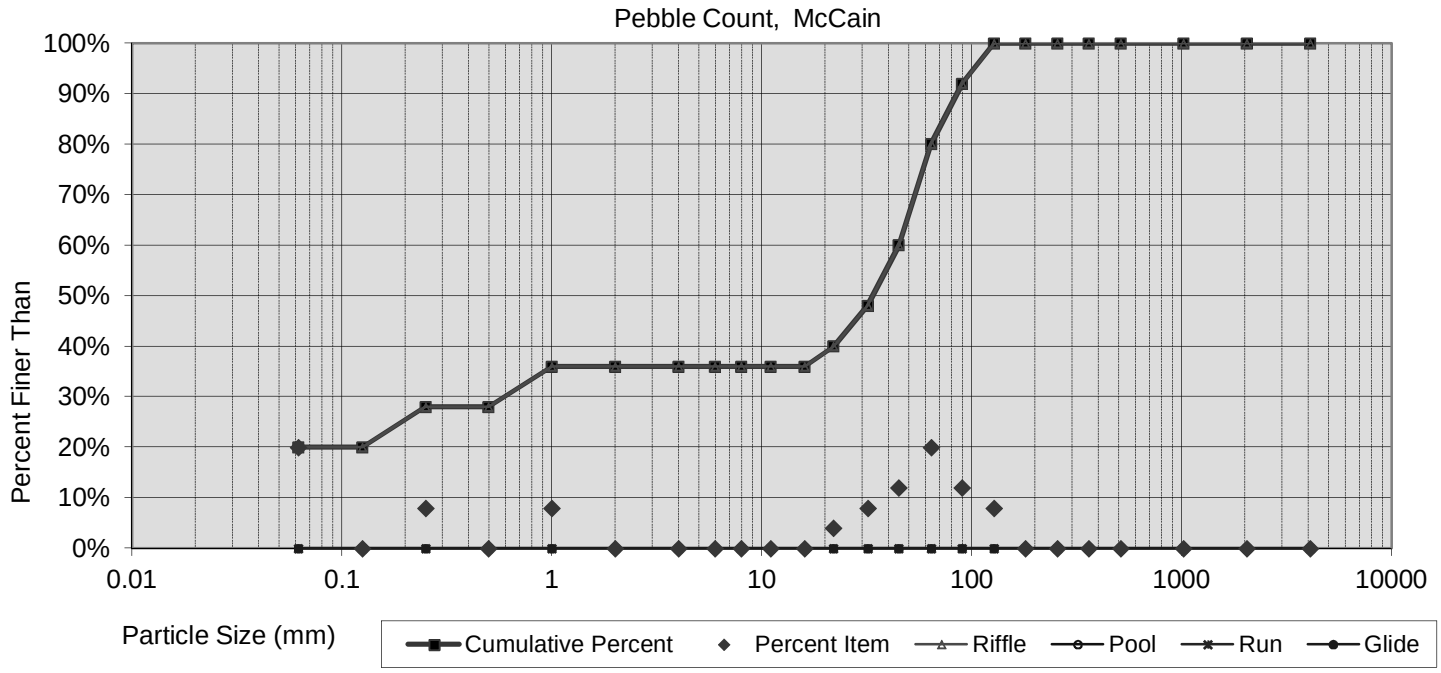


McCain Property
MY-05 Longitudinal Profile
Main Channel: Station 10+00-35+50



	Pebble Count,
	McCain

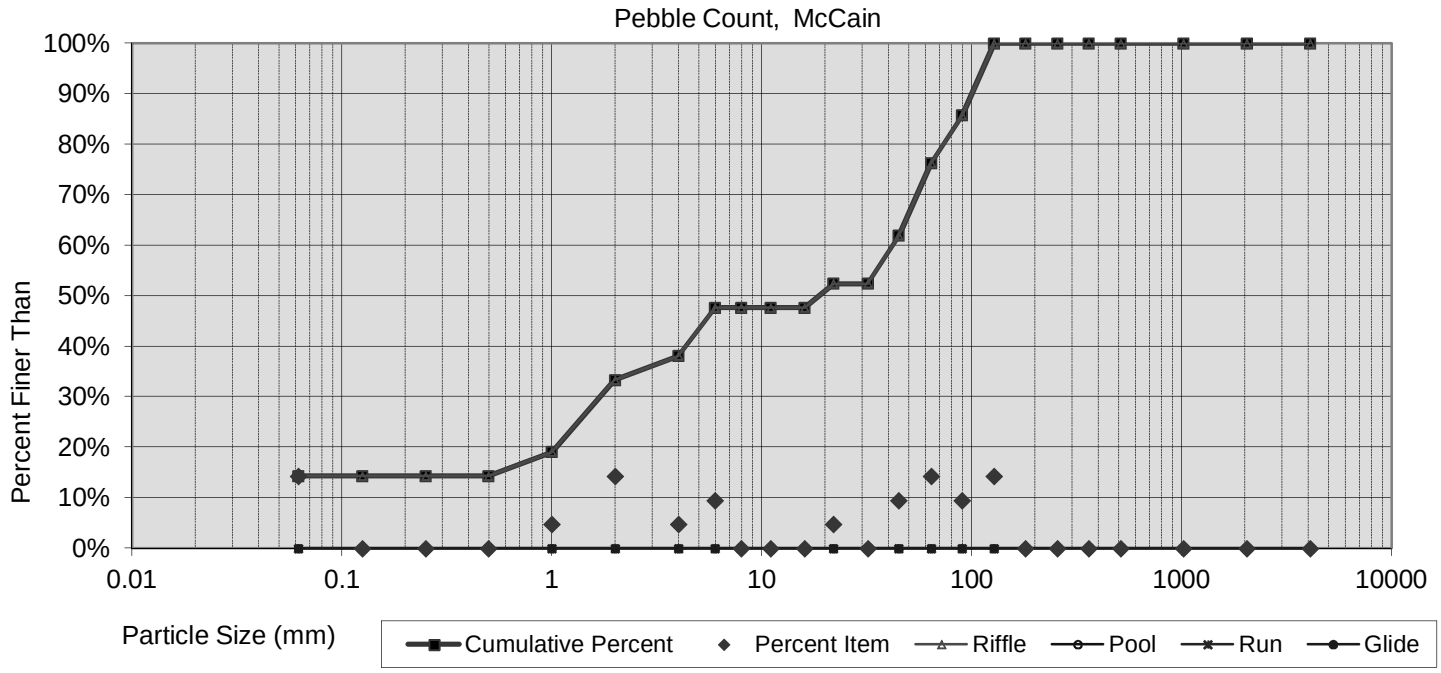
Note:	**Cross Section 1**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
#N/A	0.92	33.9	72	103	20%	16%	44%	20%	0%	0%

	Pebble Count,
	McCain

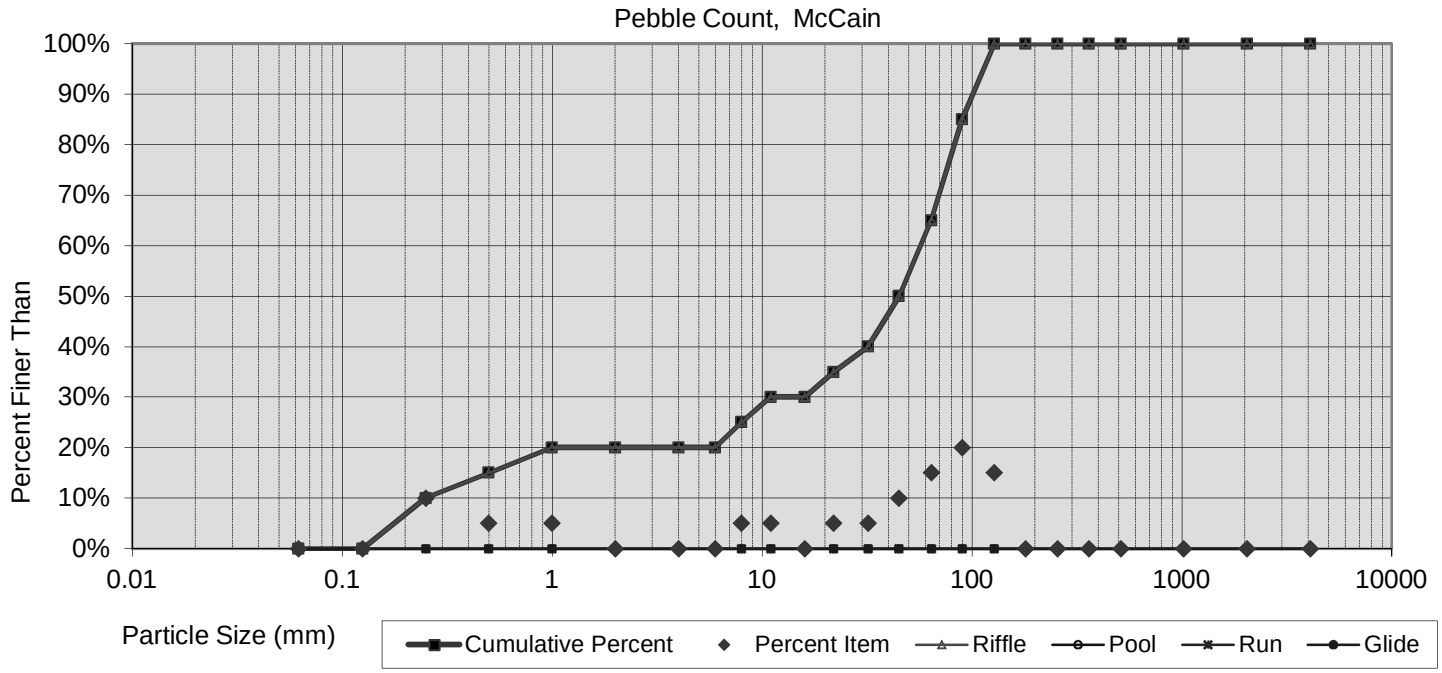
Note:	**Cross Section 2**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.642	2.55	18.8	85	113	12%	16%	36%	20%	0%	16%

	Pebble Count,
	McCain

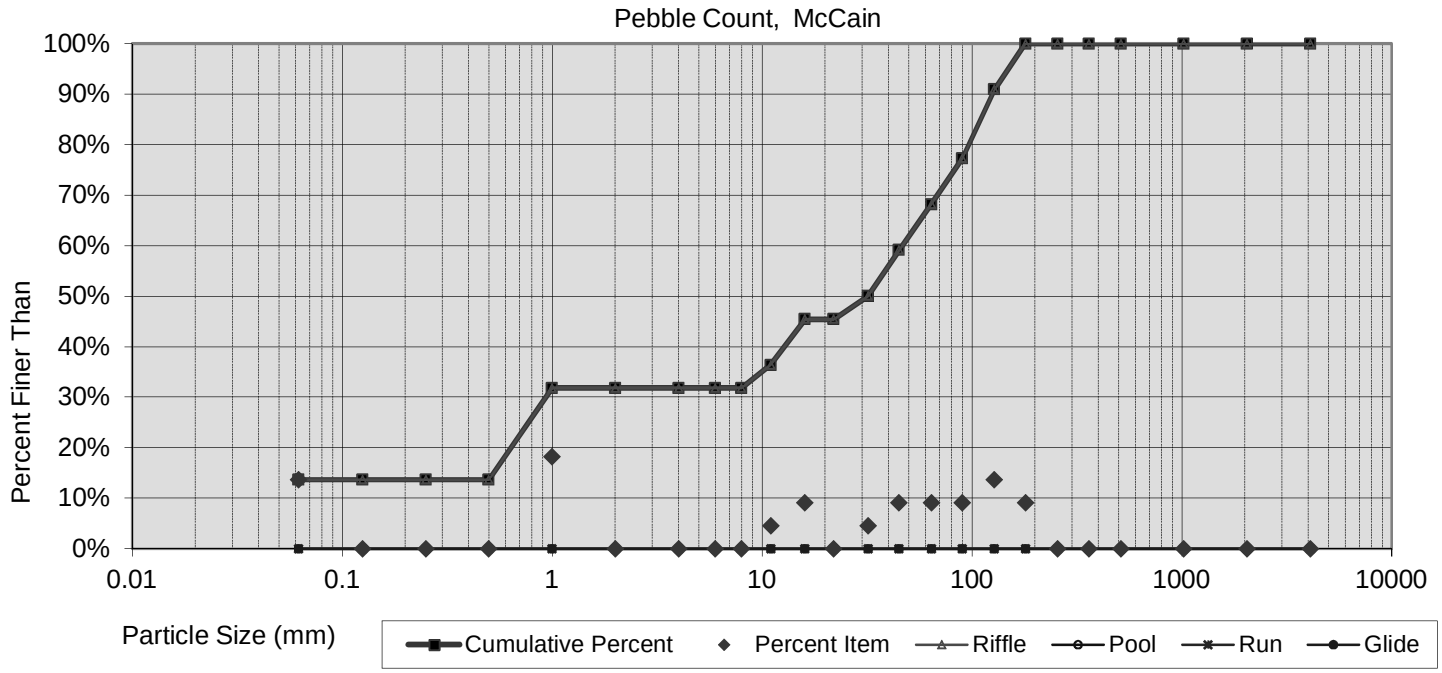
Note:	**Cross Section 4**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.574	22.00	45.0	88	114	0%	16%	36%	28%	0%	20%

	Pebble Count,
	McCain

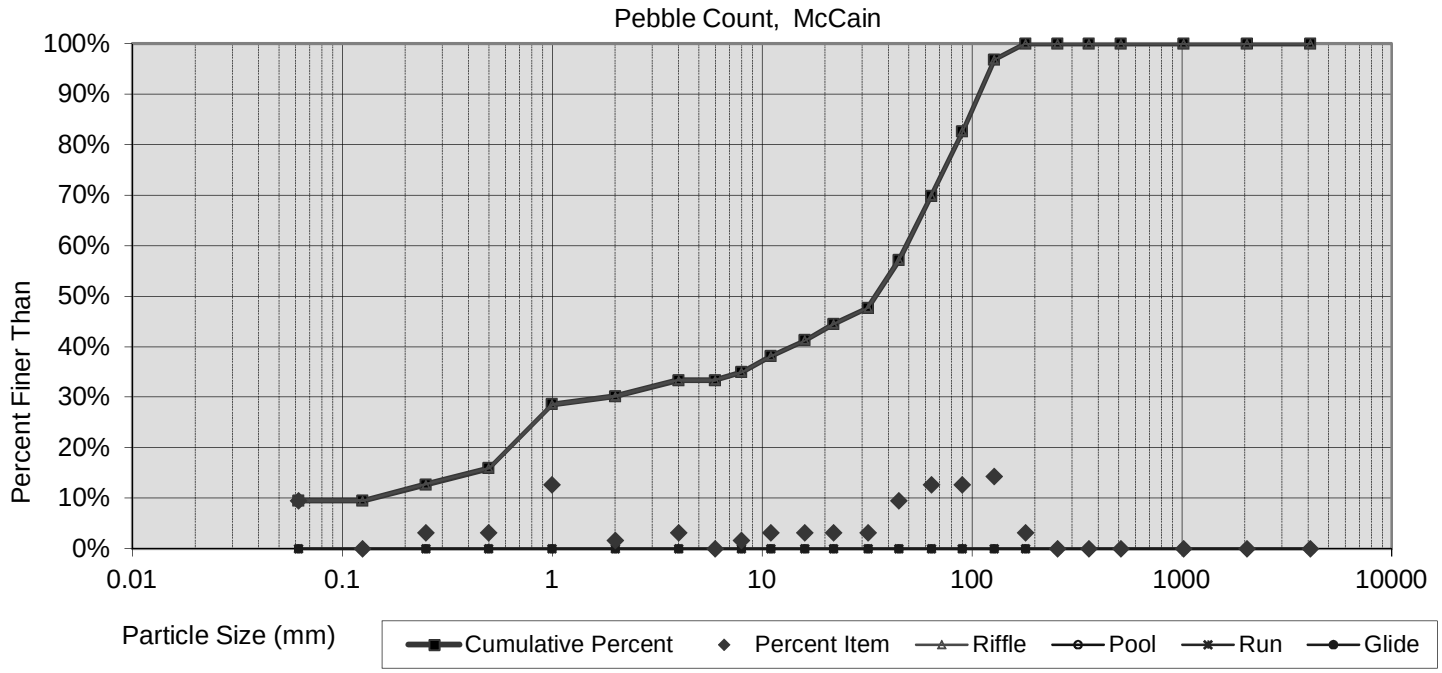
Note:	**Cross Section 6**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.547	10.00	32.0	107	149	12%	16%	32%	28%	0%	12%

	Pebble Count,
	McCain

Note:	**Reach 2 Total**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.503	8.06	34.8	93	122	8%	17%	33%	25%	0%	16%

Table 10a. Baseline Stream Data Summary
McCain Stream Restoration Site/Project No. 443 - Reach: 1 (286 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					14.6	18.7	25.9	29.3		4	10.4			27.1				18			16.9				
Floodprone Width (ft)					34	95	125	125		3	150			200							35				
Bankfull Mean Depth (ft)					1.1	1.4	1.4	1.7		4	0.8			1.5				1.4			1.1				
[1]Bankfull Max Depth (ft)					1.7	2.7	2.8	3.5		4	1.4			2				2			1.5				
Bankfull Cross Sectional Area (ft^2)					21.3	25.6	25.9	29.3		4	12.5			22.3				24.6			18.6				
Width/Depth Ratio					8.3	14	15	17.6		4	11.6			18.5				13.2			15.4				
Entrenchment Ratio					1.8	5.6	6.4	8.5		3	7.4			14.4							2.1				
[1]Bank Height Ratio					1	1.2	1.1	1.7		4	1			1				1			1				
Profile																									
Riffle Length (ft)											9			108				58		54	63	63	72	12	2
Riffle Slope (ft/ft)											0.01			0.0756				0.0068		0.0048	0.0059	0.0059	0.007	0.0016	2
Pool Length (ft)											28			108				38		16	21	22	25	4	3
Pool Max depth (ft)											1.8			3.1				3							
Pool Spacing (ft)											38			181				95		107	113	113	119	8	2
Pattern																									
Channel Beltwidth (ft)											75			135							78				
Radius of Curvature (ft)											14.5			26.8			30		35	35	38	38	40		2
Rc:Bankfull width (ft/ft)											1			1.6			1.7		1.9	2.1	2.2	2.2	2.4		
Meander Wavelength (ft)											70			148				190			204				1
Meander Width Ratio											3.6			13							4.6				
Transport parameters																									
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					B4c/E4/C4-5						B4c/C3/C4						B4c			B4c					
Bankfull Velocity (fps)																	3.9								
Bankfull Discharge (cfs)																									
Valley length (ft)					2155																				
Channel Thalweg length (ft)					2475												285			286					
Sinuosity (ft)					1.15						1.50-1.70						1.17			1.3					
Water Surface Slope (Channel) (ft/ft)											0.0070-0.0120						0.0067			0.0068					
BF slope (ft/ft)											0.0070-0.0120						0.0067			0.0065					
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10a. Baseline Stream Data Summary
McCain Stream Restoration Site/Project No. 443 - Reach: 2 (2184 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					14.6	18.7	25.9	29.3		4	10.4			27.1			18	20	24	20.6	22.8	23.3	24.6	0.9	3
Floodprone Width (ft)					34	95	125	125		3	150			200						47	54	51	63	6.2	3
Bankfull Mean Depth (ft)					1.1	1.4	1.4	1.7		4	0.8			1.5			1	1.3	1.4	1.3	1.4	1.4	1.5	0.1	3
[1]Bankfull Max Depth (ft)					1.7	2.7	2.8	3.5		4	1.4			2			1.3	1.7	2	1.8	1.9	1.8	2.1	0.2	3
Bankfull Cross Sectional Area (ft^2)					21.3	25.6	25.9	29.3		4	12.5			22.3			25	25.5	26	30.8	31.89	31.2	33.7	1.3	3
Width/Depth Ratio					8.3	14	15	17.6		4	11.6			18.5			12.7	15.6	23	13.8	16.4	17.4	18	0.8	3
Entrenchment Ratio					1.8	5.6	6.4	8.5		3	7.4			14.4						2	2.3	2.5	2.5	0.1	3
[1]Bank Height Ratio					1	1.2	1.1	1.7		4	1			1				1		1	1	1	1	0	3
Profile																									
Riffle Length (ft)											9			108			59	67	88	20	68	76	97	23	13
Riffle Slope (ft/ft)											0.01			0.0756			0.008	0.008	0.0104	0.0028	0.0087	0.0075	0.019	0.004	13
Pool Length (ft)											28			108			47	52	59	12	22	23	33	6	13
Pool Max depth (ft)											1.8			3.1			2.3	2.8	3.3	2.2	2.5		2.8		2
Pool Spacing (ft)											38			181			106	118	147	56	117	123	150	25	12
Pattern																									
Channel Beltwidth (ft)											75			135						20	66	62	97	24	10
Radius of Curvature (ft)											14.5			26.8			35		60	35	49	43	80	14	12
Rc:Bankfull width (ft/ft)											1			1.6			1.8		3.1	1.5	2.2	2.2	3.3		
Meander Wavelength (ft)											70			148			212	236	294	158	221	229	261	36	10
Meander Width Ratio											3.6			13						1.9	3.1	2.7	4.8		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					B4c/E4/C4-5						B4c/C3/C4						B4c			B4c					
Bankfull Velocity (fps)																	3.9								
Bankfull Discharge (cfs)																									
Valley length (ft)					2155																				
Channel Thalweg length (ft)					2475												285			286					
Sinuosity (ft)					1.15						1.50-1.70						1.17			1.3					
Water Surface Slope (Channel) (ft/ft)											0.0070-0.0120						0.0067			0.0068					
BF slope (ft/ft)											0.0070-0.0120						0.0067			0.0065					
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
McCain Stream Restoration Site/Project No. 443 - Entire Stream (2470 lf)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%															56%		40%												
[1]SC% / Sa% / G% / C% / B% / Be%																													
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)																													
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																													
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																													

Shaded cells indicate that these will typically not be filled in.

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design survey), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section surveys and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

McCain Stream Restoration Site/Project No. 443

	Cross Section 1 (Reach 1-Riffle)							Cross Section 2 (Reach 2-Riffle)							Cross Section 3 (Reach 2-Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	544.4	544.3	544.4	544.4	544.4	544.5		541	540.9	541	541	541	541.1		535.6	535.5	535.6	535.6	535.6	535.5	
Bankfull Width (ft)	16.9	17.2	18.11	16.22	16.7	15.2		24.6	25.2	27.87	26.32	25.3	25.2		22.6	23	22.25	22.08	22.9	22.7	
Floodprone Width (ft)	35	37	35	35	46	46		63	>75	63	63	63	63		-	-	-	-	-	-	
Bankfull Mean Depth (ft)	1.1	1.2	1.033	1.096	1.1	1.3		1.4	1.7	1.584	1.645	1.5	1.6		1.5	1.5	1.384	1.388	1.4	1.4	
Bankfull Max Depth (ft)	1.5	1.6	1.6	1.7	1.6	1.7		18	2.5	2.55	2.61	2.3	2.4		2.2	2.2	2.36	2.57	2.5	2.3	
Bankfull Cross Sectional Area (ft^2)	18.6	20.8	18.71	17.77	18.1	19		33.7	42.7	44.14	43.3	38.3	39.3		33.6	34.1	30.8	30.65	32.5	31.4	
Bankfull Width/Depth Ratio	15.4	14.2	17.52	14.79	15.5	12.2		18	14.9	17.59	16	16.7	16.2		-	-	-	-	-	-	
Bankfull Entrenchment Ratio	2.1	2.2	1.933	2.158	2.7	3		2.5	>3.0	2.261	2.394	2.5	2.5		-	-	-	-	-	-	
Bankfull Bank Height Ratio	1	1	1.1	1.188	1.3	1.17		1	1	0.969	0.954	1	1		-	-	-	-	-	-	
Cross Sectional Area between end pins (ft^2)	174.2	182	184.8	184.2	----	----		119	137	137.4	136.9	----	----		97	87	90	167.3	----	----	
d50 (mm)	21	18	13.5	32.9	49.1	33.9		19	17	24.2	32	36.7	18.8		8.1	1.7	31	43.1	----	----	
	Cross Section 4 (Reach 2-Riffle)							**Cross Section 5 (Reach 2-Pool)**							**Cross Section 6 (Reach 2-Riffle)**						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	534.5	534.4	534.5	534.5	534.5	534.5		531.3	531.2	531.3	531.3	531.3	531.3		531.3	531	531.3	531.3	531.3	531.2	
Bankfull Width (ft)	23.3	23.4	23.99	24.32	23.9	23		18.1	14.3	16.46	13.96	14.4	15		20.6	18.4	20.79	20.6	21.4	19.4	
Floodprone Width (ft)	47	52	47	47	47	47		-	-	-	-	-	-		51	50.5	51	51	51	51	
Bankfull Mean Depth (ft)	1.3	1.3	1.234	1.246	1.2	1.2		1.2	1.2	1.282	1.339	1.3	1.3		1.5	1.4	1.339	1.363	1.4	1.4	
Bankfull Max Depth (ft)	1.8	2	1.99	2.02	1.9	1.9		2.8	2.5	2.88	2.77	2.8	2.9		2.1	2	2.18	2.3	2.4	2.3	
Bankfull Cross Sectional Area (ft^2)	31.2	29.7	29.61	30.29	27.6	27		22.2	17.8	21.1	18.69	18.8	19.6		30.8	25.2	27.84	28.08	29.6	26.8	
Bankfull Width/Depth Ratio	17.4	18.4	19.44	19.53	20.8	19.6		-	-	-	-	-	-		13.8	13.4	15.52	15.11	15.5	14.1	
Bankfull Entrenchment Ratio	2	2.2	1.959	1.932	2	2		-	-	-	-	-	-		2.5	2.7	2.453	2.476	2.4	2.6	
Bankfull Bank Height Ratio	1	1	1.095	1.084	1.05	1.05		-	-	-	-	-	-		1	1	1.069	1.026	1	1	
Cross Sectional Area between end pins (ft^2)	103	120	132.3	124.2	----	----		146	148	158.3	155.8	----	----		133	159	157.1	159.2	----	----	
d50 (mm)	17	14	24	29	53.7	45		0.6	3	9.3	16.9	----	----		11	4.6	16.8	26	24.2	32	

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
McCain Stream Restoration Site/Project No. 443 - Reach: 1 (286 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)		16.9						17.2						17						16.2						16.7						15.2				
Floodprone Width (ft)		35						37						35						35						46						46				
Bankfull Mean Depth (ft)		1.1						1.2						0.92						1.1						1.1						1.3				
[1]Bankfull Max Depth (ft)		1.5						1.6						1.42						1.7						1.6						1.7				
Bankfull Cross Sectional Area (ft^2)		18.6						20.8						15.7						17.8						18.1						19				
Width/Depth Ratio		15.4						14.2						18.5						14.8						15.5						12.2				
Entrenchment Ratio		2.1						2.2						2.06						2.16						2.7						3				
[1]Bank Height Ratio		1						1						1.24						1.19						1.3						1.17				
Profile																																				
Riffle Length (ft)	54.0	63.0	63.0	72.0	12.0	2		67.0					50.5	54.9	54.9	59.3	6.23	2	43.9	49.6	49.6	55.4		2	7	42	32	123	29		5	30	22	88	20	33
Riffle Slope (ft/ft)	0.005	0.006	0.006	0.007	0.002	2		0.007					0.002	0.005	0.005	0.009	0.005	2	0.005	0.007	0.007	0.008		2	0.000	0.010	0.008	0.049	0.010		0.0011	0.0140	0.0103	0.0598	0.0131	
Pool Length (ft)	16.0	21.0	22.0	25.0	4.0	3	25.0		30.0	31.0			93	97	97	101	5.57	2	28.9	63.2	58.6	102	36.9	3	7	25	22	66	15		3	25	21	77	18	41
Pool Max depth (ft)													3.72	4.82	4.82	5.91	1.55	2	3.31	4.35	3.39	6.35	1.73	3	2.5		2.6	2.8			2.3		2.6	2.9		
Pool Spacing (ft)	107.0	113.0	113.0	119.0	8.0	2	112.0		125.0	194.0				127				1	104	118	118	131		2	7	58	59	66	29		6	60	57	147	32	41
Pattern																																				
Channel Beltwidth (ft)		78																																		
Radius of Curvature (ft)	35	38	38	40		2																														
Rc:Bankfull width (ft/ft)	2.1	2.2	2.2	2.4																																
Meander Wavelength (ft)		204																																		
Meander Width Ratio		4.6																																		

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Additional Reach Parameters																																				
Rosgen Classification	B4c						C4						B4c						B4c						B4c						B4c					
Channel Thalweg length (ft)	286						286						286						286						286						286					
Sinuosity (ft)	1.3						1.3						1.3						1.3						1.3						1.3					
Water Surface Slope (Channel) (ft/ft)	0.0068						0..65						0.0074						0.008						0.0078						0.0075					
BF slope (ft/ft)	0.0065												0.0039						0.0037						----						----					
[3]Ri% / Ru% / P% / G% / S%													38%	10%	47%	10%			34.7	5.62	45.8	8.26			43	13	27	17			42	8	41	10		
[3]SC% / Sa% / G% / C% / B% / Be%													4%	19%	65%	11%	0%	1%	0%	9%	68%	22%	1%	0%	15	0	46	38	0	0	20%	16%	44%	20%	0%	0%
[3]d16 / d35 / d50 / d84 / d95 /													0.2	14.2	21.1	58.2	90		7	18.4	32.9	82.2	163		6.3	32.4	49.1	95	117		NA	0.92	33.9	72	103	
[2]% of Reach with Eroding Banks	1%												21%						9%						10%						9%					
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
McCain Stream Restoration Site/Project No. 443 - Reach: 2 (2184 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	20.6	22.8	23.3	24.6	0.9	3	18.4	22.33	23.4	25.2	3.523	3	20.791	23.08	23.99	24.44	1.992	3	20.6	23.75	24.32	26.32	2.904	3	21.4	23.5	23.9	25.3	2		19.4	22.5	23	25.2	2.9	
Floodprone Width (ft)	47	54	51	63	6.2	3	51	55.33	52	63	6.658	3	47	53.67	51	63	8.327	3	47	53.67	51	63	8.327	3	47	53.7	51	63	8.3		47	53.7	51	63	8.3	
Bankfull Mean Depth (ft)	1.3	1.4	1.4	1.5	0.1	3	1.3	1.467	1.4	1.7	0.208	3	1.2805	1.425	1.339	1.655	0.201	3	1.246	1.418	1.363	1.645	0.205	3	1.2	1.4	1.4	1.5	0.2		1.2	1.4	1.4	1.6	0.2	
[1]Bankfull Max Depth (ft)	1.8	1.9	1.8	2.1	0.2	3	2	2.167	2	2.5	0.289	3	2.06	2.197	2.18	2.35	0.146	3	2.02	2.31	2.3	2.61	0.295	3	1.9	2.2	2.3	2.4	0.3		1.9	2.2	2.3	2.4	0.3	
Bankfull Cross Sectional Area (ft^2)	30.8	31.89	31.2	33.7	1.3	3	25.2	32.53	29.7	42.7	9.088	3	27.845	32.95	31.3	39.71	6.102	3	28.08	33.89	30.29	43.3	8.222	3	27.6	31.8	29.6	38.3	5.7		26.8	31	27	39.3	7.2	
Width/Depth Ratio	13.8	16.4	17.4	18	0.8	3	13.4	15.57	14.9	18.4	2.566	3	14.496	16.37	15.52	19.09	2.41	3	15.11	16.88	16	19.53	2.335	3	15.3	17.4	16.9	19.9	2.4		13.9	16.3	15.8	19.2	2.7	
Entrenchment Ratio	2	2.3	2.5	2.5	0.1	3	2.2	2.467	2.5	2.7	0.252	3	1.9228	2.334	2.453	2.626	0.366	3	1.932	2.267	2.394	2.476	0.293	3	2	2.3	2.4	2.5	0.3		2	2.4	2.5	2.6	0.3	
[1]Bank Height Ratio	1	1	1	1	0	3	1	1	1	1	0	3	1.0511	1.059	1.058	1.069	0.009	3	0.954	1.021	1.026	1.084	0.065	3	1	1	1	1.1	0		1	1	1	1.1	0	
Profile																																				
Riffle Length (ft)	20.0	68.0	76.0	97.0	23.0	13	16.0		37.6	86.8			13.0	65.8	69.2	112.0	29.3	17	15.63	74.41	69.7	196	37.61	17	7	42	32	123	29		5	30	22	88	20	33
Riffle Slope (ft/ft)	0.003	0.009	0.008	0.019	0.004	13	0.001		0.012	0.027			0.002	0.011	0.007	0.059	0.013	17	0.000	0.005	0.006	0.011	0.003	16	0.000	0.010	0.008	0.049	0.010		0.0011	0.0140	0.0103	0.0598	0.0131	
Pool Length (ft)	12.0	22.0	23.0	33.0	6.0	13	12.0		29.2	44.3			29.4	57.0	50.1	160.4	30.6	19	26.74	48.29	45.31	78.75	14.47	18	7	25	22	66	15		3	25	21	77	18	41
Pool Max depth (ft)	2.2	2.5		2.8		2							1.8	3.1	2.8	5.9	0.9	19	2.15	3.372	3.405	4.43	0.655	18	2.5		2.6	2.8			2.3		2.6	2.9		
Pool Spacing (ft)	56.0	117.0	123.0	150.0	25.0	12	52.0		144.0	317.0			76.9	121.5	116.5	183.7	30.7	18	48.5	124.9	121	241.2	43.89	17	7	58	59	66	29		6	60	57	147	32	41
Pattern																																				
Channel Beltwidth (ft)	20	66	62	97	24	10																														
Radius of Curvature (ft)	35	49	43	80	14	12																														
Rc:Bankfull width (ft/ft)	1.5	2.2	2.2	3.3																																
Meander Wavelength (ft)	158	221	229	261	36	10																														
Meander Width Ratio	1.9	3.1	2.7	4.8																																
Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4						C4						C4						C4					
Channel Thalweg length (ft)	2182						2182						2182						2182						2228						2228					
Sinuosity (ft)	1.18						1.18						1.18						1.18						1.18						1.18					
Water Surface Slope (Channel) (ft/ft)	0.0068						0.0067						0.0066						0.0066						0.0064						0.0058					
BF slope (ft/ft)	0.0065						0.0067						0.0068						0.0063						----						----					
[3]Ri% / Ru% / P% / G% / S%													54%	2%	32%	16%			61%	2%	33%	5%			52%	13%	21%	14%			39%	3%	44%	11%		
[3]SC% / Sa% / G% / C% / B% / Be%													11%	10%	71%	7%	0%	1%	5%	7%	71%	15%	1%	1%	13	3	40	27	1	16	8%	17%	33%	25%	0%	0%
[3]d16 / d35 / d50 / d84 / d95 /													1.6	6.22	14.06	41.34	97.76		5	15.68	29	74.88	163.6		0.1	18.2	36.5	90	127		0.5	8.1	34.8	93	122	
[2]% of Reach with Eroding Banks							0%						1%						0%						0%						0%					
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

APPENDIX E

HYDROLOGY DATA

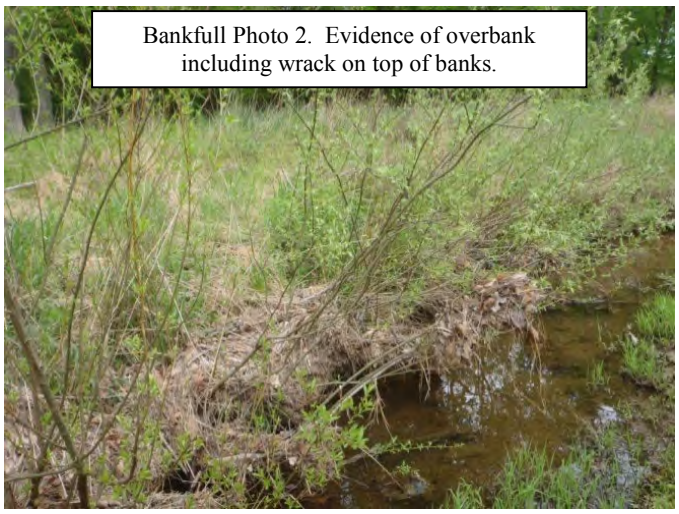
Table 12. Verification of Bankfull Events

Table 12. Verification of Bankfull Events

McCain Site Stream Restoration-Project No. 443			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo #**
November 17, 2009	November 13, 2009	Site visit to evaluate indicators of stage after storm events	--
September 30, 2010	September 30, 2010	NWS COOP Station and site visit for confirmation	Bankfull Photo 1
June 7, 2013	May 6, 2013	Wrack observed on top of banks as well as crest gauge observation indicated overbank after approximately 1.17 inches of rain documented* on May 6, 2013 following 1.9 inches of rain documented the prior week.	Bankfull Photo 2
September 9, 2013	June 7, 2013	Crest gauge observation indicated overbank after approximately 3.64 inches of rain documented* between June 2-7, 2013	--
September 9, 2013	July 11, 2013	Crest gauge observation indicated overbank after approximately 2.06 inches of rain documented* between July 10-11, 2013 following 4.31 inches of rain documented the previous two weeks.	--

*Asheboro Airport (KHBI) weather station (Weather Underground 2013)

Bankfull Photo 1. Evidence of overbank including wrack on top of banks.


Bankfull Photo 2. Evidence of overbank including wrack on top of banks.

APPENDIX F

ADDITIONAL SITE MAPPING

Restoration Plan Figure 2. Project Drainage (USGS Topo Map)

Restoration Plan Figure 3. Soils

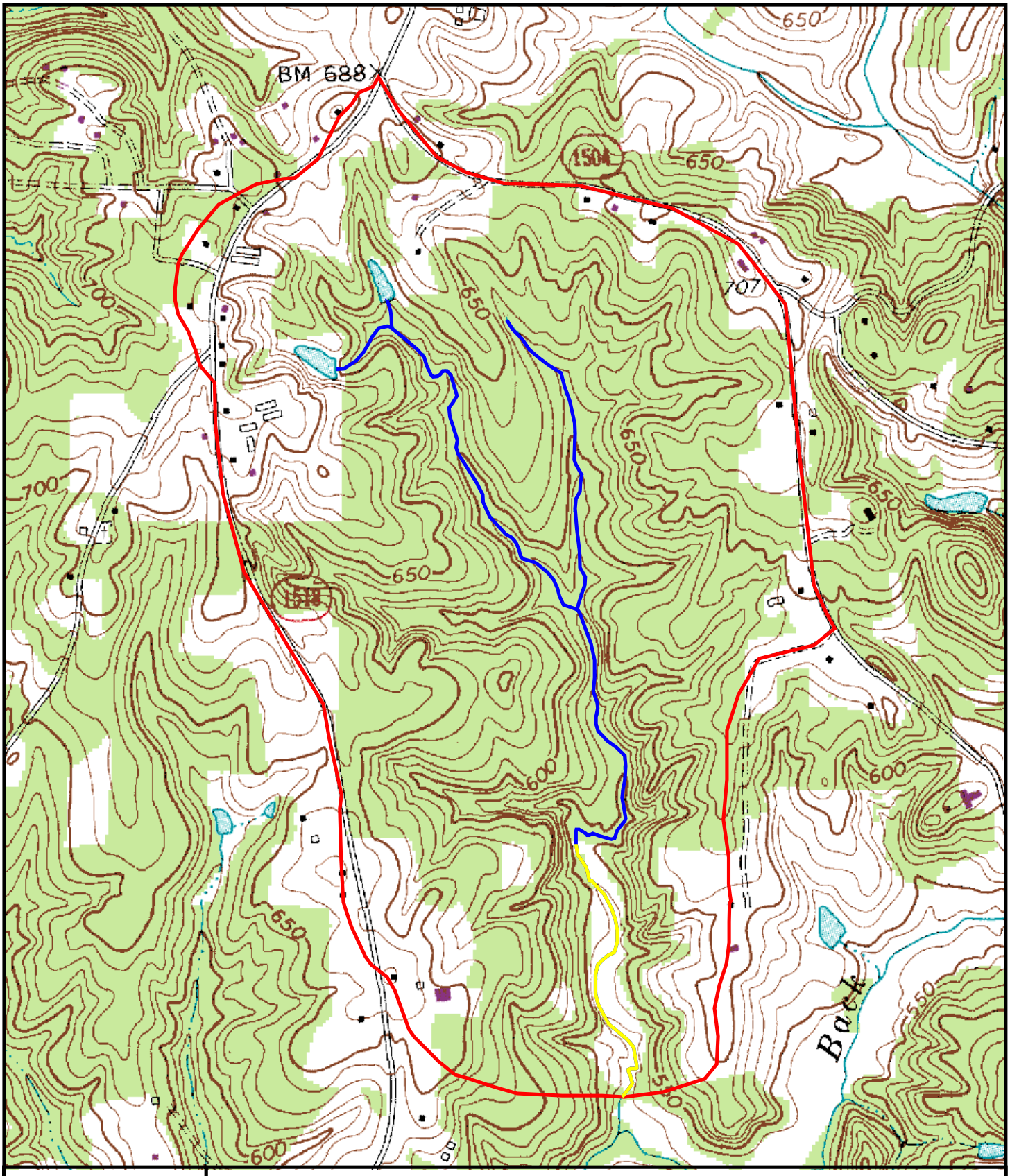


Figure 2. Project Drainage — McCain Site

Project Reach

Streams

Drainage Area
0.88 sq. miles

900 0 900 Feet

Ecosystem Enhancement Program

Source: Randleman USGS 7.5' Topographic Quadrangle

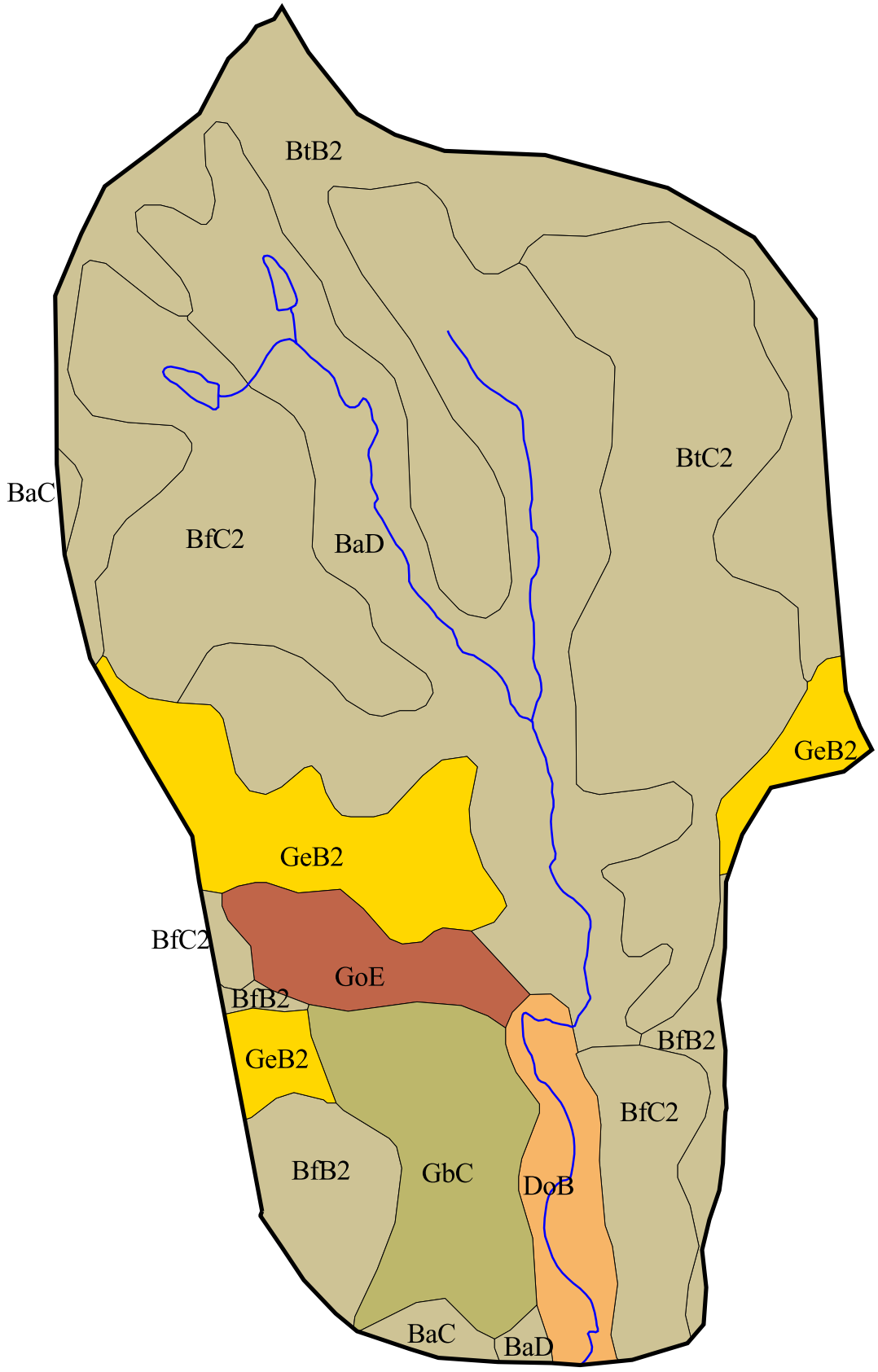


Figure 3. Soils

McCain Site

Soil Types

- Goldston Very Channery Silt Loam
- Georgeville Silty Clay Loam
- Georgeville Silt Loam
- Dogue Sandy Loam
- Badin-Tatum Complex

Streams

Drainage Area

500 0 500 Feet

Ecosystem Enhancement PROGRAM

APPENDIX G

ADDITIONAL SITE PHOTOGRAPHS

Preconstruction Site Photographs

Asbuilt Site Photographs

Preconstruction Photographs

Preconstruction Photographs (continued)

Asbuilt Photographs
Taken May 29, 2009