McKee Creek Stream Restoration
Monitoring Report – Year 3 of 5
Final
Contract # 004391
EEP Project # 92573
Cabarrus County, North Carolina

Construction 2010
Collected October 28, 2014
Report December 30, 2014
Revised February 19, 2014

Submitted to:
NCDENR-EEP
1601 Mail Service Center,
Raleigh, NC 27699-1601

Ecosystem Enhancement PROGRAM

Prepared By:

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Executive Summary/ Project Abstract

The site is located roughly 10 miles northeast of Charlotte, NC. Figure 1 includes a map and directions to the site. The restoration was designed by Withers & Ravenel and construction completed by River Works Inc. in June 2010. This report summarizes the monitoring efforts for Monitoring Year-3 (MY-3) 2014.

McKee Creek is divided into two reaches within the project site; McKee Creek – Reach 1 is upstream of Peach Orchard Road and McKee Creek – Reach 2 is downstream of the road crossing. The pre-project stream lengths of McKee Creek – Reach 1 and Reach 2 were 3,733 linear feet (lf) and 847 lf, respectively. The pre-project reach length of Clear Creek; was 1,513 lf. The total pre-project stream length within the project limits was 6,093 lf.

The stream design resulted in 1,641 lf of stream restoration on Clear Creek, and 1,096 lf of Level I stream enhancement and 3,240 lf of Level II stream enhancement on McKee Creek. The total of stream design is 5,977 lf.

The project goals and objectives stated in the McKee Creek Restoration Plan (NCEEP 2008) are as follows:

Project Goals:

- Restore through stream enhancement (Level I and Level II) McKee Creek;
- Restore Clear Creek (Priority I restoration);
- Restore the physical and biological processes of McKee and Clear Creeks;
- Restore riparian vegetation to the maximum extent feasible.

Project Objectives:

- Improve water quality by reducing bank erosion, restricting livestock access to the creeks, and re-establishing the riparian buffer;
- Stabilize McKee Creek through the use of in-stream structures and pattern re-alignment in selected areas;
- Restore the dimension, pattern, and profile of Clear Creek;
- Improve the floodplain functionality of Clear Creek by matching floodplain elevation with bank full stage;
- Improve the wildlife habitat functions of the site through riparian buffer establishment, improved stream bed form diversity, and improved floodplain functionality to reduce stream incision;
- Protect the site through a permanent conservation easement along the project reaches.

Prior to project completion, the streams suffered from excess sedimentation, channel incision, bank degradation, and limited riparian vegetation. The *Lower Yadkin River Basin Local Watershed Plan* states both McKee Creek (from source to Reedy Creek) and Clear Creek (from source to McKee Creek) 303(d) listed streams; McKee Creek for fecal coliform and sediment and Clear Creek for fecal coliform. NCDENR indicates the potential sources of impairment for McKee Creek and Clear Creek include agriculture, land development, and urban runoff/ storm sewers. Additionally, McKee Creek has non-municipal discharges from two minor NPDES

permitted discharges from private wastewater treatment plants located upstream of the project site. It is stated in the LWP; DWQ studies of fecal coliform bacterial sources for McKee and Clear Creeks indicated that livestock grazing was one of the contributing factors.

Monitoring of the project began with a visual site assessment in the spring of 2012 to identify potential problems. Cross-sections, crest gages, vegetation plots, and photo points were also established at that time. Base line information is not available since no monitoring was performed from the completion of construction in June 2010 till the spring 2012.

Project Complications

In addition to the delayed initiation of monitoring, several other factors have been detrimental to the goals of this mitigation. Approximately a month prior to the initial visual site assessment, a tornado caused damage in the area off the confluence of Clear Creek and McKee Creek, see Figure 2. The tornado downed large diameter trees with many spanning McKee and Clear Creek. Evidence of this can be seen in Photo Point 3. The downed trees have been cleared across Clear Creek, but remain a hindrance along the south bank. Many of the fallen trees on McKee Creek remain from the edge of the project limits down to Clear Creek.

The downed trees on the south bank of Clear Creek have impeded the monitoring effort. These downed trees have either attracted beavers or been exacerbated by a beaver population in the past. This assessment showed no current evidence of a beaver population, though observations will still be made to identify them.

Since completion of the stream restoration project, a sewer line was constructed along McKee Creek. The sewer serves a development west of McKee Creek and north of Peach Orchard Road. The sewer parallels the McKee Creek west bank from Peach Orchard Road to roughly stream station 40+00 where it traverses the stream and follows the east bank to a wastewater treatment plant (WWTP) upstream of the project area. This gravity sewer bucks grade to reach the WWTP from Peach Orchard Road. The construction of the sewer stream crossing required armoring both sides of the stream bank with rip rap for roughly 30 feet. The sewer has an easement along the alignment for access and maintenance that will be cleared. The easement clearing impact to the riparian buffer is limited to the stream crossing. Additionally, it appears that the majority of survey control set during the stream restoration construction was destroyed by the sewer line construction. New survey control had to be established along McKee Creek south of Peach Orchard Road in the fall of 2012.

It was noted in the Spring 2013 Assessment that Vegetation Plot 1 had been mowed over and most, if not all planted live stems had been cut to the ground. It was evident that the regeneration of 6 planted stems in the plot identified a reduction in stems as compared to data collected in the Fall of 2012 (refer to the Vegetation Results section below for a more detailed description of the effects of this complication).

The Fall 2014 site visit illustrated the increase in sedimentation problems. Specifics for each structure along Mckee Creek follow in the Stream Results section. Most of the problems that are stressing the structures along Mckee Creek are sediment related. Numerous golf balls have been seen along the Mckee Creek Reaches and in the downstream sections of Clear Creek. The likely source of these balls is a golf course roughly 4.5 miles upstream of Mckee Creek. This indicates that any loose sediments smaller than this will be transported downstream through the project

site. Of the distance upstream to the golf course, approximately 0.8 miles of the stream is located in undeveloped Cabarrus County, while the remaining 3.7 miles is located in outer Mecklenburg County. This means that sediment to this section of the stream is not temporary and will continue as development sprawls outward.

Vegetation Results

Success of the riparian buffer plantings will be based on vegetation success criteria established in the USACE Stream Mitigation Guidelines (2003). Four (4) permanent monitoring plots were established along the restored buffer in Spring of 2012. In order to be considered a successful restoration, the site must contain a minimum of 320 live stems per acre at Year 3 and 260 live stems per acre at Year 5. Year 3 shows an average of 486 live planted stems per acre with a minimum count of 243. These estimates are based on Level 2 of the CVS-EEP monitoring protocol and include only planted woody stems. The stem count is based on the average stem counts within the vegetation plots. Reference pictures of each monitoring plot were taken and attached to this report. The fact that all restored vegetation areas (on average) are performing above the requirement is good however Plot 1 is still deficient in Year 3 due to the mowing activity in 2012. It should be noted, the combination of 6 planted live stems (regenerated after mowing) and the additional natural woody stems in Vegetation Plot 1, should yield at least the minimum of planted and natural stems in Year 5. This gives the site, when accounting for volunteer stems, an average stems per acre within plots of 1,164, which is well over the requirement of 320 stems per acre in MY3.

Re-vegetation and elimination of invasives along McKee Creek Reach 2 was an important aspect of project success. The invasive species Multiflora Rose (*Rosa multiflora*) plagued the project site before and during construction. Construction logs indicate the Multiflora Rose was found to be three times greater than specified on the original plan, and though denied, the contractor requested on-site burning multiple times. As a result, several rounds of spray treatment were applied followed by bush hogging the invasive species.

During the Fall 2014, assessment of Multiflora Rose was still evident on both sides of the stream adjacent to Plot 1 and Autumn olive (*Eleagnus umbellata),* Japanese Honeysuckle (*Lonicera japonica)* and the Multiflora Rose were prominent in and around the vicinity of Plot 2. These plants are considered non-native invasive species and should be removed from the restoration areas to further limit the overtaking the native vegetation. Invasives were last treated in November 2013 and Spring of 2014, and treatment shall be repeated in Spring 2015 (early growing season), to eradicate remaining problem areas.

Stream Results

A visual qualitative assessment was performed to inspect channel facets, meanders, beds, banks, and installed structures. This visual assessment was confirmed and enhanced with a quantitative assessment of a physical stream survey for approximately 1600 feet. In general, Clear Creek appeared to preforming decently. A quick and dense development of vegetation proved to hold the stream together, along with the exclusion of bank damaging livestock. The downstream vane of the double cross-vanes is performing well, while the upstream vane has soil slumped onto the right arm and center of the structure from the bank with vegetation growing on it. The vegetation and soil on the right arm and center of the structure has caused flow to shift toward the left bank, which is becoming eroded, and flow is start to fall over the left side, beginning to detach the

boulders from the left side. While this slumping from the right side is stressing the structure, it is also causing areas of slower moving water for habitat creation. The fabric is beginning to fall off of the log vane at station 25+00, but the vane is still functioning, similarly the log vanes at 24+50 and 24+00 have lost their fabric, but are being undercut allowing water to flow under them as reported in MY-2 fall report. The constructed riffle at cross-section 23+00 looks good and a variety of pebble sizes are present and seems to be holding grade well. The pool at cross-section 22+75 is very wide and deep compared to the other pools in the stream. The stream stretch from the ford at 22+00 to 22+75 has a number of small trees that are "crisscrossing" the channel making certain parts impassable by wading. The outside bend at station 18+25 near Photo Point 6, has been eroded and an area of interest since MY-1 but well established trees along the bank appear to be greatly slowing the erosion rate. The inside of the bend is very flat and level with little vegetation, inferring shortcutting overtop of the "floodplain" during high flow instances and providing a nice bench for larger animals outside of high flow situations. The right bank bar that has been forming over the past 3 years at station 14+00 is lush, with short vegetation and is still growing slowly as sediment deposits, this bar has raccoon prints and seems to be an optimal "fishing" location. The most upstream cross-vane at station 11+25 is beginning to become overgrown as the banks, move in and some vegetation has begun to grow on top of the center stone, providing good macro-invertebrate type habitat.

A full restoration was not performed on McKee Creek Reach 1; a majority of this reach was only re-vegetated. Stream survey of this reach was performed for roughly 218 feet. The re-alignment work that was done where the sharp bend used to be is holding well. The cross-vane at station 27+00 that occupies this same area is filled in with fines and the center boulder dislodged, most likely due to development in the area as discussed in the complications section. There does not seem to be any other outside factors.

The structures on McKee Creek Reach 2 appear to be fairly stable, despite silting in presumably caused by slowed velocities approaching the tornado damaged section. Cattle exclusion has allowed the banks to re-vegetate and stabilize in the project area, while the banks are presumably unstable upstream of the project site as described in the complications section. Effective floodplain connection remains from downstream of Peach Orchard Road for approximately 650 feet, where the stream enters the tornado impacted area, approximately 635 feet of this was surveyed. Due to the high level of silt coming from the headwaters at the time of survey, a bar had formed just upstream of the cross-vane at station 16+50, additionally the J-hook at station 15+75 was silted in severely with 1.21 feet of loose silt filling the pool. The J-hook at station 14+50 is also slightly eroded exposing the J-hook's boulders as opposed to the other structures that appear to be naturally protected by the bank(s). There is a point bar that has formed between the J-hook at station 13+25 and the cross-vane at station 12+50, which has raccoon prints evidence of mammal populations being present. The left arm of the cross-vane at station 12+50 has been aggraded, such the flow now comes over the right arm of the cross-vane. The fabric and boulders still seem to be intact and the cross-vane appears to still be holding grade despite the misalignment of flow. The bank in the area just upstream of cross-vane at station 12+00 is falling into the stream along with a fallen tree. Both of which are very near the structure and may begin to fill it in as well. This fallen tree area has also caught some debris which has created a dam causing a water surface differential of 1.03 feet. Though debris and fallen trees should remain at the sides of the bank for lower velocity areas producing habitat diversity, the resulting water surface differential makes partial breaching an effective recommendation.

Hydrology Results

During the fall assessment, crest gages were checked for bankfull occurrences. On Reach 2 of McKee Creek, flattened vegetation, validates the bankfull or greater events at crest gage 1. The reading of crest gage 2 indicates events near bankfull, the presence of vegetation and small trees on the bank and at the very fringe of the floodplain leaned in the direction of flow are indicators of flow above bankfull. Whether flow rates greatly exceeded the channel capacity or not is unknown, but it demonstrates that this portion of the stream shows good floodplain connection and energy dissipation. Crest gage 3 had been toppled over again, most likely by a combination of inundated soils making it the post foundation soft and a large storm event. Visual signs indicate that the water surface did not overtopped the gage completely. The presence of golf balls at the downstream end of Clear Creek, presumably from the same source as those found in Mckee Creek, may provide evidence that Mckee flows backed into Clear Creek. This is understandable from a hydrologic standpoint, as Mckee Creek has a large drainage area and thus a greater time of concentration as compared to Clear Creeks considerable smaller drainage area and time of concentration.

The rainfall data provided in the appendix as Table 12 was for Cabarrus County per the NC Climate website through NCSU, during the period between Nov 2013 and Nov 2014 which totaled 39.62 inches. This is compared to the Harrisburg Town website, which quotes an average annual rainfall of 43.8 inches "consistent with the average rainfall for Cabarrus County." This means that the site has experienced about a 4 inch rainfall deficit over the average year.

Wetlands

No formal wetland assessment of this site was preformed. The site does have two small documented wetlands, 1,050 sf and 3,840 sf, which were discovered after the fall data collection. Both of these wetlands contain Chewacla type soils, according to the soils maps. In addition, there appears to be a small wetland just north of Peach Orchard Road, approximately 150 ft west of the stream. The soil of this wetland appears to be moderately wet upon inspection, and the surrounding ground and vegetation rather dry. No project mitigation credits are calculated, as these wetlands are incidental and not part of the project, though in the area.

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 the tables and figures in the report 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 EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request

Methodology

All survey was preformed utilizing either total station tradition survey methods or a survey grade GPS unit to capture points with high horizontal and vertical accuracy. The longitudinal stationing was formatted as close as possible to the original restoration plan stationing. The particle size distribution was collected using the standard Wolman pebble count procedure as taught by Dr. Gregory Jennings, North Carolina State University. The methodology used in this monitoring assessment followed the prescribed recommendation of the CVS-EEP Vegetation Monitoring Protocol Level-2.

References

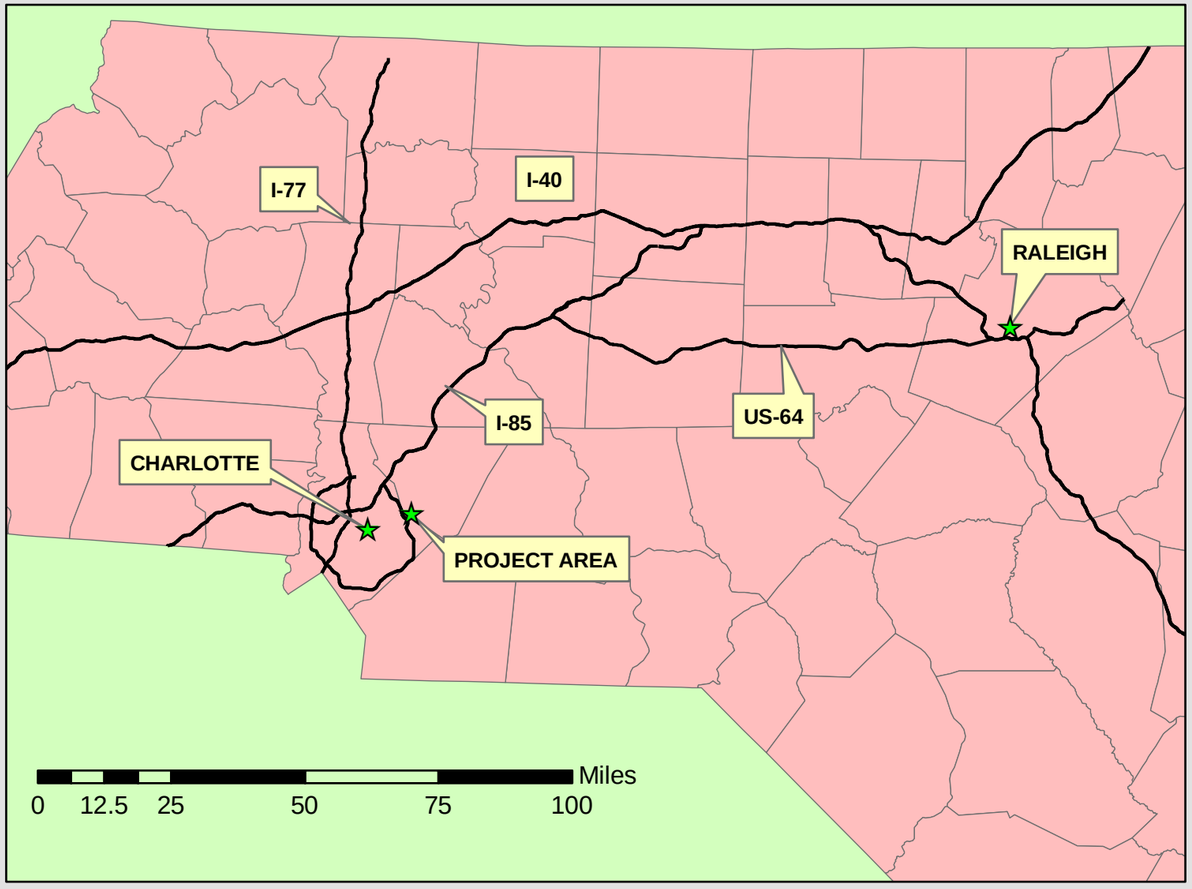
Town of Harrisburg North Carolina, Visitors Page, Geography and Climate
http://www.harrisburgnc.org/Visitors/GeographyClimate.aspx

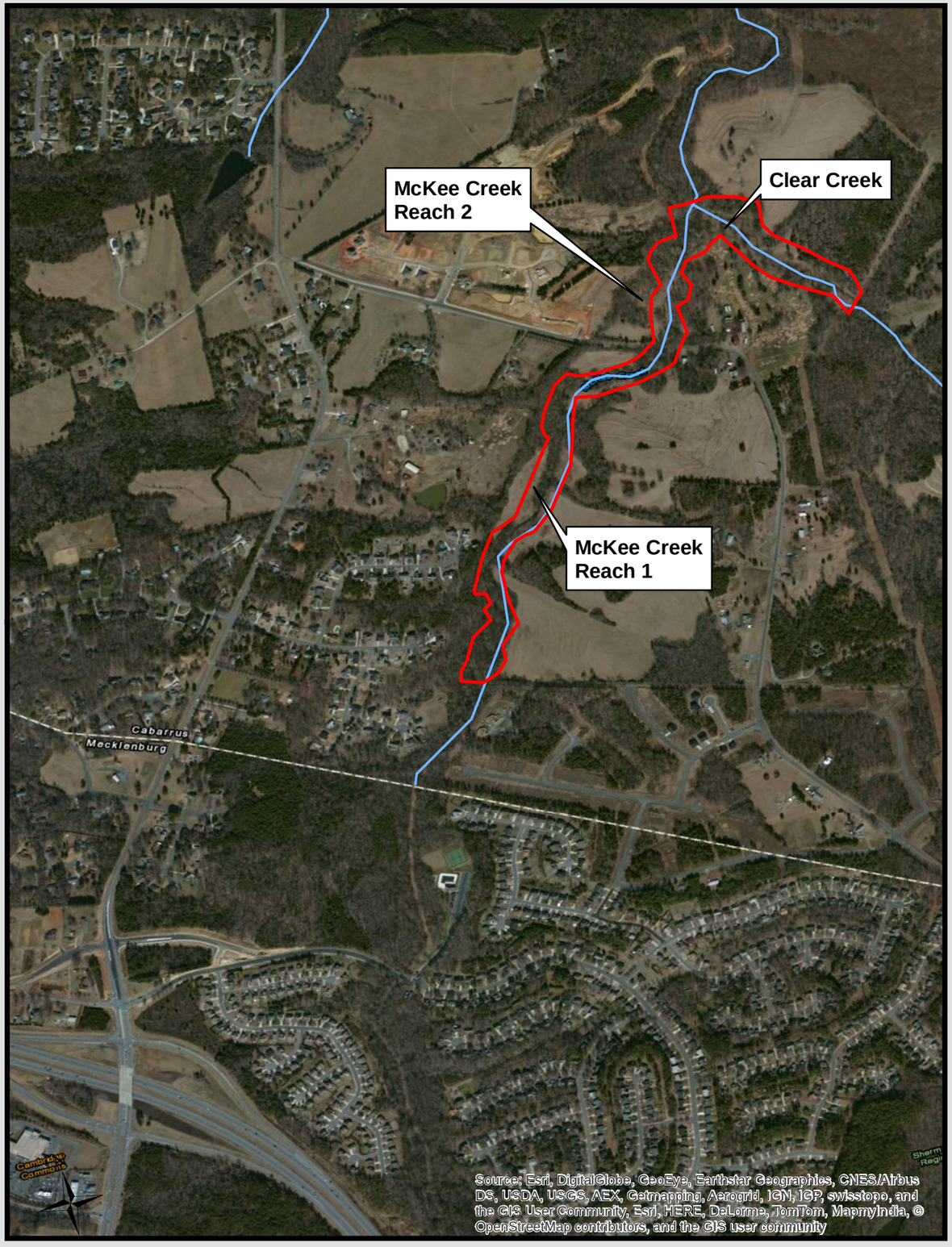
Lower Yadkin LWP– PFR, 2003 and WMP&R – Lower Yadkin LWP, 2004
http://www.nceep.net/services/lwps/Clarke_Creek/F_R_Rocky_Yadkin.pdf

Wolman Pebble Count,
http://limnology.wisc.edu/courses/zoo548/Wolman%20Pebble%20Count.pdf

Rainfall Data for Cabarrus County,
http://www.nc-climate.ncsu.edu/cronos

Appendix A
Project Vicinity Map and Background Tables





The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, monitoring and stewardship of the restoration site is permitted within the terms and timeframes of their defined, pre-approved roles. Any intended site visitation or activity by any person outside of these previously sanctioned activities/roles requires prior coordination with EEP

Take US-64 West from the Raleigh area to I-85 (approximatley 85 miles). Take I-85 south toward Charlotte (approximately 48 miles). Take exit 48 onto I-485 toward Rock Hill (approximately 8 miles) Take exit 39 onto Harrisburg Road north stay on Robinson Church for approximately 1 mile and then turn right onto NCSR 1169 Peach Orchard Road.
Peach Orchard Road intersects the project site.

N

Miles
0
0.25
0.5

Figure 1: Vicinity Map
McKee Creek Stream Restoration
EEP # 92573
Cabarrus County, NC
December 3, 2012

Ecosystem Enhancement PROGRAM

Table 1. Project Components and Mitigation Credits
McKee Creek Project #: 92573

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	3668								

Project Components

Project Component -or- Reach ID	Stationing/Location		Existing Footage/Acreage	Approach (PI, PII, etc.)	Restoration -or- Restoration Equivelent	Restoration Footage or Acreage	Mitigation Ratio
McKee Reach 1	10+00 - 25+00, 29+00 - 46+40		3240	P4	E2	3240	2.5:1 MAX
McKee Reach 1	25+00 - 29+00		400	P2	E1	400	1.5:1 MAX
McKee Reach 2	10+00 - 17+23.67		696	P2	E1	696	1.5:1 MAX
Clear Creek	11+03.05 - 27+59.18		1641	P1	R	1641	1 to 1

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetlands (acres)		Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine				
Restoration	1641						
Enhancement							
Enhancement I	1096						
Enhancement II	3240						
Creation							
Preservation							
High Quality Preservation							

BMP Elements

Element	Location	Purpose/Function	Notes

BMP Elements
BR = BioretentionCell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

Table 2. Project Activity and Reporting History
McKee Creek Project # 92573

Elapsed Time Since Grading Complete: 4 yrs 7 months
Elapsed Time Since Planting Complete: 4 yrs 7 months
Number of Reporting Years: 3

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan		Aug-08
Final Design – Construction Plans		Apr-09
Construction		May-10
Containerized, bare root and B&B plantings for reach/segments 1&2		May-10
Mitigation Plan / As-built (Year 0 Monitoring – baseline)		
Spring Year 1 Monitoring	Apr-12	May-12
Fall Year 1 Monitoring	Oct-12	Nov-12
Spring Year 2 Monitoring	Apr-13	May-13
Beaver Removal		Summer-13
Invasives Treatment		Fall-13
Fall Year 2 Monitoring	Oct-13	Nov-13
Spring Year 3 Monitoring	Apr-14	Apr-14
Invasives Treatment		Summer-14
Fall Year 3 Monitoring	Oct-14	Dec-14

Bolded items are examples of those items that are not standard, but may come up and should be included
Non-bolded items represent events that are standard components over the course of a typical project.
The above are obviously not the extent of potential relevant project activities, but are just provided as example as part of this exhibit.
If planting and morphology are on split monitoring schedules that should be made clear in the table
1 = Equals the number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table McKee Creek Project # 92573	
Designer Primary project design POC	Withers & Ravenel, Inc. 115 MacKenan Drive Cary, NC 27511 Daniel Wiebke, E.I. (919) 469-3340
Construction Contractor Construction contractor POC	River Works Inc. 6105 Chapel Hill Road Raleigh, NC 27607 Edward Haynes
Survey Contractor Survey contractor POC	Turner Land Surveying Elisabeth Turner
Planting Contractor Planting contractor POC	River Works Inc. 6105 Chapel Hill Road Raleigh, NC 27607 Edward Haynes
Seeding Contractor Contractor point of contact	Green Resources 5204 Highgreen Ct Colfax, NC 27235 Rodney Montgomery
Seed Mix Sources	
Nursery Stock Suppliers	Not Known
Monitoring Performers	Withers & Ravenel, Inc. 115 MacKenan Drive Cary, NC 27511
Stream Monitoring POC	Daniel Wiebke, E.I. (919) 535-5172
Vegetation Monitoring POC	Daniel Wiebke, E.I. (919) 535-5173
Wetland Monitoring POC	

Table 4. Project Baseline Information and Attributes

Project Name	McKee Creek, Project #92573		
County	Cabarrus		
Project Area (acres)	17.41		
Project Coordinates(latitude and longitude)			
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Yadkin Pee Dee		
USGS Hydrologic Unit 8-digit		USGS Hydrologic Unit 14-digit	3040105010050
DWQ Sub-basin	Clear- 03-07-11/03-08-34		
Thermal Regime	Warm Thermal Regime		
Project Drainage Area (acres)	8980		
Project Drainage Area Percentage of Impervious Area	36		
CGIA Land Use Classification	Single Family and Wooded		
Reach Summary Information			
Parameters	**McKee Reach 1**	**McKee Reach 2**	**Clear Creek**
Length of Reach	3640	696	1641
Valley Classification	VIII	VIII	VIII
Drainage Area(acres)	3640	696	1641
NCDWQ stream identification score	Perennial	Perennial	Perennial
NCDWQ Water Quality Classification	C	C	C/C
Morphological Description (stream type)	E4	E4	E/C5
Evolutionary trend	C4	C4	C5
Underlying mapped soils	CHEWACLA	CHEWACLA	CHEWACLA
Drainage class			
Soil Hydric status	Yes	Yes	Yes
Slope	0.005	0.005	0.014
FEMA classification	AE	AE	Mckee (Backwater)
Native vegetation community]	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest
Percent composition of exotic invasive vegitation			
Wetland Summary Information			
Parameters	**Wetland 1**	**Wetland 2**	**Wetland 3**
Size of Wetland (acres)			
Wetland Type(non-riparian, riparian riverine or riparian non-riverine)			
Mapped Soil Series			
Drainage class			
Soil Hydric Status			
Source of Hydrology			
Hydrologic Impairment			
Native vegetation community			
Percent composition of exotic invasive vegetation			
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Dcumentation**
Waters of the United States - Section 404	Yes		SAW-2008-2808
Waters of the United States - Section 401	Yes		
Land Quality	Yes		CABAR-2009-0024
Endangered Species Act	No		
Historic Preservation Act	No		
Coastal Zone Management Act(CZMA)/Costal Area Management Act(CAMA)	No		
FEMA Floodplain Compliance	Yes		
Essential Fisheries Habitat	No		

Appendix B
Visual Assessment Data

Feet

0 150 300 600

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N

Legend

- Conservation Easement
- Pre Channel
- Centerline
- XS_Lines
- Photo Points
- VegetationPlot
- Tornado Damage April 2012
- Viewports

Clear Creek
Figure 1.1

End Clear Creek Reach

Crossing Trees
Overbank

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

Feet
0 25 50 100

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Clear Creek
Figure 1.2

Bank Erosion;
Trees Holding

P

P

P

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

Feet
0 25 50 100

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Clear Creek
Figure 1.3

Multiflora Rose and Autumn Olive

Begin Clear Creek Reach

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

N

0 25 50 100 Feet

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McKee Creek Reach 2
Figure 1.4

End McKee Reach 2

17+00

Stream Not Visible from Bank
Overgrown and Storm Damage

16+00

P 3

15+00

Very Good
Tree Establishment

14+00

13+00

P 1

3

12+00

Bank Slumping;
Wood Debris Dam

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, U
Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

N

0 25 50 100 Feet

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McKee Creek Reach 1
Figure 1.5

14+00
13+00
12+00
11+00
1
3
End McKee Reach 1
46+00
PXS3
RXS1
45+00
CG1
2
44+00
43+00
42+00
1
Begin McKee Reach 2

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures
- Failing
- Stable
- Stressed

VegetationPlot
- Criteria Unmet
- Criteria Met

Feet
0 25 50 100

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McKee Creek Reach 1
Figure 1.6

3

46+00

PXS3

Begin McKee Reach 2

Most Rose Dead; Some Honeysuckle

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

Feet
0 25 50 100

N

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Ecosystem Enhancement Program

McKee Creek Reach 1
Figure 1.7

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

N

0 25 50 100 Feet

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Ecosystem Enhancement Program

McKee Creek Reach 1
Figure 1.8

36+00
35+00
34+00
33+00
32+00
31+00

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

N

0 25 50 100 Feet

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Ecosystem Enhancement Program

McKee Creek Reach 1
Figure 1.9

Multiflora Rose

Multiflora Rose

Filling with Fines

Source: Esri, Digita
Getmapping, Aer

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

N

Feet
0 25 50 100

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Ecosystem Enhancement Program

McKee Creek Reach 1
Figure 1.10

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

N

Feet
0 25 50 100

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Ecosystem Enhancement Program

McKee Creek Reach 1
Figure 1.11

Begin McKee Reach 1

Legend

- Conservation Easement
- Pre Channel
- Centerline
- SewerLine
- Approx. Sewer Easement
- XS_Lines
- Photo Points
- Crest Gauge
- Invasives
- Tornado Damage April 2012

Structures

- Failing
- Stable
- Stressed

VegetationPlot

- Criteria Unmet
- Criteria Met

Feet
0 25 50 100

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Ecosystem Enhancement Program

Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID McKee Creek Reach 1
Assessed Length 3301

Major Channel Category	Channel Sub-Category	Metric	Number of 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
Bed	Vertical Stability	Aggradation- Bar formation/growth sufficient to significantly deflect flow latereally (not to include point bars)			1	20	95%			
		Degradation-Evidence of downcutting			0	0	100%			
	Riffle Condition	Texture/Substrate - Riffle maintains coarser substrate	0	0			100%			
	Meander Pool Condition	Depth Sufficient (Max Pool Depth: Mean Bankfull Depth>= 1.6)	0	0			100%			
		Length Appropriate(>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	0	0			100%			
	Thalweg Position	Thalweg centering at upstream of meander bend (Run)	0	0			100%			
		Thalweg centering at dowsntream of meadner bend (glide)	0	0			100%			
Bank	Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and or scour and erosion			0	0	100%	0	0	100.00%
	Undercut	Banks undercut/overhanging to the extednt that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100.00%
	Mass Wasting	Bank slumping, caving, or collapse		Totals	0	0	100%	0	0	100.00%
					0	0	100%	0	0	100.00%
Engineered Structures	Overall Integrity	Structures physically intact with no dislodged boulders or logs	0	1			0%			
	Grade Control	Grade control structures exhibiting maintenance of grade across the sill	0	0			100%			
	Piping	Structures lacking any substation flow underneath sills or arms	0	0			100%			
	Bank Protection	Bank erosion within the stuctures extednt of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	0	0			100%			
	Habitat	Pool forming structures maintaining ~ Max Pool Depth: Mean Bankfull Depth >= 1.6 Rootwads/logs providing some cover at base-flow	1	1			100%			

Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID McKee Creek Reach 2
Assessed Length 723

Major Channel Category	Channel Sub-Category	Metric	Number of 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
Bed	Vertical Stability	Aggradation- Bar formation/growth sufficient to significantly deflect flow latereally (not to include point bars)			1	20	97%			
		Degradation-Evidence of downcutting			0	0	100%			
	Riffle Condition	Texture/Substrate - Riffle maintains coarser substrate	0	0			100%			
	Meander Pool Condition	Depth Sufficient (Max Pool Depth: Mean Bankfull Depth>= 1.6)	3	4			75%			
		Length Appropriate(>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	3	4			75%			
	Thalweg Position	Thalweg centering at upstream of meander bend (Run)	3	4			75%			
		Thalweg centering at dowsntream of meadner bend (glide)	3	4			75%			
Bank	Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and or scour and erosion			0	0	100%	0	0	100.00%
	Undercut	Banks undercut/overhanging to the extednt that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100.00%
	Mass Wasting	Bank slumping, caving, or collapse			1	20	97%	0	0	100.00%
				Totals	0	0	100%	0	0	100.00%
Engineered Structures	Overall Integrity	Structures physically intact with no dislodged boulders or logs	5	5			100%			
	Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	5			80%			
	Piping	Structures lacking any substation flow underneath sills or arms	5	5			100%			
	Bank Protection	Bank erosion within the stuctures extednt of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	5	5			100%			
	Habitat	Pool forming structures maintaining ~ Max Pool Depth: Mean Bankfull Depth >= 1.6 Rootwads/logs providing some cover at base-flow	5	5			100%			

Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID Clear Creek
Assessed Length 1566

Major Channel Category	Channel Sub-Category	Metric	Number of Stable Performing as Intended	Total Number in As-Built	Number of Unstable Sections	Amount of Unstable Footage	% Stable Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
Bed	Vertical Stability	Aggradation- Bar formation/growth sufficient to significantly deflect flow latereally (not to include point bars)			1	25	98%			
		Degradation-Evidence of downcutting			0	0	100%			
	Riffle Condition	Texture/Substrate - Riffle maintains coarser substrate	2	2			100%			
	Meander Pool Condition	Depth Sufficient (Max Pool Depth: Mean Bankfull Depth>= 1.6)	15	16			94%			
		Length Appropriate(>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	16	16			100%			
	Thalweg Position	Thalweg centering at upstream of meander bend (Run)	14	16			88%			
		Thalweg centering at downstream of meadner bend (glide)	14	16			88%			
Bank	Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and or scour and erosion			1	25	98%	0	0	100.00%
	Undercut	Banks undercut/overhanging to the extednt that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			1	15	99%	0	0	99.00%
	Mass Wasting	Bank slumping, caving, or collapse			1	20	98%	0	0	100.00%
				Totals	0	0	100%	0	0	100.00%
Engineered Structures	Overall Integrity	Structures physically intact with no dislodged boulders or logs	10	13			77%			
	Grade Control	Grade control structures exhibiting maintenance of grade across the sill	5	7			71%			
	Piping	Structures lacking any substation flow underneath sills or arms	18	20			90%			
	Bank Protection	Bank erosion within the stuctures extednt of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	19	20			95%			
	Habitat	Pool forming structures maintaining ~ Max Pool Depth: Mean Bankfull Depth >= 1.6 Rootwads/logs providing some cover at base-flow	4	5			80%			

Table 6 Vegetation Condition Assessment

McKee Creek Project # 92573

Planted Acreage **4.44**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Area	Very limited cover of both woddy and herbaceous material	.1 acres	Pattern and Color	0	0	0
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria	.1 acres	Pattern and Color	0	0	0
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year	.25 Acres	Pattern and Color	0	0	0

Easment Acreage **17.41**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale)	500 SF	Pattern and Color	7	0.624	3.58%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	None	Pattern and Color	0	0	0

Photo 1: Vegetation Plot 1 – Year 3 (2014)

Photo 2: Vegetation Plot 2 – Year 3 (2014)

Photo 3: Vegetation Plot 3 – Year 3 (2014)

Photo 4: Vegetation Plot 4 – Year 3 (2014)

Photo 5: Riffle XS 1 – Year 3 (2014)

Photo 6: Riffle XS 2 – Year 3 (2014)

Photo 7: Riffle XS 3 – Year 3 (2014)

Photo 8: Pool XS 1 – Year 3 (2014)

Photo 9: Pool XS 2 – Year 3 (2014)

Photo 10: Pool XS 3 – Year 3 (2014)

Photo 11: Photo Point 1 – Year 3 (2014)

Photo 12: Photo Point 2 – Year 3 (2014)

Photo 13: Photo Point 3 – Year 3 (2014)

Photo 14: Photo Point 4 – Year 3 (2014)

Photo 15: Photo Point 5 – Year 3 (2014)

Photo 16: Photo Point 6 – Year 3 (2014)

Photo 17: Photo Point 7 – Year 3 (2014)

Appendix C
Vegetation Plot Data

Table 7. Veg Plot Criteria Attainment
McKee Creek Project # 92573

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	No	
2	Yes	
3	Yes	66%
4	Yes	100%

Table 8. CVS Vegetation Plot Metadata
McKee Creek Project # 92573

Report Prepared By	Daniel Wiebke
Date Prepared	2/4/2015 15:21
database name	Withers&Ravenel-McKee Yr3 (2).mdb
database location	C:\Users\lwelch\Downloads
computer name	WR1386
file size	79175680
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	92573
project Name	McKee Creek
Description	McKee Creek Upstream and Downstream of Peach Orchard and Clear Creek
River Basin	Yadkin-Pee Dee
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	8

Table 9. Planted Stem Counts (Species by Plot with Annual Means)																	
McKee Creek Project # 92573																	
			Current Data								Annual Means						
	Common Name	Type	Plot 1		Plot 2		Plot 3		Plot 4		Current Mean		MY 1 (2012)		MY 2 (2013)		
			P	T	P	T	P	T	P	T	P	T	P	T	P	T	
Acer negundo	Box Elder		0	1	0	0	0	0	0	8	0	2.25	0	1.25	0	1.75	
Betula nigra	River Birch	Tree	1	1	0	2	2	5	0	0	0.75	2	0.75	1.25	0.75	1.25	
Carya aquatica	Water Hickory		0	0	2	2	0	0	0	0	0.5	0.5	0.5	0.5	0.5	1.5	
Diospyrus virginiana	Persimmon		0	1	0	2	0	0	0	1	0	1	0	1	0	1.25	
Eleagnus umbellata	Autumn Olive		0	0	0	0	0	0	0	0	0	0	0	0.75	0	0.5	
Fraxinus pennsylvanica	Green Ash	Tree	0	0	3	3	0	0	0	0	0.75	0.75	1	1	1	1	
Juglans nigra	Black Walnut	Tree	3	6	0	1	0	0	3	5	1.5	3	1.75	1.75	1.25	1.75	
Liquidambar styraciflua	Sweetgum		0	2	0	34	0	1	0	2	0	9.75	0	9.5	0.25	9.5	
Liriodenron tulipifera	Tulip Poplar	Tree	0	0	0	0	1	1	3	4	1	1.25	0.75	0.75	0.5	0.5	
Plantanus	Sycamore	Tree	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	
Platanus occidentalis	American Sycamore	Tree	2	2	5	5	3	3	8	9	4.5	4.75	4.5	4.25	4.75	5.5	
Quercus michauxii	Swamp Chestnut Oak	Tree	0	0	0	0	3	3	0	0	0.75	0.75	1	0.5	0.75	0.75	
Quercus nigra	Water Oak		0	0	0	0	0	0	0	0	0	0	0	1	0	0	
Quercus sp.	Oak	Shrub Tree	0	0	0	0	1	1	0	0	0.25	0.25	0.5	0.5	0	0.5	
Rhus copallinum	Winged Sumac		0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	
Salix nigra	Black Willow	Tree	0	0	0	0	0	0	8	10	2	2.5	2.25	2.25	2.25	3	
Ulmus alata	Winged Elm		0	0	0	0	0	0	0	0	0	0	0	2.25	0	0	
Unknown	Unknown	Unknown	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
	Plot Area (acres)		0.0247		0.0247		0.0247		0.0247				0.0247	0.0247	0.0247	0.0247	
	Species Count		3	6	3	7	5	6	4	7	3.75	6.5					
	Stem Count		6	13	10	49	10	14	22	39	12	28.75	14	30	12	29	
	Stems Per Acre		243	526	405	1984	405	567	891	1579	486	1164	567	1215	486	1164	

Appendix D
Stream Survey Data

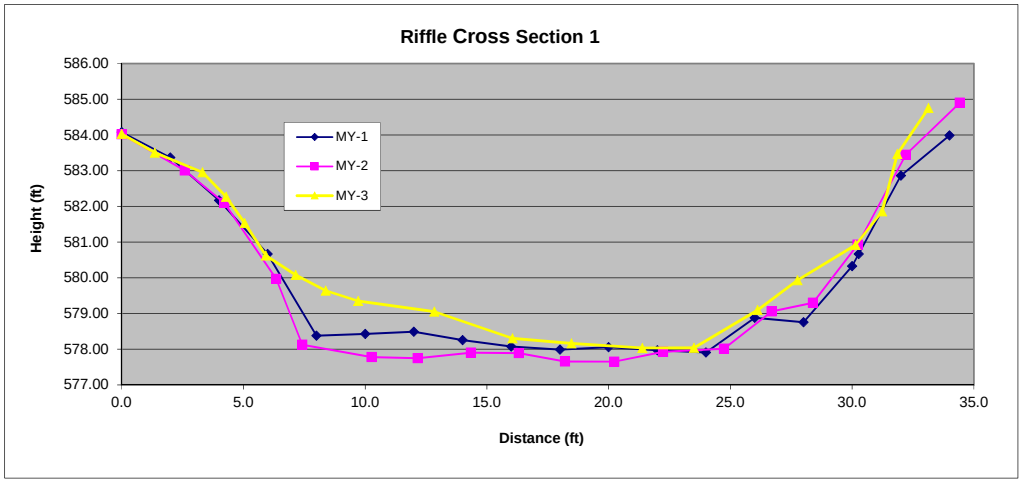
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	McKee MY-03
XS-ID	RXS-1
Drainage Area	6.42 sq. mi
Date	10/16/2014
Field Crew	D. Wiebke, J. Burley

Station	Elevation	Station	Elevation
0	584.027	16.05	578.306
1.36	583.502	18.47	578.161
3.32	582.954	21.38	578.034
4.29	582.27	23.51	578.038
5.05	581.529	26.12	579.098
5.92	580.621	27.76	579.932
7.15	580.082	30.14	580.921
8.38	579.643	31.23	581.86
9.71	579.352	31.86	583.469
12.84	579.053	33.14	584.754

Summary Data	
Bankfull Elevation	580.621
Bankfull Cross-Sectional Area	32.06
Bankfull Width	24.44
Flood Prone Area Elevation	583.495
Flood Prone Width	30.5
Max Depth at Bankfull	2.587
Mean Depth at Bankfull:	1.18
W/D Ratio:	20.72
Entrenchment Ratio:	1.25
Bank Height Ratio:	2.32

Left Bank to Right Bank



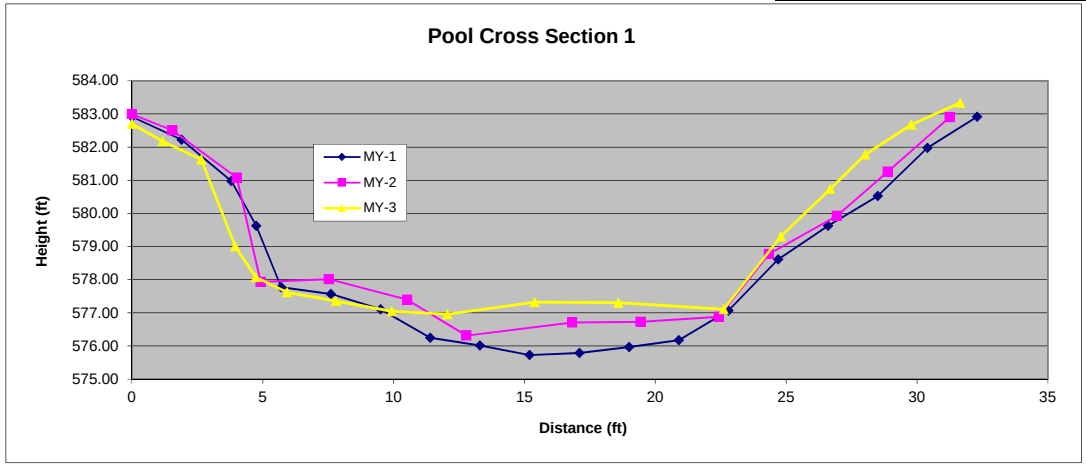
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	McKee MY-03
XS-ID	PXS-1
Drainage Area	6.42 sq. mi
Date	10/16/2014
Field Crew	D. Wiebke, J. Burley

Summary Data	
Bankfull Elevation	580.738
Bankfull Cross-Sectional Area	71.953845
Bankfull Width	22.74
Flood Prone Area Elevation	584.373
Flood Prone Width	50
Max Depth at Bankfull	3.783
Mean Depth at Bankfull:	2.75
W/D Ratio:	8.26
Entrenchment Ratio:	2.20
Bank Height Ratio:	1.69

Left Bank to Right Bank

Station	Elevation
0	582.703
1.17	582.176
2.65	581.626
3.95	579.002
4.73	578.072
5.93	577.618
7.8	577.354
9.93	577.045
12.06	576.955
15.39	577.32
18.59	577.308
22.61	577.103
24.8	579.302
26.69	580.738
28.02	581.78
29.78	582.674
31.66	583.339



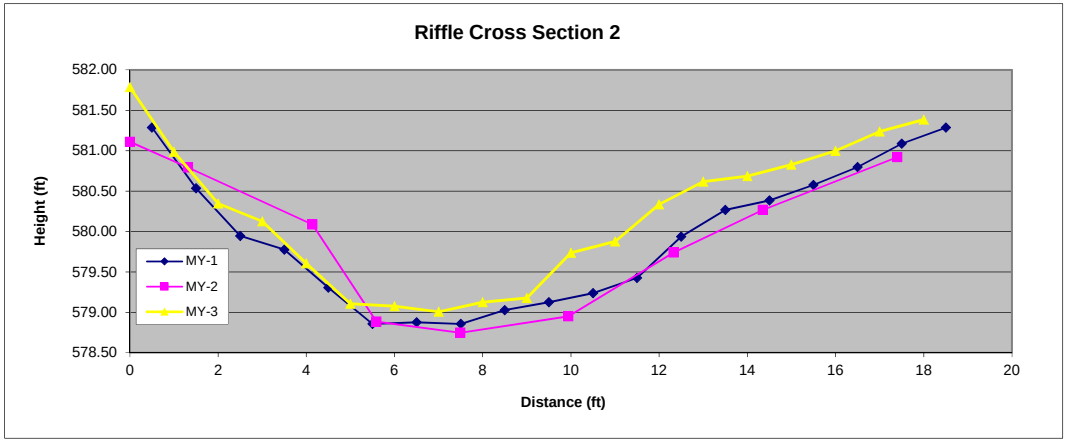
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	Clear MY-03
XS-ID	RXS-2
Drainage Area	0.95
Date	10/16/2014
Field Crew	D. Wiebke, J. Burley

Station	Elevation
0	581.786
1	580.986
2	580.346
3	580.126
4	579.606
5	579.106
6	579.076
7	579.006
8	579.126
9	579.176
10	579.736
11	579.876
12	580.336
13	580.616
14	580.686
15	580.826
16	580.996
17	581.236
18	581.386

Summary Data	
Bankfull Elevation	580.616
Bankfull Cross-Sectional Area	11.26
Bankfull Width	10
Flood Prone Area Elevation	582.226
Flood Prone Width	120
Max Depth at Bankfull	1.61
Mean Depth at Bankfull:	1.02
W/D Ratio:	9.77
Entrenchment Ratio:	12.00
Bank Height Ratio:	1.73

Left Bank to Right Bank



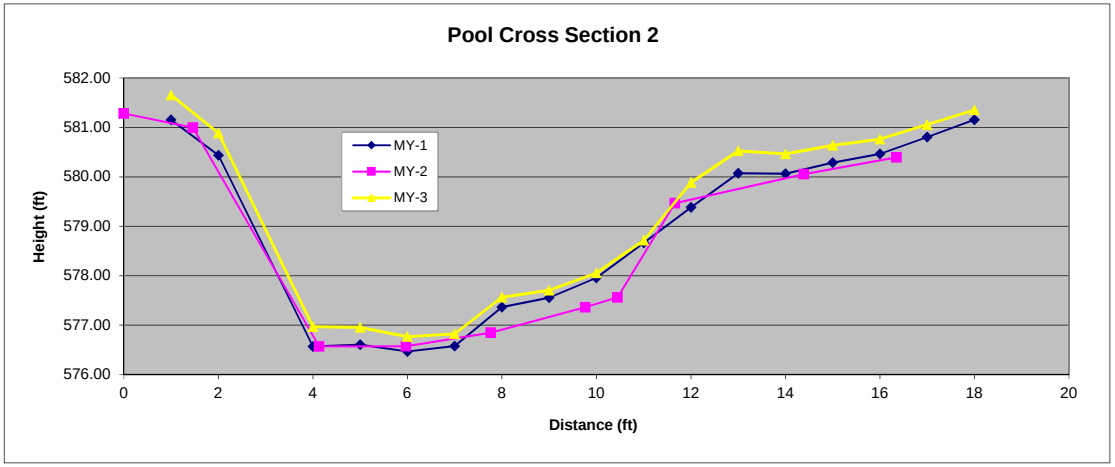
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	Clear MY-03
XS-ID	PXS-1
Drainage Area	0.95
Date	10/16/2014
Field Crew	D. Wiebke, J. Burley

Station	**Elevation**
1	581.655
2	580.885
4	576.965
5	576.955
6	576.765
7	576.825
8	577.565
9	577.705
10	578.055
11	578.715
12	579.885
13	580.525
14	580.465
15	580.635
16	580.765
17	581.055
18	581.355

Summary Data	
Bankfull Elevation	580.525
Bankfull Cross-Sectional Area	25.525
Bankfull Width	8
Flood Prone Area Elevation	584.285
Flood Prone Width	150
Max Depth at Bankfull	3.76
Mean Depth at Bankfull:	2.81
W/D Ratio:	2.85
Entrenchment Ratio:	18.75
Bank Height Ratio:	1.30

Left Bank to Right Bank



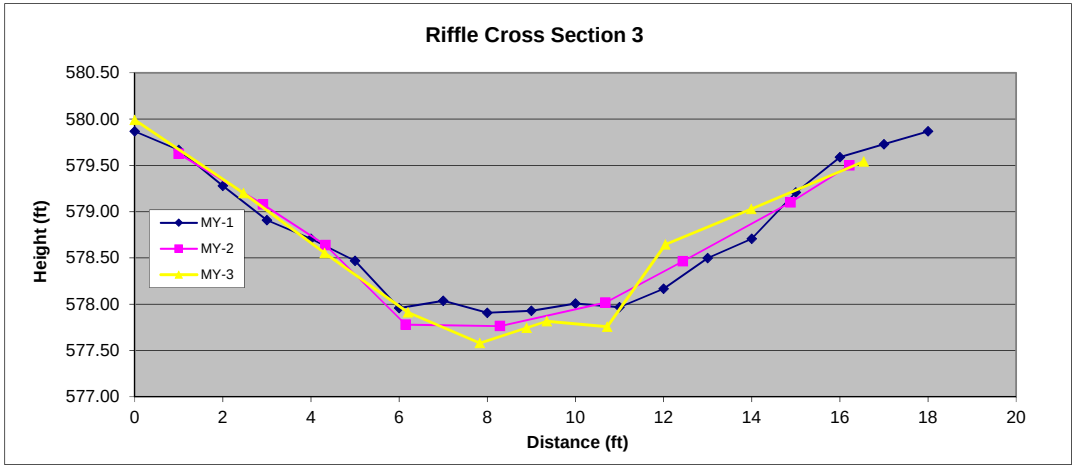
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	Clear MY-03
XS-ID	RXS-3
Drainage Area	0.95
Date	10/16/2014
Field Crew	D. Wiebke, J. Burley

Station	Elevation
0	579.992
2.47	579.201
4.31	578.552
6.2	577.913
7.83	577.58
8.89	577.744
9.35	577.815
10.72	577.756
12.04	578.645
13.99	579.029
16.54	579.543

Summary Data	
Bankfull Elevation	579.543
Bankfull Cross-Sectional Area	12.27
Bankfull Width	14.07
Flood Prone Area Elevation	581.506
Flood Prone Width	250
Max Depth at Bankfull	1.963
Mean Depth at Bankfull:	1.29
W/D Ratio:	10.87
Entrenchment Ratio:	17.77
Bank Height Ratio:	1.23

Left Bank to Right Bank



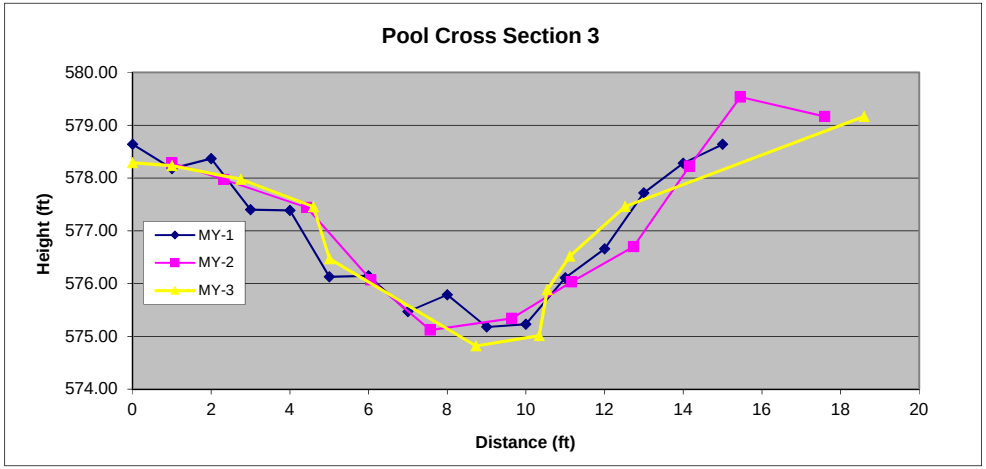
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	Clear MY-03
XS-ID	PXS-3
Drainage Area	0.95
Date	10/16/2014
Field Crew	D. Wiebke, J. Burley

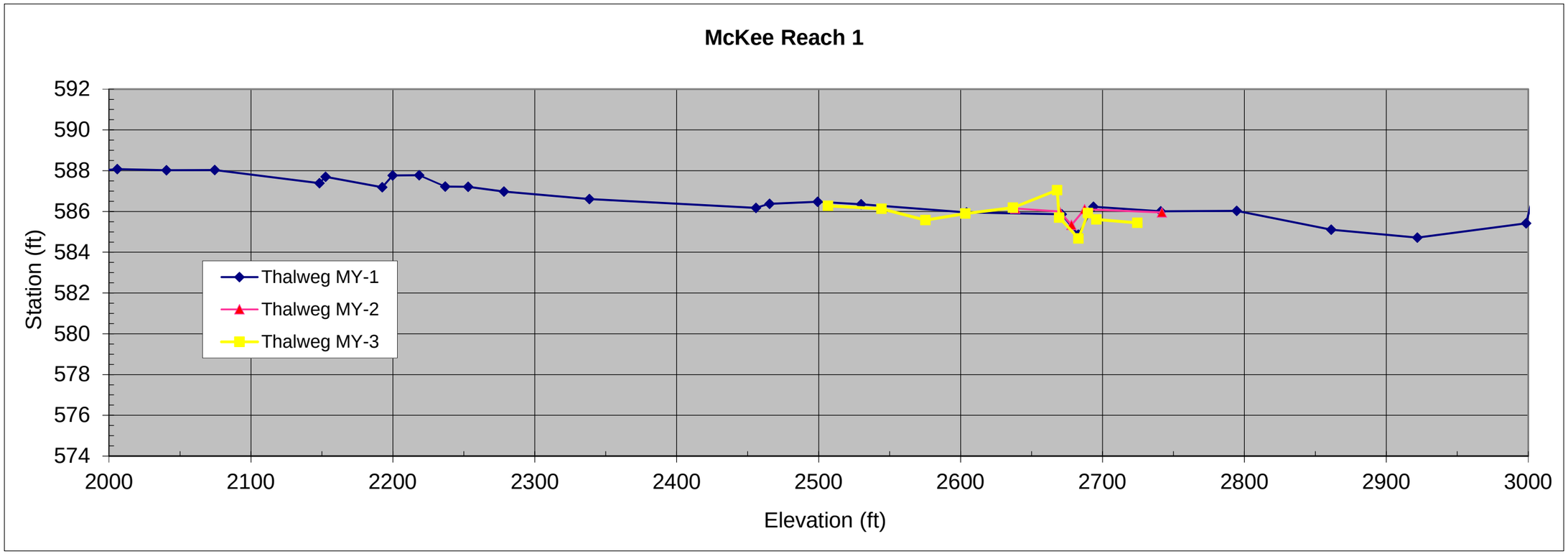
Station	Elevation
0	578.29
1	578.232
2.75	577.976
4.6	577.457
5.01	576.468
8.73	574.818
10.34	575.013
10.54	575.885
11.12	576.522
12.52	577.458
18.6	579.167

Summary Data	
Bankfull Elevation	578.29
Bankfull Cross-Sectional Area	17.81
Bankfull Width	11.52
Flood Prone Area Elevation	581.762
Flood Prone Width	200
Max Depth at Bankfull	3.472
Mean Depth at Bankfull:	1.64
W/D Ratio:	7.01
Entrenchment Ratio:	21.70
Bank Height Ratio:	1.25

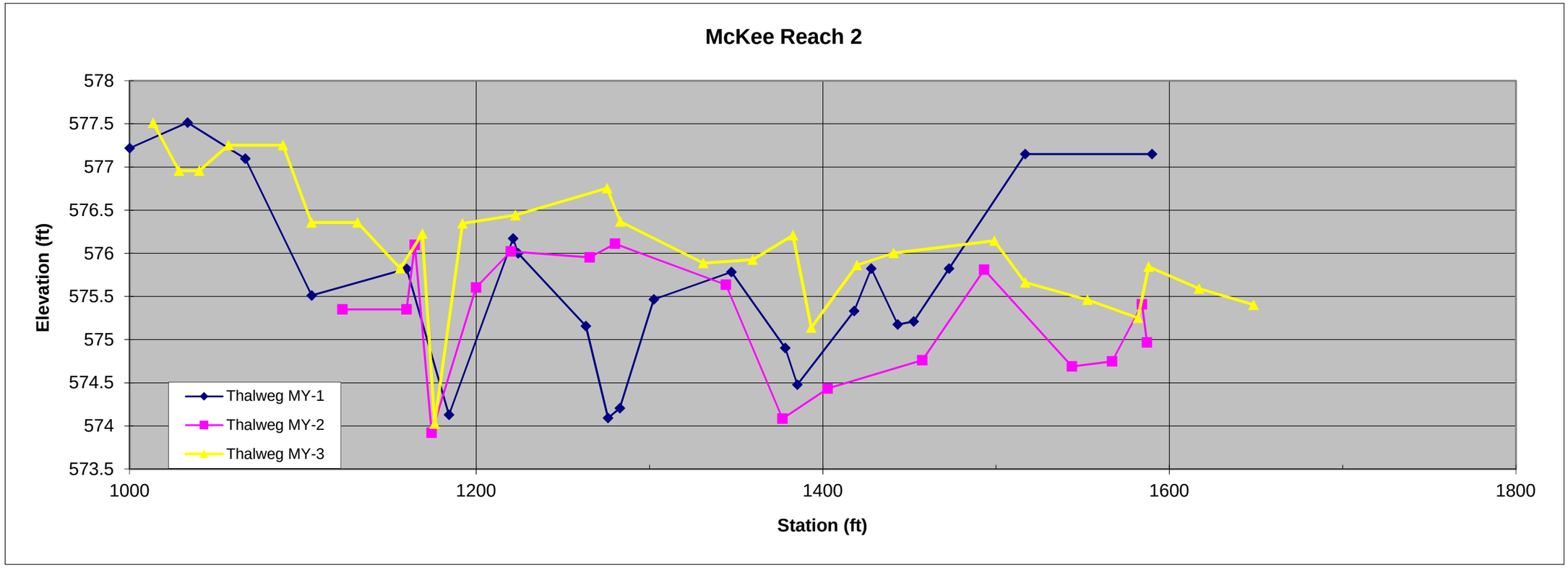
Left Bank to Right Bank



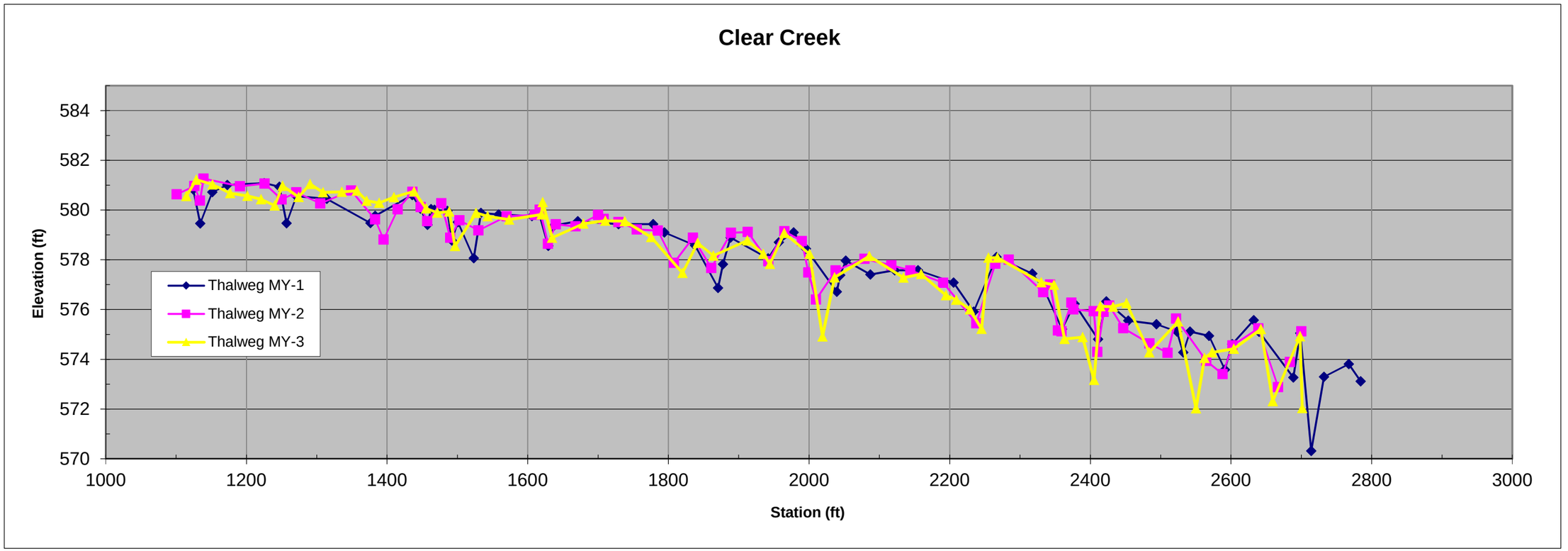
Longitudinal Profile Plot



Longitudinal Profile Plot



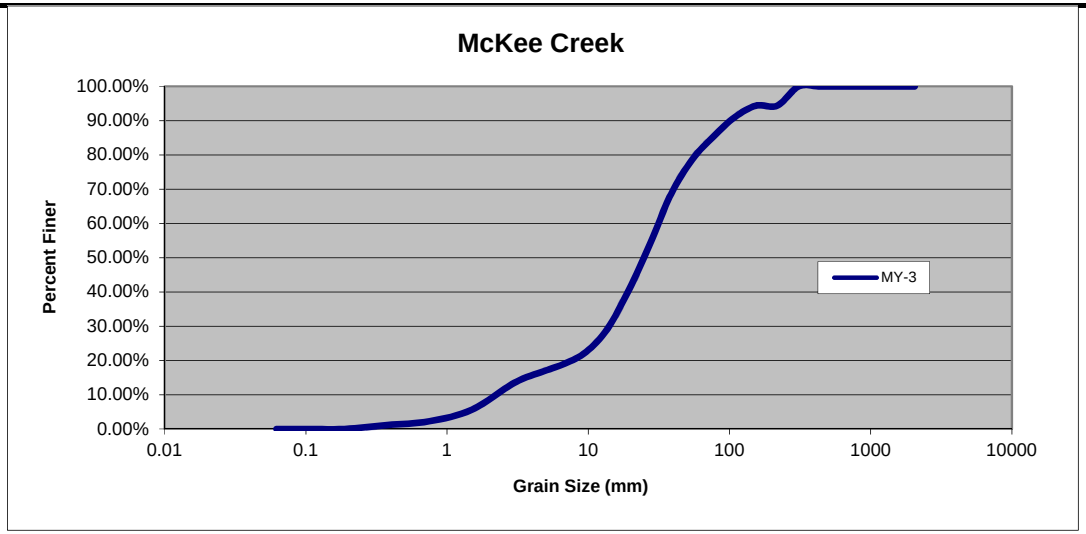
Longitudinal Profile Plot

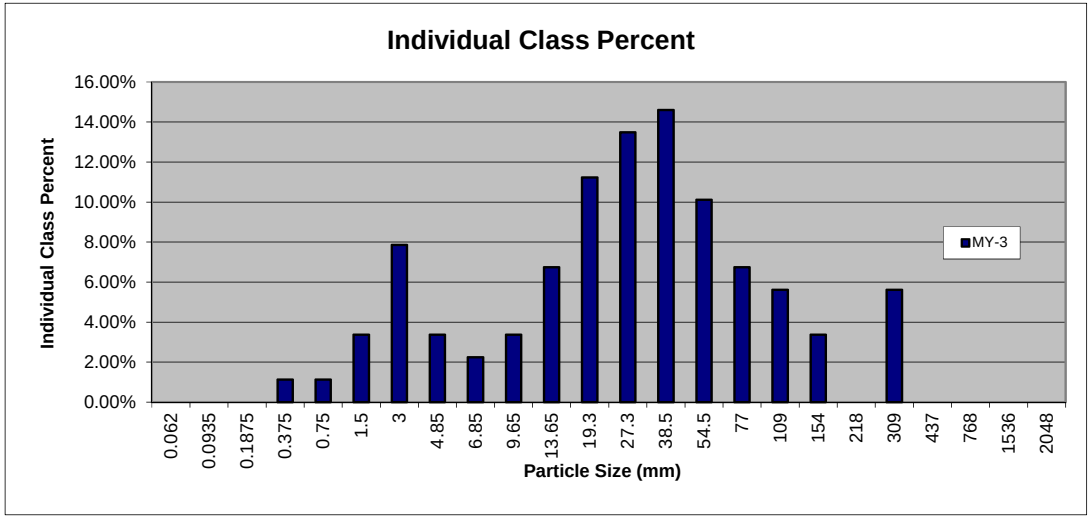


Pebble Count Exhibit

Mckee Creek Stream Resotration				
Mckee Creek				
Riffle				
Particle	**Size**	**Count**	**Percent**	**Cumulative Percent**
Silt Clay	0.062		0.00%	0.00%
Sand	0.0935		0.00%	0.00%
	0.1875		0.00%	0.00%
	0.375	1	1.12%	1.12%
	0.75	1	1.12%	2.25%
	1.5	3	3.37%	5.62%
Gravel	3	7	7.87%	13.48%
	4.85	3	3.37%	16.85%
	6.85	2	2.25%	19.10%
	9.65	3	3.37%	22.47%
	13.65	6	6.74%	29.21%
	19.3	10	11.24%	40.45%
	27.3	12	13.48%	53.93%
	38.5	13	14.61%	68.54%
	54.5	9	10.11%	78.65%
Cobble	77	6	6.74%	85.39%
	109	5	5.62%	91.01%
	154	3	3.37%	94.38%
	218		0.00%	94.38%
Boulder	309	5	5.62%	100.00%
	437		0.00%	100.00%
	768		0.00%	100.00%
	1536		0.00%	100.00%
Bedrock	2048		0.00%	100.00%
Total		89	100.00%	

Summary Data	
D50	27.3
D84	77
D95	309

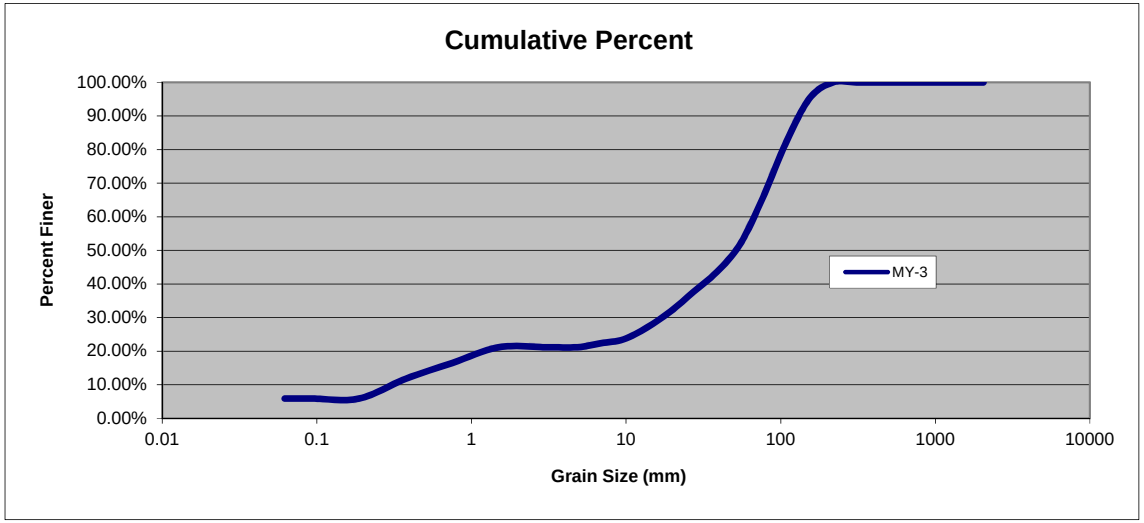


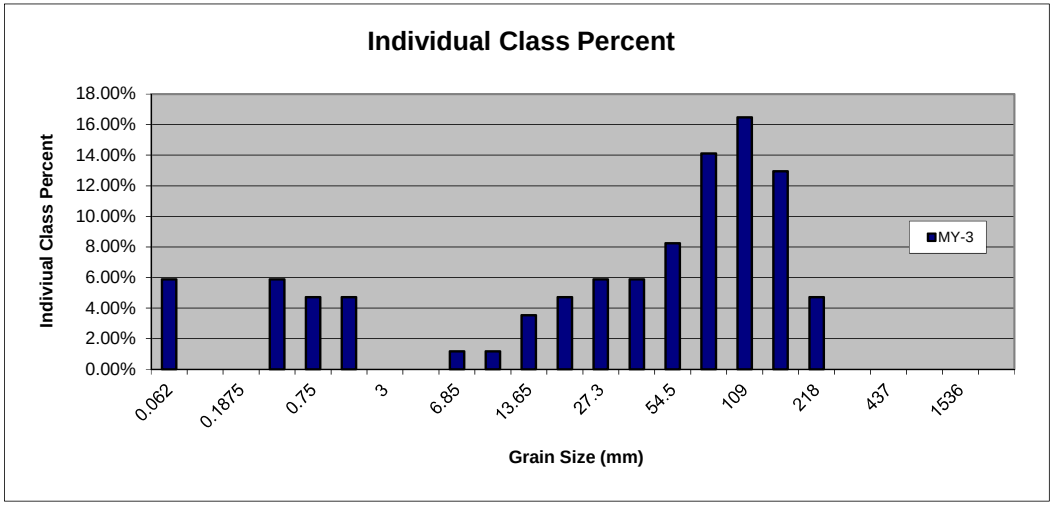


Pebble Count Exhibit

Mckee Creek Stream Resotration				
Clear Creek Upstream				
Riffle				
Particle	**Size**	**Count**	**Percent**	**Cumulative Percent**
Silt Clay	0.062	5	5.88%	5.88%
Sand	0.0935		0.00%	5.88%
	0.1875		0.00%	5.88%
	0.375	5	5.88%	11.76%
	0.75	4	4.71%	16.47%
	1.5	4	4.71%	21.18%
Gravel	3		0.00%	21.18%
	4.85		0.00%	21.18%
	6.85	1	1.18%	22.35%
	9.65	1	1.18%	23.53%
	13.65	3	3.53%	27.06%
	19.3	4	4.71%	31.76%
	27.3	5	5.88%	37.65%
	38.5	5	5.88%	43.53%
	54.5	7	8.24%	51.76%
Cobble	77	12	14.12%	65.88%
	109	14	16.47%	82.35%
	154	11	12.94%	95.29%
	218	4	4.71%	100.00%
Boulder	309		0.00%	100.00%
	437		0.00%	100.00%
	768		0.00%	100.00%
	1536		0.00%	100.00%
Bedrock	2048		0.00%	100.00%
Total		85	100.00%	

Summary Data	
D50	54.5
D84	154
D95	154

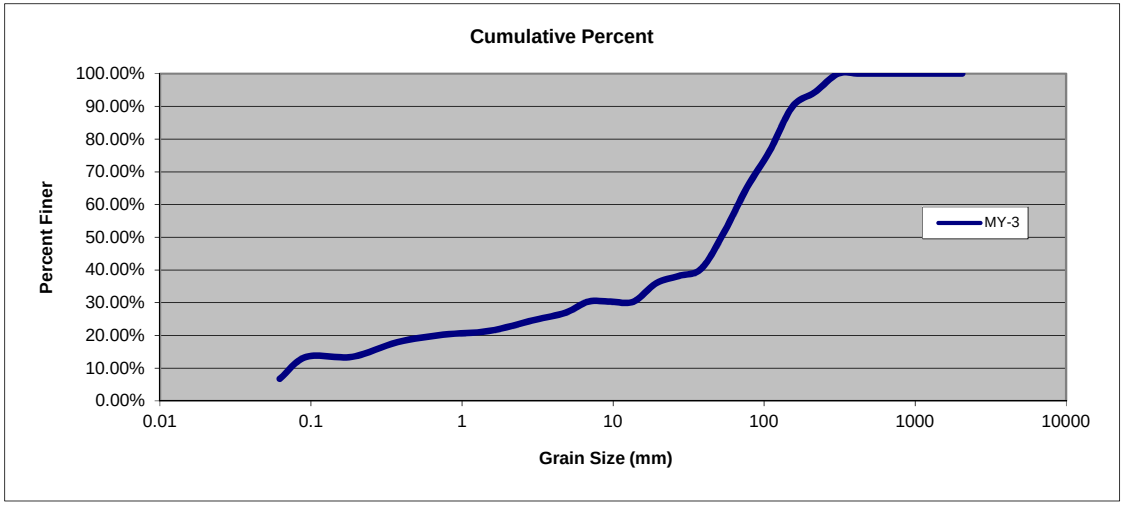




Pebble Count Exhibit

Mckee Creek Stream Restoration Clear Creek Downstream Riffle				
Particle	**Size**	**Count**	**Percent**	**Cumulative Percent**
Silt Clay	0.062	6	0.067416	6.74%
Sand	0.0935	6	6.74%	13.48%
	0.1875		0.00%	13.48%
	0.375	4	4.49%	17.98%
	0.75	2	2.25%	20.22%
	1.5	1	1.12%	21.35%
Gravel	3	3	3.37%	24.72%
	4.85	2	2.25%	26.97%
	6.85	3	3.37%	30.34%
	9.65		0.00%	30.34%
	13.65		0.00%	30.34%
	19.3	5	5.62%	35.96%
	27.3	2	2.25%	38.20%
	38.5	2	2.25%	40.45%
	54.5	10	11.24%	51.69%
Cobble	77	12	13.48%	65.17%
	109	10	11.24%	76.40%
	154	12	13.48%	89.89%
	218	4	4.49%	94.38%
Boulder	309	5	5.62%	100.00%
	437		0.00%	100.00%
	768		0.00%	100.00%
	1536		0.00%	100.00%
Bedrock	2048		0.00%	100.00%
Total		89	100.00%	

Summary Data	
D50	54.5
D84	154
D95	309



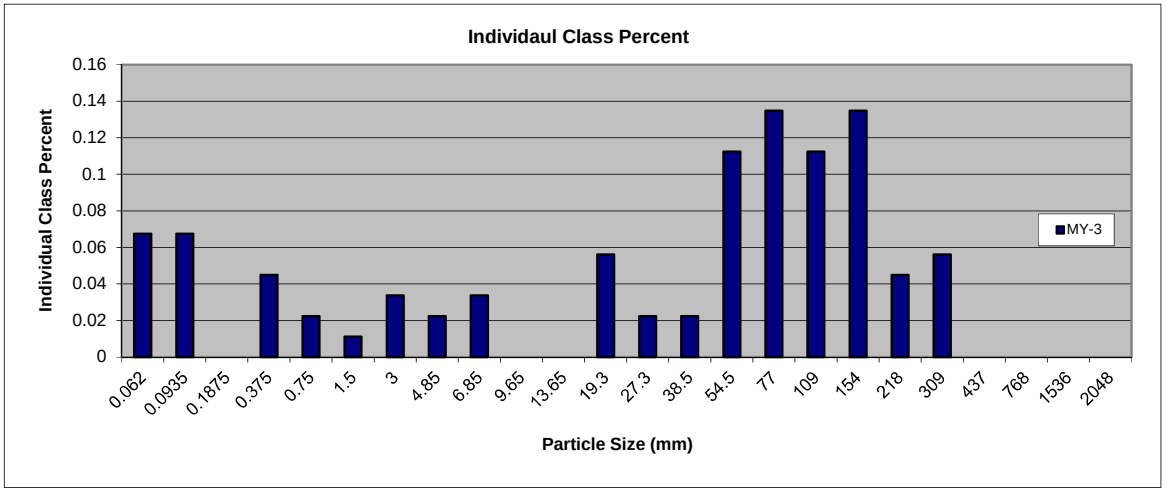


Table 10a. Baseline Stream Data Summary
McKee Creek Project # 92573 - Mckee-Reach 1

Parameter	Gauge2	Regional Curve			Pre-Existing Condition					Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Med	Max	SD5	n	Min	Med	Max	Min	Mean	Med	Max	SD5	n
Bankfull Width (ft)					27.5		31.8				31							
Floodprone Width (ft)					75		160			75		160						
Bankfull Mean Depth (ft)					2.1		2.8				2.6							
1Bankfull Max Depth (ft)					3.5		4.4			3.4		4.4						
Bankfull Cross Sectional Area (ft2)					68.2		77.6				80							
Width/Depth Ratio					10.2		14.9				12							
Entrenchment Ratio					2.6		5.5			2.4		5.2						
1Bank Height Ratio					1		2.1				1							
Profile																		
Riffle Length (ft)																		
Riffle Slope (ft/ft)					1.9		4.5			1.9		3.3						
Pool Length (ft)																		
Pool Max depth (ft)					3.1		6.4			5.2		7.7						
Pool Spacing (ft)					50		205			123.9		216.9						
Pattern																		
Channel Beltwidth (ft)					65		145			93		139						
Radius of Curvature (ft)					48		195			62		108						
Rc:Bankfull width (ft/ft)					27.5		31.8				31							
Meander Wavelength (ft)					101		305			235		350						
Meander Width Ratio					2.2		5			2		4.5						
Transport parameters																		
Reach Shear Stress (competency) lb/f2					0.49					0.52								
Max part size (mm) mobilized at bankfull					45					45								
Stream Power (transport capacity) W/m2																		
Additional Reach Parameters																		
Rosgen Classification					E4					C4								
Bankfull Velocity (fps)					4.4-5.0					4.1								
Bankfull Discharge (cfs)					350													
Valley length (ft)																		
Channel Thalweg length (ft)																		
Sinuosity (ft)					1.28					1.16								
Water Surface Slope (Channel) (ft/ft)					0.0029					0.0032								
BF slope (ft/ft)					0.0029					0.0032								
3Bankfull 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 -R2
McKee Creek Project # 92573 - Mckee-Reach 2

Parameter	Gauge2	Regional Curve			Pre-Existing Condition					Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Med	Max	SD5	n	Min	Med	Max	Min	Mean	Med	Max	SD5	n
Bankfull Width (ft)					25.5		26.8				31.9							
Floodprone Width (ft)					75		160			75		160						
Bankfull Mean Depth (ft)					2.1		2.8				2.6							
1Bankfull Max Depth (ft)					3.5		4.4			3.4		4.4						
Bankfull Cross Sectional Area (ft2)					68.2		77.6				80							
Width/Depth Ratio					10.2		14.9				12							
Entrenchment Ratio					2.6		5.5			2.4		5.2						
1Bank Height Ratio					1		2.1				1							
Profile																		
Riffle Length (ft)					101		305											
Riffle Slope (ft/ft)					0.0055		0.0131			0.0061		0.0106						
Pool Length (ft)																		
Pool Max depth (ft)					6.5		6.5			5.3		8						
Pool Spacing (ft)					45		180			127.7		223.6						
Pattern																		
Channel Beltwidth (ft)					135		240			96		287						
Radius of Curvature (ft)					95		240			64		144						
Rc:Bankfull width (ft/ft)					25.5		26.8				31.9							
Meander Wavelength (ft)					208		377			243		477						
Meander Width Ratio					5		9.2			3		9						
Transport parameters																		
Reach Shear Stress (competency) lb/f2					0.33					0.38								
Max part size (mm) mobilized at bankfull					45					45								
Stream Power (transport capacity) W/m2																		
Additional Reach Parameters																		
Rosgen Classification					E4					C4								
Bankfull Velocity (fps)					4.0-4.5					4.1								
Bankfull Discharge (cfs)					350													
Valley length (ft)																		
Channel Thalweg length (ft)																		
Sinuosity (ft)					1.5					1.17								
Water Surface Slope (Channel) (ft/ft)					0.0027					0.0027								
BF slope (ft/ft)					**0.0018**					**0.0018**								
3Bankfull 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 -R2
McKee Creek Project # 92573 - Clear Creek

Parameter	Gauge2	Regional Curve			Pre-Existing Condition					Design			Dixon Branch		
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Med	Max	SD5	n	Min	Med	Max	Min	Med	Max
Bankfull Width (ft)					**11.5**		**16.7**				**17.3**		7.9		13.9
Floodprone Width (ft)					**50**		**150**			**90**		**190**	35		100
Bankfull Mean Depth (ft)					**1.3**		**2**				**1.4**		0.8		1.4
1Bankfull Max Depth (ft					**3.7**		**6.1**			**2.2**		**2.5**	2		2.9
Bankfull Cross Sectional Area (ft2)					**21.8**		**24.8**				**25**		11.3		13.2
Width/Depth Ratio					**5.8**		**12.8**				**12**		5.4		10.8
Entrenchment Ratio					**3.8**		**11.3**			**5.2**		**11**	3.1		8.9
1Bank Height Ratio					**1.4**		**2.3**				**1**		1.1		1.5
Profile															
Riffle Length (ft)															
Riffle Slope (ft/ft)					0.0059		0.0084			**0.0061**		**0.0106**	0.012		0.018
Pool Length (ft)															
Pool Max depth (ft)					2.8		3.3			**5.3**		**8**	2.1		2.5
Pool Spacing (ft)					57.5		116.9			**127.7**		**223.6**	10		45
Pattern															
Channel Beltwidth (ft)					35		47			52		78	29		50
Radius of Curvature (ft)					15		25			35		52	6		22
Rc:Bankfull width (ft/ft)					**11.5**		**16.7**				**17.3**		7.9		13.9
Meander Wavelength (ft)					45		75			132		196	48		85
Meander Width Ratio					3.4		5.6			3		4.5	4.3		7.6
Transport parameters															
Reach Shear Stress (competency) lb/f2															
Max part size (mm) mobilized at bankfull															
Stream Power (transport capacity) W/m2															
Additional Reach Parameters															
Rosgen Classification					E/C5					C4			E4		
Bankfull Velocity (fps)					3.3-3.9					3.6			3.6		
Bankfull Discharge (cfs)					89										
Valley length (ft)															
Channel Thalweg length (ft)															
Sinuosity (ft)					1.12					1.21			1.3		
Water Surface Slope (Channel) (ft/ft)					0.0042					0.0071			0.0055		
BF slope (ft/ft)					**0.0042**					**0.0032**			0.0055		
3Bankfull 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)
McKee Creek Project # 92573- Reach 1

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
1Ri% / Ru% / P% / G% / S%																												
1SC% / Sa% / G% / C% / B% / Be%																												
1d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.7	27.8	49.4	83.2	109.5			0.7	27.8	49.4	83.2	109.5																
2Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
3Incision 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 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
McKee Creek Project # 92573- Reach 2

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
1Ri% / Ru% / P% / G% / S%																												
1SC% / Sa% / G% / C% / B% / Be%																												
1d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.7	27.8	49.4	83.2	109.5			0.7	27.8	49.4	83.2	109.5																
2Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
3Incision 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 e

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 the 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 a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
McKee Creek Project #92573- Clear Creek

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
1Ri% / Ru% / P% / G% / S%																													
1SC% / Sa% / G% / C% / B% / Be%																													
1d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.35	0.7	1.2	3.2	6			0.4	1.3	3	14	18																	
2Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																													
3Incision 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 e

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 the

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

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)

McKee Creek Project # 92573

	Cross Section 1 (Riffle-1)							Cross Section 2 (Pool-1)							Cross Section 3 (Riffle-2)						
Based on fixed baseline bankfull elevation1	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		583.4	581.0	583.40					582.7	580.0	580.74					580.8	580.5	580.70			
Bankfull Width (ft)		24.27	22.00	24.44					22.5	23.00	22.74					18.00	13.00	10.00			
Floodprone Width (ft)		160.0	33.00	30.50					160.0	36.0	50.00					150.0	150.0	120.00			
Bankfull Mean Depth (ft)		1.89	1.98	1.18					2.45	2.37	2.75					1.36	1.05	1.02			
Bankfull Max Depth (ft)		2.76	2.85	2.59					3.90	3.69	3.78					2.43	1.75	1.61			
Bankfull Cross Sectional Area (ft2)		53.00	51.40	32.06					63.68	58.50	71.95					30.61	13.40	11.26			
Bankfull Width/Depth Ratio		12.82	11.11	20.72					9.20	9.70	8.26					13.23	12.33	16.87			
Bankfull Entrenchment Ratio		6.59	1.50	1.25					7.10	1.57	2.20					8.82	11.54	12.00			
Bankfull Bank Height Ratio		2.53	2.23	2.32					1.84	1.81	1.69					1.00	1.20	1.73			
Based on current/developing bankfull feature2																					
Record elevation (datum) used																					
Bankfull Width (ft)																					
Floodprone Width (ft)																					
Bankfull Mean Depth (ft)																					
Bankfull Max Depth (ft)																					
Bankfull Cross Sectional Area (ft2)																					
Bankfull Width/Depth Ratio																					
Bankfull Entrenchment Ratio																					
Bankfull Bank Height Ratio																					
Cross Sectional Area between end pins (ft2)																					
d50 (mm)																					

	Cross Section 4 (Pool-2)							Cross Section 5 (Riffle-3)							Cross Section 6 (Pool-3)						
Based on fixed baseline bankfull elevation1	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		580.2	580.4	580.53					579.87	579.60	579.54					579.14	578.29	578.29			
Bankfull Width (ft)		17.00	14.30	8.00					17.00	13.88	14.07					15.00	13.20	11.52			
Floodprone Width (ft)		150.0	150.0	150.00					250.00	200.00	250.00					250.00	200.00	200.00			
Bankfull Mean Depth (ft)		2.55	2.62	2.81					1.11	0.96	1.29					1.70	1.68	1.64			
Bankfull Max Depth (ft)		3.97	3.82	3.76					1.96	1.84	1.96					3.46	3.17	3.47			
Bankfull Cross Sectional Area (ft2)		30.61	31.60	25.53					21.02	14.73	12.27					27.27	21.35	17.81			
Bankfull Width/Depth Ratio		6.66	5.46	2.85					15.37	14.51	10.87					8.80	7.87	7.01			
Bankfull Entrenchment Ratio		8.82	10.49	18.75					14.71	14.41	17.77					16.67	15.15	21.70			
Bankfull Bank Height Ratio		1.18	1.00	1.30					1.00	1.01	1.23					1.00	1.00	1.25			
Based on current/developing bankfull feature2																					
Record elevation (datum) used																					
Bankfull Width (ft)																					
Floodprone Width (ft)																					
Bankfull Mean Depth (ft)																					
Bankfull Max Depth (ft)																					
Bankfull Cross Sectional Area (ft2)																					
Bankfull Width/Depth Ratio																					
Bankfull Entrenchment Ratio																					
Bankfull Bank Height Ratio																					
Cross Sectional Area between end pins (ft2)																					
d50 (mm)																					

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 establis
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 ove
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.”
2 = Based on the elevation of any dominant depositional feature that develops and is observed at the time of survey. If the baseline datum remains the only significant depositional feature
then these two sets of dimensional parameters will be equal, however, if another depositional feature of significance develops above or below the baseline bankfull datum then this should be tracked and quantified in these cells.

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary

McKee Creek Project # 92573 McKee Creek- Reach 1

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
1Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft2)																																				
Width/Depth Ratio																																				
Entrenchment Ratio																																				
1Bank Height Ratio																																				
Profile																																				
Riffle Length (ft)							15	24	20	38	8	18																								
Riffle Slope (ft/ft)							0	0	0	0	0	18																								
Pool Length (ft)							10	43	32	132	33	15			17.47			1			20			1												
Pool Max depth (ft)							2	3	3	4	1	6			0.7			1			1.24			1												
Pool Spacing (ft)							59	84	86	103	19	4																								
Pattern																																				
Channel Beltwidth (ft)							42	91	64	170	56	5																								
Radius of Curvature (ft)							22	49	46	80	19	7																								
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)							138	437	290	1070	387	5																								
Meander Width Ratio							1.615	3.515	2.462	6.538	2.149	5																								
Additional Reach Parameters																																				
Rosgen Classification							E4/C4						Not enough stream data to calculate						Not enough stream data to calculate																	
Channel Thalweg length (ft)							3274						Not enough stream data to calculate						Not enough stream data to calculate																	
Sinuosity (ft)							1.12						Not enough stream data to calculate						Not enough stream data to calculate																	
Water Surface Slope (Channel) (ft/ft)							0.0019						Not enough stream data to calculate						Not enough stream data to calculate																	
BF slope (ft/ft)							0.0019						Not enough stream data to calculate						Not enough stream data to calculate																	
3Ri% / Ru% / P% / G% / S%																																				
3SC% / Sa% / G% / C% / B% / Be%																																				
3d16 / d35 / d50 / d84 / d95 /																																				
2% of Reach with Eroding Banks							0%						Not enough stream data to calculate						Not enough stream data to calculate																	
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

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
McKee Creek Project # 92573 McKee Creek- Reach 2

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n
Bankfull Width (ft)								24.7				1		22.00				1		24.44				1												
Floodprone Width (ft)								160				1		33.00				1		30.5				1												
Bankfull Mean Depth (ft)								1.89				1		1.98				1		1.179				1												
1Bankfull Max Depth (ft)								2.76				1		2.85				1		2.587				1												
Bankfull Cross Sectional Area (ft2)								53				1		51.40				1		32.06				1												
Width/Depth Ratio								12.82				1		11.11				1		20.72				1												
Entrenchment Ratio								6.59				1		1.50				1		1.248				1												
1Bank Height Ratio								2.53				**1**		2.23				1		2.316				1												
Profile																																				
Riffle Length (ft)							10	32.2	34	44	13.54	5	45	53.5	53.5	62		2	40					2												
Riffle Slope (ft/ft)							-0.049	-0.003	0.012	0.028	0.035	5	0.002	0.005	0.005	0.008		2	0.002	0.005	0.005	0.007		2												
Pool Length (ft)							24	36.6	39	55	12.74	5	15	27.8	30	40	12.32	5	20	32.8	29	39	12.1	5												
Pool Max depth (ft)							1.242	2.386	2.187	3.287	0.423	5	0.442	1.498	1.683	2.46	0.88	5	0.5	1.5	1.6	2.2	0.78	5												
Pool Spacing (ft)							45	178.8	206	267	87.81	5	0	141	162.5	239	101.2	4	50	185	200	260	80.23	4												
Pattern																																				
Channel Beltwidth (ft)							97	101	101	105	5.657	2																								
Radius of Curvature (ft)							65	128.3	120	200	67.88	3																								
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)							282	322	322	362	56.57	2																								
Meander Width Ratio							4.042	4.208	4.208	4.375	0.236	2																								
Additional Reach Parameters																																				
Rosgen Classification							E4/C4						C4						C4																	
Channel Thalweg length (ft)							1422						464 (survey reduction)						464 (survey reduction)																	
Sinuosity (ft)							1.39						1.15						1.2																	
Water Surface Slope (Channel) (ft/ft)							0.0026						0.0026						0.003																	
BF slope (ft/ft)							0.0026						0.0026						0.003																	
3Ri% / Ru% / P% / G% / S%																																				
3SC% / Sa% / G% / C% / B% / Be%							0	7.27	54.55	21.82	5.45	0	0	6	73	16	5	0	0	5.62	73.03	15.73	5.62	0												
3d16 / d35 / d50 / d84 / d95 /							19.3	38.5	54.5	109	309		3	19.3	27.3	77	154		4.85	19.3	27.3	77	309												
2% of Reach with Eroding Banks							10%						2%						4%																	
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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

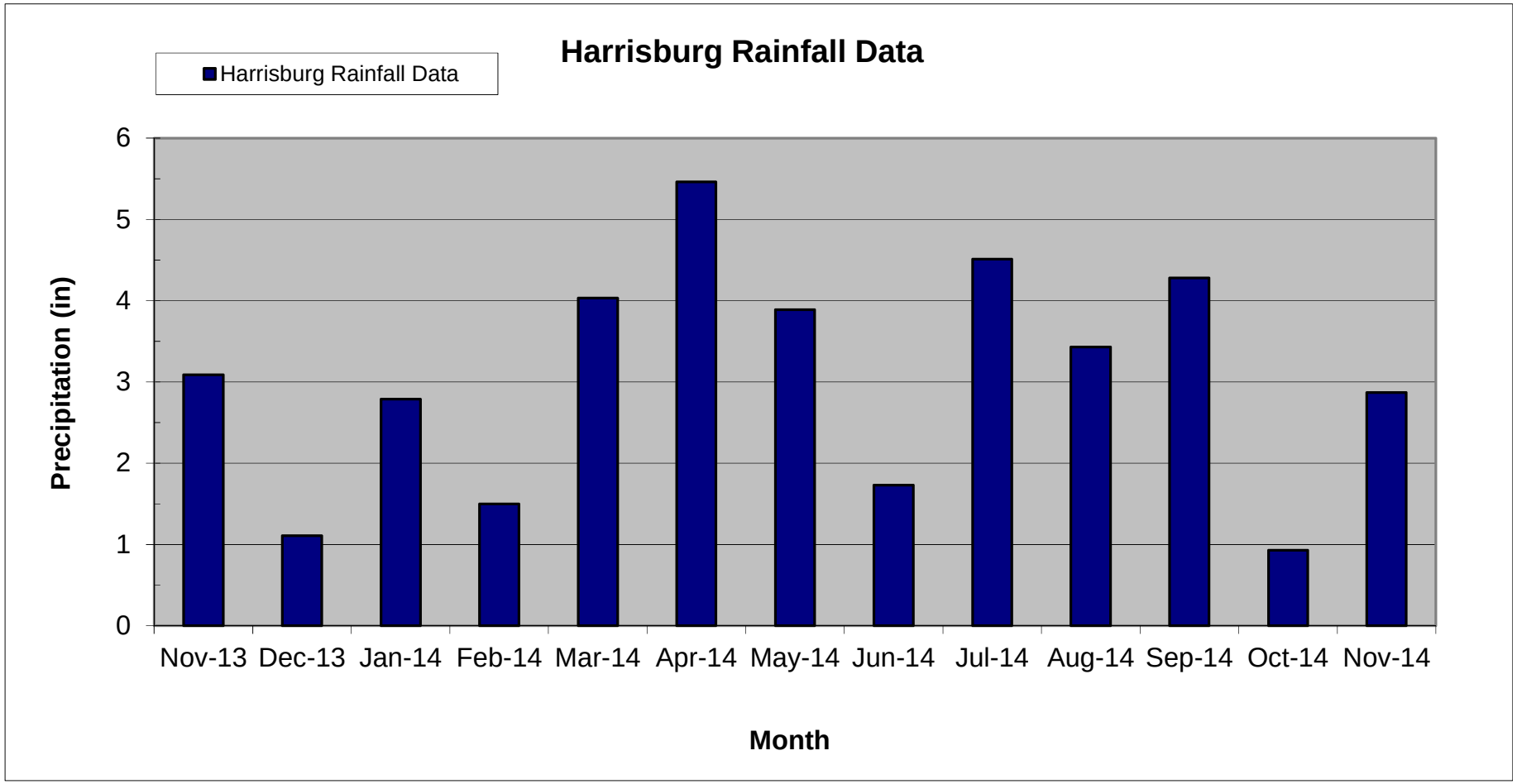
Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
McKee Creek Project # 92573 Clear Creek

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n	Min	Mean	Med	Max	SD4	n
Bankfull Width (ft)							21.02	17.5		25.85		2	13.2	13.5		13.9		2	10	12.04		14.07		2												
Floodprone Width (ft)							150	200		250		2	200.0	200.0		200.0		2	120	185		250		2												
Bankfull Mean Depth (ft)							1.11	1.23		1.36		2	1.0	1.3		1.7		2	1.02	1.16		1.29		2												
1Bankfull Max Depth (ft)							1.96	2.19		2.43		2	1.8	2.5		3.2		2	1.61	1.79		1.96		2												
Bankfull Cross Sectional Area (ft2)							21.02	23.44		25.85		2	14.7	18.0		21.4		2	11.26	11.77		12.27		2												
Width/Depth Ratio							13.23	14.29		15.37		2	7.9	11.2		14.5		2	9.77	10.32		10.87		2												
Entrenchment Ratio							8.333	11.52		14.71		2	14.4	14.8		15.2		2	12.00	14.89		17.77		2												
1Bank Height Ratio							1	1		1		2	1.0	1.0		1.0		2	1.23	1.48		1.73		2												
Profile																																				
Riffle Length (ft)							12	16.5	18	22	4	6	10	29.36	30	45	10.7	11	11	27.14	35	50	10.6	6												
Riffle Slope (ft/ft)							0	0.021	0	0	0	6	0.019	0.034	0.034	0.049	0.02	6	0.012	0.032	0.034	0.045	0.018	6												
Pool Length (ft)							15	35.09	33	66	17	13	10	29.36	30	45	10.7	11	15	29.14	32	45	10.4	11												
Pool Max depth (ft)							1.502	2.297	2	6	1	16	0.78	1.33	1.219	1.408	0.492	11	1.2	2.1	2.1	5	1.2	11												
Pool Spacing (ft)							26	105	98	189	55	8	20	94.18	86	158	51.12	11	25	98	100	200	57	11												
Pattern																																				
Channel Beltwidth (ft)							42	64.17	65	85	16	6																								
Radius of Curvature (ft)							20	44.82	40	84	23	11																								
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)							153	171.5	168	195	16	6																								
Meander Width Ratio							2.333	3.565	3.611	4.722	0.867	6																								
Additional Reach Parameters																																				
Rosgen Classification							C4						C4						C4																	
Channel Thalweg length (ft)							1660						1658						1587																	
Sinuosity (ft)							1.19						1.17						1.17																	
Water Surface Slope (Channel) (ft/ft)							0.0033						0.0033						0.004																	
BF slope (ft/ft)							0.0033						0.0034						0.004																	
3Ri% / Ru% / P% / G% / S%																																				
3SC% / Sa% / G% / C% / B% / Be%							10	7	35	47	1	0	7.5	9	30	51	2.5	0	6.32	14.94	30.46	45.41	2.87	0												
3d16 / d35 / d50 / d84 / d95 /							1.5	27.3	38.5	109	154		0.75	54.5	77	154	218		0.75	27.3	54.5	154	218												
2% of Reach with Eroding Banks							1%						5%						5%																	
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

Appendix E
Hydrology Data

Table 12. Verification of Bankfull Events			
Date of Data Collection	**Date of Occurance**	**Method**	**Photo # (if available)**
Crest Gage 1			
Oct-12	Unknown	Crest Gauge, Wrack of Flow Stage	
Oct-13	Unknown	Crest Gauge, Wrack of Flow Stage	
Oct-28-2014	Unknown	Crest Gauge, Wrack of Flow Stage	
Crest Gage 2			
Oct-13	Unknown	Crest Gauge, Wrack of Flow Stage	
Fall 2014	Unknown	Crest Gauge, Wrack of Flow Stage	
Crest Gage 3			
Oct-12	Unknown	Crest Gauge, Wrack of Flow Stage	
Oct-13	Unknown	Crest Gauge, Wrack of Flow Stage	
Oct-28-2014	Unknown	Crest Gauge, Wrack of Flow Stage	


Harrisburg Rainfall Data
Harrisburg Rainfall Data
Precipitation (in)
0
1
2
3
4
5
6
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Month

Stream Problem Area Inventory Table			
McKee Creek Project # 92573 McKee Reach 1			
Feature Name	**Station Numbers**	**Suspected Cause**	**Photo number**
Aggradation/Bar Formation	27+80	Upstream bank instability	
	28+00		1&5
Cross Vane- Buried and Dislodged, Flow over Right Arm	26+95	Sediment Deposition wedging out center stone	
	27+05		2
McKee Creek Project # 92573 McKee Reach 2			
Feature Name	**Station Numbers**	**Suspected Cause**	**Photo number**
Dam	11+40		
	11+50	Falling Trees, Bank Slumping, Debris getting caught	3
Cross Vane- Alignment shift	11+78		
	11+68	Stream shifting outward away from center	4
Cross Vane	15+75	Cross Vane silted in; loose sediment at bottom of pool	
	15+85	exceeds 1 ft thick	6
Aggradation/Bar Formation	16+05	Sediment laden water; Dam and Debris resulting from	
	16+25	tornado damage downstream	7
McKee Creek Project # 92573 Clear Creek			
Feature Name	**Station Numbers**	**Suspected Cause**	**Photo number**
Upper Cross-Vane- Alignment Shift, Flow over Left Arm	26+45	Right bank getting soggy and trees falling into	
	26+55	structure	8
Log-Vane	24+55		
	24+45	Erosive velocities	9
Log-Vane	24+10		
	24+00	Sill too high	10
Stream Impassable	22+75	Banks Over Grown, Will likely cause a dam if debris	
	22+00	occurs	11
Eroded Bank	18+30	Bank Eroded early but Woody Roots seem to be	
	18+55	holding now	12
Aggradation/Bar Formation	13+90	Over Widening causing bar to form and vegetation to	
	14+10	now take hold	13
Cross-Vane Overgrowing	11+40	Vegetation over growing cross-vane, not enough low	
	11+50	flow to keep alluvium from building on boulders	14

Raw Longitudinal Survey data

Shot #	MY	Survey Date	Northing	Easting	Elevation (Feet)	Station/Distance (Feet)	Shot ID	Notes
100	3	10/28-29/2014	556751.875	1511315.554	572.033		BP	Bottom Pool
101	3	10/28-29/2015	556752.145	1511318.64	574.921		CV	Cross Vane
102	3	10/28-29/2016	556743.706	1511356.571	572.314		BP	
103	3	10/28-29/2017	556732.883	1511369.489	575.216		CV	
104	3	10/28-29/2018	556707.34	1511398.068	574.424		TW	Thalweg
105	3	10/28-29/2019	556690.307	1511424.403	576.115		BAR	Bar
106	3	10/28-29/2020	556691.017	1511424.456	574.277		TW	
107	3	10/28-29/2021	556689.074	1511434.901	574.05		EP	End of Pool
108	3	10/28-29/2022	556682.494	1511445.364	572.023		BP	
109	3	10/28-29/2023	556667.109	1511465.315	575.516		LV	Log Vane
110	3	10/28-29/2024	556636.553	1511493.068	574.275		TW	
111	3	10/28-29/2025	556616.647	1511513.048	578.711		TW	
112	3	10/28-29/2026	556612.942	1511515.058	576.258		BP	
113	3	10/28-29/2027	556609.369	1511533.656	576.111		LV	
114	3	10/28-29/2028	556601.131	1511549.795	576.131		LV	
115	3	10/28-29/2029	556601.284	1511549.892	575.05		WSE	Water Surface
116	3	10/28-29/2030	556603.67	1511558.506	573.165		BP	
117	3	10/28-29/2031	556604.23	1511574.631	574.884		TW	
128	3	10/28-29/2042	556579.049	1511602.804	576.998		LV	
129	3	10/28-29/2043	556561.46	1511599.065	577.09		ER	End Riffle
140	3	10/28-29/2054	556504.817	1511572.722	578.084		TR	Top Rifffle
141	3	10/28-29/2055	556482.741	1511569.398	575.219		BP	
142	3	10/28-29/2056	556467.718	1511576.223	576.003		BP	
143	3	10/28-29/2057	556455.644	1511591.294	576.391		TW	
144	3	10/28-29/2058	556447.623	1511603.736	576.567		TW	
145	3	10/28-29/2059	556427.455	1511632.56	577.429		TW	
146	3	10/28-29/2060	556411.937	1511652.638	577.282		TW	
147	3	10/28-29/2061	556363.551	1511650.937	578.15		FORD	Ford
148	3	10/28-29/2062	556314.295	1511646.043	577.288		EP	
149	3	10/28-29/2063	556298.048	1511650.89	574.913		BP	
150	3	10/28-29/2064	556285.935	1511664.898	578.235		ER	
151	3	10/28-29/2065	556271.971	1511698.133	579.073		TR	
152	3	10/28-29/2066	556260.811	1511714.934	577.831		BP	
153	3	10/28-29/2067	556251.864	1511718.794	578.236		TW	
154	3	10/28-29/2068	556229.585	1511715.318	578.781		TW	
155	3	10/28-29/2069	556183.128	1511701.53	578.168		TW	
156	3	10/28-29/2070	556160.974	1511703.832	578.674		TW	
157	3	10/28-29/2071	556145.221	1511718.512	577.469		BP	
158	3	10/28-29/2072	556140.251	1511762.55	578.911		TW	
159	3	10/28-29/2073	556138.429	1511800.256	579.548		TR	
160	3	10/28-29/2074	556121.198	1511821.837	579.566		LV	
161	3	10/28-29/2075	556090.066	1511822.82	579.451		TW	
162	3	10/28-29/2076	556046.558	1511831.993	578.883		BP	
163	3	10/28-29/2077	556041.398	1511844.403	580.315		LV	
164	3	10/28-29/2078	556041.941	1511846.011	579.817		TW	
165	3	10/28-29/2079	556041.858	1511891.91	579.617		TW	
166	3	10/28-29/2080	556040.238	1511922.555	579.752		TW	
167	3	10/28-29/2081	556036.957	1511938.839	579.887		TW	
168	3	10/28-29/2082	556007.256	1511937.315	578.549		BP	
169	3	10/28-29/2083	555999.155	1511935.666	579.939		ER	
170	3	10/28-29/2084	555982.419	1511933.026	579.894		TR	
171	3	10/28-29/2085	555966.723	1511935.003	580.061		ER	
172	3	10/28-29/2086	555954.846	1511947.66	580.748		TR	
173	3	10/28-29/2087	555943.255	1511973.515	580.514		TW	
174	3	10/28-29/2088	555930.142	1511990.219	580.287		TW	
175	3	10/28-29/2089	555914.132	1511997.694	580.37		TW	
176	3	10/28-29/2090	555905.767	1512009.018	580.779		TW	
177	3	10/28-29/2091	555899.168	1512029.234	580.73		TW	
178	3	10/28-29/2092	555884.645	1512051.786	580.714		TW	
179	3	10/28-29/2093	555880.834	1512051.068	581.53		LV	
180	3	10/28-29/2094	555870.214	1512063.348	581.041		TW	
181	3	10/28-29/2095	555856.62	1512071.965	580.519		EP	
182	3	10/28-29/2096	555846.932	1512077.846	583.331		BP	
183	3	10/28-29/2097	555836.788	1512083.208	580.975		CV	
184	3	10/28-29/2098	555826.399	1512087.704	580.18		TW	
185	3	10/28-29/2099	555810.854	1512099.313	580.43		TW	
186	3	10/28-29/2100	555794.1	1512109.053	580.571		TW	
187	3	10/28-29/2101	555775.202	1512124.493	580.677		TW	
188	3	10/28-29/2102	555758.891	1512143.769	581.029		TW	
189	3	10/28-29/2103	555738.142	1512154.137	581.219		CV	
190	3	10/28-29/2104	555725.164	1512159.076	580.563		TW	
191	3	10/28-29/2105	555715.766	1512166.661	580.543		TW	
192	3	10/28-29/2106	555706.25	1512171.737	581.219		TW	
193	3	10/28-29/2107	555708.756	1512169.976	581.235		ER	
194	3	10/28-29/2108	555694.273	1512180.14	581.601		TR	
195	3	10/28-29/2109	555927.498	1510770.559	587.728		WR130	Survey Nail
196	3	10/28-29/2110	556310.364	1511025.234	575.402		TW	
197	3	10/28-29/2111	556279.971	1511033.117	575.591		TW	

198	3	10/28-29/2112	556252.008	1511041.453	575.845	CV	
199	3	10/28-29/2113	556247.293	1511045.35	575.252	TW	
200	3	10/28-29/2114	556233.07	1511041.535	577.281	SB	
201	3	10/28-29/2115	556218.458	1511042.885	574.229	SILT BOTTOI	Bottom of Sediment
202	3	10/28-29/2116	556218.448	1511041.607	575.461	TOP SILT	Top of Sediment
203	3	10/28-29/2117	556187.158	1511024.004	575.662	JH	J-Hook
204	3	10/28-29/2118	556176.097	1511010.028	576.145	TW	
205	3	10/28-29/2119	556139.501	1510964.807	576.003	TW	
206	3	10/28-29/2120	556125.098	1510949.348	575.863	TW	
207	3	10/28-29/2121	556099.282	1510941.84	574.579	BBP	Bottom of pool without loose sediment
208	3	10/28-29/2122	556099.751	1510941.851	575.138	BP	
209	3	10/28-29/2123	556091.581	1510935.257	576.208	JH	
210	3	10/28-29/2124	556069.377	1510928.095	575.927	TW	
211	3	10/28-29/2125	556041.274	1510923.987	575.886	TW	
212	3	10/28-29/2126	555993.497	1510921.559	576.368	TW	
213	3	10/28-29/2127	555985.769	1510921.53	576.754	JH	
214	3	10/28-29/2128	555934.334	1510933.791	576.441	TW	
215	3	10/28-29/2129	555906.899	1510947.336	576.345	EP	
216	3	10/28-29/2130	555892.216	1510953.858	574.026	BP	
217	3	10/28-29/2131	555887.951	1510959.434	576.228	CV	
218	3	10/28-29/2132	555880.417	1510969.755	575.825	TW	
219	3	10/28-29/2133	555856.288	1510974.516	576.357	TW	
220	3	10/28-29/2134	555821.066	1510952.5	577.254	TW	
221	3	10/28-29/2135	555833.848	1510966.415	576.838	WSE	Water Surface
222	3	10/28-29/2136	555828.793	1510964.712	577.876	WSE	
223	3	10/28-29/2137	555798.854	1510912.415	576.958	TW	
224	3	10/28-29/2138	555798.024	1510889.668	577.512	TW	
263	3	10/28-29/2177	554732.208	1509736.966	585.439	TW	
264	3	10/28-29/2178	554715.504	1509713.499	585.603	TW	
265	3	10/28-29/2179	554714.09	1509707.739	585.918	EP	
266	3	10/28-29/2180	554711.261	1509701.538	584.677	BP	
267	3	10/28-29/2181	554703.879	1509690.176	585.698	TW	
268	3	10/28-29/2182	554702.611	1509689.769	587.046	CV	
269	3	10/28-29/2183	554693.052	1509660.042	586.188	TW	
270	3	10/28-29/2184	554685.332	1509627.48	585.901	TW	
271	3	10/28-29/2185	554677.21	1509600.476	585.576	TW	
272	3	10/28-29/2186	554663.344	1509572.81	586.132	TW	
273	3	10/28-29/2187	554636.452	1509546.376	586.273	TW	
1094	N/A		556262.169	1511584.223	581.836	WR200	Survey Nail
1095	N/A		556353.203	1511393.071	600.147	WR129	Survey Nail
4075	N/A		553841.667	1509240.001	596.443	NAIL SET	Survey Nail
4166	N/A		553668.685	1509220.314	597.118	NAIL SET	Survey Nail
10051	N/A		555697.693	1512083.437	586.216	NAIL 51	Survey Nail
10559	N/A		556236.989	1511602.84	581.474	NAIL SET	Survey Nail
11223	N/A		555909.085	1511461.441	608.756	NAIL SET	Survey Nail
12221	N/A		556096.7	1510873.9	581.318	NAIL	Survey Nail
12590	N/A		555765.123	1510773.72	588.752	NAIL SET	Survey Nail
13052	N/A		555333.666	1510066.433	589.182	NAIL SET	Survey Nail
13242	N/A		555075.661	1510002.761	592.089	NAIL SET	Survey Nail
13326	N/A		554660.706	1509766.878	592.999	NAIL SET	Survey Nail
13763	N/A		554341.325	1509360.17	595.572	NAIL SET	Survey Nail
40008	N/A		555696.532	1510425.986	585.827	WR100	Survey Nail
40009	N/A		555708.295	1510782.053	583.441	WR101	Survey Nail
40021	N/A		555448.325	1510139.771	588.614	WR102	Survey Nail
100067	N/A		555456.258	1510181.209	589.59	WR120	Survey Nail
100068	N/A		555086.515	1509869.921	590.908	WR121	Survey Nail
100070	N/A		554777.913	1509640.009	592.714	WR122	Survey Nail
100088	N/A		554380.297	1509462.586	597.254	WR123	Survey Nail
100105	N/A		554121.268	1509479.7	606.01	WR124	Survey Nail
100112	N/A		553865.056	1509412.596	595.985	WR125	Survey Nail
100147	N/A		555954.313	1511778.485	593.31	WR126	Survey Nail
100167	N/A		555850.239	1511945.289	593.896	WR127	Survey Nail
100179	N/A		555709.936	1512017.724	586.354	WR128	Survey Nail
400038	N/A		556615.685	1511560.026	578.721	WR103	Survey Nail

Raw Cross Sectional Survey data

Shot #	MY	Survey Date	Northing	Easting	Elevation (Feet)	Station/Distance (Feet)	Shot ID	Notes
118	3	10/28-29/2032	556589.678	1511591.349	578.232		PXS3	Pool XS-3 Shot
119	3	10/28-29/2033	556590.476	1511592.902	577.976		PXS3	Pool XS-3 Shot
120	3	10/28-29/2034	556590.797	1511594.726	577.457		PXS3	Pool XS-3 Shot
121	3	10/28-29/2035	556590.782	1511595.136	576.468		PXS3	Pool XS-3 Shot
122	3	10/28-29/2036	556591.435	1511595.018	575.691		PXS3	Pool XS-3 Shot
123	3	10/28-29/2037	556593.146	1511598.004	574.818		PXS3	Pool XS-3 Shot
124	3	10/28-29/2038	556593.429	1511599.599	575.013		PXS3	Pool XS-3 Shot
125	3	10/28-29/2039	556593.52	1511599.775	575.885		PXS3	Pool XS-3 Shot
126	3	10/28-29/2040	556593.925	1511600.182	576.522		PXS3	Pool XS-3 Shot
127	3	10/28-29/2041	556594.969	1511601.121	577.458		PXS3	Pool XS-3 Shot
130	3	10/28-29/2044	556523.818	1511589.578	579.543		RXS3	Riffle XS-3 Shot
131	3	10/28-29/2045	556524.074	1511587.048	579.029		RXS3	Riffle XS-3 Shot
132	3	10/28-29/2046	556524.004	1511585.096	578.645		RXS3	Riffle XS-3 Shot
133	3	10/28-29/2047	556524.46	1511583.854	577.756		RXS3	Riffle XS-3 Shot
134	3	10/28-29/2048	556524.846	1511582.54	577.815		RXS3	Riffle XS-3 Shot
135	3	10/28-29/2049	556525.307	1511581.094	577.58		RXS3	Riffle XS-3 Shot
136	3	10/28-29/2050	556525.249	1511579.464	577.913		RXS3	Riffle XS-3 Shot
137	3	10/28-29/2051	556524.613	1511577.682	578.552		RXS3	Riffle XS-3 Shot
138	3	10/28-29/2052	556525.451	1511576.052	579.201		RXS3	Riffle XS-3 Shot
139	3	10/28-29/2053	556526.224	1511573.703	579.992		RXS3	Riffle XS-3 Shot
225	3	10/28-29/2139	555698.04	1510870.849	583.339		PXS1	Pool XS-1 Shot
226	3	10/28-29/2140	555699.131	1510869.32	582.674		PXS1	Pool XS-1 Shot
227	3	10/28-29/2141	555699.669	1510867.641	581.78		PXS1	Pool XS-1 Shot
228	3	10/28-29/2142	555700.001	1510866.355	580.738		PXS1	Pool XS-1 Shot
229	3	10/28-29/2143	555701.083	1510864.803	579.302		PXS1	Pool XS-1 Shot
230	3	10/28-29/2144	555701.697	1510862.711	577.103		PXS1	Pool XS-1 Shot
231	3	10/28-29/2145	555704.896	1510860.27	577.308		PXS1	Pool XS-1 Shot
232	3	10/28-29/2146	555705.802	1510857.203	577.32		PXS1	Pool XS-1 Shot
233	3	10/28-29/2147	555706.803	1510854.019	576.955		PXS1	Pool XS-1 Shot
234	3	10/28-29/2148	555708.011	1510852.276	577.045		PXS1	Pool XS-1 Shot
235	3	10/28-29/2149	555708.669	1510850.243	577.354		PXS1	Pool XS-1 Shot
236	3	10/28-29/2150	555709.485	1510848.559	577.618		PXS1	Pool XS-1 Shot
237	3	10/28-29/2151	555709.473	1510847.367	578.072		PXS1	Pool XS-1 Shot
238	3	10/28-29/2152	555709.913	1510846.723	579.002		PXS1	Pool XS-1 Shot
239	3	10/28-29/2153	555710.728	1510845.702	581.626		PXS1	Pool XS-1 Shot
240	3	10/28-29/2154	555710.967	1510844.241	582.176		PXS1	Pool XS-1 Shot
241	3	10/28-29/2155	555711.261	1510843.111	582.703		PXS1	Pool XS-1 Shot
242	3	10/28-29/2156	555654.259	1510811.873	584.754		RXS1	Riffle XS-1 Shot
243	3	10/28-29/2157	555653.727	1510812.896	584.291		RXS1	Riffle XS-1 Shot
244	3	10/28-29/2158	555655.538	1510811.775	583.469		RXS1	Riffle XS-1 Shot
245	3	10/28-29/2159	555656.09	1510811.464	581.86		RXS1	Riffle XS-1 Shot
246	3	10/28-29/2160	555657.132	1510811.14	580.921		RXS1	Riffle XS-1 Shot
247	3	10/28-29/2161	555659.424	1510810.498	579.932		RXS1	Riffle XS-1 Shot
248	3	10/28-29/2162	555660.985	1510810.005	579.098		RXS1	Riffle XS-1 Shot
249	3	10/28-29/2163	555663.421	1510809.06	578.038		RXS1	Riffle XS-1 Shot
250	3	10/28-29/2164	555665.507	1510808.657	578.034		RXS1	Riffle XS-1 Shot
251	3	10/28-29/2165	555668.23	1510807.612	578.161		RXS1	Riffle XS-1 Shot
252	3	10/28-29/2166	555670.305	1510806.369	578.306		RXS1	Riffle XS-1 Shot
253	3	10/28-29/2167	555673.212	1510805.006	579.053		RXS1	Riffle XS-1 Shot
254	3	10/28-29/2168	555675.877	1510803.371	579.352		RXS1	Riffle XS-1 Shot
255	3	10/28-29/2169	555677.122	1510802.899	579.643		RXS1	Riffle XS-1 Shot
256	3	10/28-29/2170	555678.149	1510802.229	580.082		RXS1	Riffle XS-1 Shot
257	3	10/28-29/2171	555679.216	1510801.623	580.621		RXS1	Riffle XS-1 Shot
258	3	10/28-29/2172	555679.967	1510801.165	581.529		RXS1	Riffle XS-1 Shot
259	3	10/28-29/2173	555680.65	1510800.854	582.27		RXS1	Riffle XS-1 Shot
260	3	10/28-29/2174	555681.284	1510800.11	582.954		RXS1	Riffle XS-1 Shot
261	3	10/28-29/2175	555682.954	1510799.097	583.502		RXS1	Riffle XS-1 Shot
262	3	10/28-29/2176	555684.136	1510798.416	584.027		RXS1	Riffle XS-1 Shot

Survey-Tape Down Method

Shot #	MY	Date	Station	Elevation	Name
1	3	10/28-29/2014	0	581.79	RXS-2
2	3	10/28-29/2014	1	580.99	RXS-2
3	3	10/28-29/2014	2	580.35	RXS-2
4	3	10/28-29/2014	3	580.13	RXS-2
5	3	10/28-29/2014	4	579.61	RXS-2
6	3	10/28-29/2014	5	579.11	RXS-2
7	3	10/28-29/2014	6	579.08	RXS-2
8	3	10/28-29/2014	7	579.01	RXS-2
9	3	10/28-29/2014	8	579.13	RXS-2
10	3	10/28-29/2014	9	579.18	RXS-2
11	3	10/28-29/2014	10	579.74	RXS-2
12	3	10/28-29/2014	11	579.88	RXS-2
13	3	10/28-29/2014	12	580.34	RXS-2
14	3	10/28-29/2014	13	580.62	RXS-2
15	3	10/28-29/2014	14	580.69	RXS-2
16	3	10/28-29/2014	15	580.83	RXS-2
17	3	10/28-29/2014	16	581	RXS-2

[redacted]	18	3	10/28-29/2014	17	581.24	RXS-2	[redacted]
	19	3	10/28-29/2014	18	581.39	RXS-2	
	20	3	10/28-29/2014	1	581.66	PXS-2	
	21	3	10/28-29/2014	2	580.89	PXS-2	
	22	3	10/28-29/2014	4	576.97	PXS-2	
	23	3	10/28-29/2014	5	576.96	PXS-2	
	24	3	10/28-29/2014	6	576.77	PXS-2	
	25	3	10/28-29/2014	7	576.83	PXS-2	
	26	3	10/28-29/2014	8	577.57	PXS-2	
	27	3	10/28-29/2014	9	577.71	PXS-2	
	28	3	10/28-29/2014	10	578.06	PXS-2	
	29	3	10/28-29/2014	11	578.72	PXS-2	
	30	3	10/28-29/2014	12	579.89	PXS-2	
	31	3	10/28-29/2014	13	580.53	PXS-2	
	32	3	10/28-29/2014	14	580.47	PXS-2	
	33	3	10/28-29/2014	15	580.64	PXS-2	
	34	3	10/28-29/2014	16	580.77	PXS-2	
	35	3	10/28-29/2014	17	581.06	PXS-2	
	36	3	10/28-29/2014	18	581.36	PXS-2	

Date/Time of ob	Number of Records Compiled	monthly SUM of Daily Precipitation at 2m (in)
Nov-13	12 (40%)	3.09
Dec-13	13 (41.9%)	1.11
Jan-14	22 (71%)	2.79
Feb-14	15 (53.6%)	1.5002
Mar-14	23 (74.2%)	4.0301
Apr-14	24 (80%)	5.4601
May-14	22 (71%)	3.8902
Jun-14	16 (53.3%)	1.7302
Jul-14	22 (71%)	4.5102
Aug-14	22 (71%)	3.4301
Sep-14	22 (73.3%)	4.2803
Oct-14	25 (80.6%)	0.9302
Nov-14	21 (70%)	2.8703