WITHERS & RAVENEL
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April 30, 2013

North Carolina Ecosystem Enhancement Program
Michael McDonald
1652 Mail Service Center
Raleigh, NC 27699-1652

Re: McKee Creek, Cabarrus County
EEP Project ID 92573
Year 1 Monitoring Report Comments Round Three

Dear Mr. McDonald,

Enclosed is the Final Draft of the referenced project report. We have revised the report as follows:

1. Removed "Draft" and added "Final" to the Cover
2. Added plant volunteer counts to Table 9.

We completed these edits as instructed by Ms. Julie Cahlill. We have remitted two copies to the Raleigh EEP office and one copy to the Asheville EEP office.

We trust this is responsive to your request. Please don't hesitate to call if you have any additional requests.

Sincerely,

WITHERS & RAVENEL, INC.

William "Billy" Lee, P.E., C.F.M., LEED-AP
Vice President Water Resource

Cc: Ms. Julie Cahill

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1410 Commonwealth Drive | Suite 101 | Wilmington, NC 28403 | tel: 910.256.9277 | fax: 910.256.2584
7011 Albert Pick Road, Suite G | Greensboro, NC 27409 | tel: 336.605.3009 | fax: 919.467.6008

McKee Creek Stream Restoration
Monitoring Report – Year 1 of 5
FINAL
Contract # 004391
EEP Project # 92573
Cabarrus County, North Carolina

Collected October 2012
Completed 2012
Report December 4, 2012
April 12, 2013 Revisions

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

Ecosystem Enhancement
PROGRAM

Prepared By:

WITHERS & RAVENEL

ENGINEERS | PLANNERS | SURVEYORS

Withers & Ravenel
115 McKenan Drive
Cary, NC 27511

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Project Manager: William E. Lee
Email: Blee@withersravenel.com

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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-1 (MY-1) 2012.

McKee Creek was 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 that 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. These downed trees have been cleared across Clear Creek but remain an obstacle to access on the south bank. All the fallen trees on McKee Creek remain and are preventing this area from being surveyed.

The downed trees on the south bank of Clear Creek as well as three log jams unrelated to the tornado have impeded the monitoring effort. These downed trees have either attracted beavers or been exacerbated by a beaver population.

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.

Vegetation Results

Success of the riparian buffer plantings will be based on plant survival, as per the buffer restoration guidelines, administered by the NC Division of Water Quality. 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 1 shows an average of 567 live planted stems per acre with a minimum count of 405 . 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 of the vegetation plots are performing above the requirement is good considering the 10 inch deficit of rain fall in the monitoring period.

Re-vegetation and elimination of invasives along McKee Creek Reach 2 was an important part of the success this project. The invasive species *Rosa multiflora* plagued the project site before and during construction. Construction logs indicate the *Rosa multiflora* was found to be three times greater than specified on the original plan and though denied, the contractor requested onsite burning multiple times. As a result, several rounds of spray treatment were applied followed by bush hogging the invasive species. During the fall assessment *Eleagnus umbellata*, *Rosa multiflora*, and *Lonicera japonica* were noted in Vegetation Plots 1 and 2. These plants are considered non-native invasive species and should be removed from the plots before overtaking the native vegetation.

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. This data will be used for comparison in the absence of initial baseline data. In general, Clear Creek appeared to be meeting expectation. A quick and dense development of vegetation proved to hold the stream together, along with the exclusion of bank damaging livestock. A majority of the Clear Creek is consistent from upstream to downstream of the ford.

A full restoration was not performed on McKee Creek Reach 1, so failure of structures was not assessed due to lack of structures. Over-widening and formation of mid-channel bars is present in a couple regions where the stream enters wooded areas and restoration was not completed. These bars are naturally formed and presumably present before the restoration of the stream and most likely stabilized, but will continue to be monitored for further aggradations. On McKee Creek, fine particle buildup in the streambed made bedform determination difficult. This occurred on Reach 2 from station 12+00 to the beginning of the tornado damage and again on Reach 1 from about 27+00 to 34+00. In addition, log jams were noted along both streams; all three log jams and mid-channel bars were placed in the CCPV. The log jams are important because of the potential for impeding flow and sediment transport capability of the stream, as well as creating the potential for additional mid channel bars.

McKee Creek Reach 2 appears to be stable despite the tornado damage. Cattle exclusion has allowed the banks to re-vegetate and stabilize. Effective floodplain connection remains from downstream of Peach Orchard Road for approximately 600 feet where the stream enters the tornado impacted area. The expected removal of additional debris over the next year will allow for a more thorough assessment of this portion of the stream be completed in Monitoring Year 2.

Hydrology Results

During the fall assessment, crest gages were checked for bankfull occurrences. The crest gages indicated water levels at or above bankfull for crest gages 1 and 3. crest gage 2 reads 0.2-0.3 feet below bankfull. On Reach 2 of McKee Creek, flattened and sparse vegetation, due to prolonged inundation and very soft soils at the edge of the banks, validate 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 at or just 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 read roughly bankfull, the bank just downstream of list location is higher than bankfull so visual indicators are minimal but small terraces collecting falling leaves seem to be forming at approximately this same elevation between the gage and the confluence.

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 Dec 2011 and Dec 2012 which totaled 33.21 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 10 inch rainfall deficit over the previous year.

Wetlands

No formal wetland assessment of this site was preformed. The site does have two small documented wetlands of 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. Though not identified by a biologist, the plants that inhabited this small wetland looked to be wetland species. Further inspection and detail will follow in the MY-2 documents.

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 utilized 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

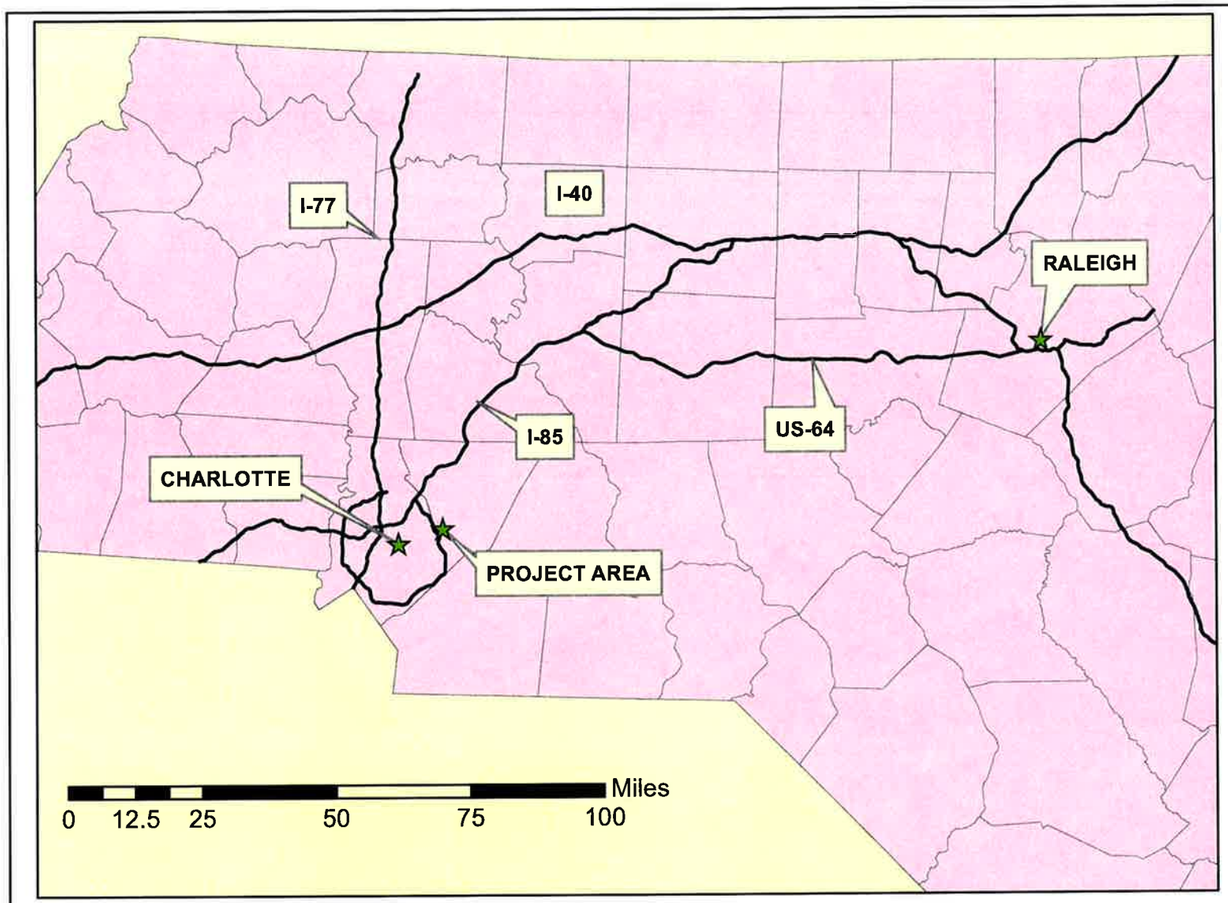
Town of Harrisburg North Carolina, Visitors Page, Geography and Climate
http://www.harrisburgnc.org/Visitors/GeographyClimate.aspx

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

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Ecosystem Enhancement

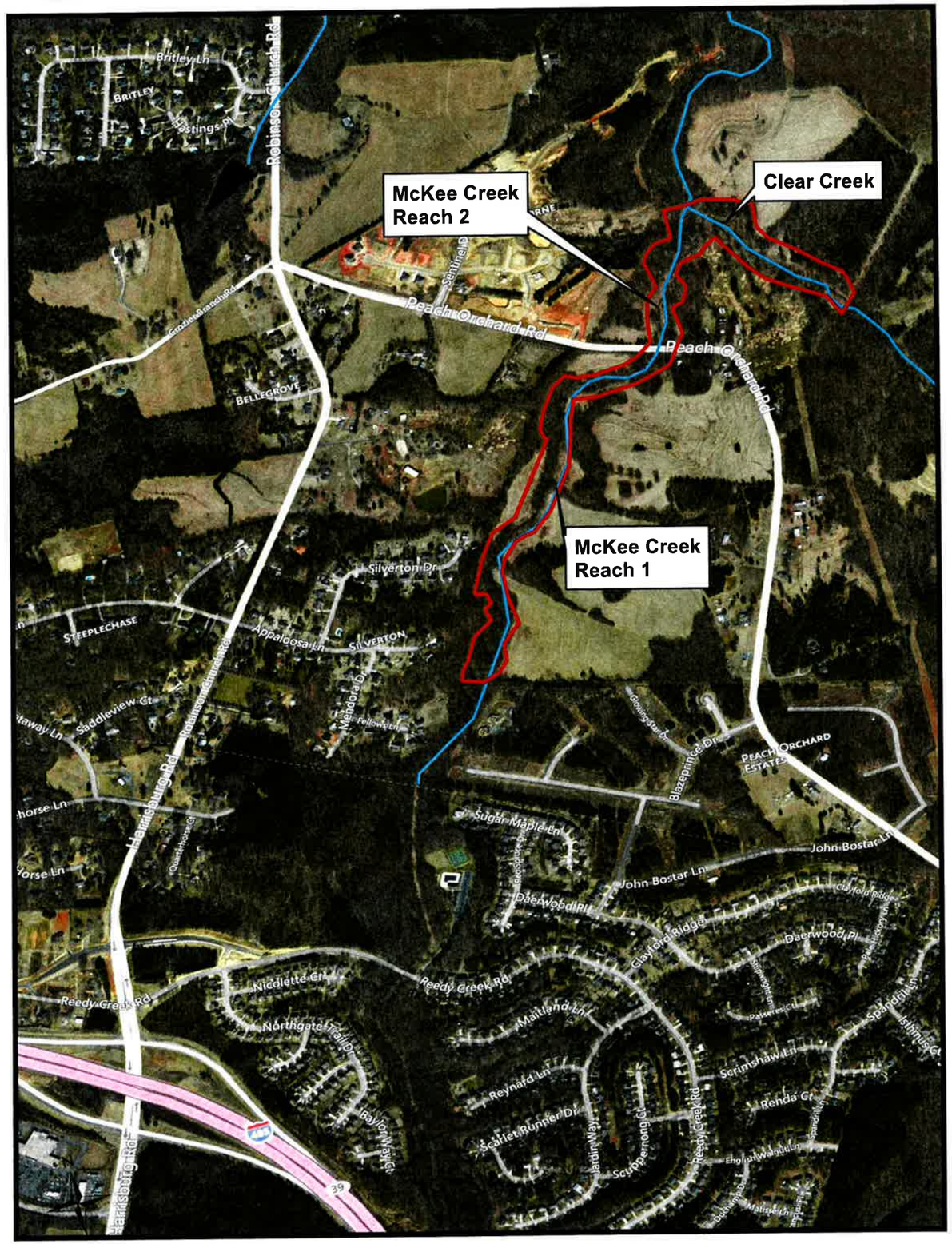

Table 1. Project Components and Mitigation Credits McKee Creek Project # 92573								
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Acreage**	**Stationing**	**Mitigation Ratio**	**BMP Elements[1]**	**Comment**
McKee Reach 1	3240	E2	P4	3240	10+00 - 25+00 29+00 - 46+40	2.5:1 MAX		This is a mix of P2 and P4 as designated by the stationing.
McKee Reach 1	493	E1	P2	400	25+00 - 29+00	1.5:1 MAX		
McKee Reach 2	847	E1	P2	696	10+00 - 17+23.67	1.5:1 MAX		The reach is a mix of P2 and P3, but is mostly dominated by P2. Includes 200 lf of channel relocation
Clear Creek	1513	R	P1	1641	11+03.05 - 27+59.18	1 to 1		Includes 1,351 lf of channel relocation

1 = BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; Grassed Swale = S; LS = Level Spreader; NI = Natural Infiltration Area, O = Other
CF = Cattle Fencing; WS = Watering System; CH = Livestock Housing

Table 1b. Component Summations McKee Creek Project # 92573							
Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	1641						
Enhancement							
Enhancement I	1096						
Enhancement II	3240						
Creation							
Preservation							
HQ Preservation							
Totals (Feet/Acres)	**5977**	**0**		**0**	**0**	**0**	

Non-Applicable

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

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.

Table 3. Project Contacts Table McKee Creek Project # 92573	
Designer Primary project design POC	Withers & Ravenel, Inc. 111 MacKenan Drive Cary, NC 27511 Alwyn Smith, P.E. (919) 467-6008
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. 111 MacKenan Drive Cary, NC 27511
Stream Monitoring POC	Billy Lee, P.E. (919) 467-6008
Vegetation Monitoring POC	Billy Lee, P.E. (919) 467-6008
Wetland Monitoring POC	

Table 4. Project Attribute Table			
McKee Creek Project # 92573			
Project County	Cabarrus		
Physiographic Region	Piedmont		
Ecoregion	Southern Outer Piedmont		
Project River Basin	Yadkin-Pee Dee		
USGS HUC for Project (14 digit)			
NCDWQ Sub-basin for Project	Clear- 03-07-11/03-08-34		
Within extent of EEP Watershed Plan?	Name the plan document		
WRC Hab Class (Warm, Cool, Cold)	Cool		
% of project easement fenced or demarcated	McKee - 100% Clear-100%		
Beaver activity observed during design phase?	Yes		
Restoration Component Attribute Table			
	McKee Reach 1	McKee Reach 2	Clear Creek
Drainage area (acres)	4131	4214	635
Stream order	2	2	1
Restored length (feet)	3640	696	1641
Perennial or Intermittent	Perennial	Perennial	Perennial
Watershed type (Rural, Urban, Developing etc.)	Developing	Developing	Rural
Watershed LULC Distribution (e.g.) acres			
Single Family	2150	2147	106
Woods	1154	1166	469
Commercial	114	113	
Govt-Inst	73	73	
Warehouse	76	76	
Pasture	565	640	60
Watershed impervious cover (%)	16	16	4
NCDWQ AU/Index number			
NCDWQ classification	C	C	C/C
303d listed?	Yes	Yes	Yes
Upstream of a 303d listed segment?	Yes	Yes	Yes
Reasons for 303d listing or stressor	Fecal Coliform, Sediment	Fecal Coliform, Sediment	Fecal Coliform
Total acreage of easement	10.63	2.03	4.75
Total vegetated acreage within the easement	2.57	0.11	1.76
Total planted acreage as part of the restoration	2.57	0.11	1.76
Rosgen classification of pre-existing	E4	E4	E/C5
Rosgen classification of As-built	E4	E4	E/C5
Valley type	VIII	VIII	VIII
Valley slope	0.005	0.005	0.014
Valley side slope range (e.g. 2-3.%)	1-2%	1-2%	1-2%
Valley toe slope range (e.g. 2-3.%)	1-2%	1-2%	1-2%
Cowardin classification	PFO1A	PFO1A	PFO1A
Trout waters designation	No	No	No
Species of concern, endangered etc.? (Y/N)	Yes	Yes	Yes
Dominant soil series and characteristics			
Series	Chewacla	Chewacla	Chewacla
Depth	6 to 24 inches	6 to 24 inches	6 to 24 inches
Clay%	20.5	20.5	20.5
K	0.275	0.275	0.275
T	4.584	4.584	4.584

Use for items that may not apply. Use "-" for items that are unavailable and "U" for items that are unknown

Appendix B
Visual Assessment Data

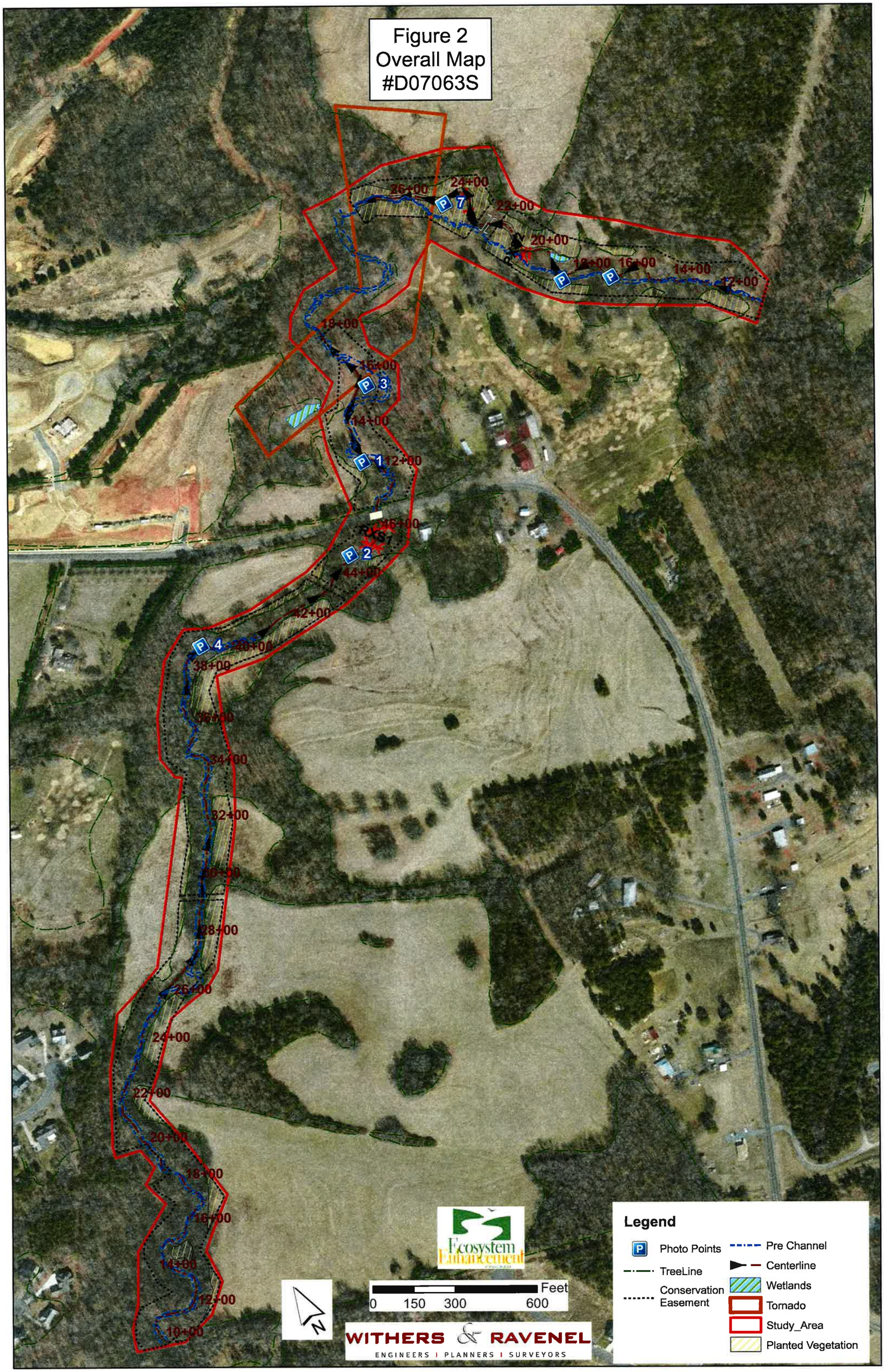
Figure 2
Overall Map
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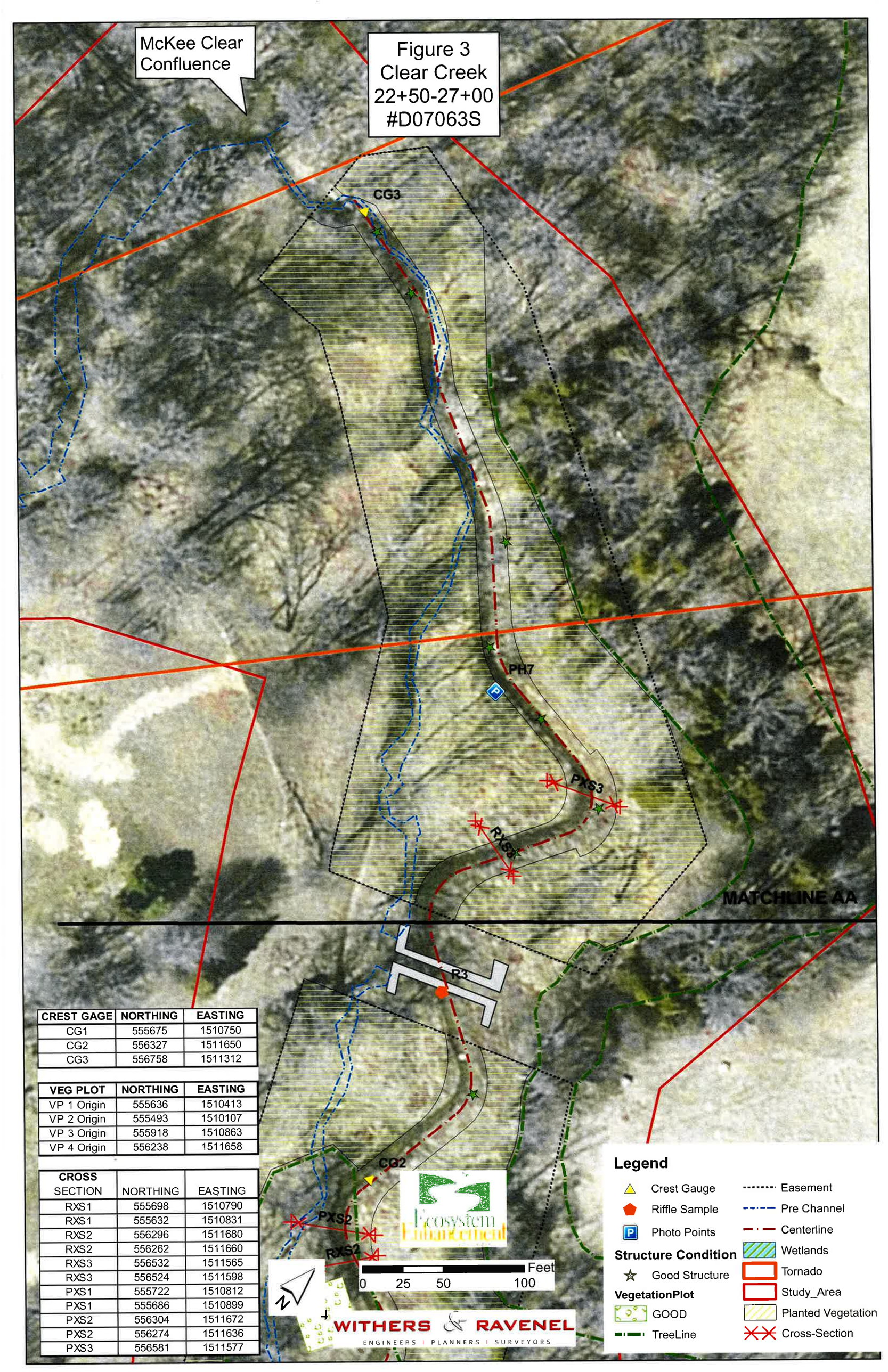
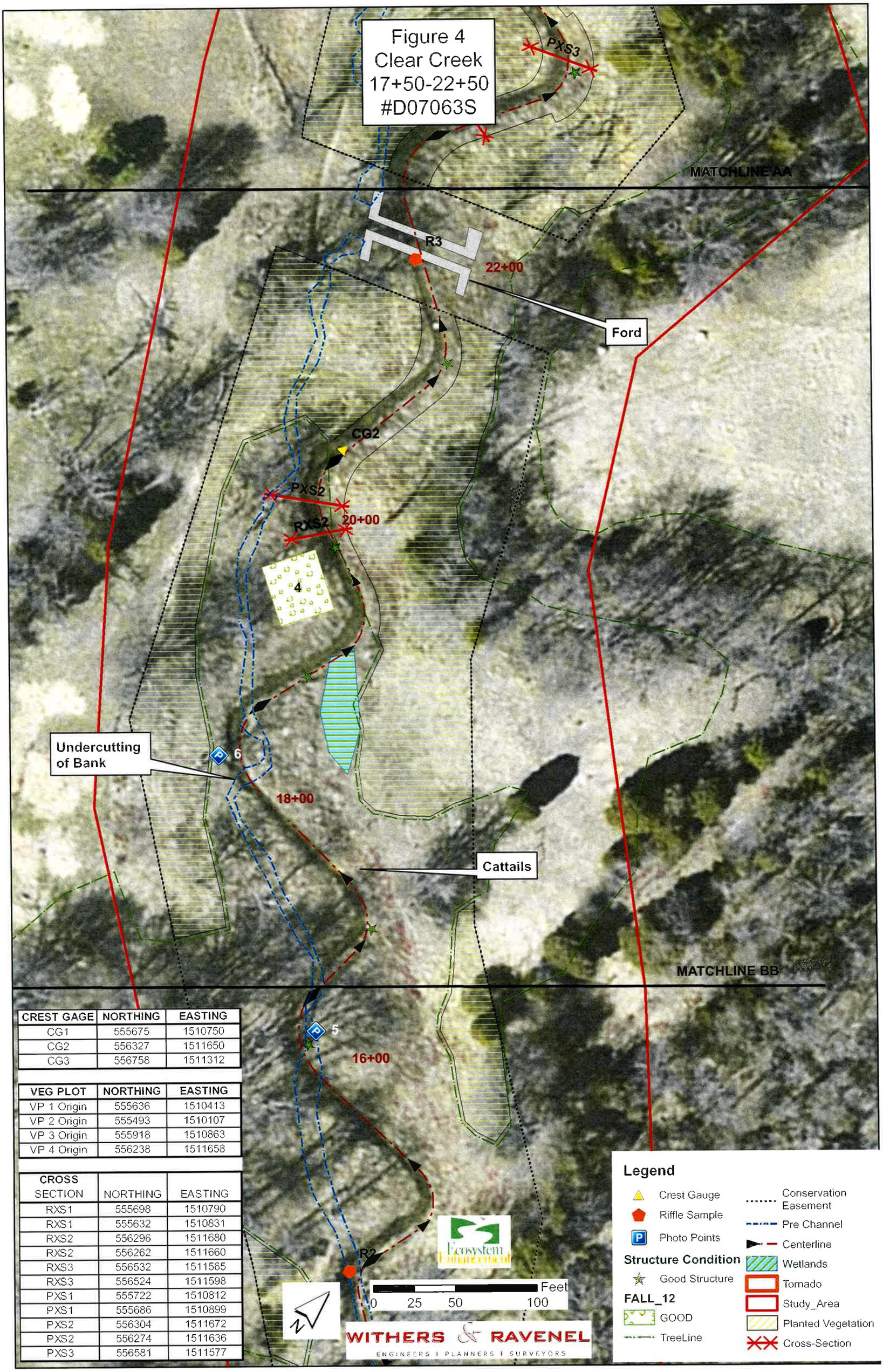
26+00
24+00
22+00
20+00
18+00
16+00
14+00
12+00
10+00
P 1
P 2
P 3
P 4
P 7
Ecosystem Enhancement
0 150 300 600 Feet
N
WITHERS & RAVENEL
ENGINEERS | PLANNERS | SURVEYORS
Legend
Photo Points
TreeLine
Conservation Easement
Pre Channel
Centerline
Wetlands
Tornado
Study_Area
Planted Vegetation



CREST GAGE	NORTHING	EASTING
CG1	555675	1510750
CG2	556327	1511650
CG3	556758	1511312

VEG PLOT	NORTHING	EASTING
VP 1 Origin	555636	1510413
VP 2 Origin	555493	1510107
VP 3 Origin	555918	1510863
VP 4 Origin	556238	1511658

CROSS SECTION	NORTHING	EASTING
RXS1	555698	1510790
RXS1	555632	1510831
RXS2	556296	1511680
RXS2	556262	1511660
RXS3	556532	1511565
RXS3	556524	1511598
PXS1	555722	1510812
PXS1	555686	1510899
PXS2	556304	1511672
PXS2	556274	1511636
PXS3	556581	1511577



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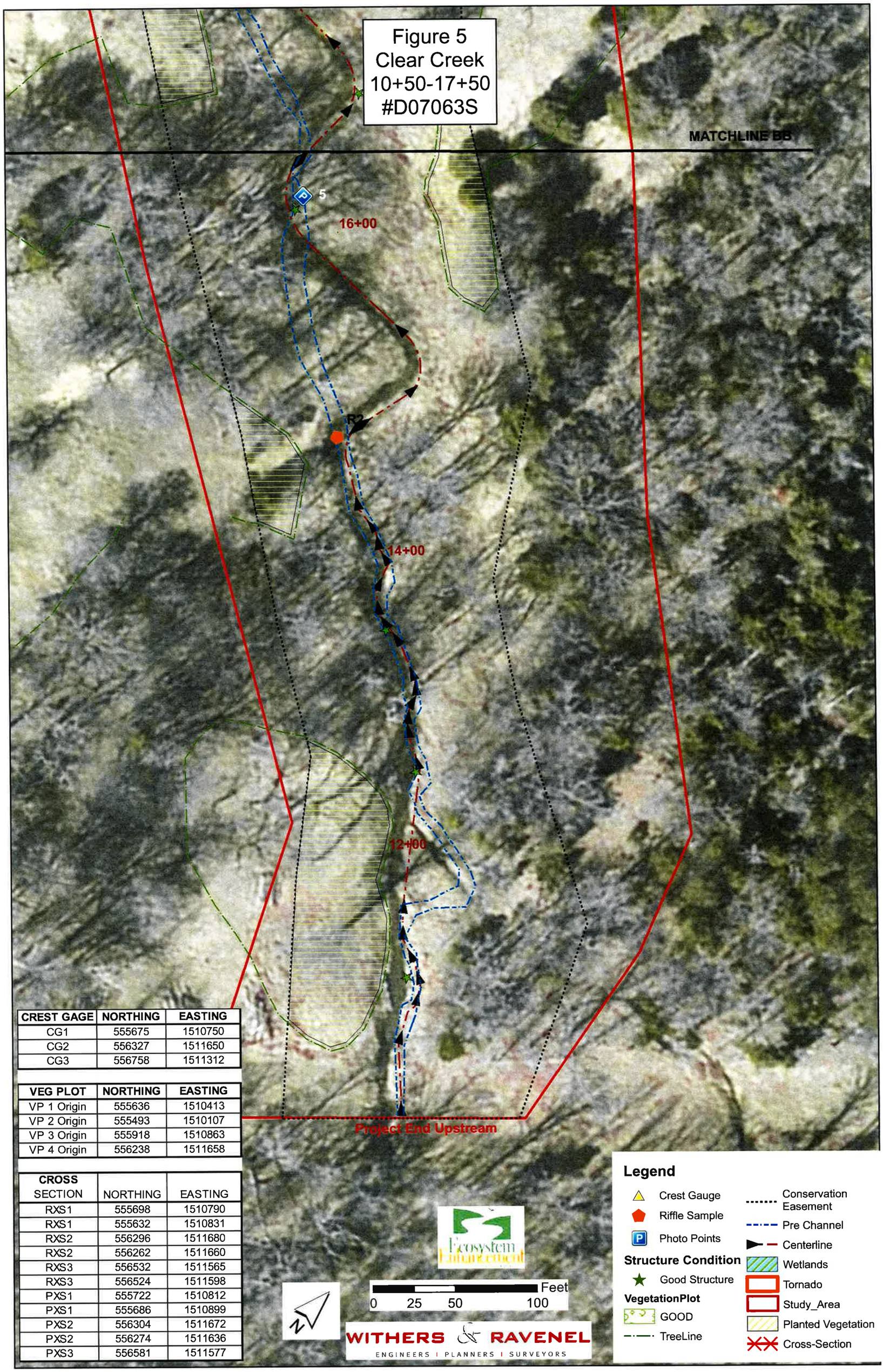

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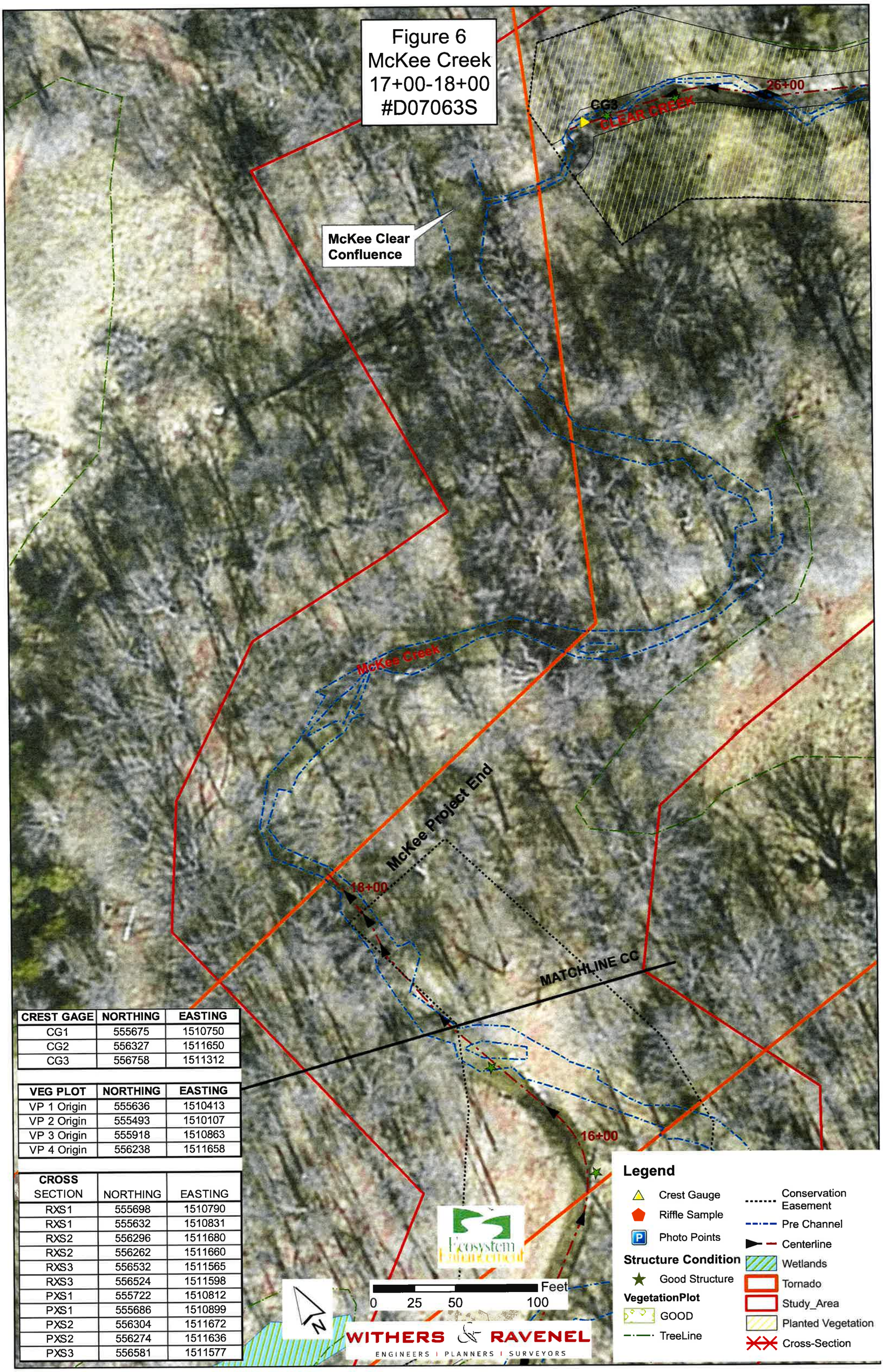

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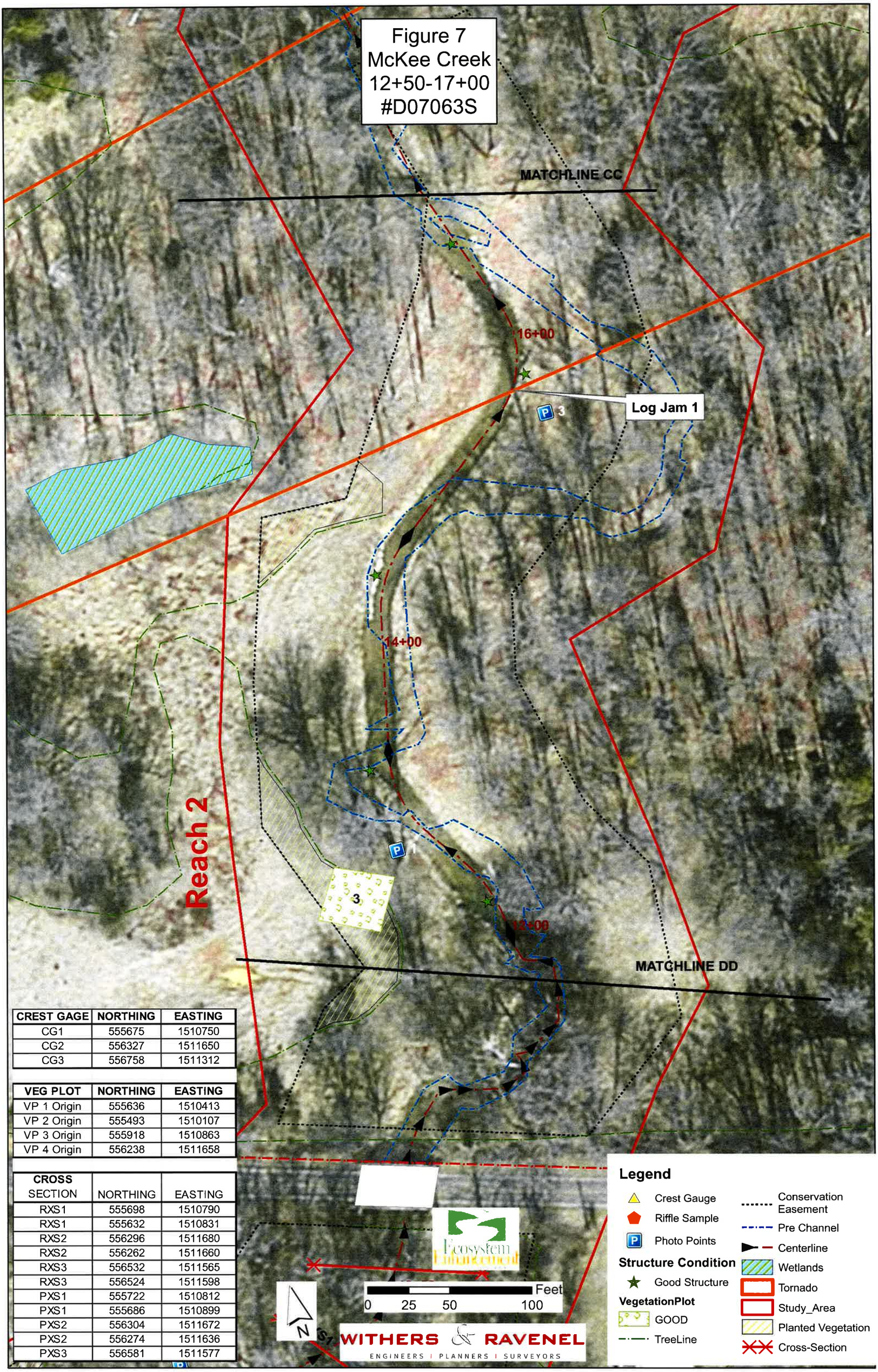

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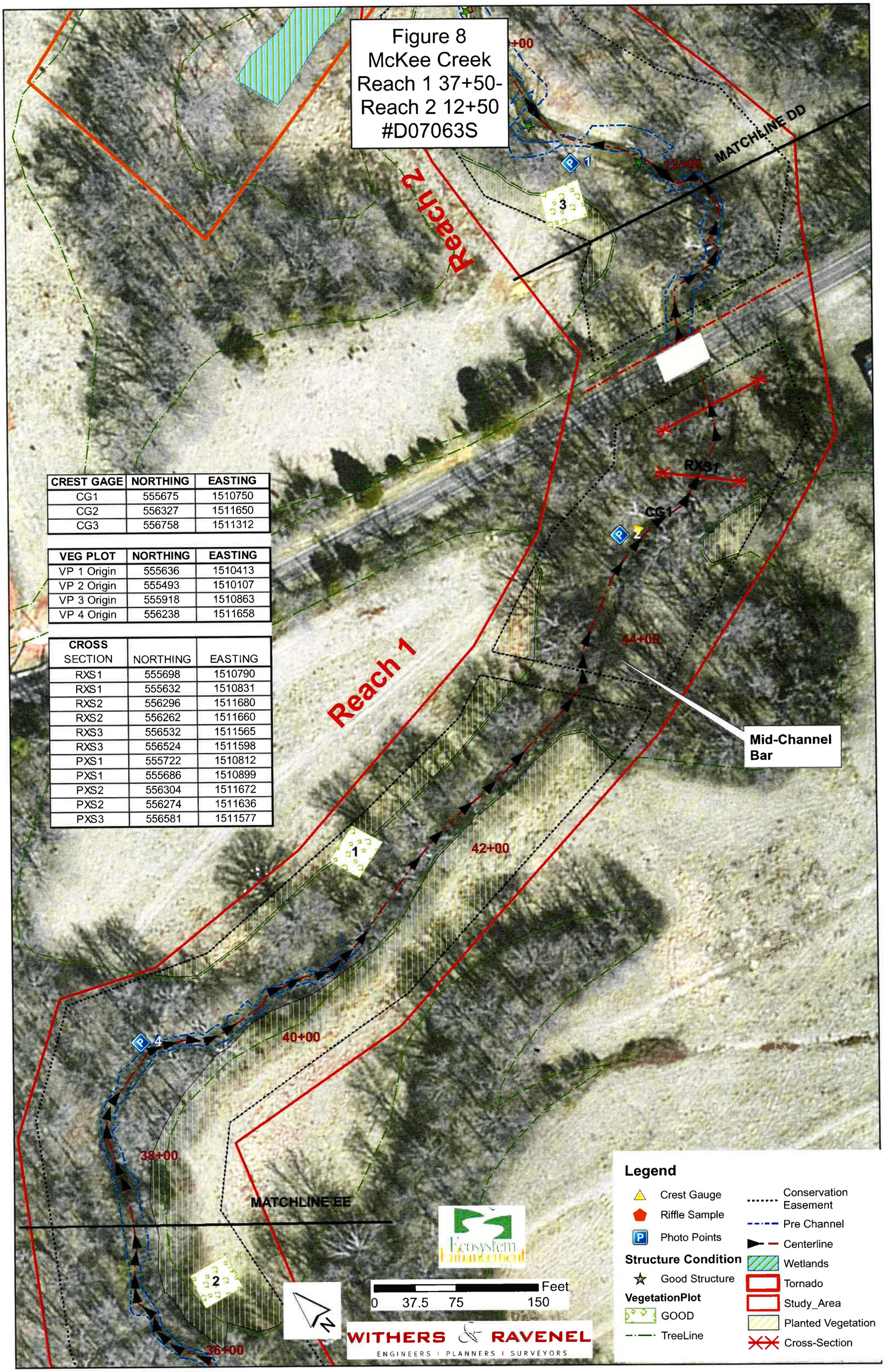
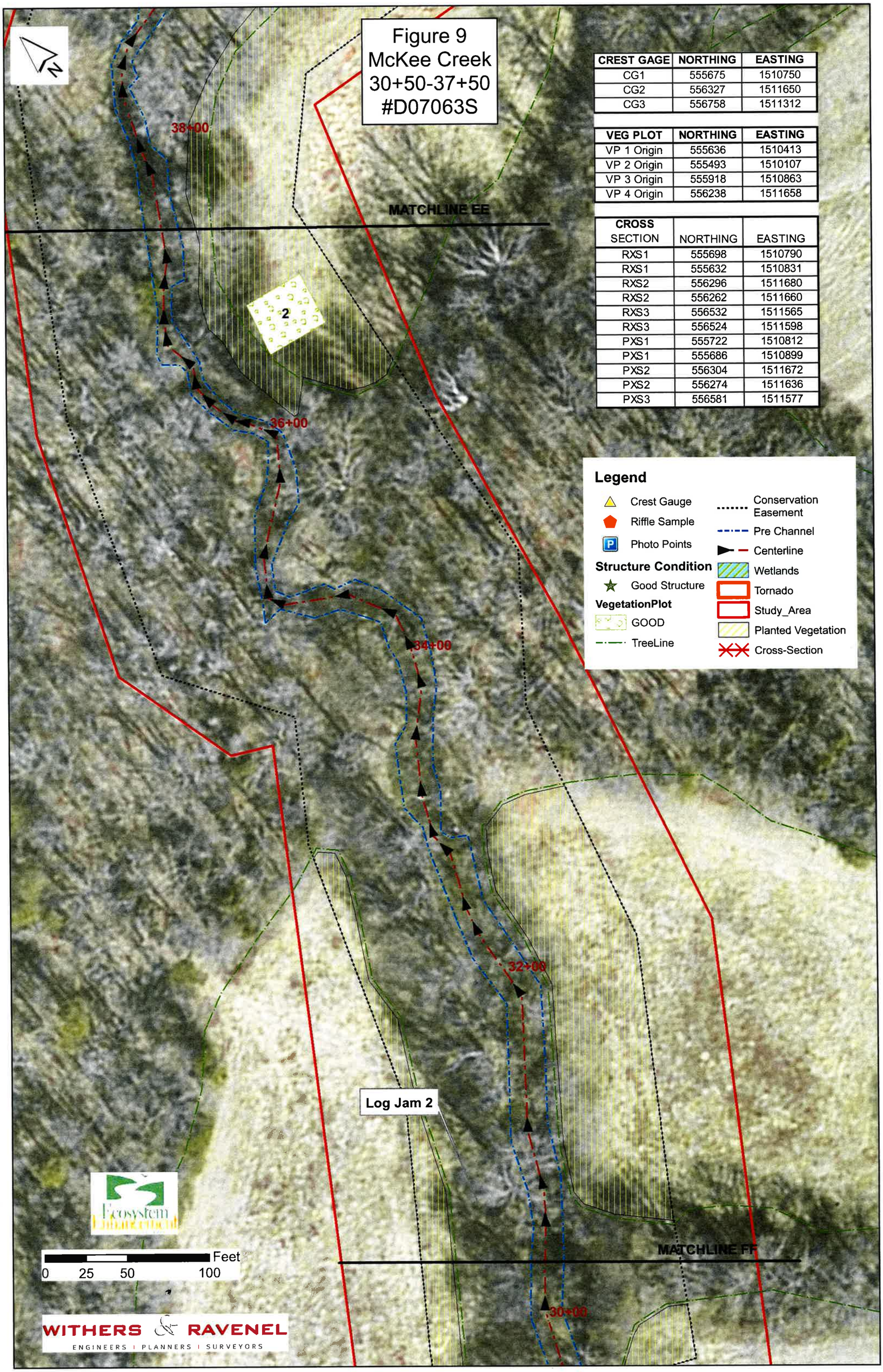
PXS2	556274	1511636
PXS3	556581	1511577



CREST GAGE	NORTHING	EASTING
CG1	555675	1510750
CG2	556327	1511650
CG3	556758	1511312

VEG PLOT	NORTHING	EASTING
VP 1 Origin	555636	1510413
VP 2 Origin	555493	1510107
VP 3 Origin	555918	1510863
VP 4 Origin	556238	1511658

CROSS SECTION	NORTHING	EASTING
RXS1	555698	1510790
RXS1	555632	1510831
RXS2	556296	1511680
RXS2	556262	1511660
RXS3	556532	1511565
RXS3	556524	1511598
PXS1	555722	1510812
PXS1	555686	1510899
PXS2	556304	1511672
PXS2	556274	1511636
PXS3	556581	1511577



CREST GAGE	NORTHING	EASTING
CG1	555675	1510750
CG2	556327	1511650
CG3	556758	1511312

VEG PLOT	NORTHING	EASTING
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RXS1	555698	1510790
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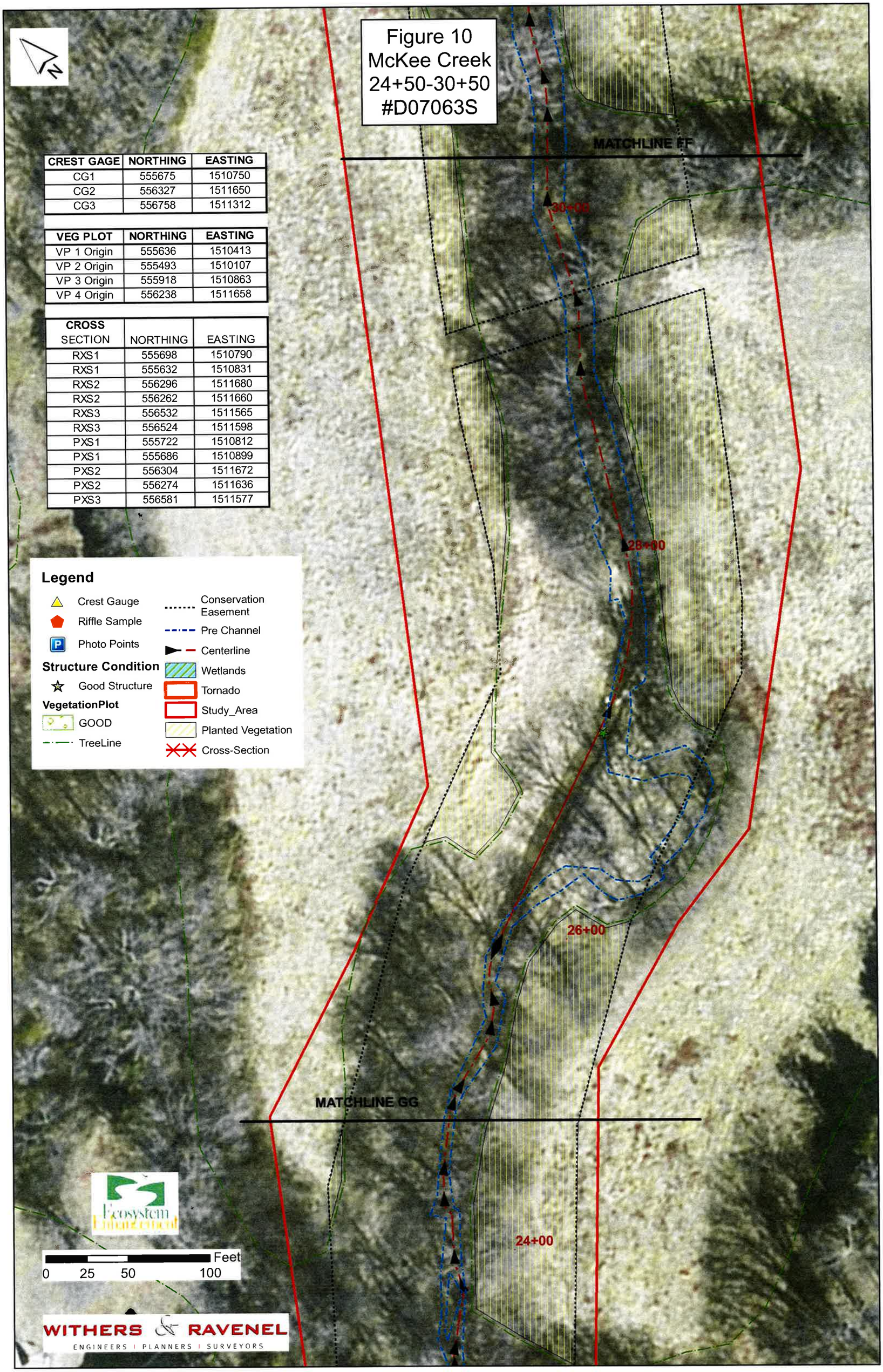
RXS2	556296	1511680
RXS2	556262	1511660
RXS3	556532	1511565
RXS3	556524	1511598
PXS1	555722	1510812
PXS1	555686	1510899
PXS2	556304	1511672
PXS2	556274	1511636
PXS3	556581	1511577



CREST GAGE	NORTHING	EASTING
CG1	555675	1510750
CG2	556327	1511650
CG3	556758	1511312

VEG PLOT	NORTHING	EASTING
VP 1 Origin	555636	1510413
VP 2 Origin	555493	1510107
VP 3 Origin	555918	1510863
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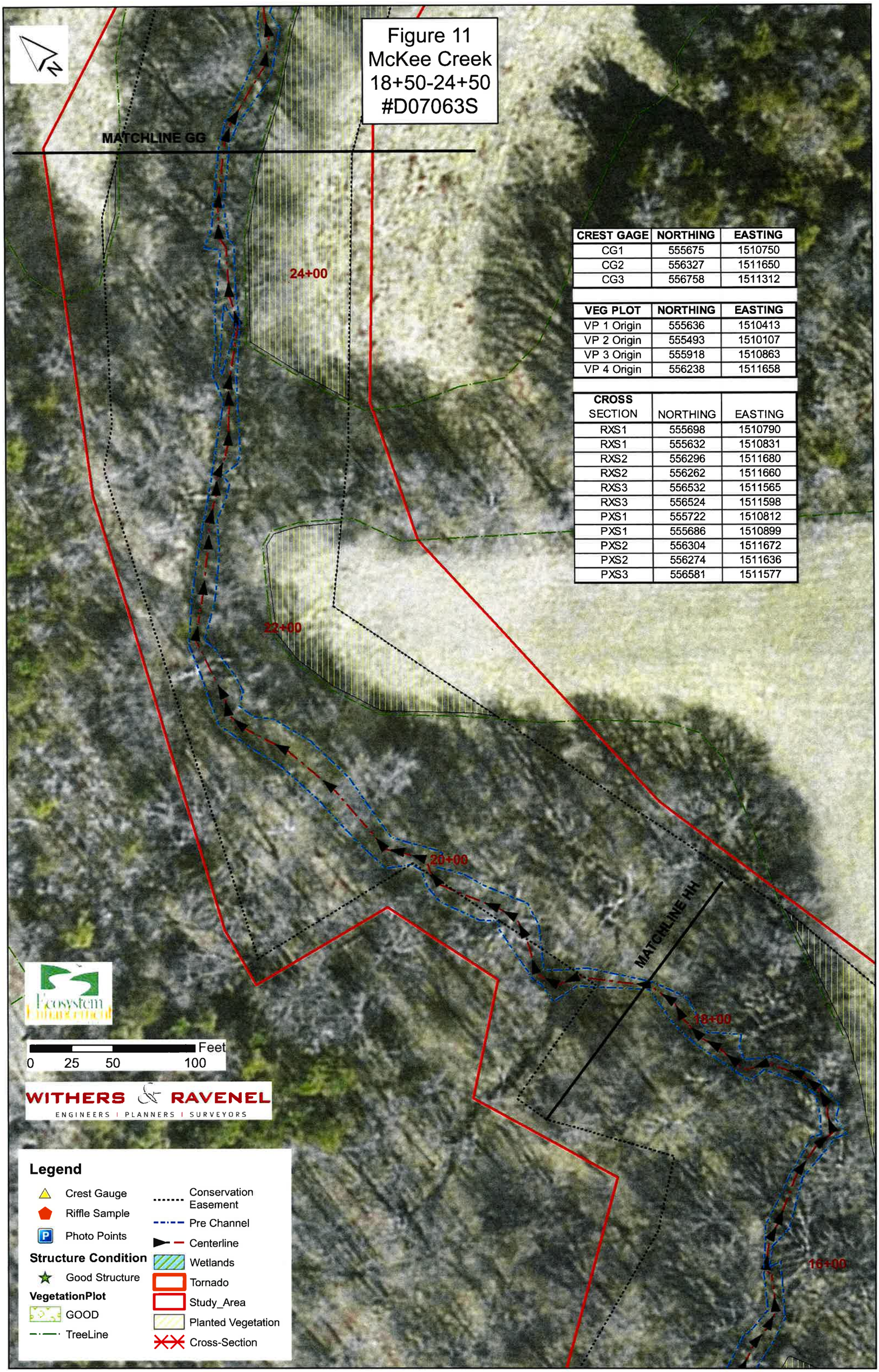
CROSS SECTION	NORTHING	EASTING
RXS1	555698	1510790
RXS1	555632	1510831
RXS2	556296	1511680
RXS2	556262	1511660
RXS3	556532	1511565
RXS3	556524	1511598
PXS1	555722	1510812
PXS1	555686	1510899
PXS2	556304	1511672
PXS2	556274	1511636
PXS3	556581	1511577



CREST GAGE	NORTHING	EASTING
CG1	555675	1510750
CG2	556327	1511650
CG3	556758	1511312

VEG PLOT	NORTHING	EASTING
VP 1 Origin	555636	1510413
VP 2 Origin	555493	1510107
VP 3 Origin	555918	1510863
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CROSS SECTION	NORTHING	EASTING
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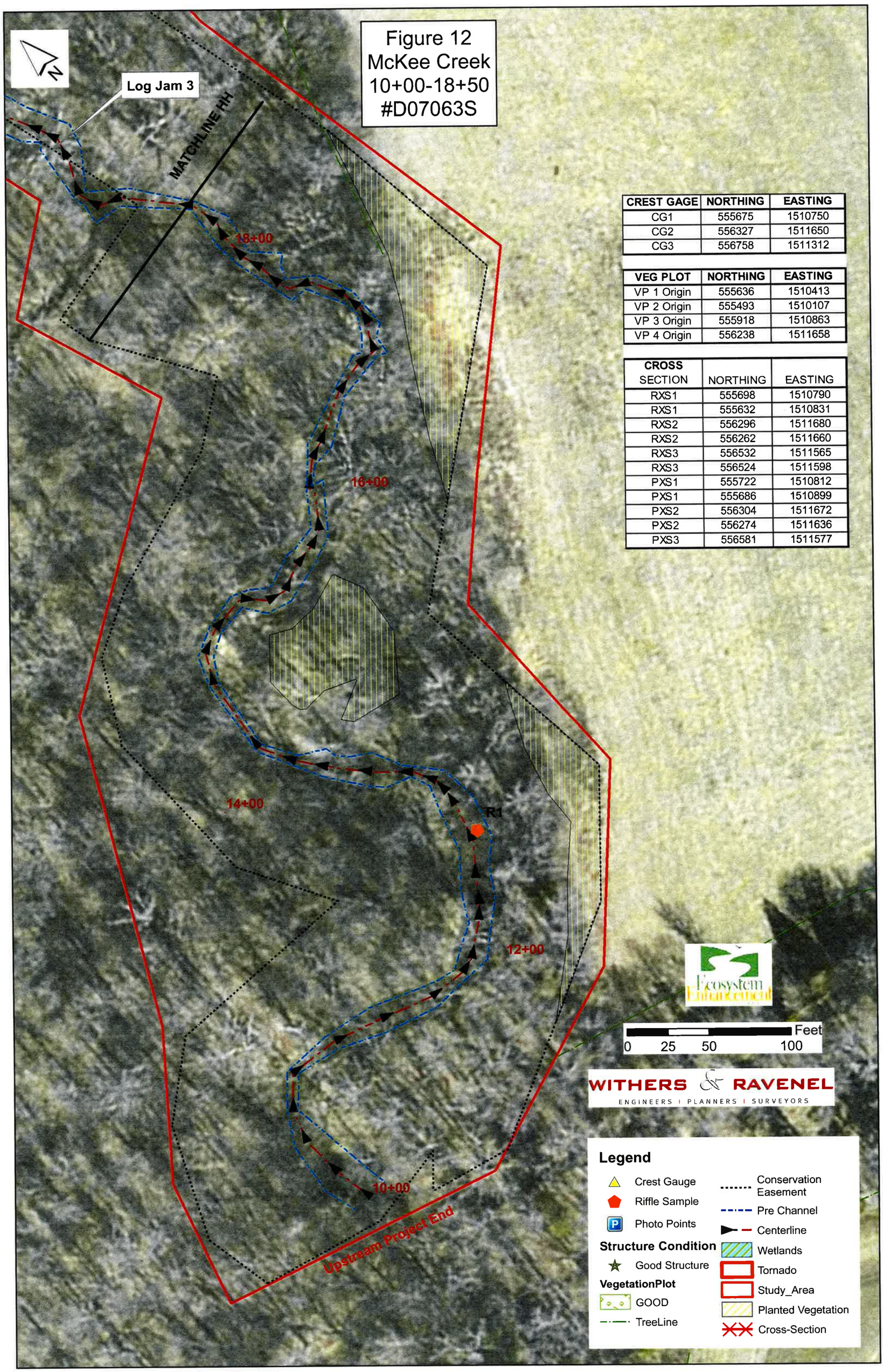
RXS3	556532	1511565
RXS3	556524	1511598
PXS1	555722	1510812
PXS1	555686	1510899
PXS2	556304	1511672
PXS2	556274	1511636
PXS3	556581	1511577



CREST GAGE	NORTHING	EASTING
CG1	555675	1510750
CG2	556327	1511650
CG3	556758	1511312

VEG PLOT	NORTHING	EASTING
VP 1 Origin	555636	1510413
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CROSS SECTION	NORTHING	EASTING
RXS1	555698	1510790
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RXS3	556532	1511565
RXS3	556524	1511598
PXS1	555722	1510812
PXS1	555686	1510899
PXS2	556304	1511672
PXS2	556274	1511636
PXS3	556581	1511577

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)			0	0	100%			
		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)	11	12			92%			
		Length Appropriate(>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	12	12			100%			
	Thalweg Position	Thalweg centering at upstream of meander bend (Run)	12	12			100%			
		Thalweg centering at dowsntream of meadner bend (glide)	12	12						
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	1	1			100%			
	Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%			
	Piping	Structures lacking any substation flow underneath sills or arms	1	1			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)	1	1			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)			0	0	100%			
		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)	4	4			100%			
		Length Appropriate(>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	4	4			100%			
	Thalweg Position	Thalweg centering at upstream of meander bend (Run)	4	4			100%			
		Thalweg centering at dowsntream of meadner bend (glide)	4	4			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	5	5			100%			
	Grade Control	Grade control structures exhibiting maintenance of grade across the sill	5	5			100%			
	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)			0	0	100%			
		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)	16	16			100%			
		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)	16	16			100%			
		Thalweg centering at dowsntream of meadner bend (glide)	16	16			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			10	10	99%	0	0	99.00%
	Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	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	13	13			100%			
	Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	Piping	Structures lacking any substation flow underneath sills or arms	20	20			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)	19	20			95%			
	Habitat	Pool forming structures maintaining ~ Max Pool Depth: Mean Bankfull Depth >= 1.6 Rootwads/logs providing some cover at base-flow	5	5			100%			

Photo 1- Veg Plot 1- Year 1 (2012)

Photo 2- Veg Plot 2- Year 1 (2012)

Photo 3- Veg Plot 3- Year 1 (2012)

Photo 4- Veg Plot 4- Year 1 (2012)

Photo 5 - Riffle XS 1 - Year 1 (2012)

Photo 6- Pool XS 1 - Year 1 (2012)

Photo 7- Riffle XS 2- Year 1 (2012)

Photo 8- Pool XS 2 - Year 1 (2012)

Photo 9 - Riffle XS 3 - Year 1 (2012)

Photo 10 - Pool XS 3 - Year 1 (2012)

Photo 11- Photo Point 1- Year 1 (2012)

Photo 12 - Photo Point 2 - Year 1 (2012)

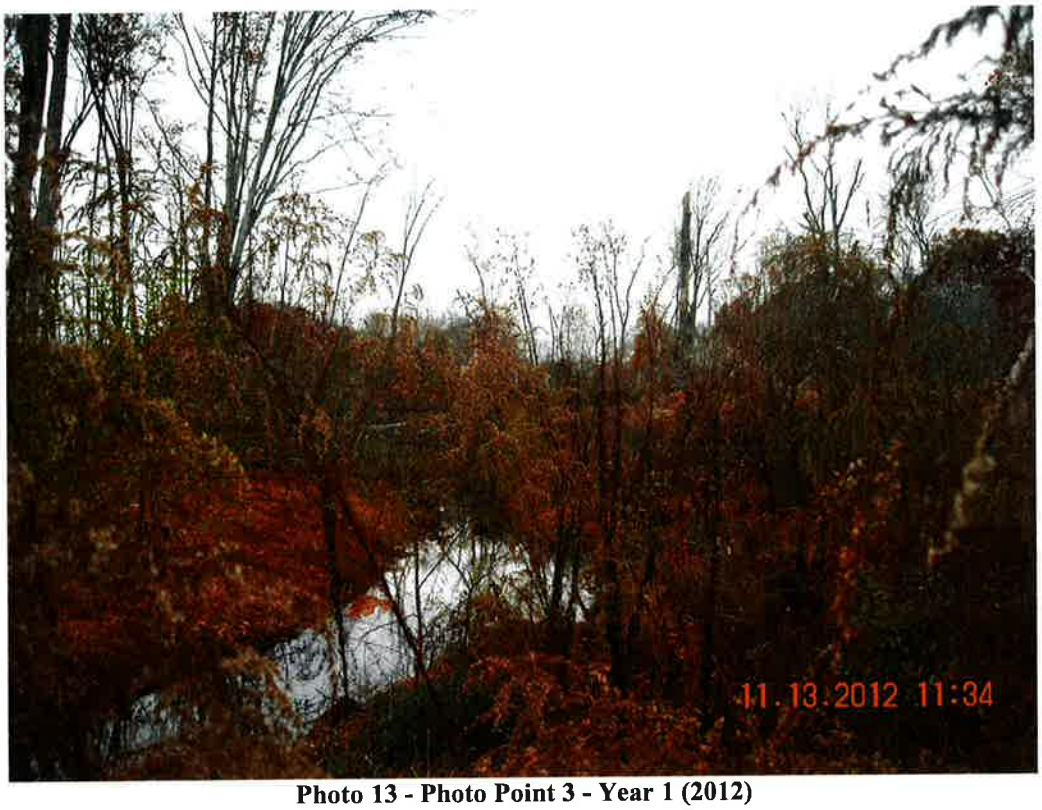


Photo 13 - Photo Point 3 - Year 1 (2012)

Photo 14 - Photo Point 4 - Year 1 (2012)

Photo 15- Photo Point 5 - Year 1 (2012)

Photo 16 - Photo Point 6 - Year 1 (2012)

Photo 17 - Photo Point 7 - Year 1 (2012)

Appendix C
Vegetation Plot Data

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 woody 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	1	0.011478421	0.07%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	None	Pattern and Color	0	0	0

Table 7. Veg Plot Criteria Attainment

McKee Creek Project # 92573

Vegetation Plot ID	Vegetation Survival Threshold Met?
1	Yes
2	Yes
3	Yes
4	Yes

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

Report Prepared By	Daniel Wiebke
Date Prepared	41260.64791
database name	WithersRavenel-2012-A.mdb
database location	C:\Users\Daniel\Desktop
computer name	DANIEL-PC
file size	60686336
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	4

Table 9. Planted Stem Counts (Species by Plot with Annual Means)
McKee Creek Project # 92573

	Common Name	Type	Current Data					Annual Means	
			Plot 1	Plot 2	Plot 3	Plot 4	Current Mean	MY 2 (2013)	
			P	P	P	P	P	P	T
Acer negundo	Box Elder		0	0	0	0	0		
Betula nigra	River Birch	Tree	1	0	2	0	0.75		
Carya aquatica	Water Hickory		0	2	0	0	0.5		
Diospyrus virginiana	Persimmon		0	0	0	0	0		
Eleagnus umbellata	Autumn Olive		0	0	0	0	0		
Fraxinus pennsylvanica	Green Ash	Tree	0	3	1	0	1		
Juglans nigra	Black Walnut	Tree	6	0	0	1	1.75		
Liquidambar styraciflua	Sweetgum		0	0	0	0	0		
Liriodenron tulipifera	Tulip Poplar	Tree	0	0	1	2	0.75		
Plantanus	Sycamore	Tree	0	0	0	0	0		
Platanus occidentalis	American Sycamore	Tree	1	5	1	11	4.5		
Quercus michauxii	Swamp Chestnut Oak	Tree	0	0	4	0	1		
Quercus nigra	Water Oak		0	0	0	0	0		
Quercus sp.	Oak	Shrub Tree	0	0	2	0	0.5		
Rhus copallinum	Winged Sumac		0	0	0	0	0		
Salix nigra	Black Willow	Tree	2	0	0	7	2.25		
Ulmus alata	Winged Elm		0	0	0	0	0		
Unknown	Unknown	Unknown	0	0	1	3	1		
	Plot Area (acres)		0.0247	0.0247	0.0247	0.0247			
	Species Count		4	3	7	5	6.25		
	Stem Count		10	10	12	24	14		
	Stems Per Acre		405	405	486	972	567		

Appendix D
Stream Survey Data

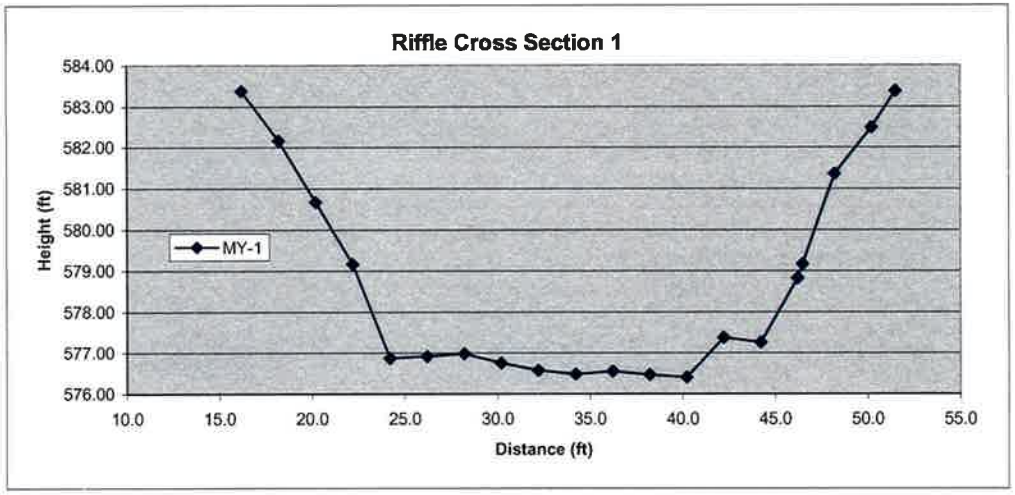
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	McKee MY-01
XS-ID	RXS-1
Drainage Area	6.42 sq. mi
Date	11/1/2012
Field Crew	D. Wiebke, D. Byrd

Summary Data	
Bankfull Elevation	579.248
Bankfull Cross-Sectional Area	53
Bankfull Width	24.27
Flood Prone Area Elevation	581.928
Flood Prone Width	32
Max Depth at Bankfull	2.76
Mean Depth at Bankfull:	1.89
W/D Ratio:	12.82
Entrenchment Ratio:	1.32
Bank Height Ratio:	2.53

Left Bank to Right Bank

Station	Elevation
16.2	583.38
18.2	582.17
20.2	580.67
22.2	579.17
24.2	576.88
26.2	576.93
28.2	576.99
30.2	576.76
32.2	576.58
34.2	576.49
36.2	576.56
38.2	576.47
40.2	576.41
42.2	577.38
44.2	577.26
46.2	578.83
46.5	579.17
48.2	581.36
50.2	582.49
51.5	583.38



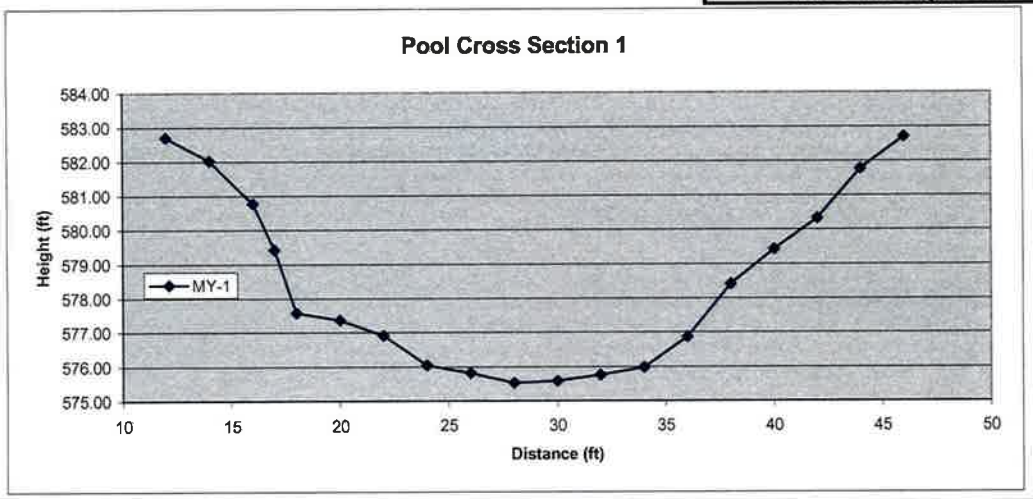
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	McKee MY-01
XS-ID	PXS-1
Drainage Area	6.42 sq. mi
Date	11/1/2012
Field Crew	D. Wiebke, D. Byrd

Station	Elevation
12	582.72
14	582.03
16	580.78
17.0	579.43
18	577.58
20	577.37
22	576.91
24	576.05
26	575.82
28	575.53
30	575.59
32	575.77
34	575.98
36	576.87
38	578.42
40	579.43
42	580.33
44	581.78
46	582.72

Summary Data	
Bankfull Elevation	579.43
Bankfull Cross-Sectional Area	63.68
Bankfull Width	22.53
Flood Prone Area Elevation	583.33
Flood Prone Width	110
Max Depth at Bankfull	3.9
Mean Depth at Bankfull:	2.45
W/D Ratio:	9.2
Entrenchment Ratio:	4.88
Bank Height Ratio:	1.84

Left Bank to Right Bank



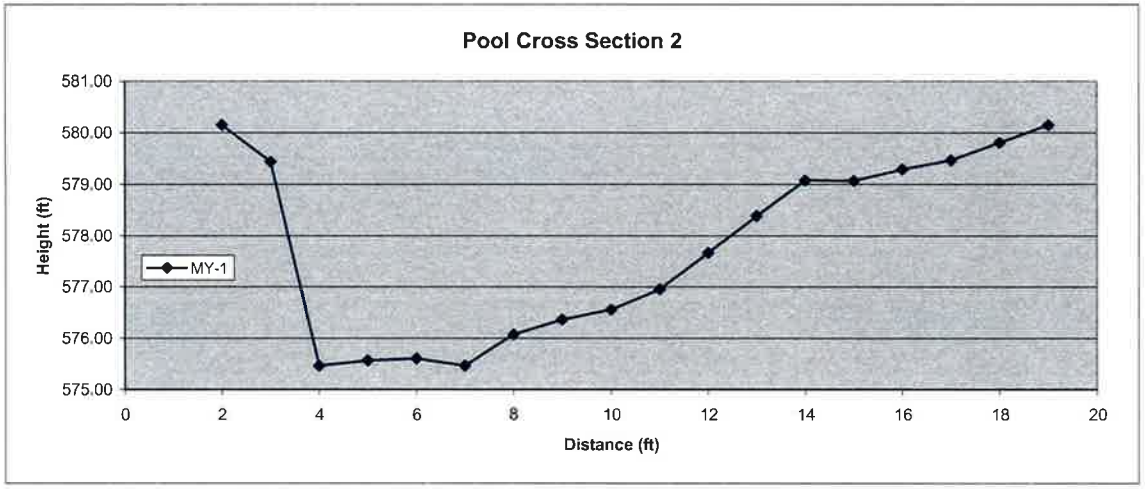
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	Clear MY-01
XS-ID	PXS-1
Drainage Area	0.95
Date	11/1/2012
Field Crew	D. Wiebke, D. Byrd

Station	Elevation
2	580.16
3	579.44
4	575.47
5	575.57
6	575.61
7	575.47
8	576.08
9	576.37
10	576.56
11	576.96
12	577.67
13	578.39
14	579.08
15	579.07
16	579.29
17	579.47
18	579.81
19	580.16

Summary Data	
Bankfull Elevation	579.44
Bankfull Cross-Sectional Area	30.61
Bankfull Width	17
Flood Prone Area Elevation	583.41
Flood Prone Width	150
Max Depth at Bankfull	3.97
Mean Depth at Bankfull:	2.55
W/D Ratio:	6.66
Entrenchment Ratio:	8.82
Bank Height Ratio:	1.18

Left Bank to Right Bank



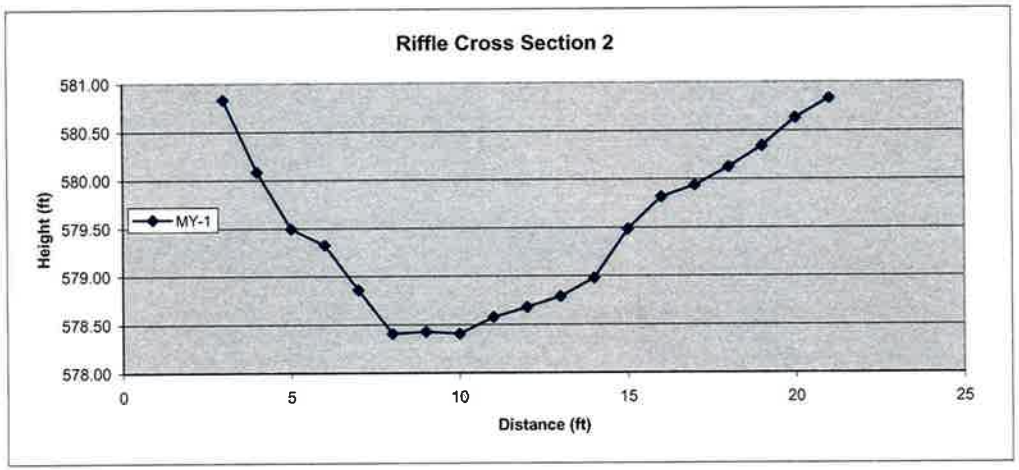
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	Clear MY-01
XS-ID	RXS-2
Drainage Area	0.95
Date	11/1/2012
Field Crew	D. Wiebke, D. Byrd

Station	Elevation
3	580.84
4	580.09
5	579.50
6	579.33
7	578.86
8	578.41
9	578.43
10	578.41
11	578.58
12	578.68
13	578.79
14	578.98
15	579.49
16	579.82
17	579.94
18	580.13
19	580.35
20	580.64
21	580.84

Summary Data	
Bankfull Elevation	580.84
Bankfull Cross-Sectional Area	25.85
Bankfull Width	18
Flood Prone Area Elevation	583.27
Flood Prone Width	150
Max Depth at Bankfull	2.43
Mean Depth at Bankfull:	1.36
W/D Ratio:	13.23
Entrenchment Ratio:	8.33
Bank Height Ratio:	1

Left Bank to Right Bank



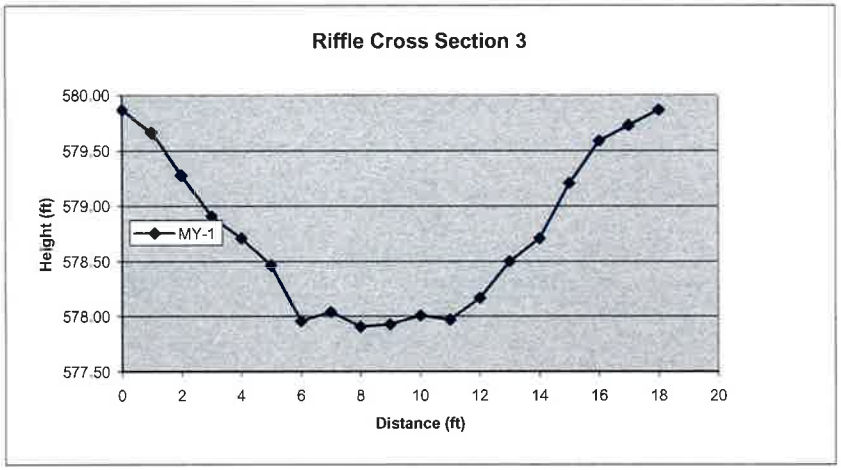
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	Clear MY-01
XS-ID	RXS-3
Drainage Area	0.95
Date	11/1/2012
Field Crew	D. Wiebke, D. Byrd

Station	Elevation
0	579.87
1	579.67
2	579.28
3	578.91
4	578.71
5	578.47
6	577.96
7	578.04
8	577.91
9	577.93
10	578.01
11	577.97
12	578.17
13	578.50
14	578.71
15	579.21
16	579.59
17	579.73
18	579.87

Summary Data	
Bankfull Elevation	579.87
Bankfull Cross-Sectional Area	21.02
Bankfull Width	17
Flood Prone Area Elevation	581.83
Flood Prone Width	250
Max Depth at Bankfull	1.96
Mean Depth at Bankfull:	1.11
W/D Ratio:	15.37
Entrenchment Ratio:	14.71
Bank Height Ratio:	1

Left Bank to Right Bank



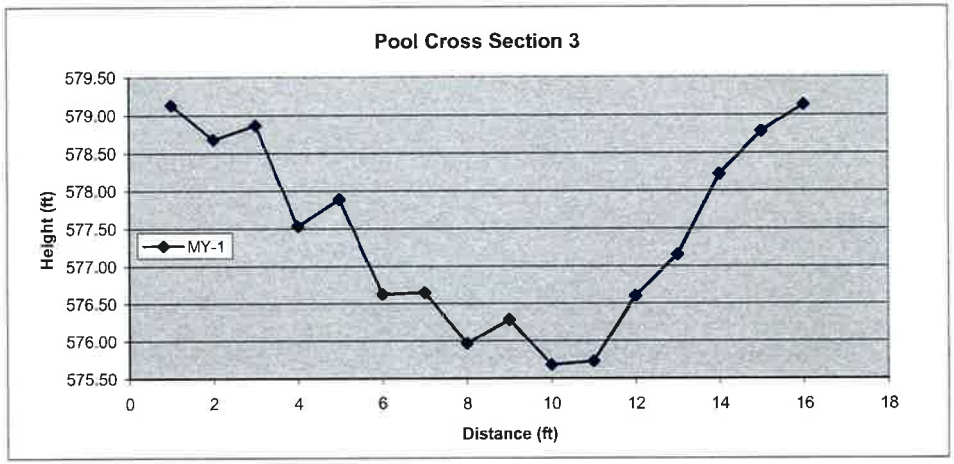
Cross-section Plot Exhibit

River Basin	Yadkin Pee-Dee
Watershed	Clear MY-01
XS-ID	PXS-3
Drainage Area	0.95
Date	11/1/2012
Field Crew	D. Wiebke, D. Byrd

Station	Elevation
1	579.14
2	578.68
3	578.87
4	577.53
5	577.89
6	576.63
7	576.65
8	575.97
9	576.29
10	575.68
11	575.73
12	576.61
13	577.16
14	578.22
15	578.78
16	579.14

Summary Data	
Bankfull Elevation	579.43
Bankfull Cross-Sectional Area	27.27
Bankfull Width	15
Flood Prone Area Elevation	582.89
Flood Prone Width	250
Max Depth at Bankfull	3.46
Mean Depth at Bankfull:	3.46
W/D Ratio:	8.8
Entrenchment Ratio:	16.67
Bank Height Ratio:	1

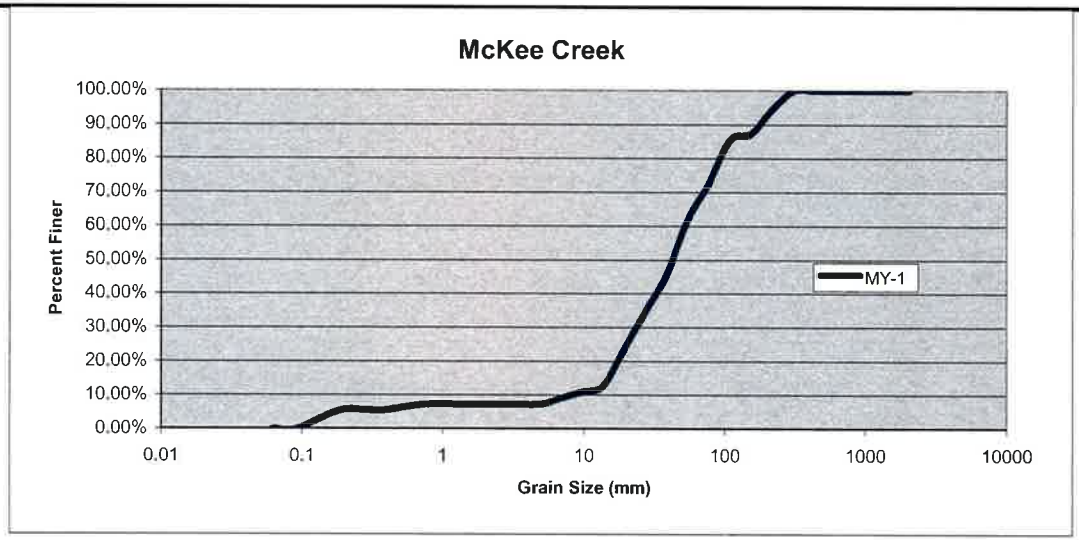
Left Bank to Right Bank

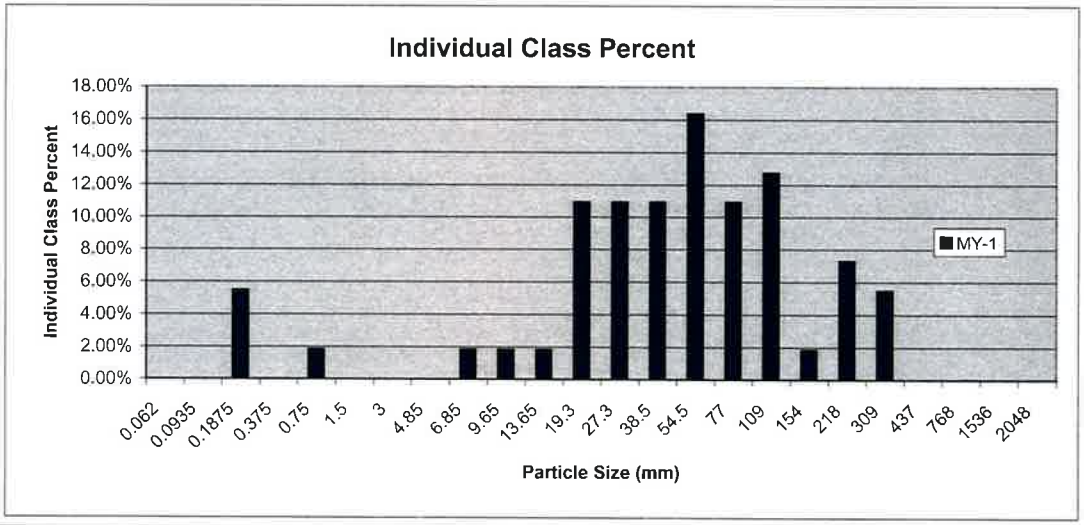


Pebble Count Exhibit

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	6	5.45%	5.45%
	0.375		0.00%	5.45%
	0.75	2	1.82%	7.27%
	1.5		0.00%	7.27%
Gravel	3		0.00%	7.27%
	4.85		0.00%	7.27%
	6.85	2	1.82%	9.09%
	9.65	2	1.82%	10.91%
	13.65	2	1.82%	12.73%
	19.3	12	10.91%	23.64%
	27.3	12	10.91%	34.55%
	38.5	12	10.91%	45.45%
	54.5	18	16.36%	61.82%
Cobble	77	12	10.91%	72.73%
	109	14	12.73%	85.45%
	154	2	1.82%	87.27%
	218	8	7.27%	94.55%
Boulder	309	6	5.45%	100.00%
	437		0.00%	100.00%
	768		0.00%	100.00%
	1536		0.00%	100.00%
Bedrock	2048		0.00%	100.00%
Total		110	100.00%	

Summary Data	
D50	38.5
D84	109
D95	309

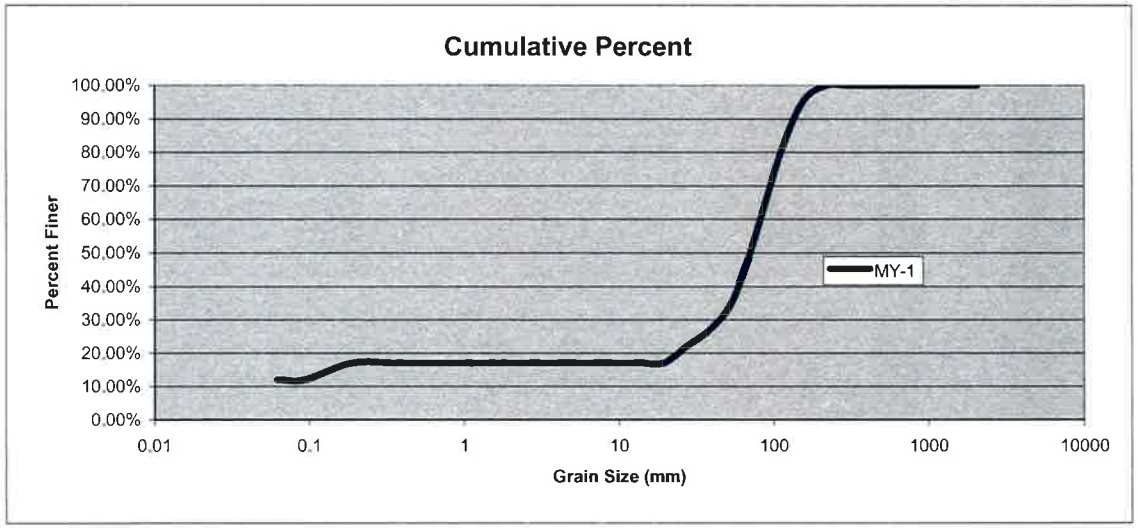


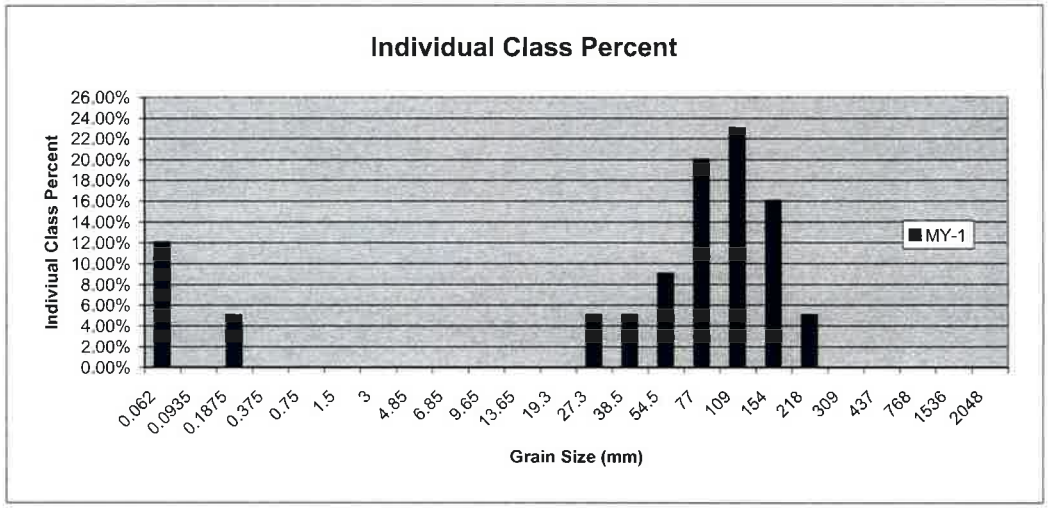


Pebble Count Exhibit

Mckee Creek Stream Resotration				
Clear Creek Upstream				
Riffle				
Particle	**Size**	**Count**	**Percent**	**Cumulative Percent**
Silt Clay	0.062	12	12.00%	12.00%
Sand	0.0935		0.00%	12.00%
	0.1875	5	5.00%	17.00%
	0.375		0.00%	17.00%
	0.75		0.00%	17.00%
	1.5		0.00%	17.00%
Gravel	3		0.00%	17.00%
	4.85		0.00%	17.00%
	6.85		0.00%	17.00%
	9.65		0.00%	17.00%
	13.65		0.00%	17.00%
	19.3		0.00%	17.00%
	27.3	5	5.00%	22.00%
	38.5	5	5.00%	27.00%
	54.5	9	9.00%	36.00%
Cobble	77	20	20.00%	56.00%
	109	23	23.00%	79.00%
	154	16	16.00%	95.00%
	218	5	5.00%	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		100	100.00%	

Summary Data	
D50	77
D84	154
D95	154

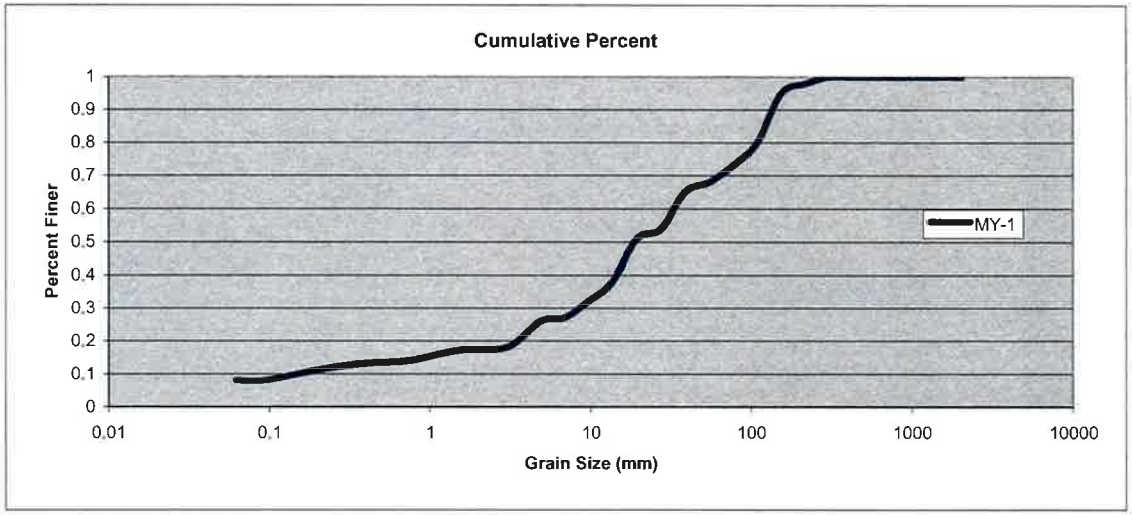


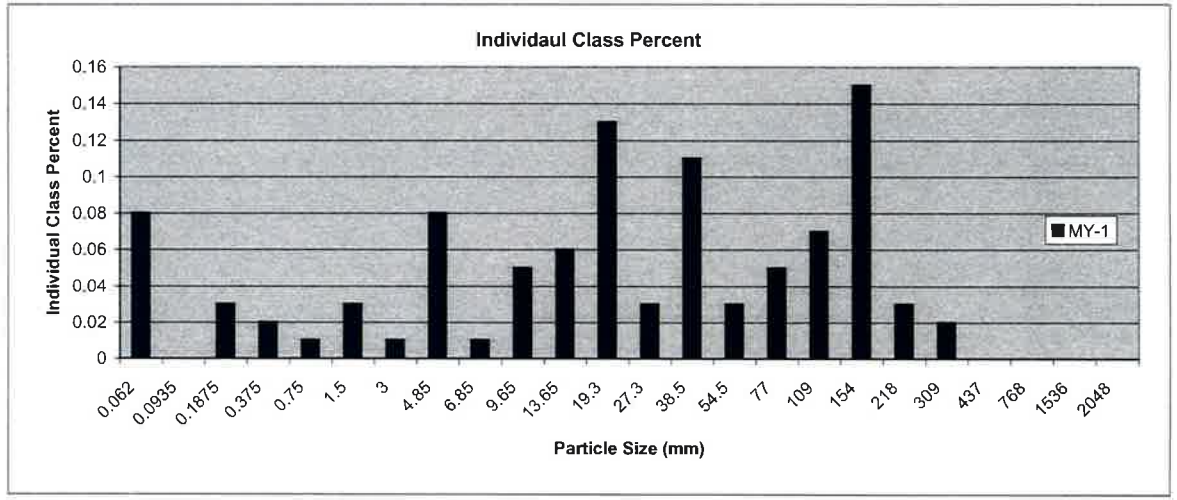


Pebble Count Exhibit

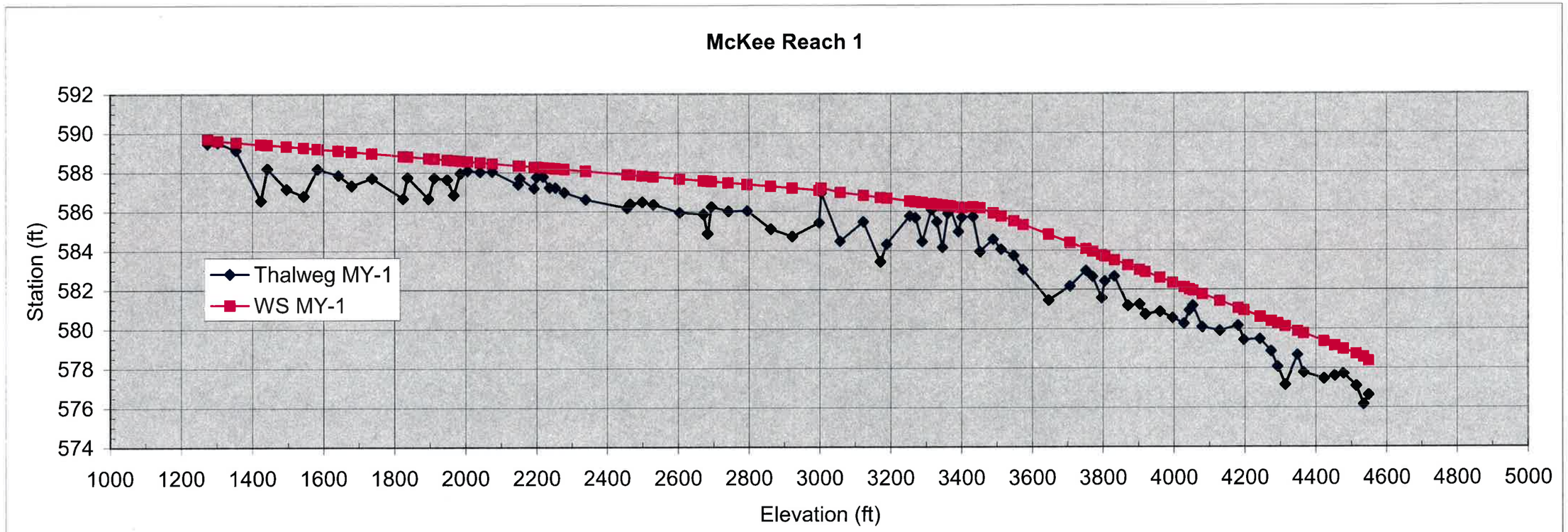
Mckee Creek Stream Restoration				
Clear Creek Downstream				
Riffle				
Particle	Size	Count	Percent	Cumulative Percent
Silt Clay	0.062	8	0.08	0.08
Sand	0.0935		0.00%	8.00%
	0.1875	3	3.00%	11.00%
	0.375	2	2.00%	13.00%
	0.75	1	1.00%	14.00%
	1.5	3	3.00%	17.00%
Gravel	3	1	1.00%	18.00%
	4.85	8	8.00%	26.00%
	6.85	1	1.00%	27.00%
	9.65	5	5.00%	32.00%
	13.65	6	6.00%	38.00%
	19.3	13	13.00%	51.00%
	27.3	3	3.00%	54.00%
	38.5	11	11.00%	65.00%
	54.5	3	3.00%	68.00%
Cobble	77	5	5.00%	73.00%
	109	7	7.00%	80.00%
	154	15	15.00%	95.00%
	218	3	3.00%	98.00%
Boulder	309	2	2.00%	100.00%
	437		0.00%	100.00%
	768		0.00%	100.00%
	1536		0.00%	100.00%
Bedrock	2048		0.00%	100.00%
Total		100	100.00%	

Summary Data	
D50	19.3
D84	154
D95	154

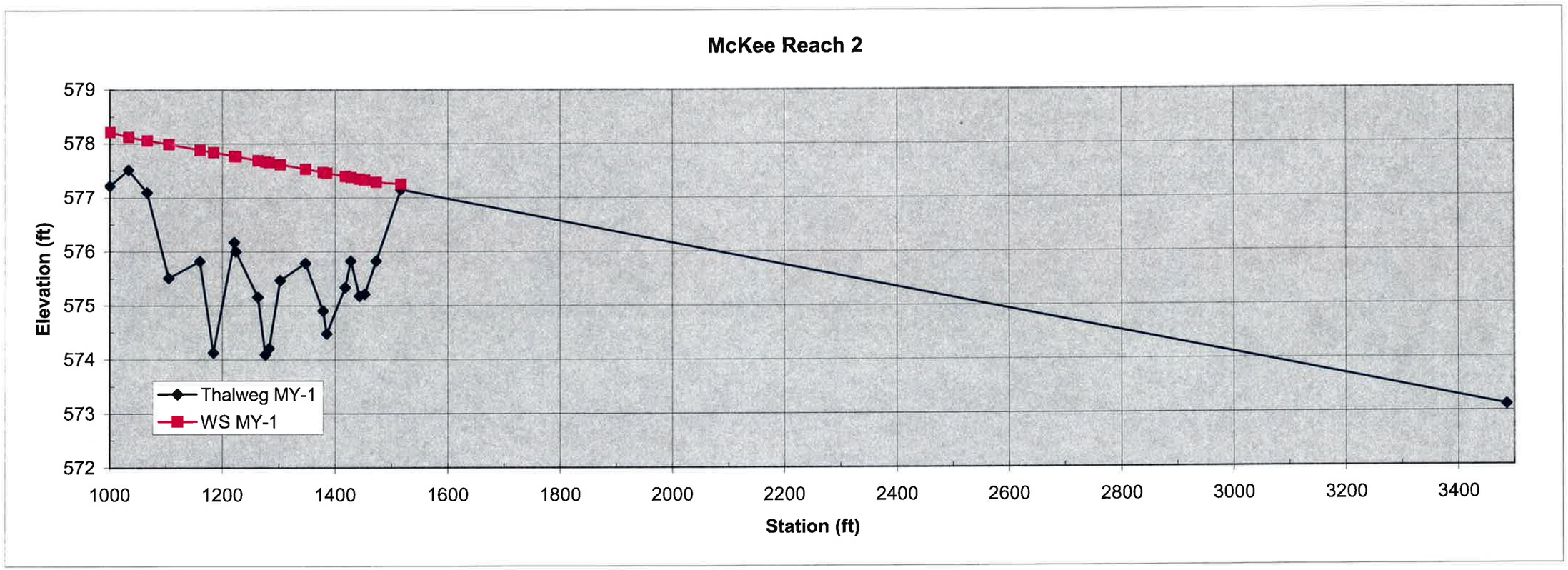




Longitudinal Profile Plot



Longitudinal Profile Plot



Longitudinal Profile Plot

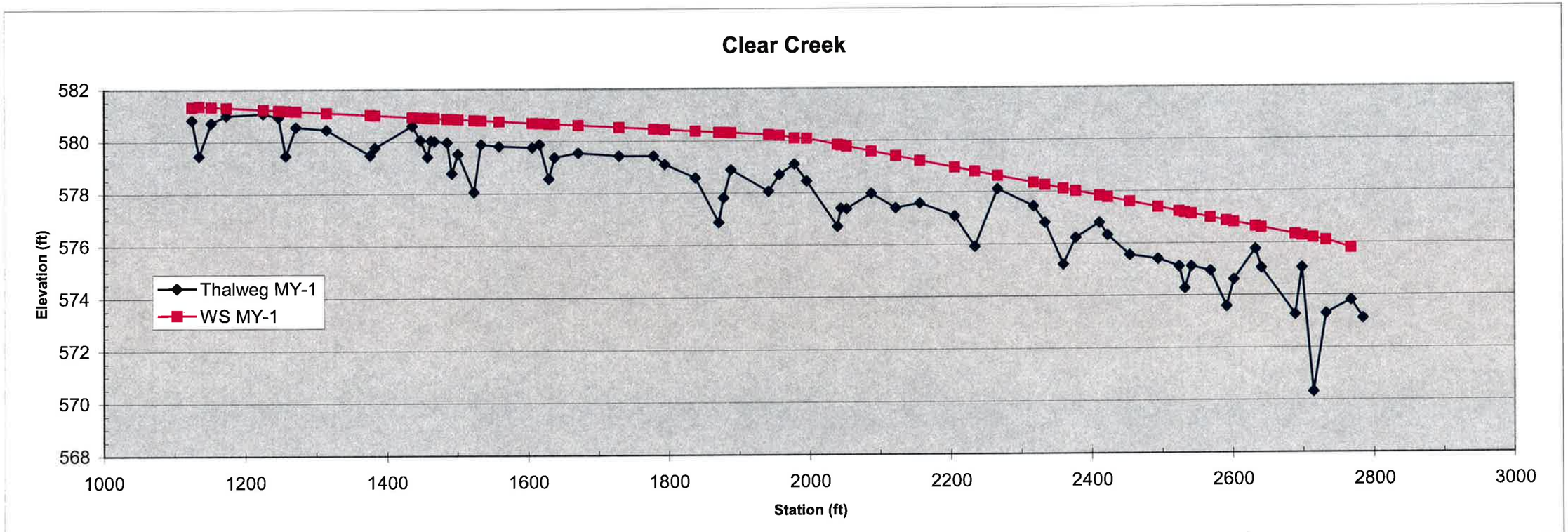


Table 10a. Baseline Stream Data Summary
McKee Creek Project # 92573 - Mckee-Reach 1

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 - rate).

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

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

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

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-constrution 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							582.7							580.8					
Bankfull Width (ft)		24.27							22.53							18					
Floodprone Width (ft)		160							160							150					
Bankfull Mean Depth (ft)		1.89							2.45							1.36					
Bankfull Max Depth (ft)		2.76							3.9							2.43					
Bankfull Cross Sectional Area (ft2)		53							63.68							30.61					
Bankfull Width/Depth Ratio		12.82							9.2							13.23					
Bankfull Entrenchment Ratio		6.59							7.1							8.82					
Bankfull Bank Height Ratio		2.53							1.84							1					
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 6 (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							579.9							579.1					
Bankfull Width (ft)		17							17							15					
Floodprone Width (ft)		150							250							250					
Bankfull Mean Depth (ft)		2.55							1.11							1.7					
Bankfull Max Depth (ft)		3.97							1.96							3.46					
Bankfull Cross Sectional Area (ft2)		30.61							21.02							27.27					
Bankfull Width/Depth Ratio		6.66							15.37							8.8					
Bankfull Entrenchment Ratio		8.82							14.71							16.67					
Bankfull Bank Height Ratio		1.18							1							1					
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 datu
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 consist
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)								24.7				1																								
Floodprone Width (ft)								160				1																								
Bankfull Mean Depth (ft)								1.89				1																								
1Bankfull Max Depth (ft)								2.76				1																								
Bankfull Cross Sectional Area (ft2)								53				1																								
Width/Depth Ratio								12.82				1																								
Entrenchment Ratio								6.59				1																								
1Bank Height Ratio								2.53				1																								
Profile																																				
Riffle Length (ft)							10	32.2	34	44	13.54	5																								
Riffle Slope (ft/ft)							-0.049	-0.003	0.012	0.028	0.035	5																								
Pool Length (ft)							24	36.6	39	55	12.74	5																								
Pool Max depth (ft)							1.242	2.386	2.187	3.287	0.423	5																								
Pool Spacing (ft)							45	178.8	206	267	87.81	5																								
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																												
Channel Thalweg length (ft)								1422																												
Sinuosity (ft)								1.39																												
Water Surface Slope (Channel) (ft/ft)								0.0026																												
BF slope (ft/ft)								0.0026																												
3Ri% / Ru% / P% / G% / S%																																				
3SC% / Sa% / G% / C% / B% / Be%							**0**	**7.27**	**54.55**	**21.82**	**5.45**	**0**																								
3d16 / d35 / d50 / d84 / d95 /							**19.3**	**38.5**	**54.5**	**109**	**309**																								
2% of Reach with Eroding Banks								10																												
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
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)																																				
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																								
Pool Max depth (ft)							2	3	3	4	1	6																								
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																													
Channel Thalweg length (ft)							3274																													
Sinuosity (ft)							1.12																													
Water Surface Slope (Channel) (ft/ft)							0.0019																													
BF slope (ft/ft)							0.0019																													
3Ri% / Ru% / P% / G% / S%																																				
3SC% / Sa% / G% / C% / B% / Be%																																				
3d16 / d35 / d50 / d84 / d95 /																																				
2% of Reach with Eroding Banks							0																													
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 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																								
Floodprone Width (ft)							150	200		250		2																								
Bankfull Mean Depth (ft)							1.11	1.23		1.36		2																								
1Bankfull Max Depth (ft)							1.96	2.19		2.43		2																								
Bankfull Cross Sectional Area (ft2)							21.02	23.44		25.85		2																								
Width/Depth Ratio							13.23	14.29		15.37		2																								
Entrenchment Ratio							8.333	11.52		14.71		2																								
1Bank Height Ratio							**1**	**1**		**1**		**2**																								
Profile																																				
Riffle Length (ft)							12	16.5	18	22	4	6																								
Riffle Slope (ft/ft)							0	0.021	0	0	0	6																								
Pool Length (ft)							15	35.09	33	66	17	13																								
Pool Max depth (ft)							1.502	2.297	2	6	1	16																								
Pool Spacing (ft)							26	105	98	189	55	8																								
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																													
Channel Thalweg length (ft)							1660																													
Sinuosity (ft)							1.19																													
Water Surface Slope (Channel) (ft/ft)							0.0033																													
BF slope (ft/ft)							**0.0033**																													
3R% / Ru% / P% / G% / S%																																				
3SC% / Sa% / G% / C% / B% / Be%							**10**	**7**	**35**	**47**	**1**	**0**																								
3d16 / d35 / d50 / d84 / d95 /							**1.5**	**27.3**	**38.5**	**109**	**154**																								
2% of Reach with Eroding Banks							**0.01**																													
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 Crest Gauge Readings			
Gauge	**Year**	**WSE**	**Bankfull**
CG1	MY1-2012	581.2	Over Bf
CG2	MY1-2012	580.8	Slightly below Bf
CG3	MY1-2012	576.8	~Bf