As-built Baseline Monitoring Report

Stony Fork Restoration Site
Upper Neuse River Basin - 03020201
Monitoring Year 00
DMS Contract 6830
DMS Project Number 97085

DWR #: 2016-0372
USACE Action ID: 2016-00875
Johnston County, North Carolina

Prepared for:
NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699

Baseline Data Collected: May 2019
Date Submitted: July 2019

Monitoring and Design Firm

Prepared by:

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Suite 400
Raleigh, NC 27609
(919) 783-9214

Project Contact: Tim Morris
Email: tim.morris@kci.com

June 2019

KCI ASSOCIATES OF NORTH CAROLINA, PA

ENGINEERS • SCIENTISTS • SURVEYORS • CONSTRUCTION MANAGERS
4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 (919) 783-9214 (919) 783-9266 Fax

MEMORANDUM

Date: August 7, 2019
To: Lindsay Crocker, DMS Project Manager
From: Adam Spiller, Project Manager
KCI Associates of North Carolina, PA
Subject: MY-00 Monitoring Report Comments
Stony Fork DMS #6830, Contract 006830
Neuse River Basin CU 030202018
Johnston County, North Carolina

Please find below our responses in italics to the MY-00 Monitoring Report comments from NCDMS received on August 5, 2019, for the Stony Fork Restoration Site.

As-Built Drawing Comments:

- Vegetation: the table of planted species in the as-built drawings doesn't match some of the shown planted vegetation on Table 6. Please update the table on as-built drawings to include additional planted (and red-line additional spp. as necessary).
  - *This As-built drawings have been updated to reflect the actual number and species that were planted at the site. In addition, several stems classified as planted stems in Table 6 have been re-classified as volunteers.*

Baseline/MY0 Comments:

- Cover Page, Add the River Basin and 8-digit CU number
  - *This change has been made.*

- Page 1, last paragraph: Pressure transducer or camera is missing on SF3. Is the crest gauge there serving as a surrogate to provide bankfull info in lieu of flow gauge?
  - *The stream gauge on SF3 is a pressure transducer, like those measuring flow on the tributaries. While the data collected from this gauge could be used to determine flow, it is currently only being interpreted to provide verification of bankfull events. The text of the report has been updated to make this clearer.*

- Page 2, second paragraph: the vegetative success for stream buffer and riparian buffer success criteria are intermingled. Please provide sentences separating the two success criterium for clarity. Also, insert the other parameters for success from the Mitigation Plan, including flow requirements and <10% change for riffles to be comprehensive and ensure that they match (check bankfull event success). You may directly copy and paste the success criteria (7.0) from the Mitigation Plan or reference the Mitigation Plan if easier.
  - *This change has been made.*

- Vegetation Table 5: see comment on As-Built drawings above. Please provide number of stems and species planted to include as a separate table in the baseline report also.
  - *This change has been made.*

- Page 25, check riffle slope in the profile section, max-min appears to be swapped.
  - *Tables 7a through 7h were reviewed and no cases of max-min being swapped were found.*

- Long-pro: can you overlay design thalweg? This appears to show in the legend on a few reaches, but it not visible.
  - *This change has been made.*

- Table 1. Please re-name the 'Restoration Footage' column to 'As-Built Restoration Footage.' Provide a column to the left of 'Restoration Footage' that shows the 'MP Restoration Footage' (DMS understands there are slight differences on SF2 and SF3). Make a footnote that project credits are based on Mitigation Plan credits. There is a lot of confusion as to what the IRT would like to use for crediting, and DMS would like to make the numbers as visually clear as possible.
  - *This change has been made. The Project Components table on the As-built drawings has also been updated to reflect the correct number of credits.*

Electronic Deliverables:

- Need asset shapefiles. Stream asset should be attributed by reach name and restoration approach. Riparian buffer shapefiles should be attributed by restoration approach (R, E, P) and broken out to show width if the credit ratio is different (i.e. buffer restoration TOB-100, restoration 101-200'). These asset segments should essentially match the submitted segments in Table 1.
  - *This change has been made.*

- Need TOB feature and planted area.
  - *This change has been made.*

- Ensure all shapefiles are submitted in NAD 83 (State Plane). Currently, these are GCS for the monitoring features.
  - *This change has been made.*

Sincerely,

Adam Spiller
Project Manager

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PROJECT SUMMARY

The Stony Fork Restoration Site (SFRS) was completed in May 2019 and restored a total of 6,810 linear feet of stream and 949,747 square feet of riparian buffer under the Neuse Buffer Rule (NCAC Rule 15A 02B.029). The SFRS is a riparian system in the Upper Neuse River Basin (03020201 8-digit cataloging unit) in Johnston County, North Carolina. The site's natural hydrologic regime had been substantially modified through the relocation and straightening of the existing stream channels, impacted by land clearing, and cleared of any riparian buffer. This completed project will restore impacted agricultural and timber lands to a stable stream ecosystem with a functional riparian buffer and floodplain access.

The SFRS is protected by a 24.4 acre permanent conservation easement, held by the State of North Carolina. The site is located approximately 5.5 miles north of Benson, NC. Specifically, the site is 0.2 mile west on Elevation Road from its intersection with Federal Road (SR-1331).

The North Carolina Ecosystem Enhancement Program (NCEEP) published the Neuse River Basin Priorities in 2010. These were updated in for the Neuse 01 cataloging unit (CU) in 2015 due to extensive mitigation needs and changes in watershed conditions since 2010. The project 14 digit CU 03020201150010) was identified as a Targeted Local Watershed (TLW) in the updated priorities. The goals and priorities for the SFRS are based on the information presented in the Neuse River Basin Restoration Priorities: maintaining and enhancing water quality, restoring hydrology, and improving fish and wildlife habitat (NCEEP, 2009). The project will support the following basin priorities:

- Managing stormwater runoff
- Improving/restoring riparian buffers
- Reducing sediment loading
- Improving stream stability

The goals for the project are to:

- Restore channelized and agriculture impacted streams to stable C/Cb channels.
- Restore a forested riparian buffer to provide bank stability, filtration, and shading.

The project goals will be addressed through the following objectives:

- Relocate a channelized stream to its historic landscape position.
- Install cross-sections sized to the bankfull discharge.
- Create bedform diversity with pools, riffles, and habitat structures
- Plant the site with native trees and shrubs and an herbaceous seed mix.

Project planting and construction were completed in May 2019. The SFRS involved restoration and establishment of a functioning stream ecosystem with 6,810 linear feet of stream restored by re-meandering the stream and by tying the bankfull elevation to the historic floodplain where feasible. The entire site was planted to establish a forested riparian buffer. The site was constructed as designed with no major modifications from the design plan. The monitoring components were installed in May 2019. Four automatically recording pressure transducer stream gauges that take a reading every 10 minutes were installed in the upper third of T1, T1-A, T2 and T3 to document flow within those reaches. Cameras were installed in the vicinity of each of these gauges and set to record a short video once a day to provide additional verification of flow. An additional automatically recording pressure transducer stream gauge was installed near the bottom of the main stem (SF3) to record the occurrence of bankfull events. To determine the success of the planted mitigation areas, seven 10 m x 10 m permanent vegetation monitoring plots were established. An additional five 10 m x 10 m random vegetation monitoring plots were sampled as well. The locations of the planted stems relative to the origin were recorded within the permanent plots and the species and height of each planted stem were recorded for all plots. Any volunteers found within the plots were also grouped into size categories by species, but separate from the planted stems. Twelve permanent photo

reference points were established and will be taken annually. Sixteen permanent cross-sections (eight riffle cross-sections and eight pool cross-sections) were also established and a detailed longitudinal profile of the stream was taken. Wolman pebble counts were performed at all of the riffle cross-sections. The cross-section measurements will be repeated in future monitoring years, but the longitudinal profile will only be repeated if there are concerns about bed elevation adjustments. Reports will be submitted to DMS each year and the first year of monitoring will take place in 2019. First year monitoring data is scheduled to be collected in November 2019, six months after baseline data collection.

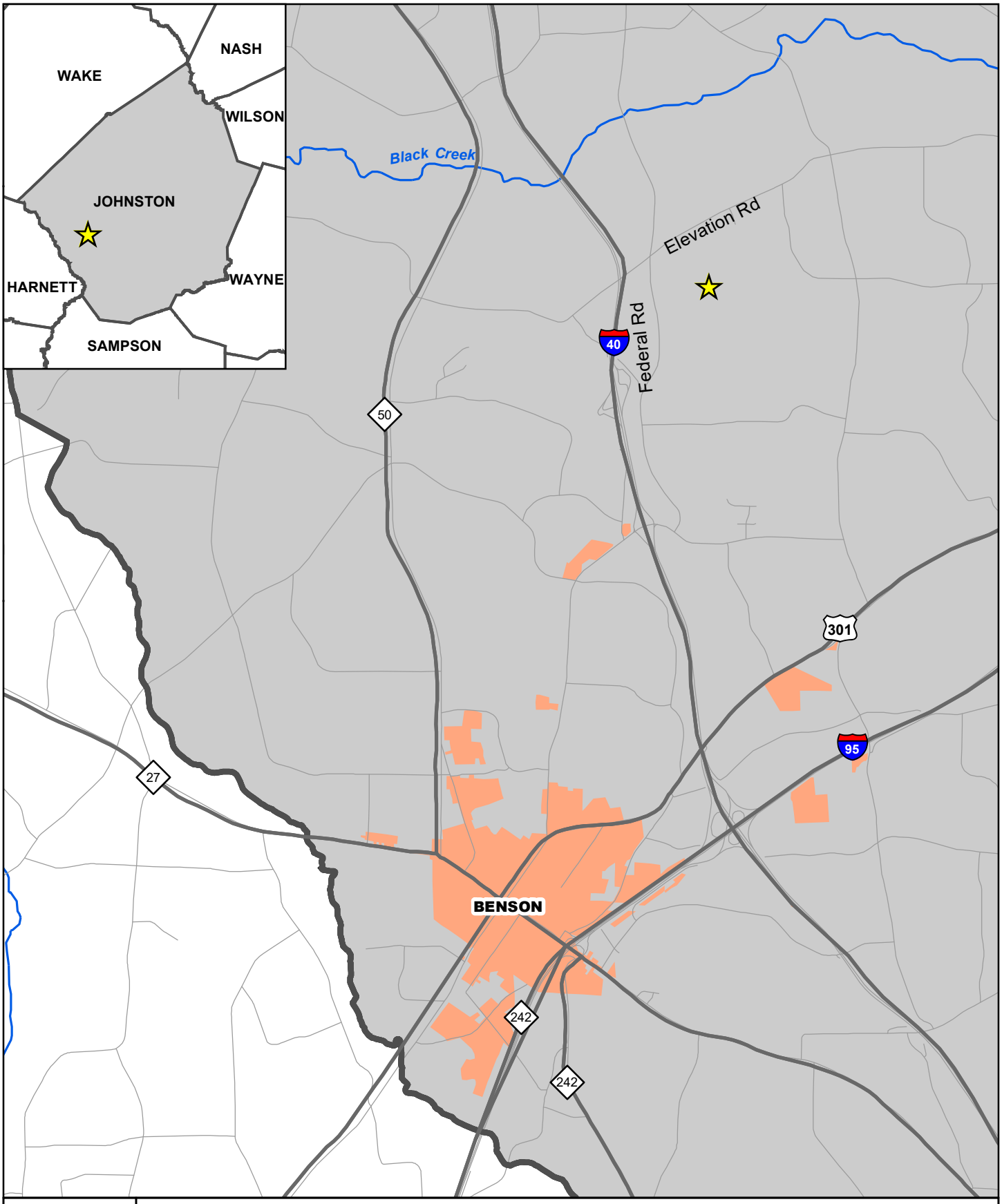
Vegetative success criteria for the stream mitigation is 260 woody stems/acre after five years, and 210 woody stems/acre after seven years. Trees in each plot must average seven feet in height at Year 5 and ten feet in height at Year 7. Volunteer species must be present for a minimum of two growing seasons and must be a species from the approved planting list to count toward vegetative success. A single species may not account for more than 50% of the required number of stems within any plot. A minimum of four bankfull events must also be recorded during the monitoring period. All project streams must show a minimum of 30 continuous days of flow within a calendar year for three out of the first four years of monitoring. Bank height ratios (BHR) should not exceed 1.2 and the entrenchment ratios (ER) should be 2.2 or greater. BHR and ER at any measured riffle cross-section should not change more than 10% from the baseline condition during any given monitoring interval (e.g. no more than 10% between years 1 and 2, 2 and 3, 3 and 5, or 5 and 7). Visual assessments will also be used to identify problem areas.

Vegetative success criteria for the areas proposed for riparian buffer credit is 260 woody stems/acre at the end of five years of monitoring. Trees in each plot must average seven feet in height at Year 5. There should be a minimum of four native hardwood tree species, with no species greater than 50% of the stems. Volunteer species must be from the approved planting list to count toward vegetative success.

BASELINE CONDITIONS

The site was planted in May 2019 with tree tube protection installed around approximately 1 out of every 14 of the planted stems. The baseline conditions monitoring was conducted May 6 through 15, 2019. The average plot stem density from the twelve surveyed plots is 1,523 planted stems/acre. Baseline monitoring was conducted during dormancy, so most of the stems were not identified to species. During MY01, these trees will be identified to species.

The baseline survey found that the stream was constructed as designed and all structures were installed as planned with small variations called out in the as-built plans. The profile and cross-section survey found that the dimension and profile of the stream are as designed, with some small variation as is typical for stream restoration projects.



KCI ASSOCIATES OF NC

FIGURE 1. VICINITY MAP, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

REFERENCES

NCDENR, Ecosystem Enhancement Program. 2010. Neuse River Basin Restoration Priorities 2009. Raleigh, NC. Last accessed 5/2019 at: https://files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Neuse_River_Basin/FINAL%20RBRP%20Neuse%202010_%2020111207%20CORRECTED.pdf9

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Stream and Wetland Mitigation Monitoring Guidelines. Last accessed 1/2016 at: http://portal.ncdenr.org/c/document_library/get_file?p_l_id=60409&folderId=18877169&name=DLFE-86604.pdf

NCDENR, Ecosystem Enhancement Program. 2014. Stream and Wetland Mitigation Monitoring Guidelines. Last accessed 6/2015 at: http://portal.ncdenr.org/c/document_library/get_file?p_l_id=60409&folderId=18877169&name=DLFE-86606.pdf

APPENDIX A

Background Tables

Table 1. Project Components and Mitigation Credits
Stony Fork Restoration Site, DMS Project #97085

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer		Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE	R	RE		
Linear Feet/Acres	6,405	405					450,285 sf	499,462 sf		
Credits	6,405	181					425,434	59,904		
TOTAL CREDITS	**6,586**						**480,338**			

Project Components

Project Component -or- Reach ID	Stationing/ Location	Existing Footage/ Square Footage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	MP Restoration Footage*	As-built Restoration Footage	Mitigation Ratio
SF1	10+00 – 21+55	1,235	PI/PII	R	1,155	1,155	1:1
SF2	21+55 – 49+54	2,453	PI	R	2,707**	2,714**	1:1
SF3	49+54 – 56+08	618	PI	R	624**	624**	1:1
T1	100+00 – 105+10	365	PI/PII	R	510	510	1:1
T1A	150+00 – 151+59	47	PI/PII	R	159	159	1:1
T2-1	200+00 – 203+34	327	N/A	EII	334	334	2.5:1
T2-2	203+34 – 206+71	326	PI/PII	R	337	337	1:1
T2-3	206+71 – 215+26	780	PI/PII	R	855	855	1:1
T3-1	300+00 – 300+71	72	PI/PII	EI	71	71	1.5:1
T3-2	300+71 – 301+29	82	PI/PII	R	58	58	1:1
Buffer Restoration TOB to 100’	N/A	413,194	N/A	R	413,194	413,194	100%
Buffer Restoration 101-200’	N/A	37,091	N/A	R	37,091	37,091	33%
Buffer Enhancement TOB to 100’	N/A	74,802	N/A	E	74,802	74,802	50%
Buffer Preservation TOB to 100’	N/A	424,660	N/A	P	424,660	424,660	10%

*Mitigation Plan footage used for credit calculations. **Crossings have been removed from creditable linear footage for all project streams

Component Summation					
Restoration Level	**Stream (linear feet)**	**Riparian Wetlands (Acres)**		**Non-Riparian Wetlands (Acres)**	**Buffer (square feet)**
		Riverine	Non-Riverine		
Restoration	6,405				450,285
Enhancement					74,802
Enhancement I	71				
Enhancement II	334				
Creation					
Preservation					424,660 (175,029 allowable for credit)
High Quality Preservation					
TOTAL CREDITS	6,586				480,338

Table 2. Project Activity & Reporting History
Stony Fork Restoration Sites, DMS Project #97085

Activity or Report	Data Collection Complete	Actual Completion or Delivery
Mitigation Plan		Sept. 5, 2018
Final Design - Construction Plans		Oct. 15, 2018
Construction Grading Completed		May 3, 2019
Planting Completed		May 6, 2019
Baseline Monitoring/Report		July 2018
Vegetation Monitoring	May 9, 2019	
Stream Survey	May 15, 2019	

Table 3. Project Contacts Stony Fork Restoration Site, DMS Project #97085	
Design Firm	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
Construction Contractor Stony Fork and T3	Fluvial Solutions, Inc. PO Box 28749 Raleigh, NC 27611 Contact: Mr. Peter Jelenevsky Phone: (919) 605-6134
Construction Contractor T1, T1A, and T2	KCI Environmental Technologies and Construction 4505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512
Planting Contractor	Bruton Natural Systems, Inc. PO Box 1197 Fremont, NC 27830 Contact: Mr. Charlie Bruton Phone: (919)783-9214
Monitoring Performers	
	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table 4. Project Information Stony Fork Restoration Site, DMS Project #97085				
Project Name	Stony Fork Restoration Site			
County	Johnston County			
Project Area	24.4 acres			
Project Coordinates (lat. and long.)	35°26'55.0"N, 78°31'18.5"W			
Planted Acreage (acres of woody stems planted)	24.4 acres			
Project Watershed Summary Information				
Physiographic Province	Coastal Plain			
River Basin	Neuse			
USGS Hydrologic Unit 8-digit	03020201	**USGS Hydrologic Unit 14-digit**	03020201150010	
DWQ Sub-basin	03-04-04			
Project Drainage Area (acres)	497 acres			
Project Drainage Area Percentage of Impervious Area	5%			
CGIA Land Use Classification	Managed Herbaceous Cover 53% (262 ac), Mixed Hardwoods/Conifers 31% (150 ac), Low Density Developed 9% (42 ac), Medium Density Residential 5% (24 ac), Transportation/Impervious 3% (13 ac)			
Existing Reach Summary Information				
Parameters	**Stony Fork**	**T1 and T1A**	**T2**	**T3**
Length of reach (linear feet)	3,141	412	1,433	154
Valley confinement				
Drainage area (acres)	497	12	150	29
Perennial, Intermittent, Ephemeral	Perennial	Intermittent	Perennial	Intermittent
NCDWQ Water Quality Classification	C; NSW	C; NSW	C; NSW	C; NSW
Stream Classification (existing)	G4c	G4	G4	G4
Stream Classification (proposed)	C4	C4	C4	C4
Evolutionary trend (Simon)	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Modified with pond, Stage III
FEMA classification	None	None	None	None
Existing Wetland Summary Information				
Parameters				
Size of Wetland (acres)	0.33 (WA and WE)	0.06 (WB)	0.14 (WC and WF)	
Wetland Type	Headwater Forest	Bottomland Hardwood Forest	Non-Tidal Freshwater Marsh	
Mapped Soil Series	Gilead sandy loam	Bibb sandy loam	Bibb sandy loam	
Drainage class	Moderately Well Drained	Poorly Drained	Poorly Drained	
Soil Hydric Status	Non-hydric	Hydric	Hydric	
Source of Hydrology	Surface Water	Stream Floodplain	Stream Floodplain	
Restoration or Enhancement Method	N/A	N/A	N/A	

Table 4, continued			
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Yes	404 permit
Waters of the United States – Section 401	Yes	Yes	401 permit
Endangered Species Act	No	N/A	N/A
Historic Preservation Act	No	N/A	N/A
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	Yes	N/A
Essential Fisheries Habitat	No	N/A	N/A

APPENDIX B

Visual Assessment Data

Stream Mitigation

- R *(6,405 lf / 6,405 SMCs)*
- EI *(71 lf / 47 SMCs)*
- EII *(334 lf / 134 SMCs)*

Buffer Mitigation

- R 0-100' *(413,194 sf / 413,194 credits)*
- R 101-200' *(37,091 sf / 12,240 credits)*
- E *(74,802 sf / 37,401 credits)*
- P *(424,660 sf / 17,503 credits)*

- Project Easement
- Cross-Sections
- Photo Points
- Flow Gauge
- Camera
- Bankfull Gauge

Vegetation Monitoring Plots

- Success Criteria Met
- Success Criteria Not Met

Sheet 4
Sheet 3
Sheet 2
Sheet 1

T2-1
T2-2
T2-3
T1
T1A
T3-1
T3-2
SF1
SF2
SF3
R1
R2
R3
R4
R5
1331

0 155 310 Feet

CURRENT CONDITIONS PLANVIEW
STONY FORK RESTORATION SITE
JOHNSTON COUNTY, NC

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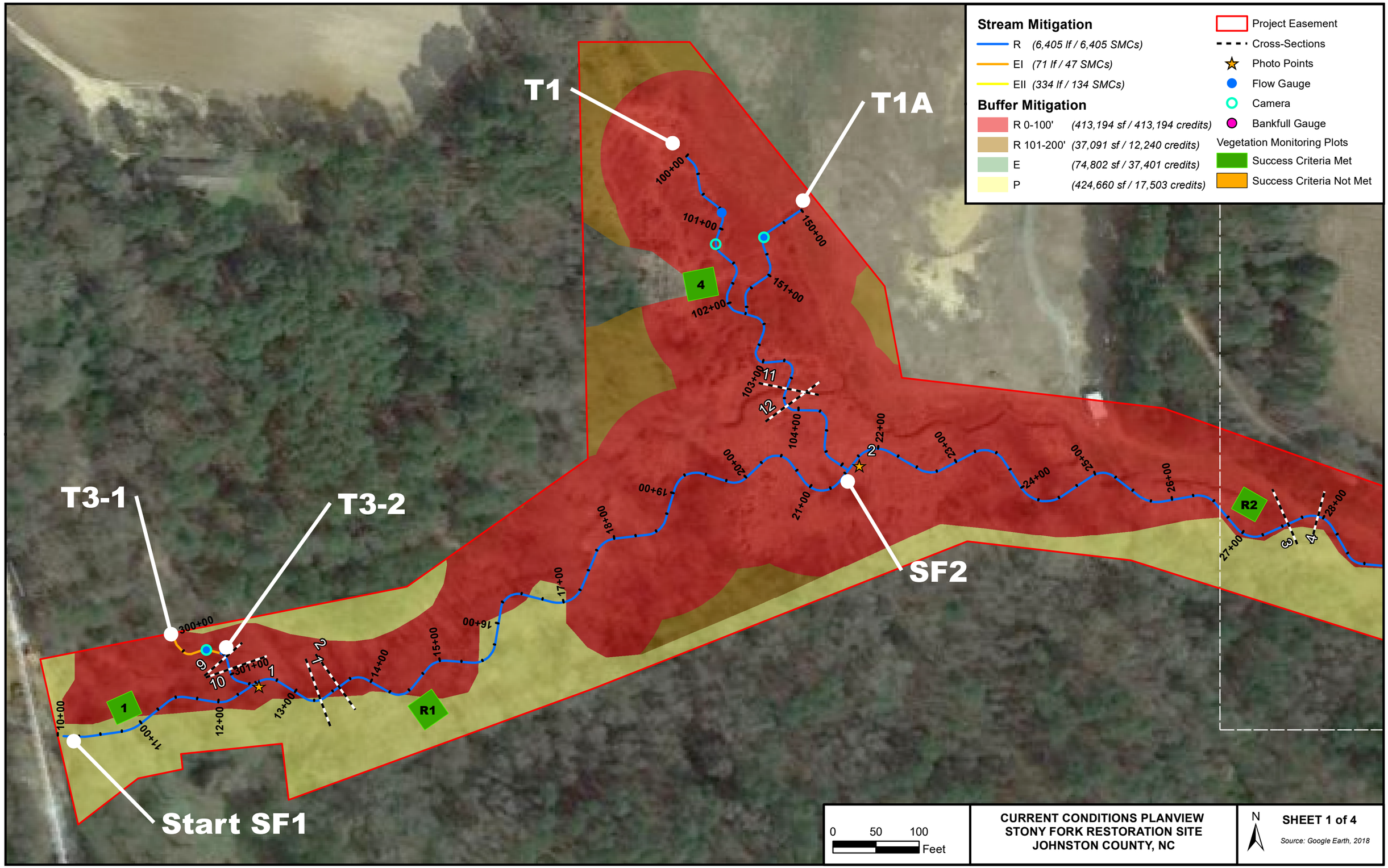
Overview

Source: Google Earth, 2018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T3-2
SF2
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R1
R2
Stream Mitigation
R (6,405 lf / 6,405 SMCs)
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CURRENT CONDITIONS PLANVIEW
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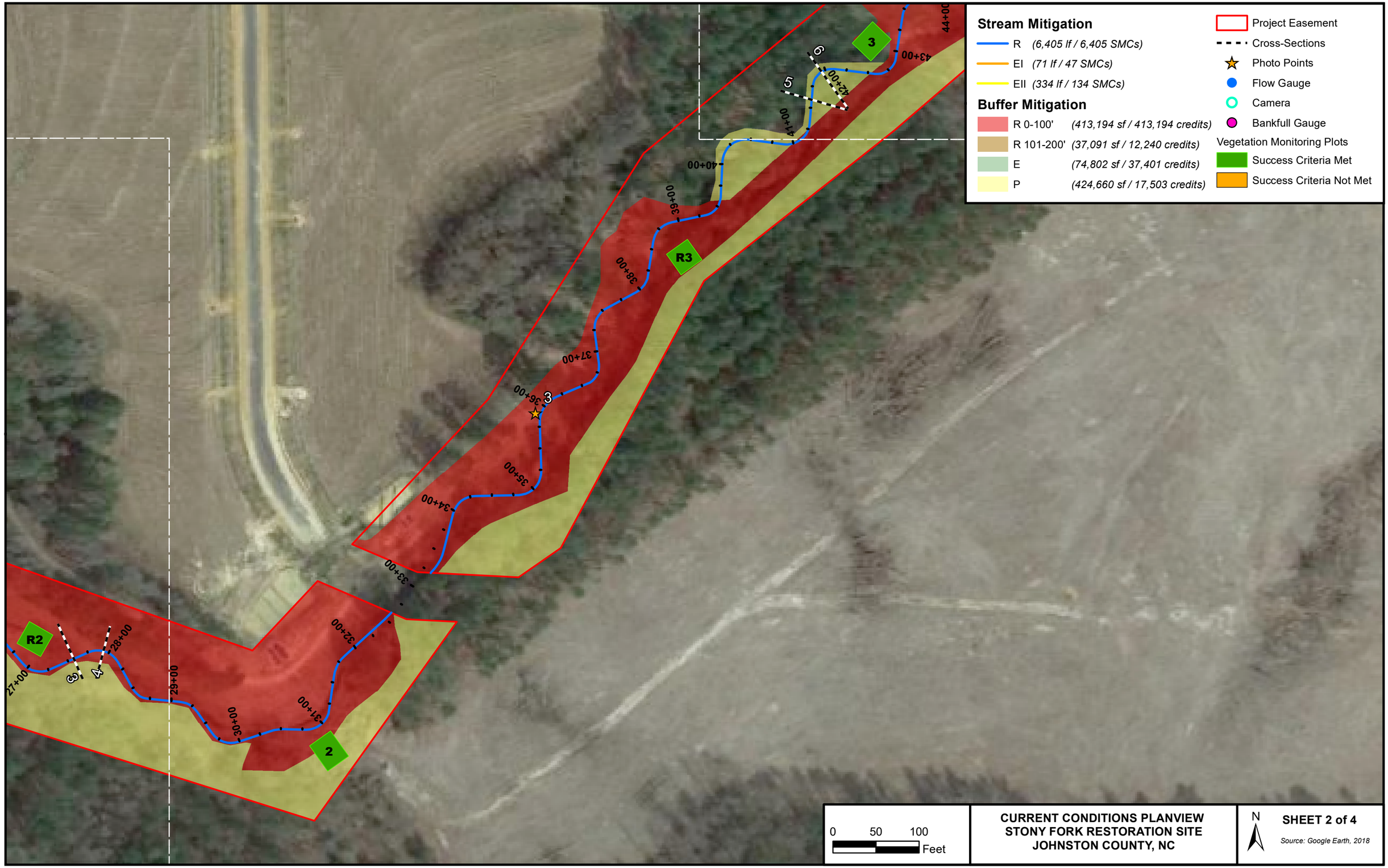
SHEET 1 of 4
Source: Google Earth, 2018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Bankfull Gauge
Vegetation Monitoring Plots
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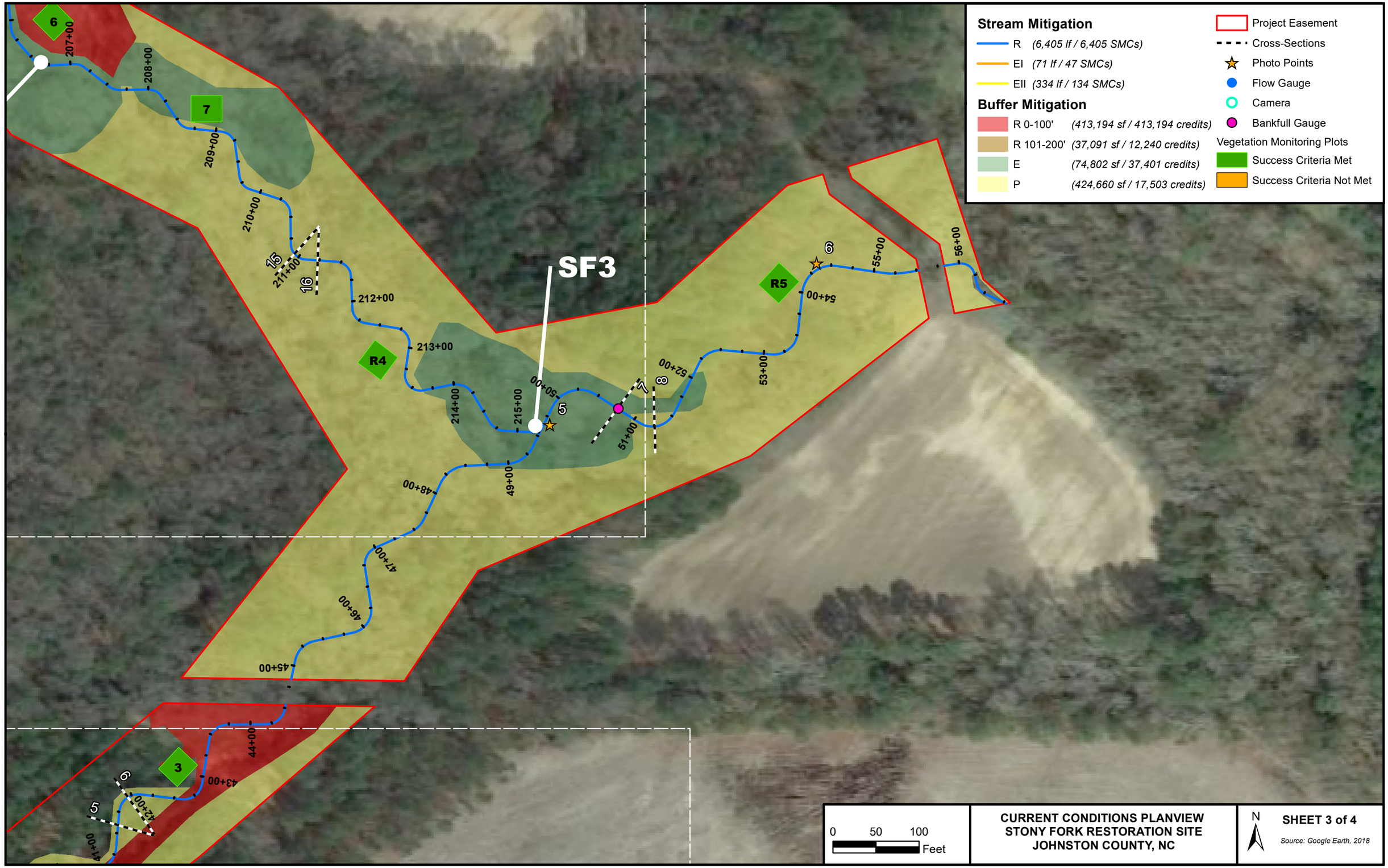
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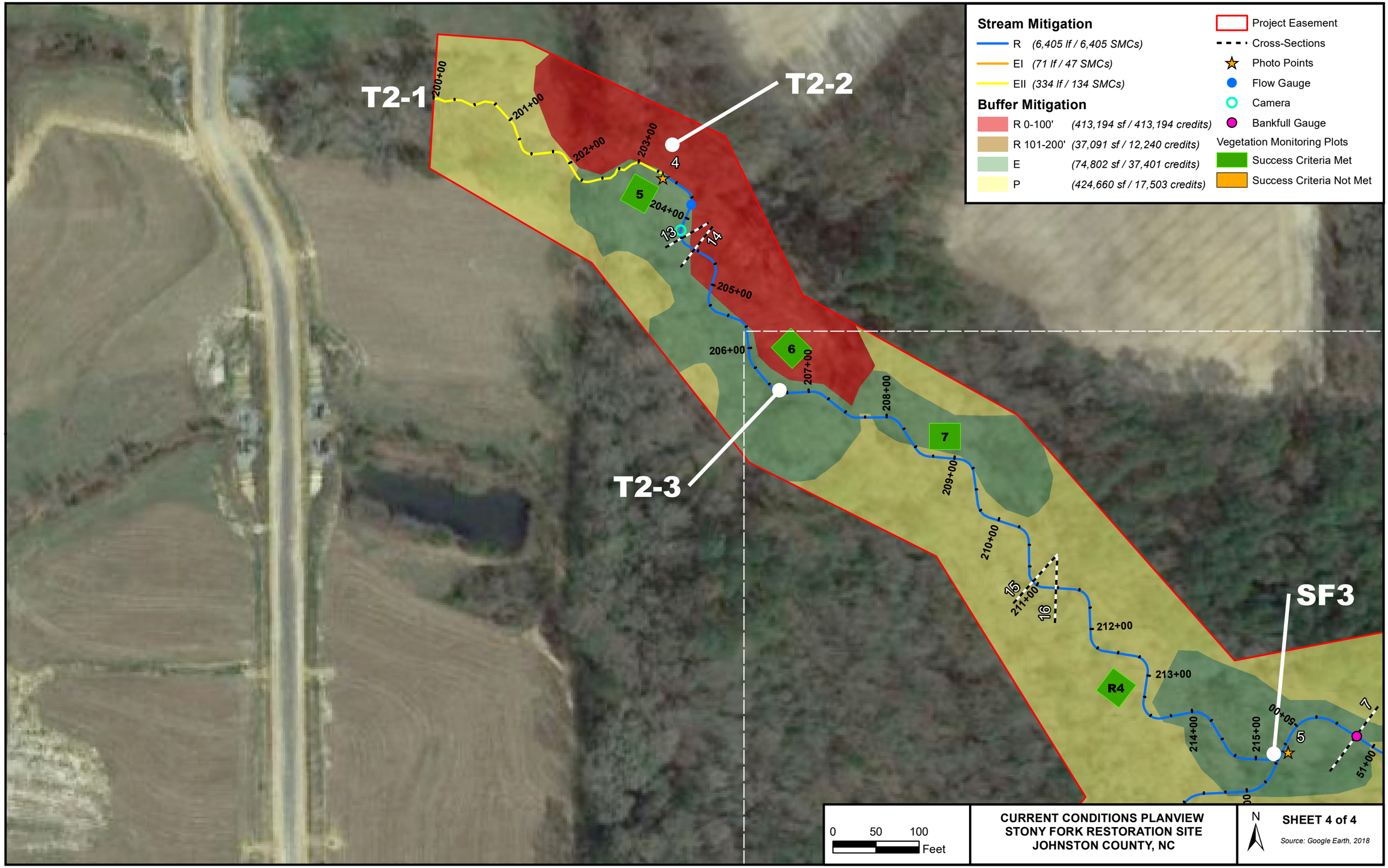
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N
SHEET 4 of 4
Source: Google Earth, 2018

Photo Reference Photos

PP1U – MY-00 – 5/15/19

PP1D – MY-00 – 5/15/19

PP2U – MY-00 – 5/15/19

PP2D – MY-00 – 5/15/19

PP3U – MY-00 – 5/15/19

PP3D – MY-00 – 5/15/19

PP4U – MY-00 – 5/15/19

PP4D – MY-00 – 5/15/19

PP5U – MY-00 – 5/15/19

PP5D – MY-00 – 5/15/19

PP6U – MY-00 – 5/15/19

PP6D – MY-00 – 5/15/19

Vegetation Monitoring Plot Photos

Vegetation Plot 1 – MY-00 – 5/15/19

Vegetation Plot 2 – MY-00 – 5/15/19

Vegetation Plot 3 – MY-00 – 5/15/19

Vegetation Plot 4 – MY-00 – 5/15/19

Vegetation Plot 5 – MY-00 – 5/15/19

Vegetation Plot 6 – MY-00 - 5/15/19

Vegetation Plot 7 – MY-00 – 5/15/19

Vegetation Plot R1 – MY-00 – 5/15/19

Vegetation Plot R2 – MY00 – 5/15/19

Vegetation Plot R3 – MY00 – 5/15/19

Vegetation Plot R4 – MY00 – 5/15/19

Vegetation Plot R5 – MY00 – 5/15/19

APPENDIX C

Vegetation Plot Data

Table 5. Species and Quantity of Planted Stems Stony Fork Restoration Site, DMS Project #97085				
Common Name	Scientific Name	1 Gallon Containers	Bare Root	Live Stakes
Sycamore	*Platanus occidentalis*	145	3120	
Swamp Chestnut Oak	*Quercus michauxii*	142		
Green Ash	*Fraxinus pennsylvanica*		2720	
River Birch	*Betula nigra*		3120	
Willow Oak	*Quercus phellos*		3220	
Tulip Poplar	*Liriodenron tulipifera*	145	3320	
Southern Red Oak	*Quercus falcata*	26	2300	
White Oak	*Quercus alba*	27	1900	
Persimmon	*Diospyros virginiana*		900	
Pin Oak	*Quercus palustris*	70	900	
Bald Cypress	*Taxodium distichum*		400	
Black Willow	*Salix nigra*			2525
Silky Willow	*Salix sericea*			2525
Silky Dogwood	*Cornus ammomum*		400	2525

Table 6. Stem Count by Plot and Species
Stony Fork Restoration Site, DMS Project #97085

	Current Plot Data (MY00 2019)													
	Plot 01		Plot 02		Plot 03		Plot 04		Plot 05		Plot 06		Plot 07	
Species	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**
Bald Cypress (*Taxodium distichum*)							1	1						
Elderberry (*Sambucus canadensis*)														
Green Ash (*Fraxinus pennsylvanica*)					2	2	5	5	6	6				
Oak (*Quercus sp.*)	1	1	2	2	1	1	7	7						
Pin Oak (*Quercus palustris*)	2	2									1	1		
Red Maple (*Acer rubrum*)										2				
River Birch (*Betula nigra*)					1	1							1	1
Silky Dogwood (*Cornus amomum*)							2	2	3	3	4	4	1	1
Sugar Berry (*Celtis laevigata*)														
Swamp Chestnut Oak (*Quercus michauxi*)	3	3							1	1	1	1	1	1
Sweet Bay (*Magnolia virginiana*)										1				
Sycamore (*Platanus occidentalis*)	3	3	1	1			1	1	1	1			1	1
Tulip Poplar (*Liriodendron tulipifera*)	3	3	1	1										
White Oak (*Quercus alba*)									1	4				
Willow Oak (*Quercus phellos*)											1	1	2	2
Unknown	15	15	22	22	22	22	4	4	5	5	13	13	16	16
Stem count	27	27	26	26	26	26	20	20	17	23	20	20	22	22
size (ares)	1		1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025	
Species count	6	6	4	4	4	4	6	6	6	8	5	5	6	6
Stems per ACRE	1093		1052		1052		809		688		809		890	

Table 6, continued.
Stony Fork Restoration Site, DMS Project #97085

Species	Current Plot Data (MY00 2019)										Annual Means	
	Plot R1		Plot R2		Plot R3		Plot R4		Plot R5		MY00 (2019)	
	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Bald Cypress (*Taxodium distichum*)											1	1
Elderberry (*Sambucus canadensis*)		2										2
Green Ash (Fraxinus pennsylvanica)	2	2	6	6	3	3	5	5			29	29
Oak (Quercus sp.)	1	1	1	1	3	3	2	2			18	18
Pin Oak (Quercus palustris)											3	3
Red Maple (Acer rubrum)												2
River Birch (Betula nigra)											2	2
Silky Dogwood (Cornus amomum)											10	10
Sugar Berry (Celtis laevigata)		2										2
Swamp Chestnut Oak (Quercus michauxi)	1	1									7	7
Sweet Bay (Magnolia virginiana)												1
Sycamore (Platanus occidentalis)	2	2									9	9
Tulip Poplar (Liriodendron tulipifera)			1	1	6	6			3	3	14	14
White Oak (Quercus alba)	1	1									2	5
Willow Oak (Quercus phellos)											3	3
Unknown	8	8	16	16	40	40	17	17	21	21	199	199
Stem count	15	19	24	24	52	52	24	24	24	24	297	307
size (ares)	1		1		1		1		1		8	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.20	
Species count	6	8	4	4	4	4	3	3	2	2	12	16
Stems per ACRE	607		971		2104		971		971		1502	1553

APPENDIX D

Stream Measurement and Geomorphology Data

Table 7a. SF1 Data Summary
Stony Fork Restoration Site, DMS Project #97085

Parameter	Pre-Existing Condition	Reference Reach(es) Data	Design	As-built			
Dimension - Riffle				Min	Mean	Max	n
Bankfull Width (ft)	7.2	14.8-18.8	9.7		9.3		1
Floodprone Width (ft)	8.7	>50	100		>80		1
Bankfull Mean Depth (ft)	0.9	1.3-1.8	0.7		0.8		1
Bankfull Max Depth (ft)	1.2	1.9-2.4	1.1		1.2		1
Bankfull Cross-Sectional Area (ft^2)	6.4	25	7.0		7.0		1
Width/Depth Ratio	8.1	9.0-14.0	13.5		12.2		1
Entrenchment Ratio	1.2	>2.5	10.3		8.7		1
Bank Height Ratio	2.9	1.0-1.2	1.0		1.0		1
Pattern							
Channel Beltwidth (ft)	*	60	30-55		30-55		
Radius of Curvature (ft)	*	16—87	20-29		20-29		
Rc:Bankfull width (ft/ft)	*	3.5—12.9	9.6-13.6		9.6-13.6		
Meander Wavelength (ft)	*	66—191	93-132		93-132		
Meander Width Ratio	*	4.1	3.1-5.7		3.1-5.7		
Profile							
Riffle Length (ft)				23.40	31.55	40.95	17
Riffle Slope (ft/ft)	0.009	0.013—0.035	0.009-0.015	0.0031	0.0141	0.0137	17
Pool Length (ft)	*	14—33	21-46	12.47	28.73	41.34	17
Pool Spacing (ft)	*	2.7—7.1	5.6-7.3	44.28	68.72	142.01	17
Substrate and Transport Parameters							
SC% / Sa% / G% / C% / B% /Be%	3/40/57/0/0/0			0/4/90/7/0/0			
d16 / d35 / d50 / d84 / d95 (mm)	0.15/1.2/2.2/7.5/11/-0.4/7.1	Gravel	Gravel	9.4/16/22/33/53/70			
Channel length (ft)	1235		1155	1155			
Drainage Area (SM)	0.27	1.49	0.27	0.27			
Rosgen Classification	G4c	C4	C4	C4			
Sinuosity	1.3	1.3	1.2	1.2			
Water Surface Slope (ft/ft)	0.009	0.005	0.009	0.01			

* : no data shown for pools, radius of curvature or meanders in existing stream do to channelization / lack of bed diversity

Table 7b. SF2 Baseline Stream Data Summary Stony Fork Restoration Site, DMS Project #97085							
Parameter	Pre-Existing Condition	Reference Reach(es) Data (SF)	Design	As-built			
Dimension - Riffle				Min	Mean	Max	n
Bankfull Width (ft)	5.0-10.0	14.8-18.8	11.3	12.2	12.4	12.6	2
Floodprone Width (ft)	7.4-14.5	>50	100	53.3	67.0	80.7	2
Bankfull Mean Depth (ft)	1.0-1.4	1.3-1.8	0.8	0.9	0.95	1.0	2
Bankfull Max Depth (ft)	1.3-2.2	1.9-2.4	1.2	1.4	1.5	1.6	2
Bankfull Cross-Sectional Area (ft^2)	6.9-8.9	25	9.4	10.6	11.6	12.5	2
Width/Depth Ratio	3.7-11.2	9.0-14.0	13.5	12.8	13.5	14.1	2
Entrenchment Ratio	1.4-1.5	>2.5	8.8	4.2	5.4	6.6	2
Bank Height Ratio	1.6-2.1	1.0-1.2	1.0	1	1	1	2
Pattern							
Channel Beltwidth (ft)	*	60	37-65	37-65			
Radius of Curvature (ft)	*	16—87	22-33	22-33			
Rc:Bankfull width (ft/ft)	*	3.5—12.9	9.3-13.1	9.3-13.1			
Meander Wavelength (ft)	*	66—191	105-148	105-148			
Meander Width Ratio	*	4.1	3.3-5.8	3.3-5.8			
Profile							
Riffle Length (ft)				17.58	39.07	86.38	36
Riffle Slope (ft/ft)	0.003-0.008	0.013—0.035	0.009 - 0.015	0.0021	0.0118	0.0256	36
Pool Length (ft)	*	14—33	24-52	12.51	28.83	52.39	34
Pool Spacing (ft)	*	2.7—7.1	5.2-7.4	43.01	81.44	178.86	34
Substrate and Transport Parameters							
SC% / Sa% / G% / C% / B% /Be%	20.3/30/49.8/0/0/0			5/8/54/33/0/0			
d16 / d35 / d50 / d84 / d95 (mm)	0.33/0.61/1.2/6.2/9.8/0.3/5.5	Gravel	Gravel	5.9/31/45/61/98.5/140			
Channel length (ft)	2453		2802	2802			
Drainage Area (SM)	0.41	1.49	0.41	0.41			
Rosgen Classification	G4c—G5c	C4	C4	C4			
Sinuosity	1.1	1.3	1.2	1.2			
Water Surface Slope (ft/ft)	0.008	0.005	0.008	0.008			

* : no data shown for pools, radius of curvature or meanders in existing stream do to channelization / lack of bed diversity

Table 7c. SF3 Baseline Stream Data Summary
Stony Fork Restoration Site, DMS Project #97085

Parameter	Pre-Existing Condition	Reference Reach(es) Data (SF)	Design	As-built			
Dimension - Riffle				Min	Mean	Max	n
Bankfull Width (ft)	10.5	14.8-18.8	12.6		11.6		1
Floodprone Width (ft)	14.4	>50	100		92.4		1
Bankfull Mean Depth (ft)	1.2	1.3-1.8	0.9		1.1		1
Bankfull Max Depth (ft)	1.3	1.9-2.4	1.4		1.7		1
Bankfull Cross-Sectional Area (ft^2)	12.5	25	11.8		12.9		1
Width/Depth Ratio	8.9	9.0-14.0	13.5		10.4		1
Entrenchment Ratio	1.4	>2.5	7.9		8.0		1
Bank Height Ratio	2.0	1.0-1.2	1.0		1.0		1
Pattern							
Channel Beltwidth (ft)	*	60	46-77		46-77		
Radius of Curvature (ft)	*	16—87	28-35		28-35		
Rc:Bankfull width (ft/ft)	*	3.5—12.9	11.7-14		11.7-14		
Meander Wavelength (ft)	*	66—191	148-176		148-176		
Meander Width Ratio	*	4.1	3.7-6.1		3.7-6.1		
Profile							
Riffle Length (ft)				7.4	35.2	52.4	7
Riffle Slope (ft/ft)	0.006	0.013—0.035	0.01	0.0032	0.0075	0.0175	7
Pool Length (ft)	*	14—33	35-62	12.4	33.9	39.7	7
Pool Spacing (ft)	*	2.7—7.1	6.7-8.0	92.0	103.1	114.4	7
Substrate and Transport Parameters							
SC% / Sa% / G% / C% / B% /Be%	10/0/0/0/0/0			21/21/40/18/0/0			
d16 / d35 / d50 / d84 / d95 (mm)	1.1/6.0/8.3/12/15/-0.7/3.3	Gravel	Gravel	0.06/0.77/16/29/70/120			
Channel length (ft)	618		654	654			
Drainage Area (SM)	0.84	1.49	0.84	0.84			
Rosgen Classification	G4c	C4	C4	C4			
Sinuosity	1.1	1.3	1.2	1.2			
Water Surface Slope (ft/ft)	0.006	0.005	0.008	0.006			

* : no data shown for pools, radius of curvature or meanders in existing stream do to channelization / lack of bed diversity

Table 7d. T1 Baseline Stream Data Summary
Stony Fork Restoration Site, DMS Project #97085

Parameter	Pre-Existing Condition	Reference Reach(es) Data (SF)	Design	As-built			
Dimension - Riffle				Min	Mean	Max	n
Bankfull Width (ft)	3.4	14.8-18.8	5.0		4.2		1
Floodprone Width (ft)	4.5	>50	50		45.0		1
Bankfull Mean Depth (ft)	0.3	1.3-1.8	0.4		0.2		1
Bankfull Max Depth (ft)	0.4	1.9-2.4	0.6		0.5		1
Bankfull Cross-Sectional Area (ft^2)	0.9	25	1.9		0.9		1
Width/Depth Ratio	12.7	9.0-14.0	13.5		18.6		1
Entrenchment Ratio	1.3	>2.5	10		10.8		1
Bank Height Ratio	4.5	1.0-1.2	1.0		1.0		1
Pattern							
Channel Beltwidth (ft)	*	60	23-37		23-37		
Radius of Curvature (ft)	*	16—87	11-17		11-17		
Rc:Bankfull width (ft/ft)	*	3.5—12.9	11.6-14.4		11.6-14.4		
Meander Wavelength (ft)	*	66—191	58-72		58-72		
Meander Width Ratio	*	4.1	4.6-7.4		4.6-7.4		
Profile							
Riffle Length (ft)				4.53	18.2	29.1	11
Riffle Slope (ft/ft)	0.035	0.013—0.035	0.014-0.04	0.00	0.024	0.045	11
Pool Length (ft)	*	14—33	11-29	7.29	40.2	65.6	11
Pool Spacing (ft)	*	2.7—7.1	6.2-8.8	35.7	45.7	60.3	11
Substrate and Transport Parameters							
SC% / Sa% / G% / C% / B% /Be%				10/3/21/66/0/0			
d16 / d35 / d50 / d84 / d95 (mm)	Silt-Clay	Gravel	Gravel	37/65/78/94/130/170			
Channel length (ft)	365		510	510			
Drainage Area (SM)	0.02	1.49	0.02	0.02			
Rosgen Classification	G5	C4	C4	C4			
Sinuosity	1.0	1.3	1.2	1.2			
Water Surface Slope (ft/ft)	0.035	0.005	0.020	0.019			

* : no data shown for pools, radius of curvature or meanders in existing stream do to channelization / lack of bed diversity

Table 7e. T2-1 Baseline Stream Data Summary Stony Fork Restoration Site, DMS Project #97085				
Parameter	Pre-Existing Condition	Reference Reach(es) Data	Design	As-built
Dimension - Riffle				
Bankfull Width (ft)	4.5-5.7	14.8-18.8	5.0	
Floodprone Width (ft)	5.7-30.7	>50	50	
Bankfull Mean Depth (ft)	0.8-1.7	1.3-1.8	0.4	
Bankfull Max Depth (ft)	1.2-2.1	1.9-2.4	0.6	
Bankfull Cross-Sectional Area (ft^2)	3.6-9.4	25	1.9	
Width/Depth Ratio	3.4-5.4	9.0-14.0	13.5	
Entrenchment Ratio	1.3-5.4	>2.5	10	
Bank Height Ratio	1.5-4.1	1.0-1.2	1.0	
Pattern				
Channel Beltwidth (ft)	*	60	25-40	25-40
Radius of Curvature (ft)	*	16—87	12-15	12-15
Rc:Bankfull width (ft/ft)	*	3.5—12.9	14	14
Meander Wavelength (ft)	*	66—191	70	70
Meander Width Ratio	*	4.1	5.0-8.0	5.0-8.0
Profile				
Riffle Length (ft)				
Riffle Slope (ft/ft)	0.009-0.020	0.013—0.035	0.016	
Pool Length (ft)	*	14—33	6-16	
Pool Spacing (ft)	*	2.7—7.1	6.4-8.0	
Substrate and Transport Parameters				
SC% / Sa% / G% / C% / B% /Be%				
d16 / d35 / d50 / d84 / d95 (mm)	Silt-Clay	Gravel	Gravel	
Channel length (ft)	327		334	334
Drainage Area (SM)	0.23	1.49	0.04	0.04
Rosgen Classification	G5c	C4	C4	C4
Sinuosity	1.1	1.3	1.2	1.2
Water Surface Slope (ft/ft)	0.014	0.005	0.012	

* : no data shown for pools, radius of curvature or meanders in existing stream do to channelization / lack of bed diversity

Table 7f. T2-2 Baseline Stream Data Summary Stony Fork Restoration Site, DMS Project #97085							
Parameter	Pre-Existing Condition	Reference Reach(es) Data	Design	As-built			
				Min	Mean	Max	n
Bankfull Width (ft)	4.5-5.7	14.8-18.8	7.6		9.7		1
Floodprone Width (ft)	5.7-30.7	>50	50		43.4		1
Bankfull Mean Depth (ft)	0.8-1.7	1.3-1.8	0.6		0.6		1
Bankfull Max Depth (ft)	1.2-2.1	1.9-2.4	0.8		1.0		1
Bankfull Cross-Sectional Area (ft^2)	3.6-9.4	25	4.3		5.8		1
Width/Depth Ratio	3.4-5.4	9.0-14.0	13.4		16.4		1
Entrenchment Ratio	1.3-5.4	>2.5	6.6		4.5		1
Bank Height Ratio	1.5-4.1	1.0-1.2	1.0		1.0		1
Pattern							
Channel Beltwidth (ft)	*	60	28-45		28-45		
Radius of Curvature (ft)	*	16—87	16-23		16-23		
Rc:Bankfull width (ft/ft)	*	3.5—12.9	11.2-11.8		11.2-11.8		
Meander Wavelength (ft)	*	66—191	85-90		85-90		
Meander Width Ratio	*	4.1	3.7-5.9		3.7-5.9		
Profile							
Riffle Length (ft)				20.0	29.0	56.7	6
Riffle Slope (ft/ft)	0.009-0.020	0.013—0.035	0.014	0.01	0.018	0.028	6
Pool Length (ft)	*	14—33	14-24	10.8	17.6	22.8	6
Pool Spacing (ft)	*	2.7—7.1	5.7-6.6	47.0	48.8	51.2	6
Substrate and Transport Parameters							
SC% / Sa% / G% / C% / B% /Be%				6/45/15/33/0/0			
d16 / d35 / d50 / d84 / d95 (mm)	Silt-Clay	Gravel	Gravel	26/35/42/51/74/110			
Channel length (ft)	326		337	337			
Drainage Area (SM)	0.23	1.49	0.15	0.15			
Rosgen Classification	G5c	C4	C4	C4			
Sinuosity	1.1	1.3	1.2	1.2			
Water Surface Slope (ft/ft)	0.014	0.005	0.012	0.011			

* : no data shown for pools, radius of curvature or meanders in existing stream do to channelization / lack of bed diversity

Table 7g. T2-3 Baseline Stream Data Summary Stony Fork Restoration Site, DMS Project #97085							
Parameter	Pre-Existing Condition	Reference Reach(es) Data	Design	As-built			
Dimension - Riffle				Min	Mean	Max	n
Bankfull Width (ft)	4.5-5.7	14.8-18.8	9.0		8.6		1
Floodprone Width (ft)	5.7-30.7	>50	50		80.9		1
Bankfull Mean Depth (ft)	0.8-1.7	1.3-1.8	0.6		0.7		1
Bankfull Max Depth (ft)	1.2-2.1	1.9-2.4	1.0		1.2		1
Bankfull Cross-Sectional Area (ft^2)	3.6-9.4	25	5.8		6.0		1
Width/Depth Ratio	3.4-5.4	9.0-14.0	13.9		12.3		1
Entrenchment Ratio	1.3-5.4	>2.5	5.6		9.4		1
Bank Height Ratio	1.5-4.1	1.0-1.2	1.0		1.0		1
Pattern							
Channel Beltwidth (ft)	*	60	32-45		32-45		
Radius of Curvature (ft)	*	16—87	18-23		18-23		
Rc:Bankfull width (ft/ft)	*	3.5—12.9	10.2-11.1		10.2-11.1		
Meander Wavelength (ft)	*	66—191	92-100		92-100		
Meander Width Ratio	*	4.1	3.6-6.0		3.6-6.0		
Profile							
Riffle Length (ft)				25.8	33.6	38.9	15
Riffle Slope (ft/ft)	0.009-0.020	0.013—0.035	0.012-0.015	0.002	0.014	0.024	15
Pool Length (ft)	*	14—33	12-34	8.48	35.6	91.4	14
Pool Spacing (ft)	*	2.7—7.1	5.1-7.0	45.7	57.3	77.4	14
Substrate and Transport Parameters							
SC% / Sa% / G% / C% / B% /Be%				4/7/65/24/0/0			
d16 / d35 / d50 / d84 / d95 (mm)	0.031/0.13/0.21/2.0/6.1/0.1/8	Gravel	Gravel	18/35/45/77/120			
Channel length (ft)	780		855	855			
Drainage Area (SM)	0.23	1.49	0.23	0.23			
Rosgen Classification	G5c	C4	C4	C4			
Sinuosity	1.1	1.3	1.2	1.2			
Water Surface Slope (ft/ft)	0.014	0.005	0.011	0.011			

* : no data shown for pools, radius of curvature or meanders in existing stream do to channelization / lack of bed diversity

Table 7h. T3 Baseline Stream Data Summary
Stony Fork Restoration Site, DMS Project #97085

Parameter	Pre-Existing Condition	Reference Reach(es) Data	Design	As-built			
Dimension - Riffle				Min	Mean	Max	n
Bankfull Width (ft)	4.2-4.8	14.8	5.0		5.2		1
Floodprone Width (ft)	5.0-5.9	>50	50		38.0		1
Bankfull Mean Depth (ft)	0.4-0.6	1.3-1.8	0.4		0.4		1
Bankfull Max Depth (ft)	0.6-0.7	1.9-2.4	0.6		0.7		1
Bankfull Cross-Sectional Area (ft^2)	1.9-2.6	25	1.9		2.1		1
Width/Depth Ratio	6.9-12.6	9.0-14.0	13.5		13.0		1
Entrenchment Ratio	1.2	>2.5	10		7.2		1
Bank Height Ratio	3.2-3.4	1.0-1.2	1.0		1.0		1
Pattern							
Channel Beltwidth (ft)	**	60	16-26		16-26		
Radius of Curvature (ft)	**	16—87	11-14		11-14		
Rc:Bankfull width (ft/ft)	**	3.5—12.9	8.6-9.4		8.6-9.4		
Meander Wavelength (ft)	**	66—191	43-47		43-47		
Meander Width Ratio	**	4.1	3.2-5.2		3.2-5.2		
Profile							
Riffle Length (ft)				34.3	36.9	39.5	2
Riffle Slope (ft/ft)	**	0.013—0.035	0.0025	0.006	0.0098	0.014	2
Pool Length (ft)	**	14—33	7-15	38.43			1
Pool Spacing (ft)	**	2.7—7.1	4.2-5.4				
Substrate and Transport Parameters							
SC% / Sa% / G% / C% / B% /Be%	8/67/25/0/0/0			9/15/58/19/0/0			
d16 / d35 / d50 / d84 / d95 (mm)	N/A	Gravel	Gravel	0.3/8.2/18/35/72/140			
Channel length (ft)	154		129	129			
Drainage Area (SM)	0.05	1.49	0.02	0.02			
Rosgen Classification	G4	C4	C4	C4			
Sinuosity	1.0	1.3	1.2	1.2			
Water Surface Slope (ft/ft)	0.007	0.005	0.0016	0.005			

** :channel affected by former pond

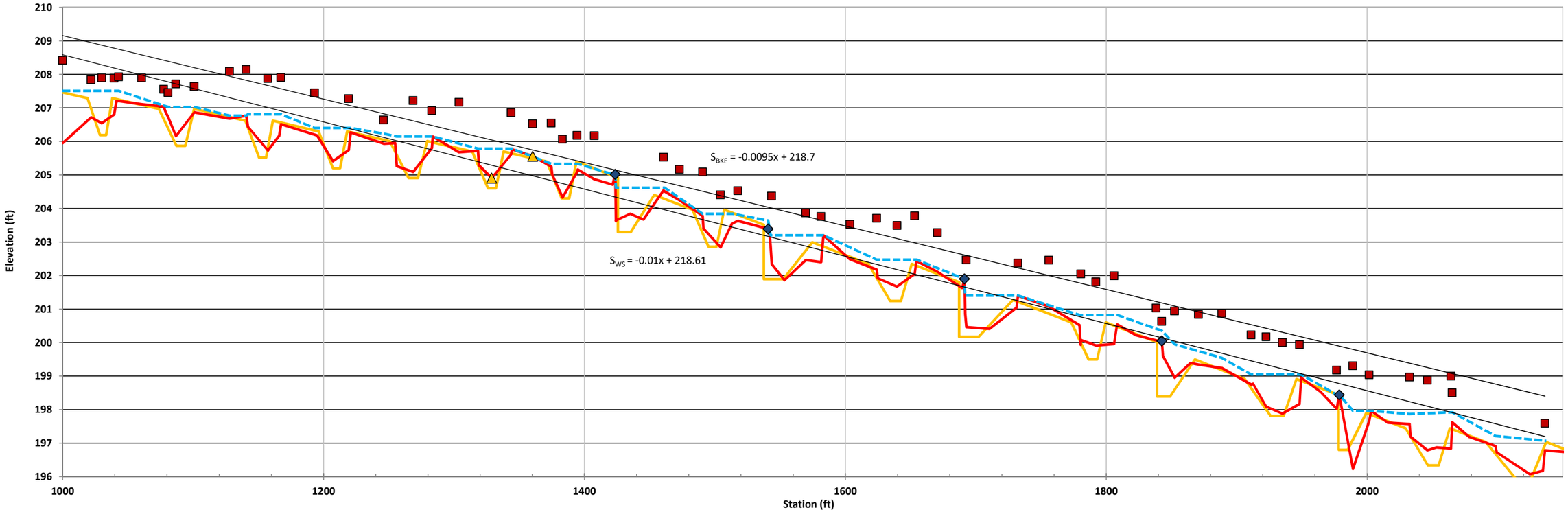
Table 8. Cross Section Dimensional Morphology Summary
Stony Fork Stream Restoration Site, DMS Project #97085

	Cross-Section 1 (Pool) Station 13+32, SF							Cross-Section 2 (Riffle) Station 13+59, SF							Cross-Section 3 (Riffle) Station 27+57, SF						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull Area	206.8							206.6							192.5						
Bank Height Ratio Based on AB Bankfull Area	-							1.0							1.0						
Thalweg Elevation	204.8							205.3							190.9						
LTOB Elevation	206.8							206.6							192.5						
LTOB Max Depth (ft)	1.9							1.2							1.6						
LTOB Cross Sectional Area (ft^2)	11.5							7.1							12.5						
	Cross-Section 4 (Pool) Station 27+93, SF							Cross-Section 5 (Riffle) Station 41+58, SF							Cross-Section 6 (Pool) Station 41+95, SF						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull Area	192.0							182.1							181.74						
Bank Height Ratio Based on AB Bankfull Area	-							1.0							-						
Thalweg Elevation	190.1							180.8							179.4						
LTOB Elevation	192.0							182.1							181.7						
LTOB Max Depth (ft)	1.9							1.4							2.4						
LTOB Cross Sectional Area (ft^2)	13.6							10.6							14.5						
	Cross-Section 7 (Riffle) Station 50+76, SF							Cross-Section 8 (Pool) Station 51+25, SF							Cross-Section 9 (Pool) Station 300+78, T3						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull Area	176.0							175.26							206.99						
Bank Height Ratio Based on AB Bankfull Area	1.0							-							-						
Thalweg Elevation	174.3							172.6							205.9						
LTOB Elevation	176.0							175.3							207.0						
LTOB Max Depth (ft)	1.7							2.7							1.1						
LTOB Cross Sectional Area (ft^2)	12.8							20.7							3.7						

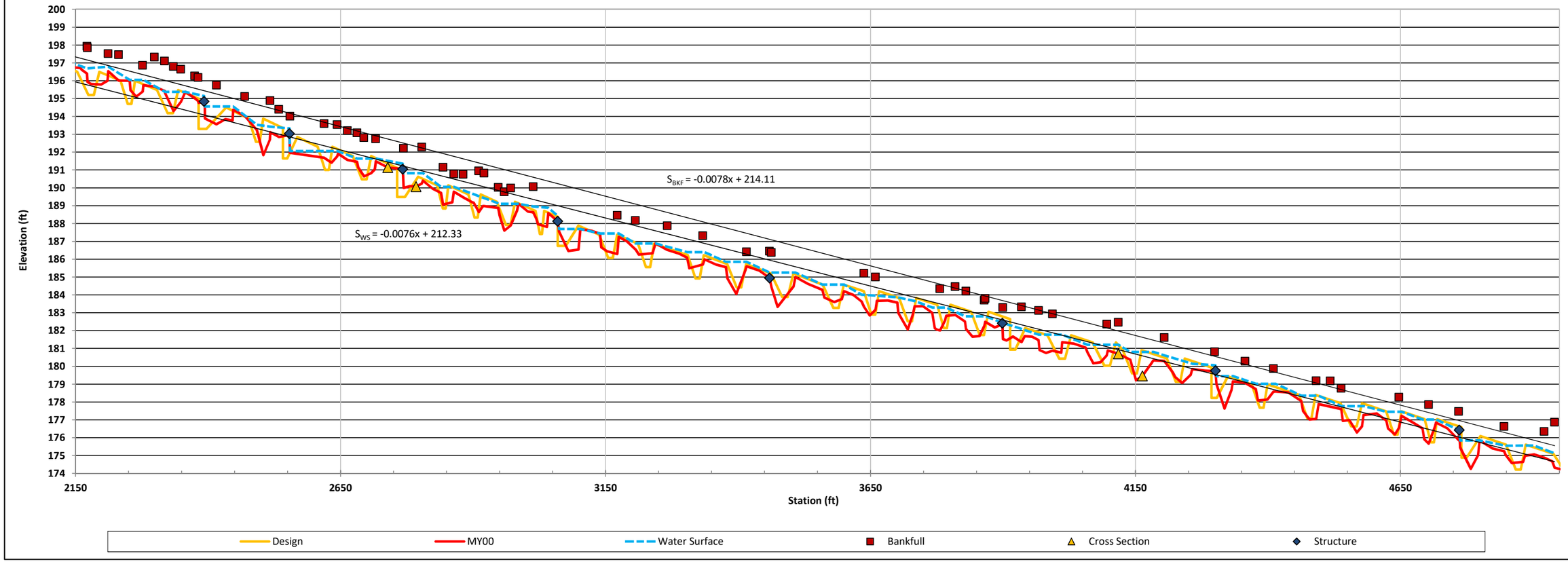
Table 8. Cross Section Dimensional Morphology Summary
Stony Fork Stream Restoration Site, DMS Project #97085

	Cross-Section 10 (Riffle) Station 300+94, T3							Cross-Section 11 (Riffle) Station 103+63, T1							Cross-Section 12 (Pool) Station 103+85, T1						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull Area	207.1							198.2							198.39						
Bank Height Ratio Based on AB Bankfull Area	1.0							1.0							-						
Thalweg Elevation	206.4							197.7							197.2						
LTOB Elevation	207.1							198.2							198.4						
LTOB Max Depth (ft)	0.7							0.5							1.2						
LTOB Cross Sectional Area (ft^2)	2.1							0.9							0.8						
	Cross-Section 13 (Pool) Station 204+25, T2							Cross-Section 14 (Riffle) Station 204+45, T2							Cross-Section 15 (Pool) Station 210+94, T2						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull Area	#####							187.9							180.87						
Bank Height Ratio Based on AB Bankfull Area	-							1.0							-						
Thalweg Elevation	186.9							186.9							179.1						
LTOB Elevation	188.4							187.9							180.9						
LTOB Max Depth (ft)	1.5							1.0							1.8						
LTOB Cross Sectional Area (ft^2)	9.3							5.8							11.2						
	Cross-Section 16 (Riffle) Station 211+23, T2																				
	Base	MY1	MY2	MY3	MY4	MY5	MY+														
Bankfull Elevation (ft) - Based on AB-Bankfull Area	180.7																				
Bank Height Ratio Based on AB Bankfull Area	1.0																				
Thalweg Elevation	179.6																				
LTOB Elevation	180.7																				
LTOB Max Depth (ft)	1.2																				
LTOB Cross Sectional Area (ft^2)	6.0																				

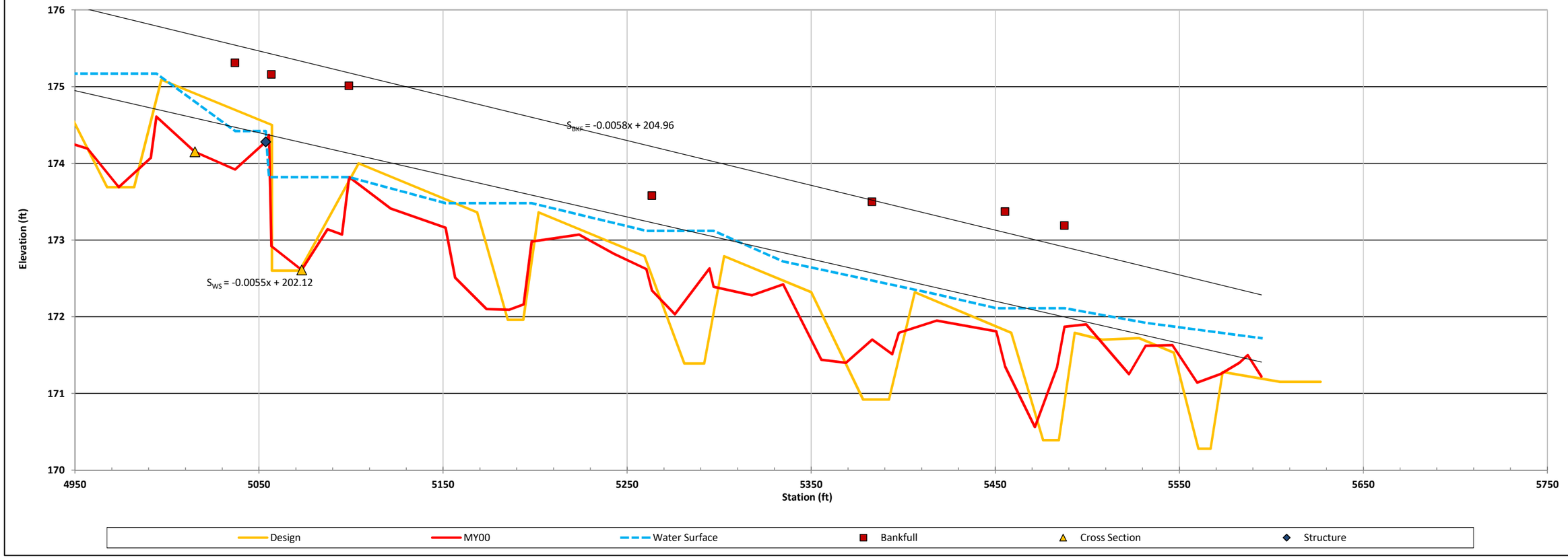
Longitudinal Profile
Stony Fork - Reach 1
Monitoring Year 00, 2019



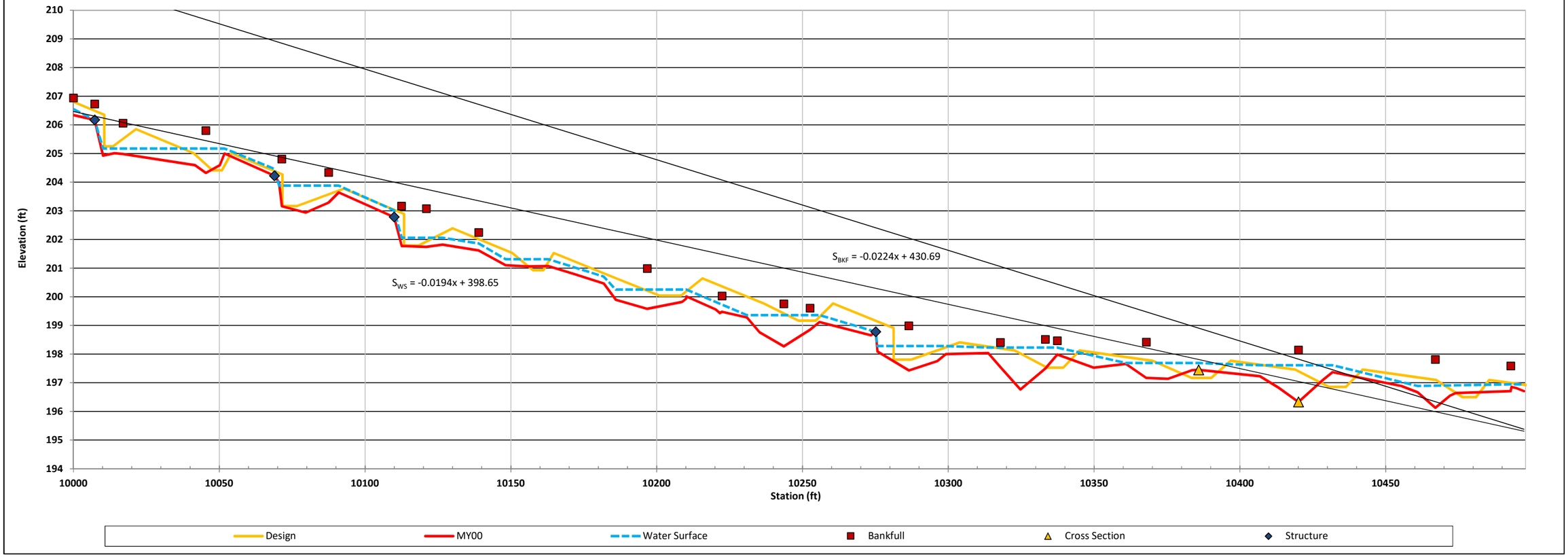
Longitudinal Profile
Stony Fork - Reach 2
Monitoring Year 00, 2019



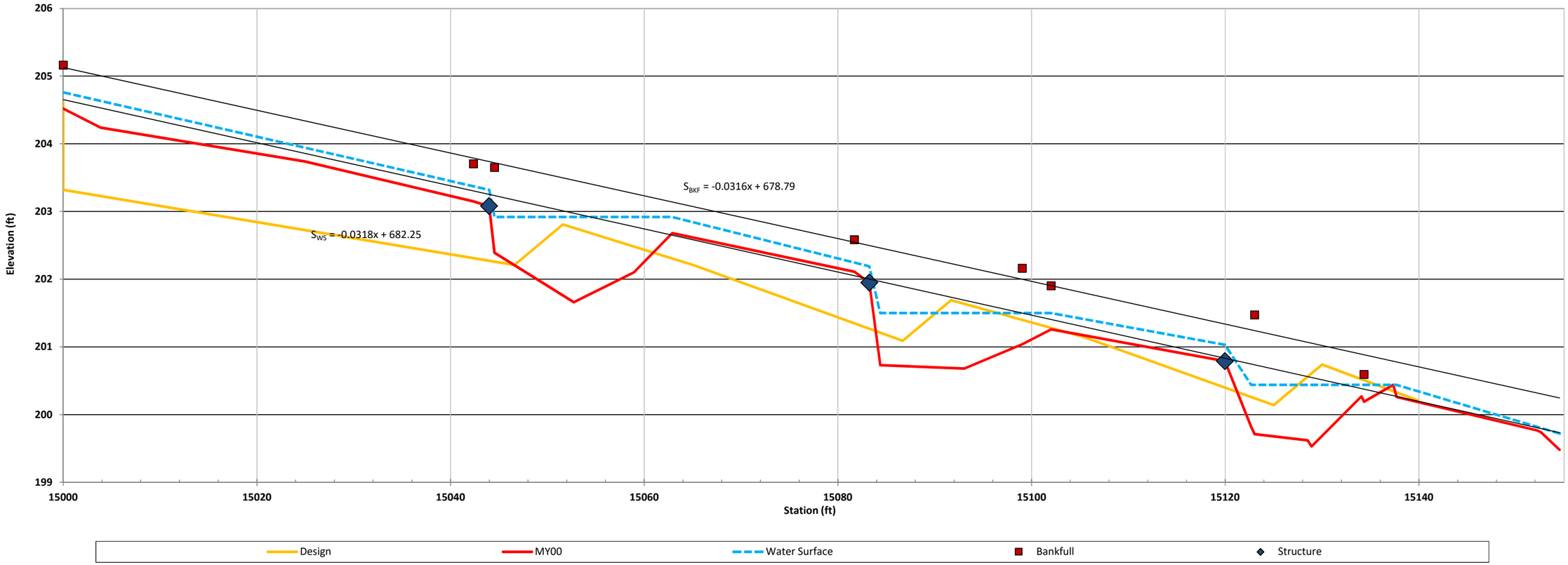
Longitudinal Profile
Stony Fork - Reach 3
Monitoring Year 00, 2019



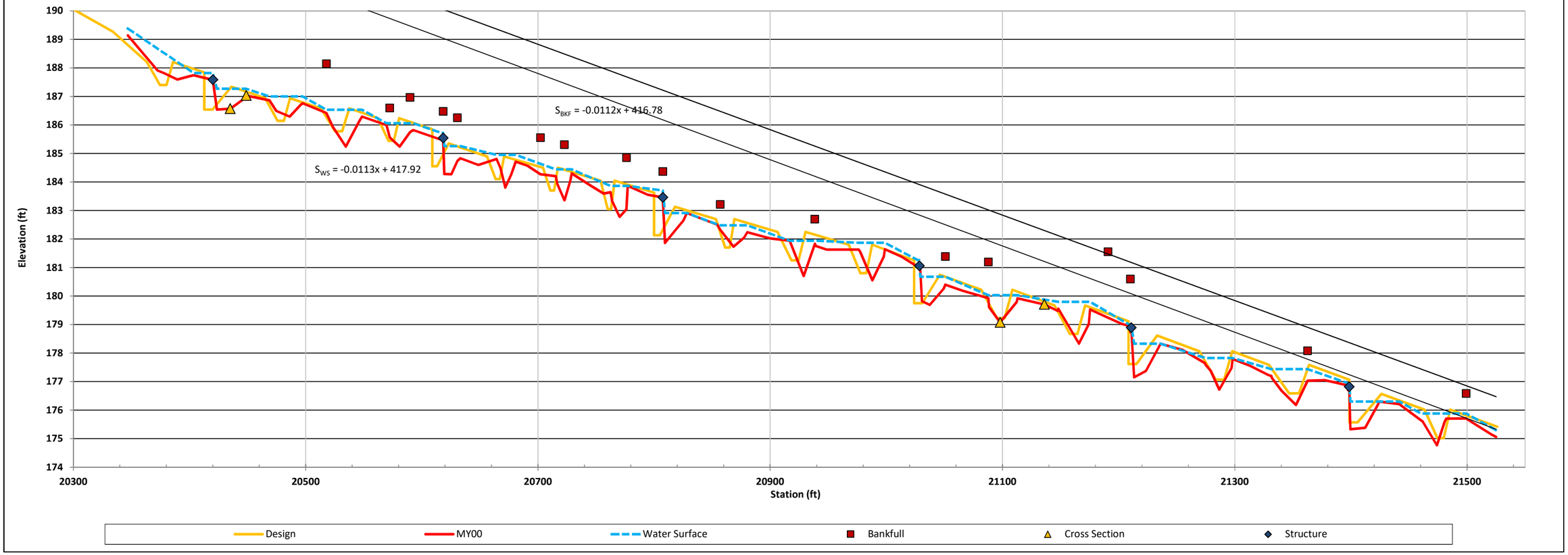
Longitudinal Profile
Stony Fork - T1
Monitoring Year 00, 2019



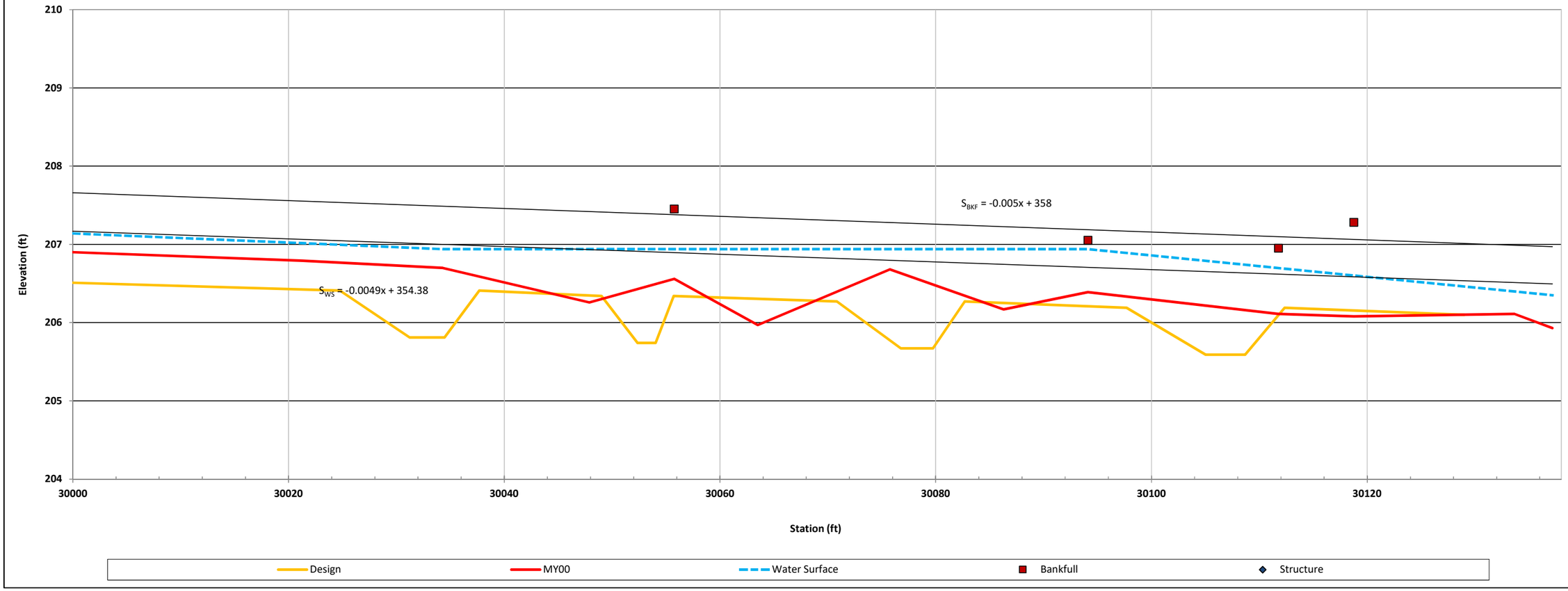
Longitudinal Profile
Stony Fork - T1-A
Monitoring Year 00, 2019



Longitudinal Profile
Stony Fork - T2
Monitoring Year 00, 2019



Longitudinal Profile
Stony Fork - T3
Monitoring Year 00, 2019

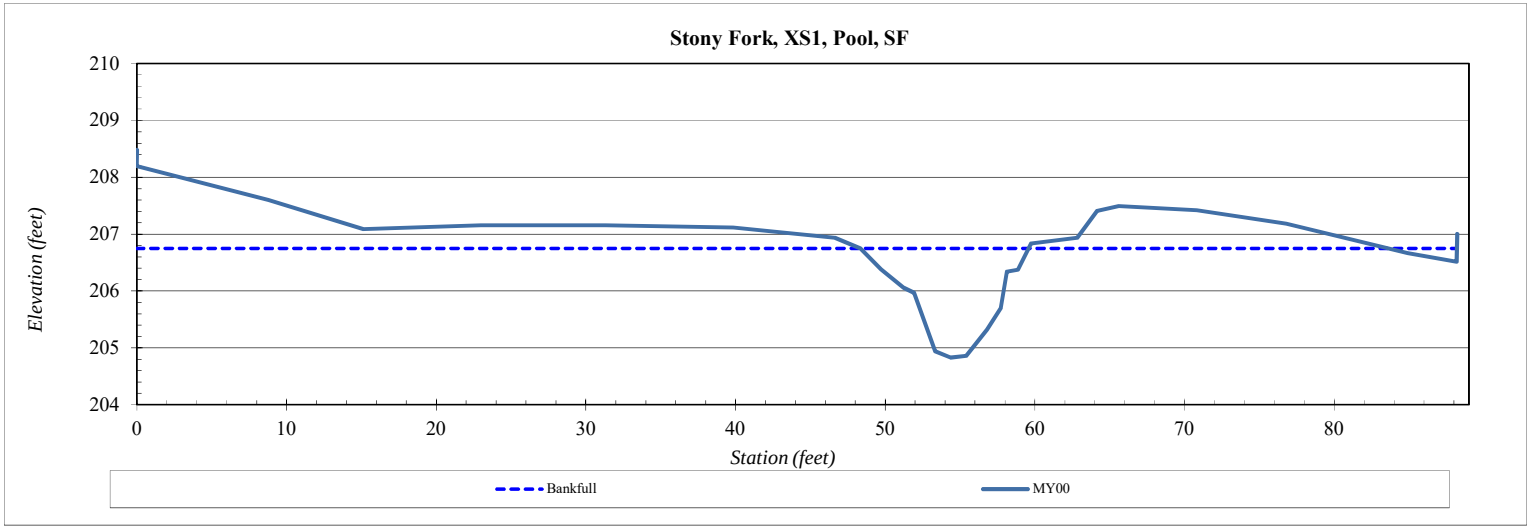


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS1
Drainage Area (sq mi):	0.28
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
-0.02	208.20
0.00	208.48
8.80	207.60
15.13	207.09
22.98	207.16
31.31	207.16
39.85	207.12
46.63	206.94
48.31	206.75
49.70	206.38
51.22	206.06
51.94	205.97
53.34	204.94
54.38	204.83
55.42	204.86
56.80	205.32
57.72	205.71
58.14	206.34
58.85	206.37
59.73	206.84
62.85	206.94
64.16	207.41
65.60	207.50
70.81	207.42
76.81	207.19
84.90	206.67
88.17	206.51
88.23	207.01

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	206.75
Thalweg Elevation	204.83
Bankfull Cross-Sectional Area:	11.5
LTOB Cross Sectional Area (ft^2)	11.5
Bankfull Width:	12.6
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth (ft)	1.9
Mean Depth at Bankfull:	0.9
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio Based on AB Bankfull Area:	---

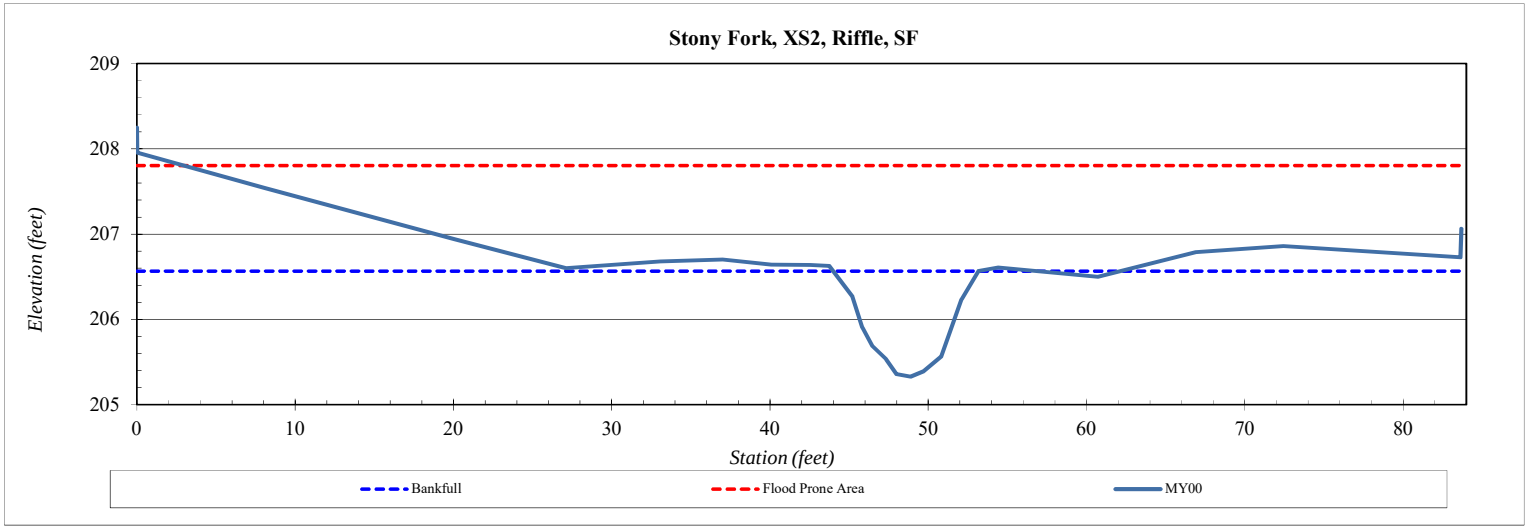


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS2
Drainage Area (sq mi):	0.28
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	208.25
0.02	207.96
8.03	207.55
20.02	206.94
27.09	206.60
33.07	206.68
37.00	206.70
40.07	206.64
42.55	206.64
43.74	206.63
45.20	206.27
45.82	205.91
46.46	205.69
47.33	205.53
48.00	205.36
48.88	205.33
49.70	205.39
50.83	205.57
52.10	206.23
53.17	206.57
54.42	206.61
60.72	206.50
66.91	206.79
72.44	206.86
83.61	206.73
83.68	207.06

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	206.57
Thalweg Elevation	205.33
Bankfull Cross-Sectional Area:	7.0
LTOB Cross Sectional Area (ft^2)	7.1
Bankfull Width:	9.3
Flood Prone Area Elevation:	207.8
Flood Prone Width:	80.7
LTOB Max Depth (ft)	1.2
Mean Depth at Bankfull:	0.8
W / D Ratio:	12.2
Entrenchment Ratio:	8.7
Bank Height Ratio Based on AB Bankfull Area:	1.0

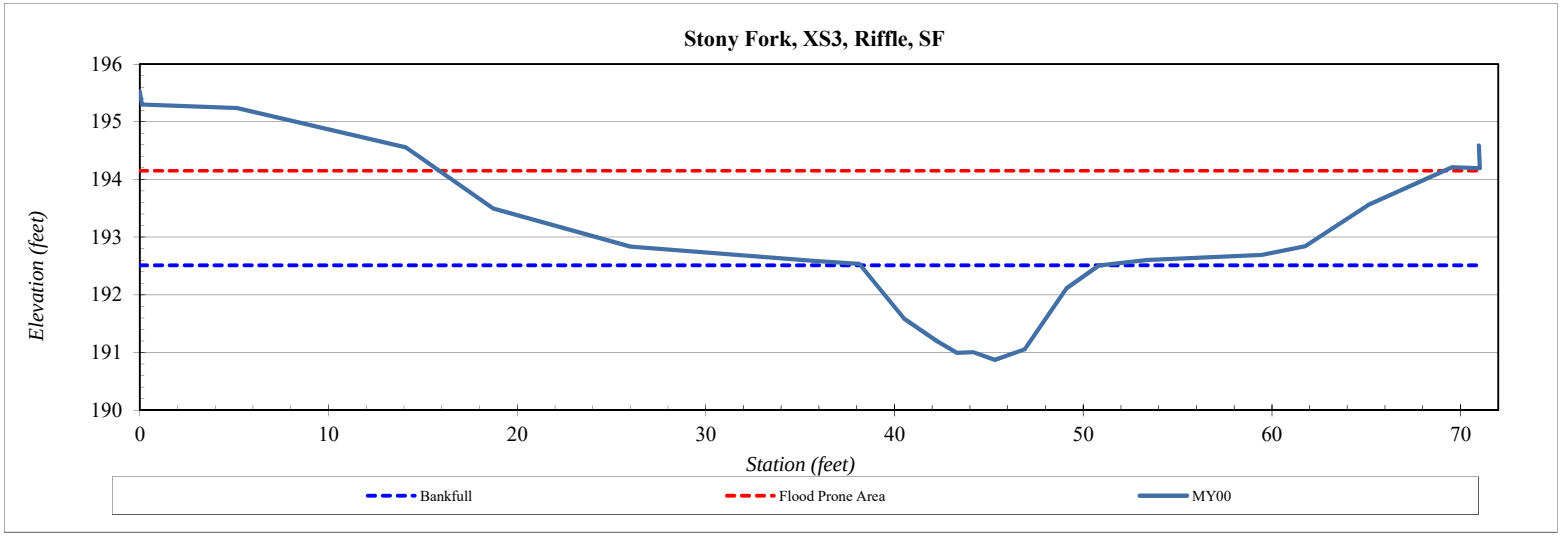


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS3
Drainage Area (sq mi):	0.46
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	195.53
0.11	195.30
5.15	195.24
14.10	194.56
18.74	193.50
26.01	192.84
35.57	192.59
38.13	192.54
40.51	191.59
42.27	191.19
43.31	190.99
44.16	191.01
45.33	190.87
46.88	191.05
49.10	192.11
50.84	192.51
53.37	192.60
59.47	192.69
61.76	192.84
65.07	193.55
69.58	194.21
71.03	194.20
70.97	194.59

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	192.51
Thalweg Elevation	190.87
Bankfull Cross-Sectional Area:	12.5
LTOB Cross Sectional Area (ft^2)	12.5
Bankfull Width:	12.6
Flood Prone Area Elevation:	194.2
Flood Prone Width:	53.3
LTOB Max Depth (ft)	1.6
Mean Depth at Bankfull:	1.0
W / D Ratio:	12.8
Entrenchment Ratio:	4.2
Bank Height Ratio Based on AB Bankfull Area:	1.0

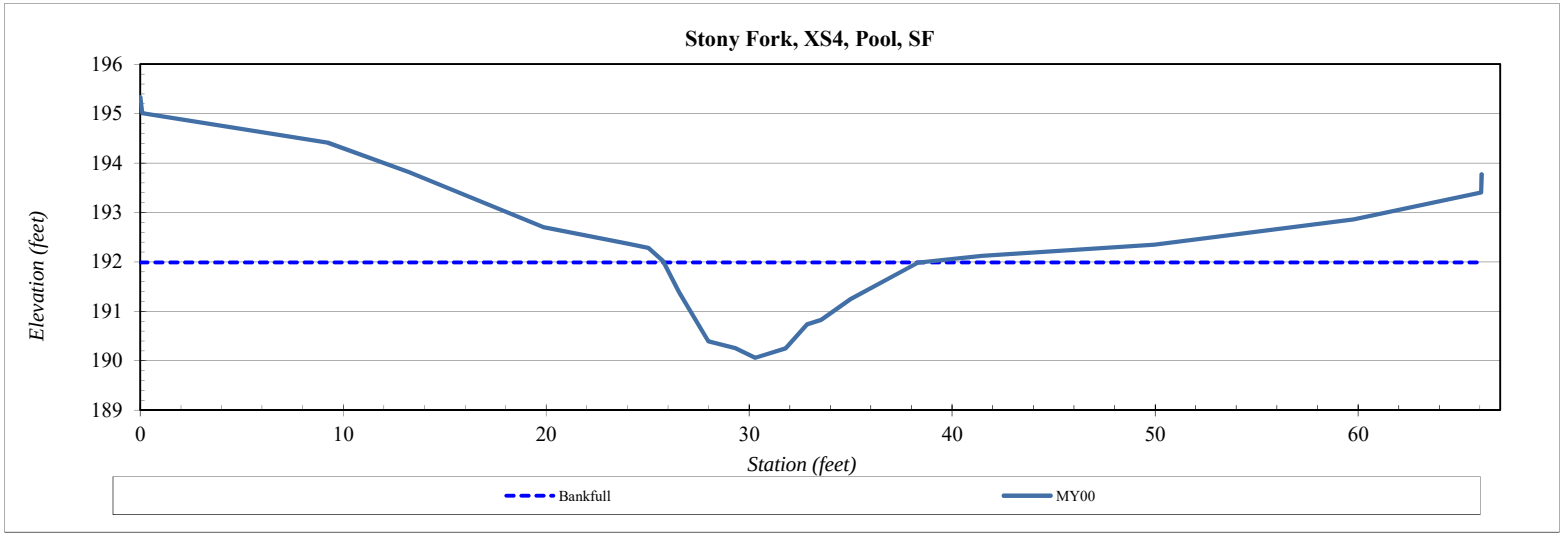


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS4
Drainage Area (sq mi):	0.46
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	195.33
0.10	195.01
9.23	194.41
13.25	193.81
19.84	192.70
24.02	192.37
25.02	192.29
25.76	192.01
26.55	191.38
27.98	190.39
29.30	190.25
30.31	190.06
31.81	190.25
32.86	190.73
33.55	190.83
35.00	191.25
38.33	191.99
41.46	192.12
49.96	192.35
59.79	192.86
66.06	193.40
66.08	193.78

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	191.99
Thalweg Elevation	190.06
Bankfull Cross-Sectional Area:	13.6
LTOB Cross Sectional Area (ft^2)	13.6
Bankfull Width:	12.5
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth (ft)	1.9
Mean Depth at Bankfull:	1.1
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio Based on AB Bankfull Area:	---

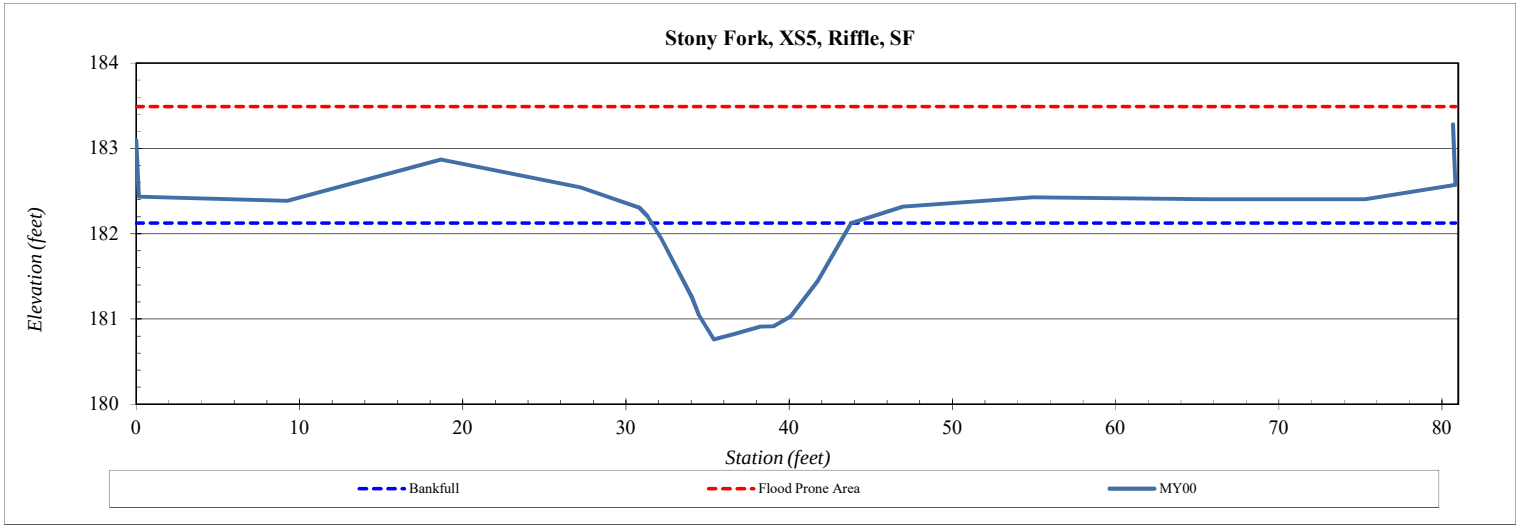


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS5
Drainage Area (sq mi):	0.46
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	183.09
0.16	182.44
9.26	182.39
18.68	182.87
27.23	182.54
30.81	182.31
31.33	182.20
32.19	181.94
34.05	181.26
34.48	181.05
35.41	180.76
36.66	180.83
38.24	180.91
39.07	180.92
40.08	181.03
41.75	181.44
43.80	182.13
46.99	182.32
54.92	182.43
65.62	182.40
75.29	182.40
80.82	182.58
80.67	183.28

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	182.13
Thalweg Elevation	180.76
Bankfull Cross-Sectional Area:	10.6
LTOB Cross Sectional Area (ft^2)	10.7
Bankfull Width:	12.2
Flood Prone Area Elevation:	183.5
Flood Prone Width:	80.7
LTOB Max Depth (ft)	1.4
Mean Depth at Bankfull:	0.9
W / D Ratio:	14.1
Entrenchment Ratio:	6.6
Bank Height Ratio Based on AB Bankfull Area:	1.0

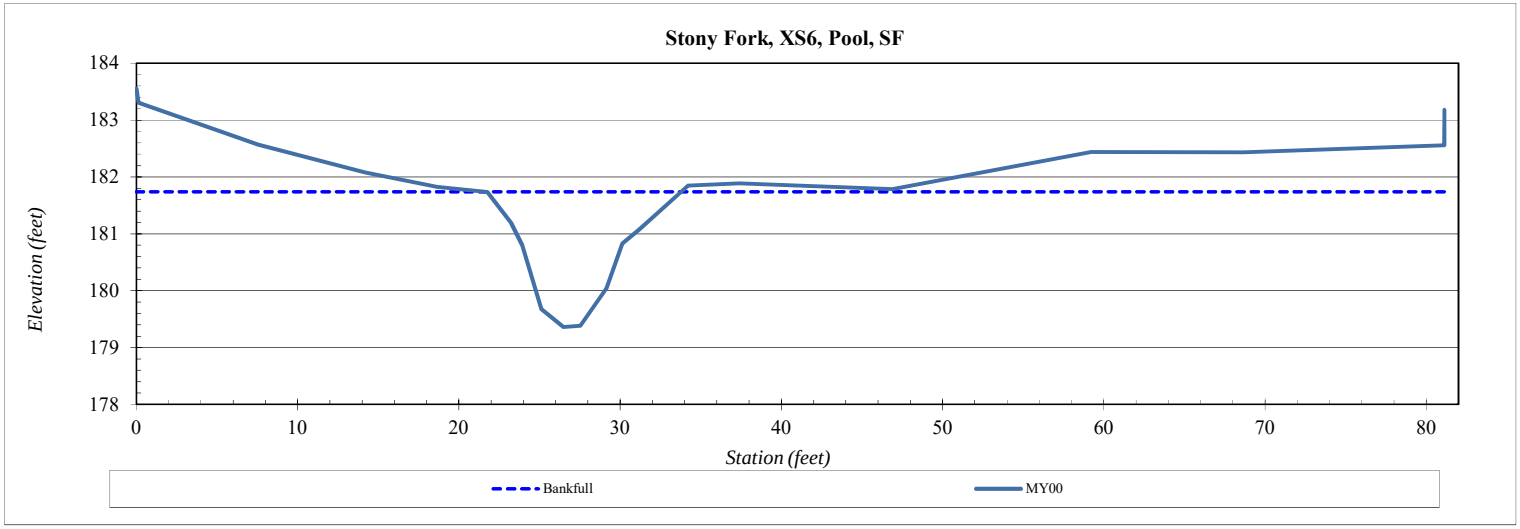


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS6
Drainage Area (sq mi):	0.46
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	183.55
0.14	183.31
7.54	182.57
14.20	182.08
18.65	181.83
21.77	181.74
23.23	181.20
23.93	180.80
25.12	179.68
26.48	179.36
27.54	179.38
29.15	180.04
30.14	180.83
31.18	181.08
34.22	181.85
37.38	181.89
46.89	181.79
59.21	182.44
68.65	182.43
81.11	182.56
81.12	183.18

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	181.74
Thalweg Elevation	179.36
Bankfull Cross-Sectional Area:	14.5
LTOB Cross Sectional Area (ft^2)	14.5
Bankfull Width:	12.0
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth (ft)	2.4
Mean Depth at Bankfull:	1.2
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio Based on AB Bankfull Area:	---

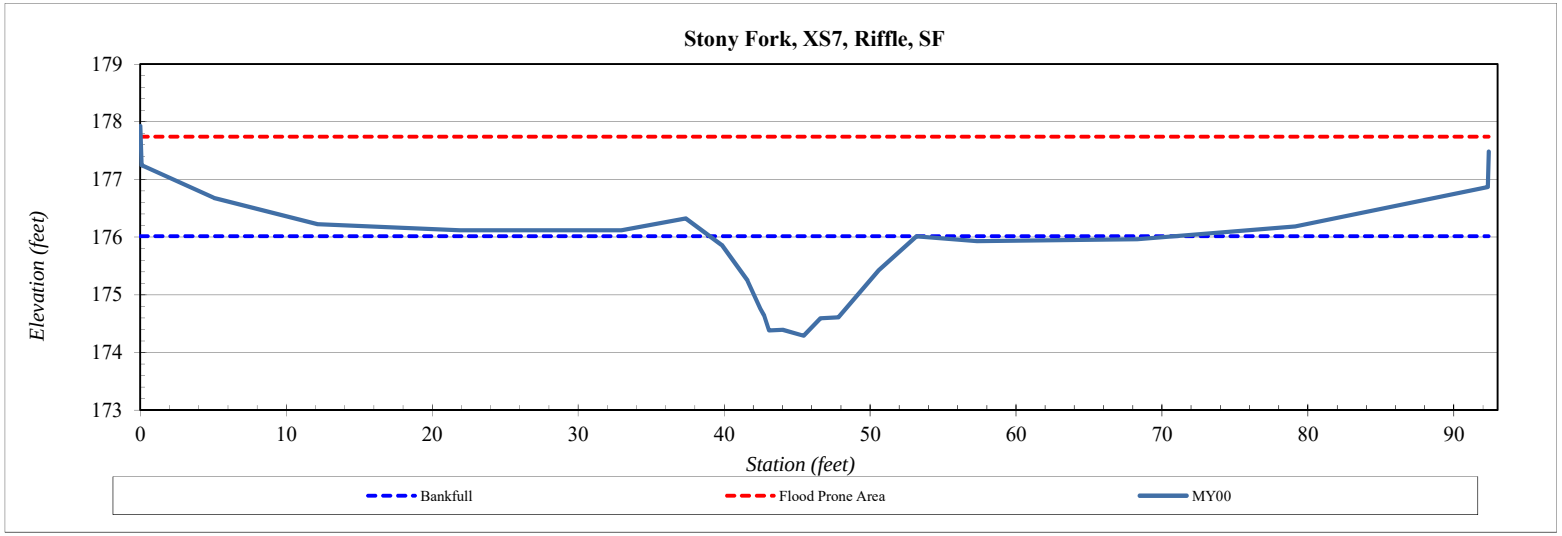


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS7
Drainage Area (sq mi):	0.83
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	177.93
0.08	177.25
5.05	176.68
12.15	176.22
21.90	176.12
32.98	176.12
37.38	176.33
39.83	175.86
41.62	175.24
42.48	174.76
42.76	174.64
43.07	174.38
44.02	174.39
45.44	174.29
46.60	174.59
47.84	174.61
50.60	175.43
53.18	176.02
57.32	175.93
68.30	175.96
79.12	176.19
92.31	176.87
92.38	177.48

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	176.02
Thalweg Elevation	174.29
Bankfull Cross-Sectional Area:	12.8
LTOB Cross Sectional Area (ft^2)	12.9
Bankfull Width:	11.6
Flood Prone Area Elevation:	177.7
Flood Prone Width:	92.4
LTOB Max Depth (ft)	1.7
Mean Depth at Bankfull:	1.1
W / D Ratio:	10.4
Entrenchment Ratio:	8.0
Bank Height Ratio Based on AB Bankfull Area:	1.0

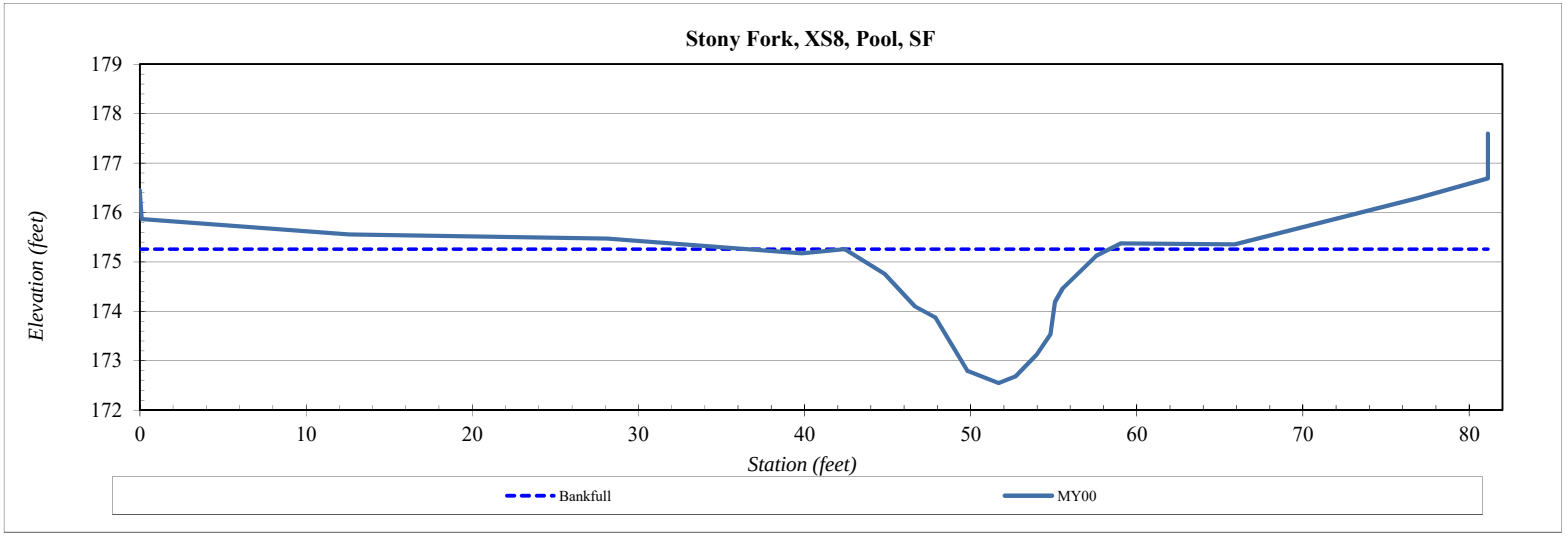


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS8
Drainage Area (sq mi):	0.83
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	176.45
0.10	175.87
12.58	175.56
28.15	175.47
39.84	175.17
42.41	175.26
44.84	174.75
46.65	174.10
47.86	173.88
49.81	172.79
51.67	172.55
52.70	172.68
53.95	173.11
54.80	173.54
55.06	174.18
55.56	174.47
57.52	175.11
59.06	175.37
65.89	175.36
76.86	176.29
81.13	176.69
81.12	177.59

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	175.26
Thalweg Elevation	172.55
Bankfull Cross-Sectional Area:	20.7
LTOB Cross Sectional Area (ft^2)	20.7
Bankfull Width:	13.5
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth (ft)	2.7
Mean Depth at Bankfull:	1.5
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio Based on AB Bankfull Area:	---

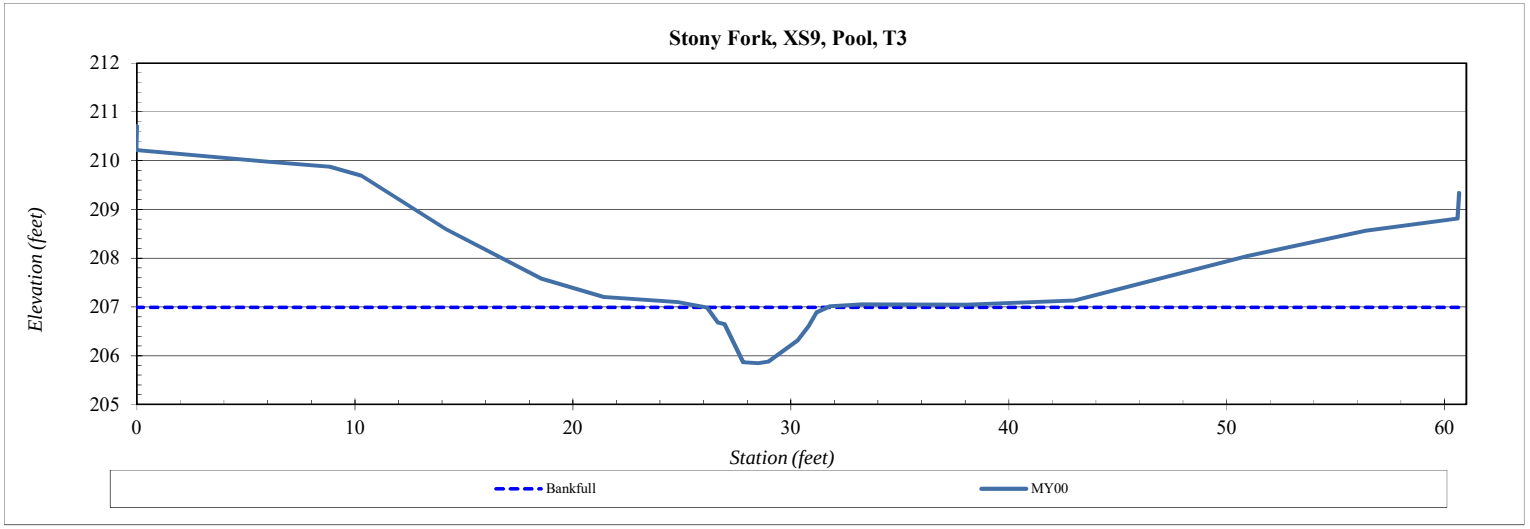


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS9
Drainage Area (sq mi):	0.04
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	210.71
-0.03	210.22
5.95	209.98
8.84	209.88
10.30	209.70
14.17	208.60
18.51	207.58
21.41	207.21
24.82	207.10
26.16	206.99
26.65	206.68
26.97	206.64
27.82	205.87
28.51	205.85
28.97	205.88
30.31	206.31
30.81	206.60
31.19	206.89
31.80	207.01
33.28	207.06
38.10	207.05
43.02	207.13
50.96	208.05
56.37	208.56
60.59	208.82
60.67	209.34

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	206.99
Thalweg Elevation	205.85
Bankfull Cross-Sectional Area:	3.7
LTOB Cross Sectional Area (ft^2)	3.7
Bankfull Width:	5.5
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth (ft)	1.1
Mean Depth at Bankfull:	0.7
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio Based on AB Bankfull Area:	---

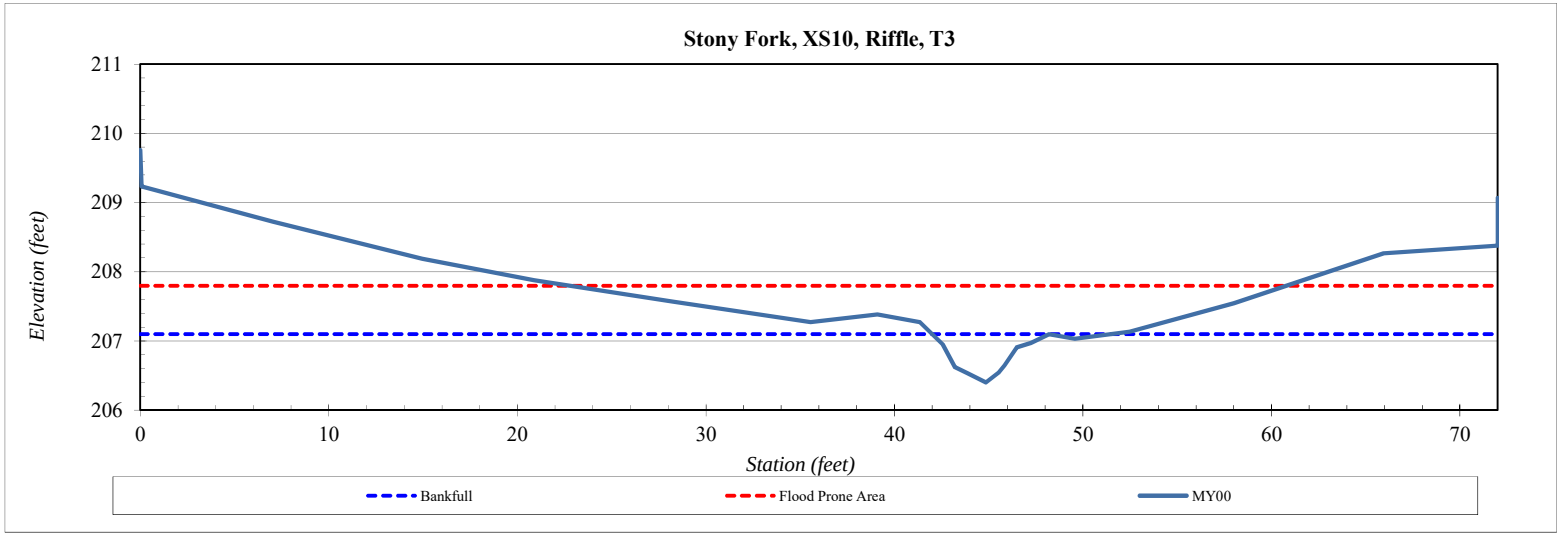


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS10
Drainage Area (sq mi):	0.04
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	209.76
0.07	209.23
7.02	208.72
14.95	208.19
20.87	207.88
28.27	207.57
35.56	207.27
39.10	207.38
41.35	207.27
42.57	206.95
43.21	206.62
43.88	206.53
44.86	206.40
45.53	206.54
45.85	206.64
46.49	206.91
47.25	206.97
48.22	207.10
49.57	207.03
52.47	207.13
58.00	207.55
65.96	208.27
72.00	208.38
72.00	209.07

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	207.10
Thalweg Elevation	206.40
Bankfull Cross-Sectional Area:	2.1
LTOB Cross Sectional Area (ft^2)	2.1
Bankfull Width:	5.2
Flood Prone Area Elevation:	207.8
Flood Prone Width:	38.0
LTOB Max Depth (ft)	0.7
Mean Depth at Bankfull:	0.4
W / D Ratio:	13.0
Entrenchment Ratio:	7.2
Bank Height Ratio Based on AB Bankfull Area:	1.0

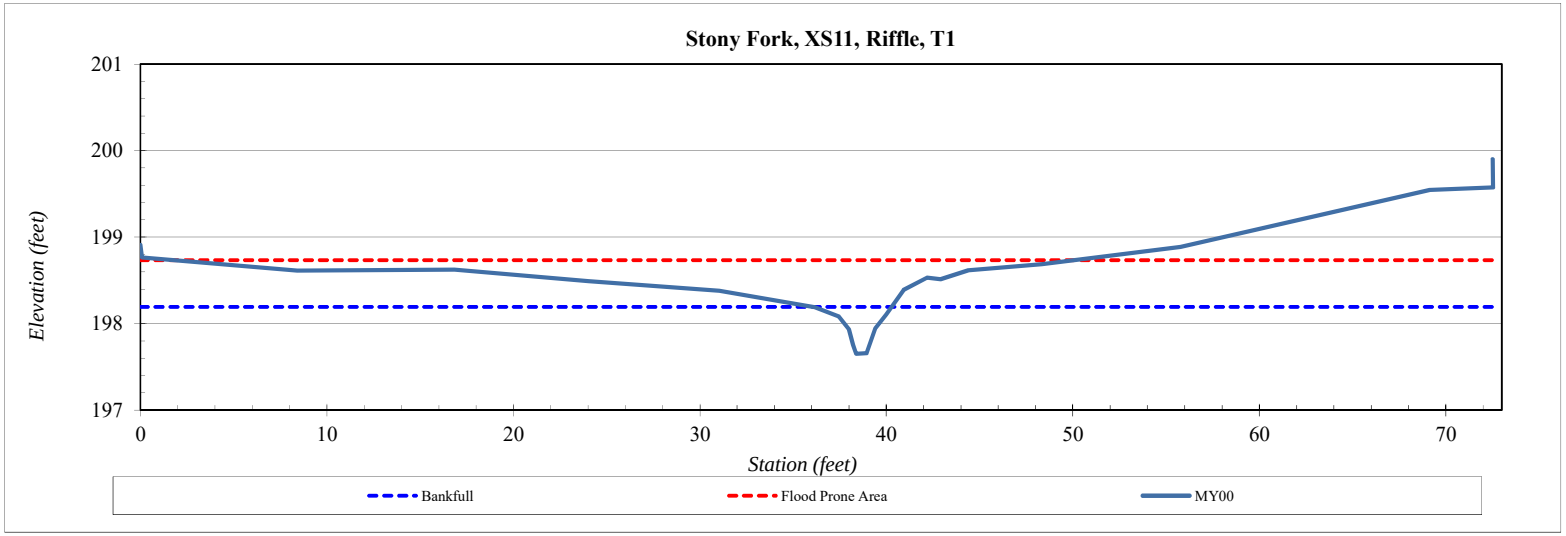


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS11
Drainage Area (sq mi):	0.02
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	198.91
0.09	198.77
8.40	198.61
16.84	198.63
24.03	198.49
31.03	198.38
36.12	198.19
37.46	198.08
37.98	197.94
38.21	197.76
38.38	197.65
38.94	197.66
39.41	197.95
39.98	198.10
40.92	198.39
42.19	198.53
42.92	198.51
44.40	198.62
48.33	198.69
55.78	198.89
69.12	199.55
72.54	199.90
72.51	199.57

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	198.19
Thalweg Elevation	197.65
Bankfull Cross-Sectional Area:	0.9
LTOB Cross Sectional Area (ft^2)	0.9
Bankfull Width:	4.2
Flood Prone Area Elevation:	198.7
Flood Prone Width:	48.2
LTOB Max Depth (ft)	0.5
Mean Depth at Bankfull:	0.2
W / D Ratio:	18.6
Entrenchment Ratio:	11.6
Bank Height Ratio Based on AB Bankfull Area:	1.0

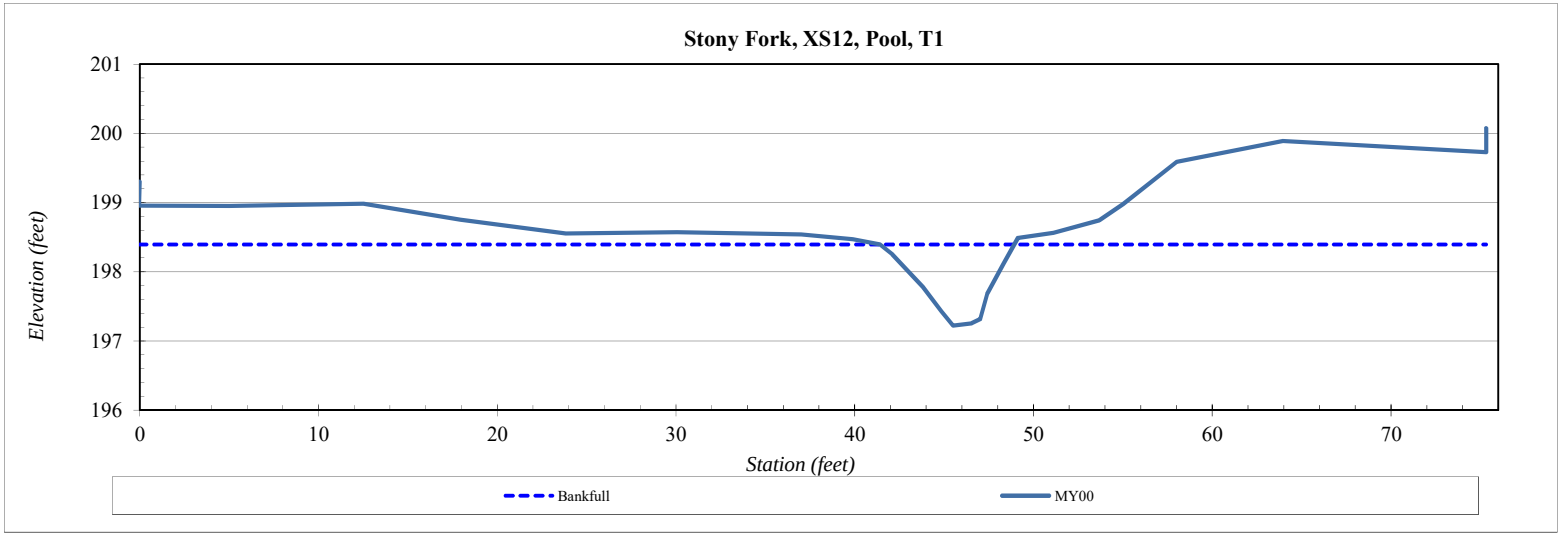


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS12
Drainage Area (sq mi):	0.02
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	199.30
-0.03	198.95
5.00	198.95
12.52	198.99
17.94	198.75
23.83	198.55
30.06	198.57
37.00	198.54
39.90	198.47
41.40	198.39
42.09	198.25
43.81	197.78
44.86	197.43
45.49	197.22
46.54	197.25
47.02	197.31
47.40	197.68
48.32	198.12
49.12	198.49
51.12	198.56
53.67	198.74
55.03	198.98
58.02	199.59
63.96	199.89
75.32	199.73
75.31	200.07

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	198.39
Thalweg Elevation	197.22
Bankfull Cross-Sectional Area:	0.8
LTOB Cross Sectional Area (ft^2)	0.8
Bankfull Width:	3.0
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth (ft)	1.2
Mean Depth at Bankfull:	0.3
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio Based on AB Bankfull Area:	---

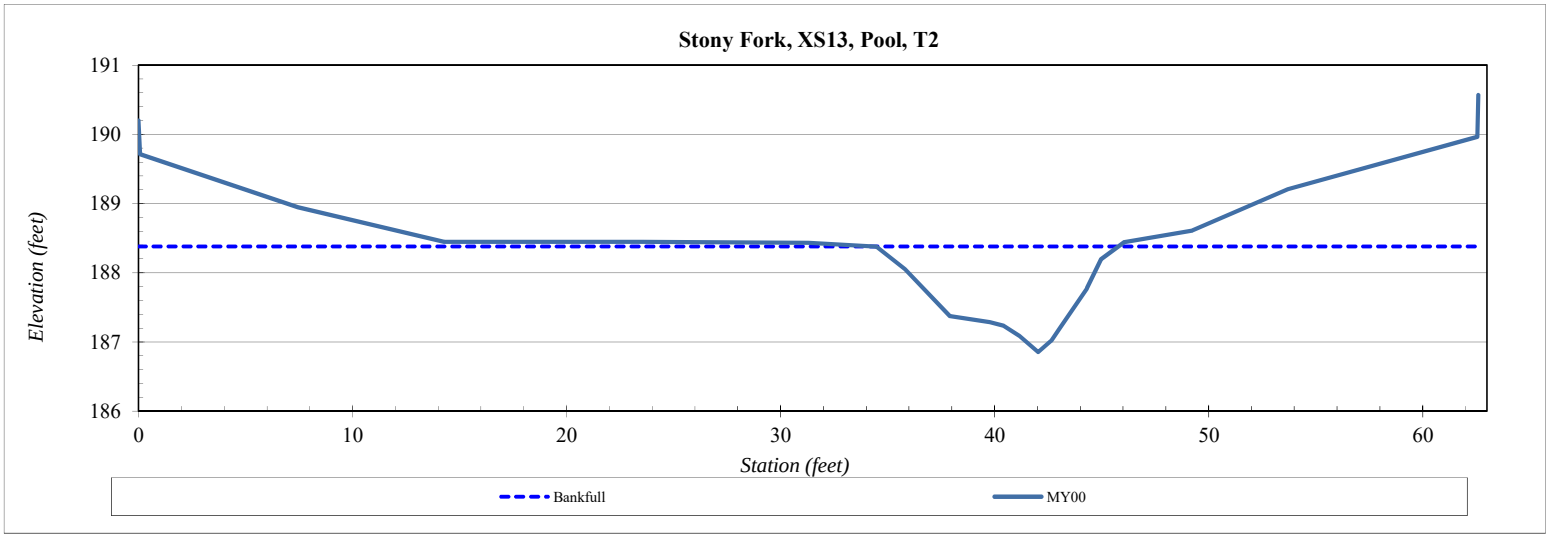


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS13
Drainage Area (sq mi):	0.14
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	190.20
0.08	189.71
7.45	188.94
14.27	188.45
23.57	188.45
31.29	188.44
34.47	188.38
35.81	188.05
37.90	187.37
39.77	187.28
40.41	187.24
41.15	187.09
42.04	186.85
42.63	187.01
43.04	187.20
44.31	187.77
44.98	188.20
46.06	188.44
49.22	188.61
53.70	189.20
62.55	189.97
62.59	190.57

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	188.38
Thalweg Elevation	186.85
Bankfull Cross-Sectional Area:	9.3
LTOB Cross Sectional Area (ft^2)	9.3
Bankfull Width:	11.3
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth (ft)	1.5
Mean Depth at Bankfull:	0.8
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio Based on AB Bankfull Area:	---

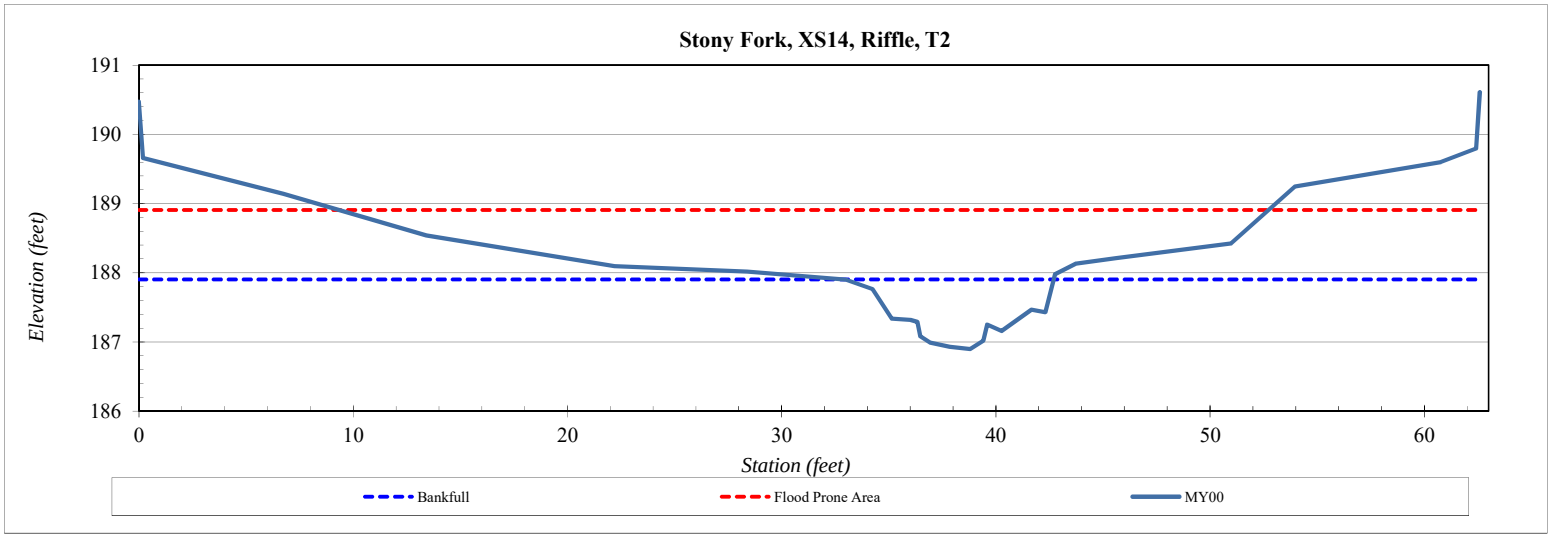


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS14
Drainage Area (sq mi):	0.14
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	190.47
0.18	189.66
6.74	189.14
13.43	188.54
22.20	188.10
28.40	188.02
32.97	187.90
34.24	187.76
35.14	187.34
36.02	187.32
36.33	187.29
36.46	187.08
36.93	186.99
37.85	186.93
38.80	186.90
39.41	187.02
39.59	187.25
40.26	187.16
41.66	187.47
42.31	187.43
42.76	187.97
43.76	188.13
45.60	188.21
50.99	188.42
53.97	189.25
60.77	189.60
62.42	189.79
62.59	190.61

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	187.90
Thalweg Elevation	186.90
Bankfull Cross-Sectional Area:	5.8
LTOB Cross Sectional Area (ft^2)	5.8
Bankfull Width:	9.7
Flood Prone Area Elevation:	188.9
Flood Prone Width:	43.4
LTOB Max Depth (ft)	1.0
Mean Depth at Bankfull:	0.6
W / D Ratio:	16.4
Entrenchment Ratio:	4.5
Bank Height Ratio Based on AB Bankfull Area:	1.0

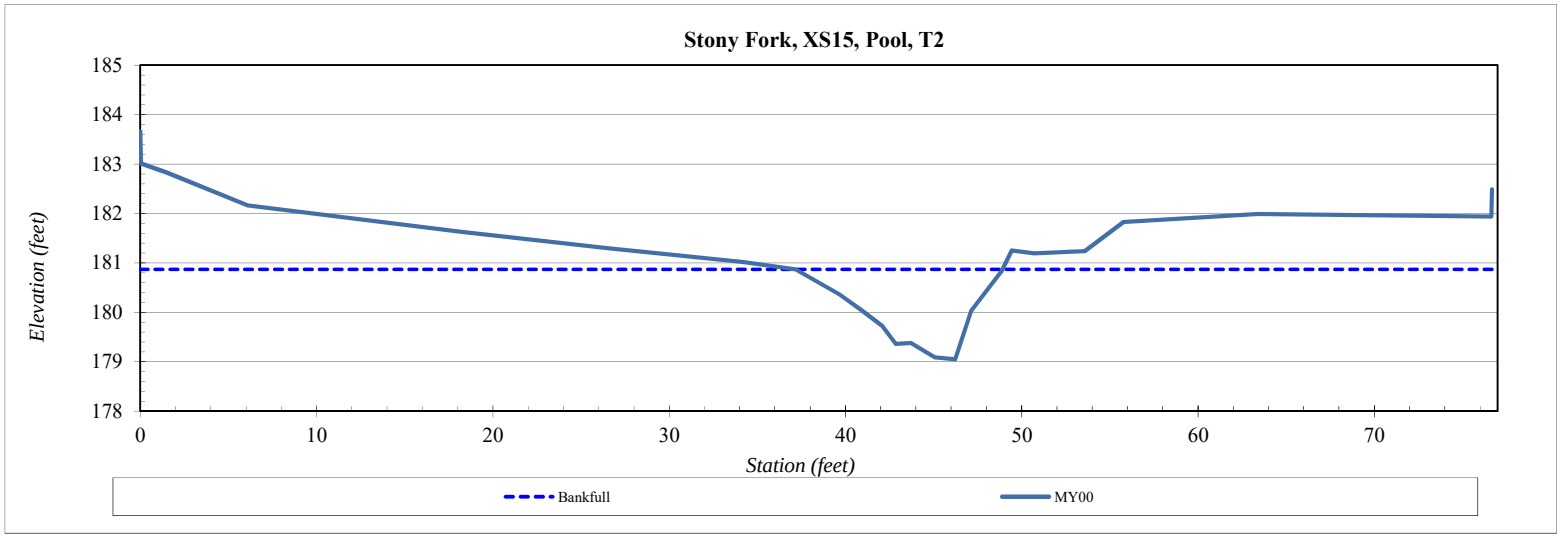


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS15
Drainage Area (sq mi):	0.22
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.00	183.66
0.04	183.01
1.52	182.83
6.06	182.16
18.25	181.63
26.54	181.30
34.18	181.02
37.17	180.87
39.66	180.36
40.94	180.03
42.07	179.73
42.86	179.36
43.70	179.38
45.06	179.09
46.23	179.05
47.14	180.03
48.87	180.83
49.44	181.25
50.71	181.20
53.58	181.24
55.77	181.83
63.39	181.99
76.64	181.94
76.67	182.49

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	180.87
Thalweg Elevation	179.05
Bankfull Cross-Sectional Area:	11.2
LTOB Cross Sectional Area (ft^2)	11.2
Bankfull Width:	11.8
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth (ft)	1.8
Mean Depth at Bankfull:	1.0
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio Based on AB Bankfull Area:	---

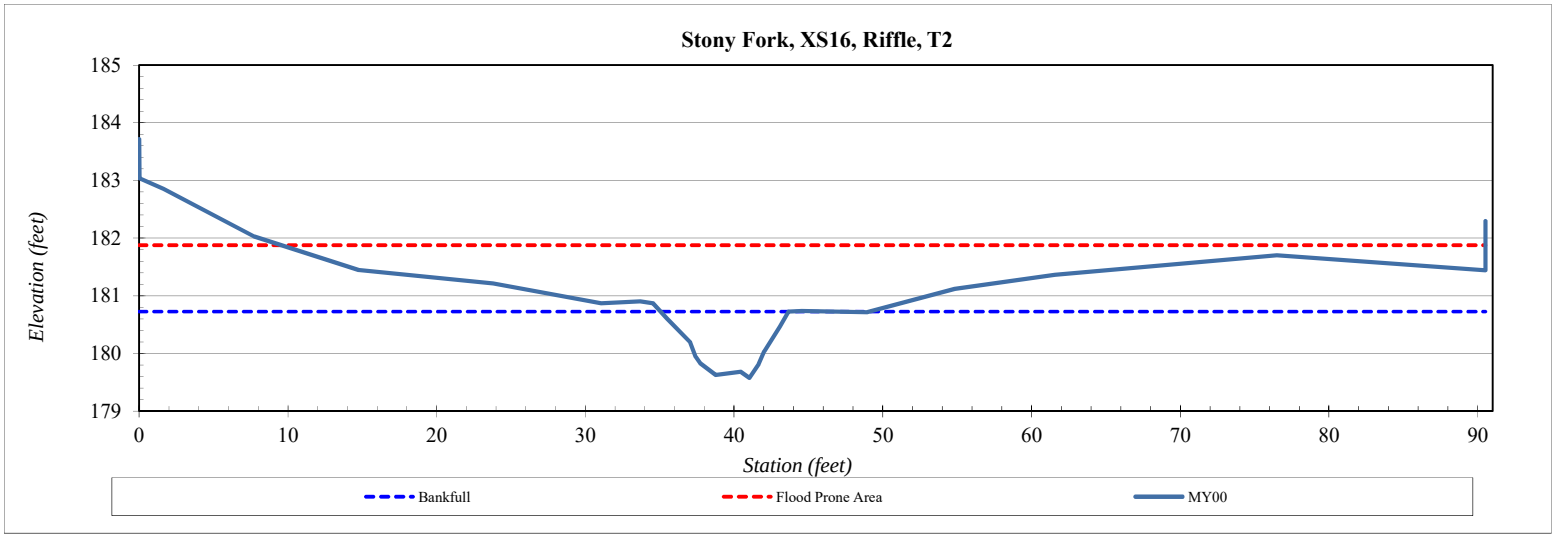


Cross-Section Plots

River Basin:	Neuse River
Site:	Stony Fork
XS ID	XS16
Drainage Area (sq mi):	0.22
Date:	5/14/2019
Field Crew:	T. Seelinger, A. Gutierrez

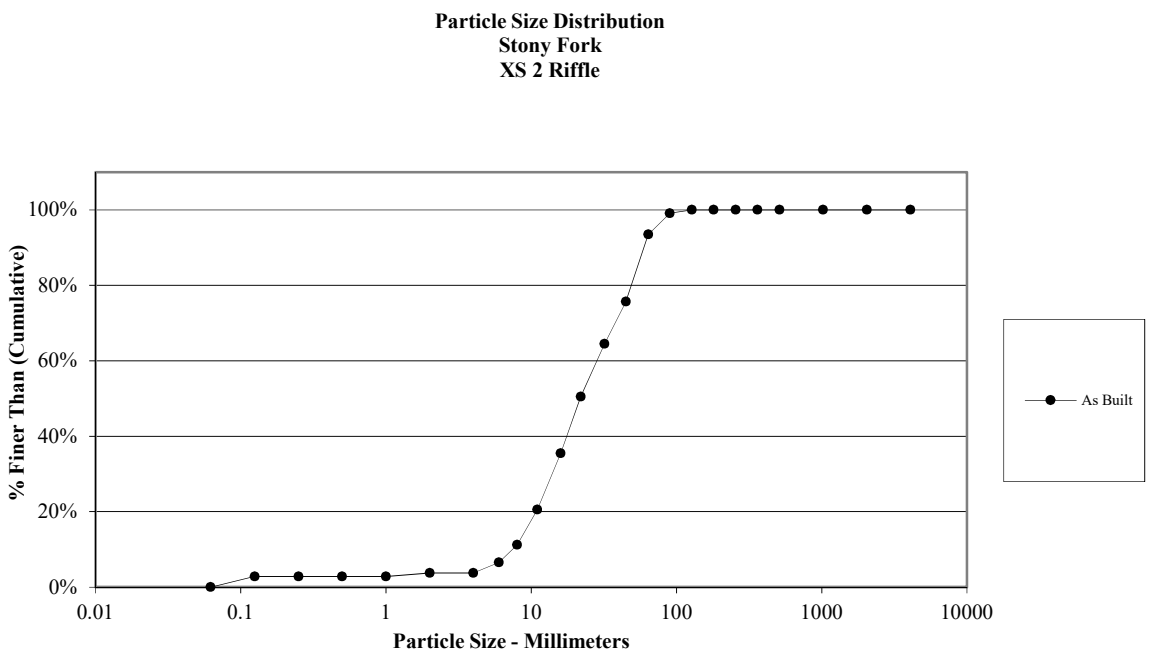
Station	Elevation
0.00	183.72
0.03	183.04
1.64	182.85
7.74	182.03
14.76	181.45
23.79	181.21
31.07	180.87
33.69	180.90
34.55	180.87
35.50	180.61
37.04	180.19
37.42	179.95
37.72	179.83
38.78	179.63
40.45	179.68
41.03	179.58
41.65	179.82
42.01	180.03
43.06	180.47
43.66	180.73
44.56	180.74
48.93	180.71
54.83	181.12
61.57	181.37
76.48	181.71
90.51	181.44
90.51	182.30

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	180.73
Thalweg Elevation	179.58
Bankfull Cross-Sectional Area:	6.0
LTOB Cross Sectional Area (ft^2)	6.0
Bankfull Width:	8.6
Flood Prone Area Elevation:	181.9
Flood Prone Width:	80.9
LTOB Max Depth (ft)	1.2
Mean Depth at Bankfull:	0.7
W / D Ratio:	12.3
Entrenchment Ratio:	9.4
Bank Height Ratio Based on AB Bankfull Area:	1.0



Cross-Section 1 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	3
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	1
Very Fine	2 - 4		
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	10
Medium	11.3 - 16	V	16
Coarse	16 - 22.6	E	16
Coarse	22.6 - 32	L	15
Very Coarse	32 - 45	S	12
Very Coarse	45 - 64		19
Small	64 - 90	C	6
Small	90 - 128	O	1
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	107

Note:



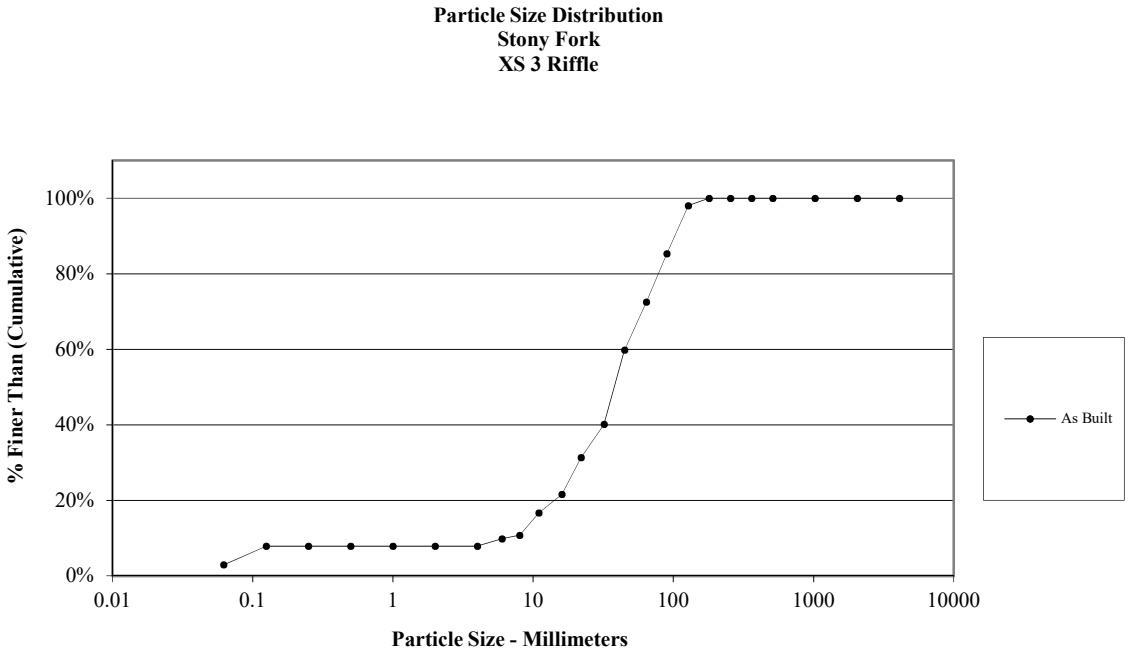
Size (mm)	
D16	9.4
D35	16
D50	22
D65	33
D84	53
D95	70

Size Distribution	
mean	22.3
dispersion	2.4
skewness	0.01

Type	
silt/clay	0%
sand	4%
gravel	90%
cobble	7%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 3 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	5
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	6
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	10
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	20
Very Coarse	45 - 64		13
Small	64 - 90	C	13
Small	90 - 128	O	13
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	102

Note:



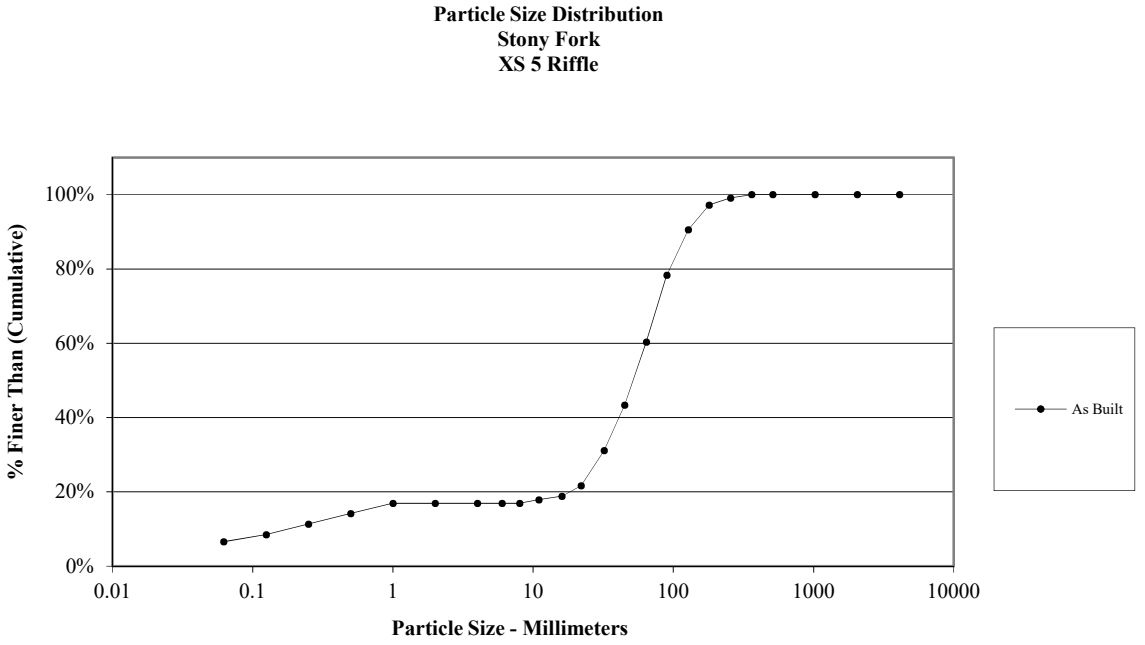
Size (mm)	
D16	11
D35	26
D50	38
D65	52
D84	87
D95	120

Size Distribution	
mean	30.9
dispersion	2.9
skewness	-0.09

Type	
silt/clay	3%
sand	5%
gravel	65%
cobble	27%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 5 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	7
Very Fine	.062 - .125	S	2
Fine	.125 - .25	A	3
Medium	.25 - .50	N	3
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	10
Very Coarse	32 - 45	S	13
Very Coarse	45 - 64		18
Small	64 - 90	C	19
Small	90 - 128	O	13
Large	128 - 180	B	7
Large	180 - 256	L	2
Small	256 - 362	B	1
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	106

Note:



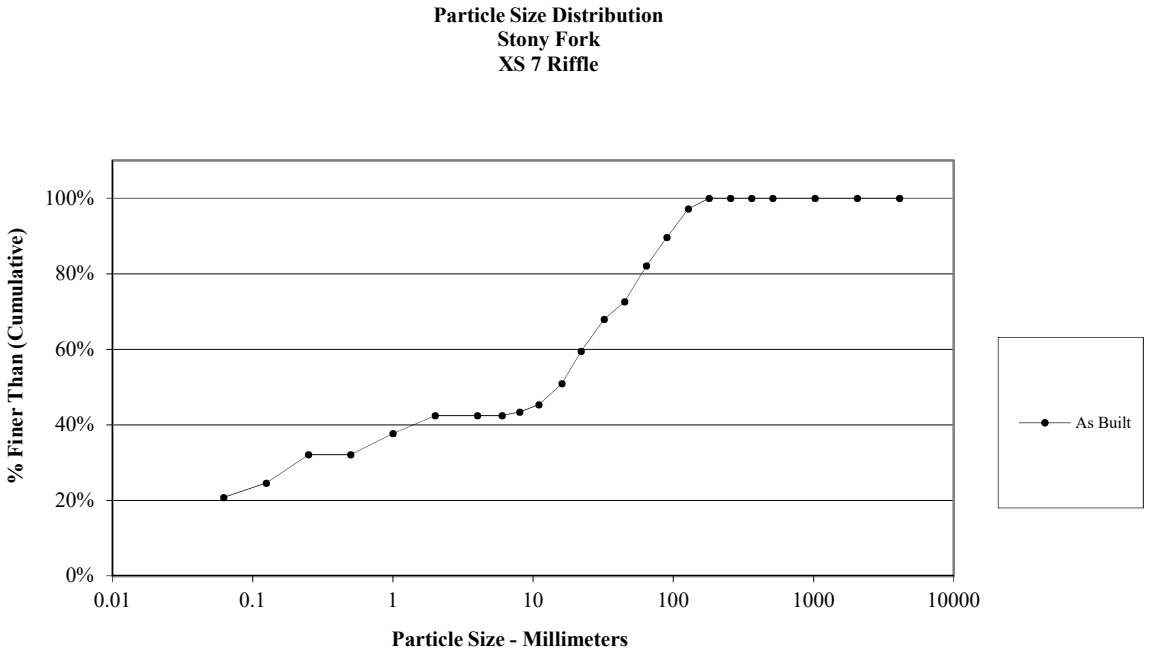
Size (mm)	
D16	0.79
D35	36
D50	52
D65	70
D84	110
D95	160

Size Distribution	
mean	9.3
dispersion	34.0
skewness	-0.51

Type	
silt/clay	7%
sand	10%
gravel	43%
cobble	39%
boulder	1%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 7 Riffle -MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	22
Very Fine	.062 - .125	S	4
Fine	.125 - .25	A	7
Medium	.25 - .50	N	
Coarse	.50 - 1	D	6
Very Coarse	1 - 2	S	5
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	6
Coarse	16 - 22.6	E	9
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	5
Very Coarse	45 - 64		10
Small	64 - 90	C	8
Small	90 - 128	O	8
Large	128 - 180	B	3
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	105

Note:



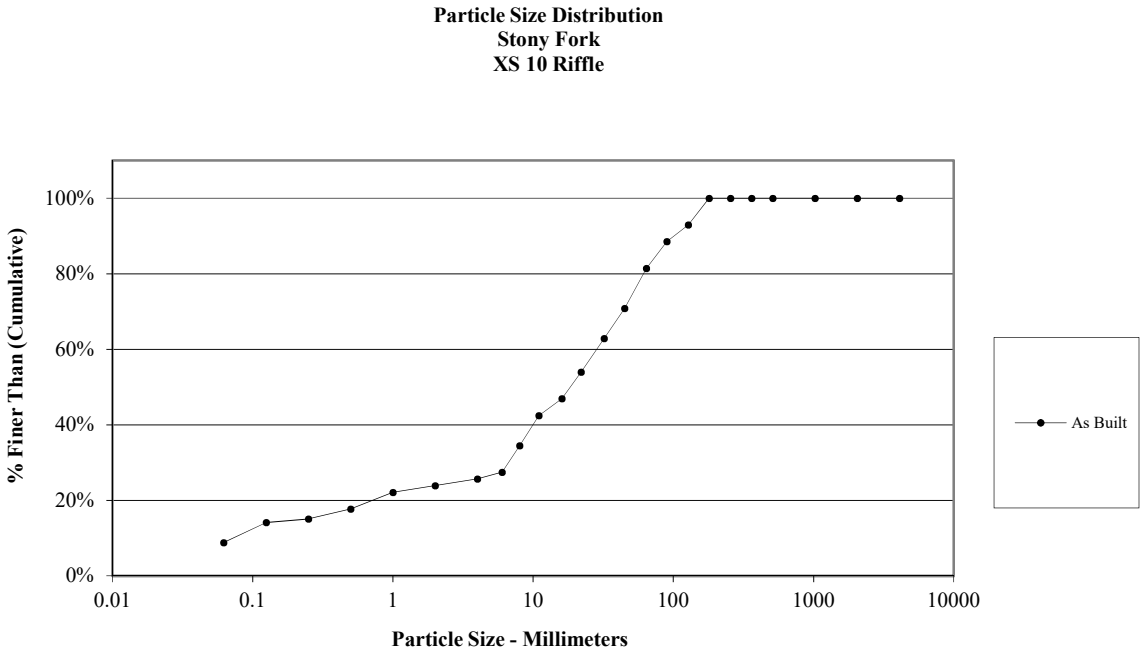
Size (mm)	
D16	0.062
D35	0.77
D50	16
D65	29
D84	70
D95	120

Size Distribution	
mean	2.1
dispersion	131.2
skewness	-0.51

Type	
silt/clay	21%
sand	21%
gravel	40%
cobble	18%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 10 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	10
Very Fine	.062 - .125	S	6
Fine	.125 - .25	A	1
Medium	.25 - .50	N	3
Coarse	.50 - 1	D	5
Very Coarse	1 - 2	S	2
Very Fine	2 - 4		2
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	8
Medium	8 - 11.3	A	9
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	10
Very Coarse	32 - 45	S	9
Very Coarse	45 - 64		12
Small	64 - 90	C	8
Small	90 - 128	O	5
Large	128 - 180	B	8
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	113

Note:



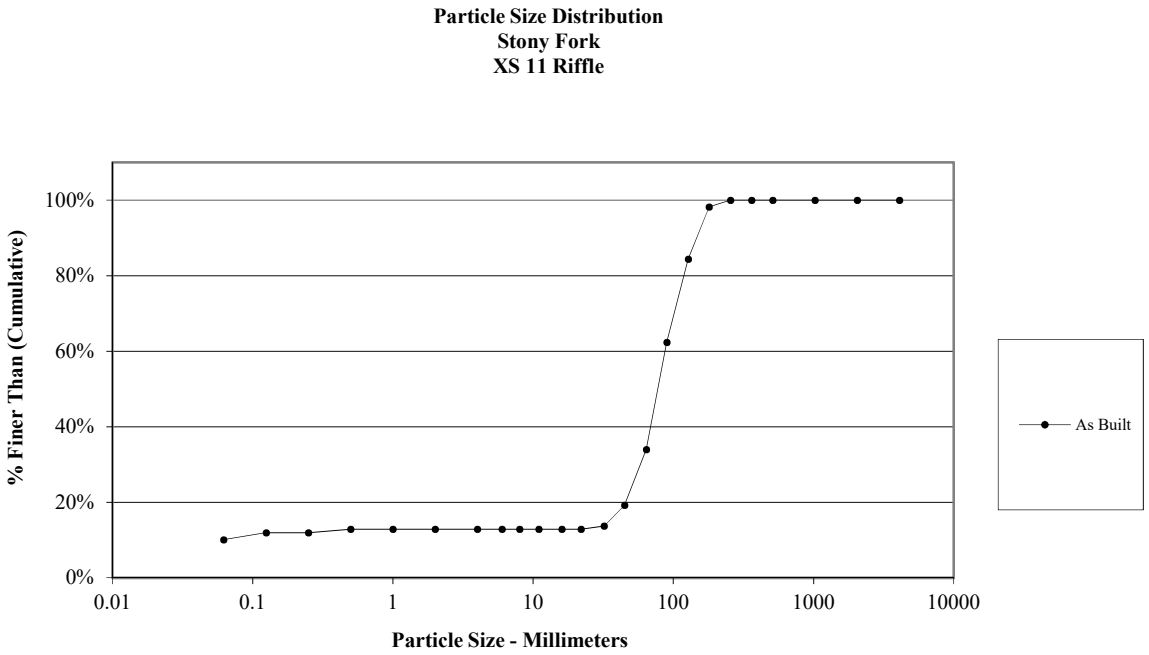
Size (mm)	
D16	0.32
D35	8.2
D50	18
D65	35
D84	72
D95	140

Size Distribution	
mean	4.8
dispersion	30.1
skewness	-0.37

Type	
silt/clay	9%
sand	15%
gravel	58%
cobble	19%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 11 Riffle -MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	11
Very Fine	.062 - .125	S	2
Fine	.125 - .25	A	
Medium	.25 - .50	N	1
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	6
Very Coarse	45 - 64		16
Small	64 - 90	C	31
Small	90 - 128	O	24
Large	128 - 180	B	15
Large	180 - 256	L	2
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	109

Note:



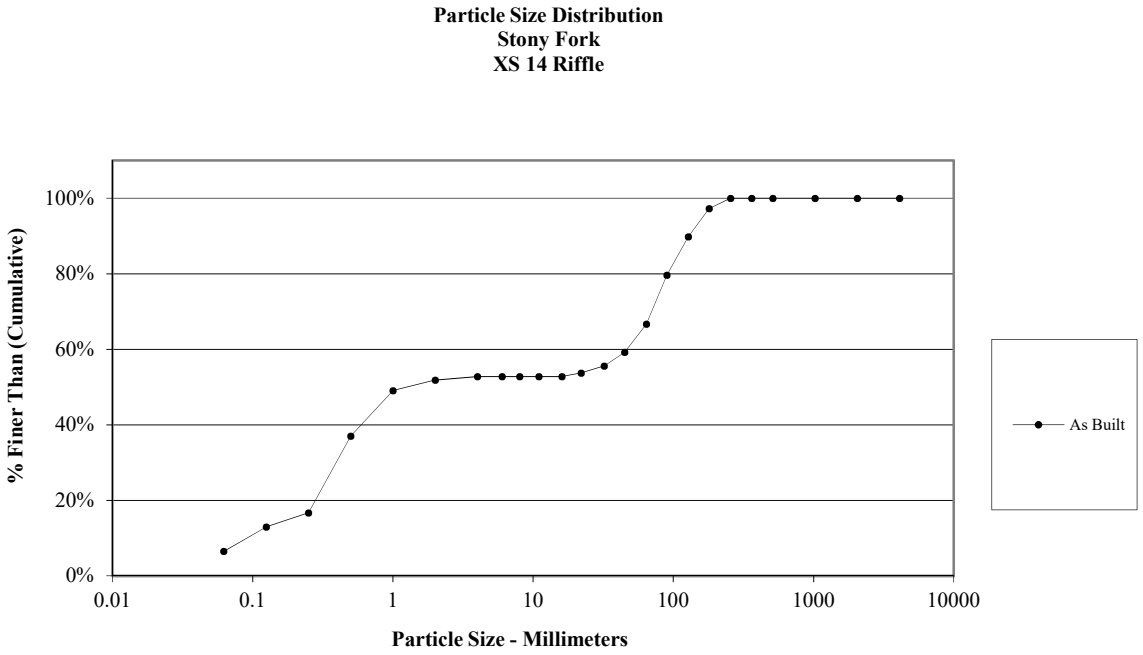
Size (mm)	
D16	37
D35	65
D50	78
D65	94
D84	130
D95	170

Size Distribution	
mean	69.4
dispersion	1.9
skewness	-0.07

Type	
silt/clay	10%
sand	3%
gravel	21%
cobble	66%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 14 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	7
Very Fine	.062 - .125	S	7
Fine	.125 - .25	A	4
Medium	.25 - .50	N	22
Coarse	.50 - 1	D	13
Very Coarse	1 - 2	S	3
Very Fine	2 - 4		1
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		8
Small	64 - 90	C	14
Small	90 - 128	O	11
Large	128 - 180	B	8
Large	180 - 256	L	3
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	108

Note:



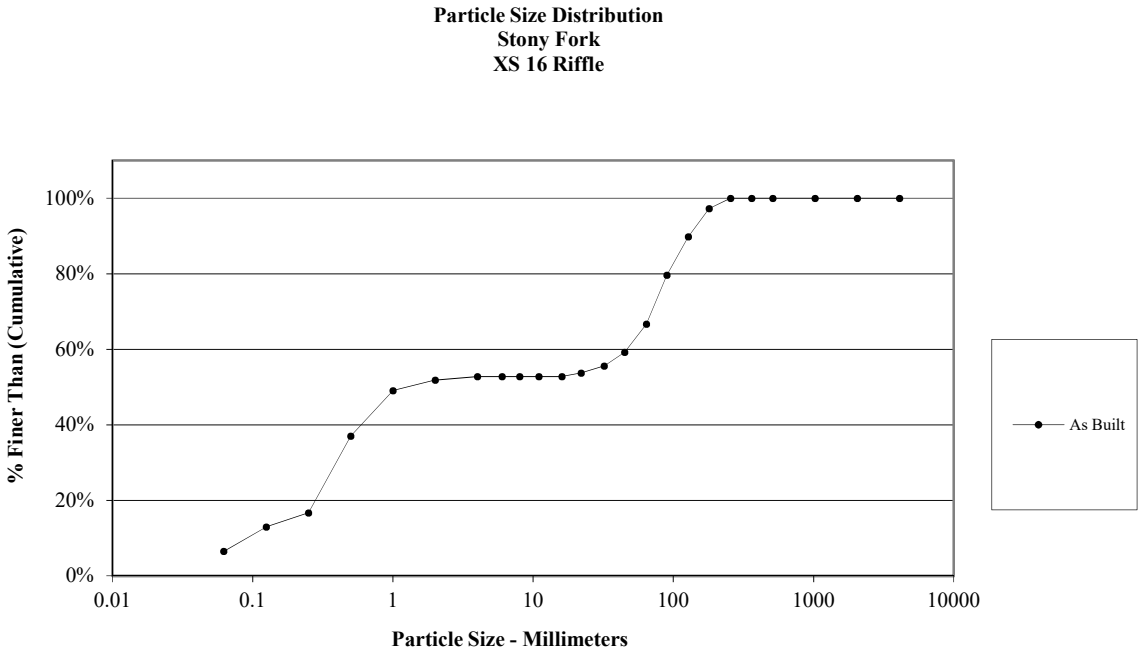
Size (mm)	
D16	26
D35	35
D50	42
D65	51
D84	74
D95	110

Size Distribution	
mean	43.9
dispersion	1.7
skewness	0.03

Type	
silt/clay	6%
sand	45%
gravel	15%
cobble	33%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 16 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	4
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	3
Medium	.25 - .50	N	
Coarse	.50 - 1	D	4
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	10
Very Coarse	32 - 45	S	22
Very Coarse	45 - 64		26
Small	64 - 90	C	14
Small	90 - 128	O	6
Large	128 - 180	B	3
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



Size (mm)	
D16	18
D35	35
D50	45
D65	55
D84	77
D95	120

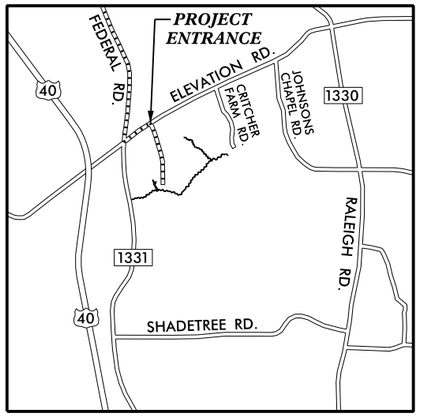
Size Distribution	
mean	37.2
dispersion	2.1
skewness	-0.10

Type	
silt/clay	4%
sand	7%
gravel	65%
cobble	24%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

APPENDIX E

As-Built Plan Sheets

KCI JOB# : 161600959



VICINITY MAP
NOT TO SCALE

NCDEQ DIVISION OF MITIGATION SERVICES

STONY FORK STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

STATE	DMS PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
N.C.	97085	1	8

INDEX OF SHEETS

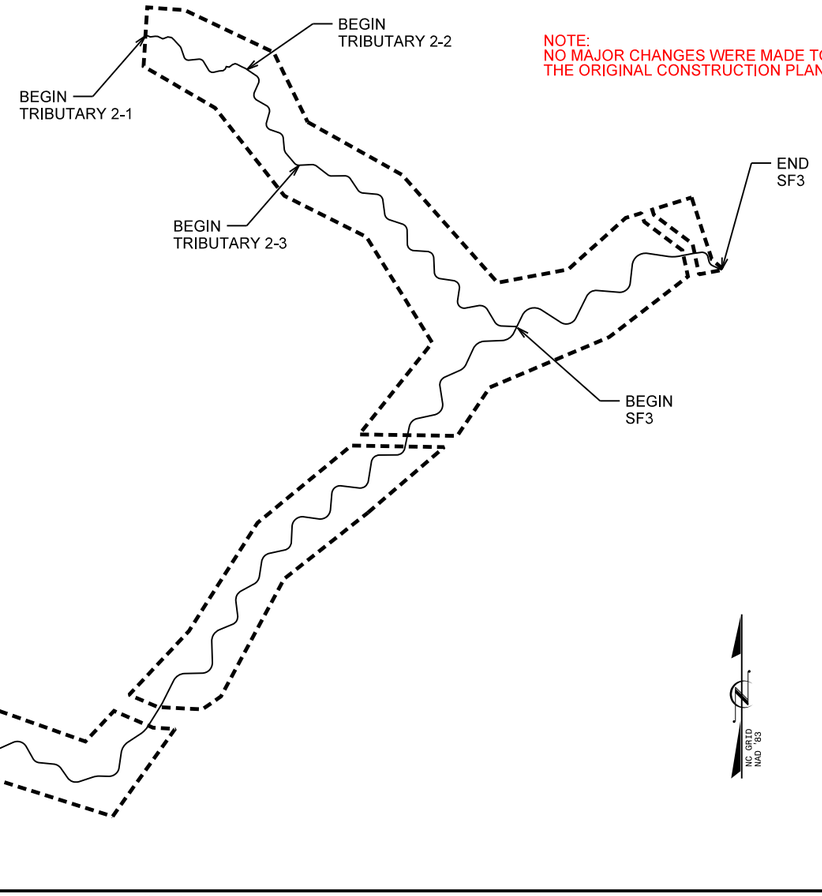
AS–BUILT PLANS

NOTE:
NO MAJOR CHANGES WERE MADE TO THE ORIGINAL CONSTRUCTION PLANS.

PROJECT COMPONENTS – 6,588 STREAM CREDITS AND 480,338 BUFFER CREDITS

Reach ID	Proposed Stationing	Existing Footage or Square Feet	Approach	Mitigation Ratio	Restoration Footage or Area	Mitigation Credits
SF1	10+00 to 21+55	1,235	Restoration	1 to 1	1,155	1,155
	21+55 to 32+62	1,143			1,105	1,105
SF2*	33+19 to 44+53	1,027	Restoration	1 to 1	1,134	1,134
	44+84 to 49+54	283			470	470
SF3*	49+54 to 55+52	592	Restoration	1 to 1	598	598
	55+82 to 56+08	26			26	26
Tributary 1	100+00 to 105+10	365	Restoration	1 to 1	510	510
Tributary 1A	150+00 to 151+59	47	Restoration	1 to 1	159	159
Tributary 2-1	200+00 to 203+34	326	Enhancement II	2.5 to 1	334	134
Tributary 2-2	203+34 to 206+71	318	Restoration	1 to 1	337	337
Tributary 2-3	206+71 to 215+26	820	Restoration	1 to 1	855	855
Tributary 3	300+00 to 300+71	72	Enhancement I	1.5 to 1	71	47
Tributary 3	300+71 to 301+29	82	Restoration	1 to 1	58	58
				TOTAL STREAM CREDITS		6,586
Buffer Restoration TOB to 100'	N/A	413,194	Buffer Restoration TOB to 100'	1.00	413,194	413,194
Buffer Restoration 101-200'	N/A	37,091	Buffer Restoration 101-200'	0.33	37,091	12,240
Buffer Enhancement TOB to 100'	N/A	74,802	Buffer Enhancement TOB to 100'	0.50	74,802	37,401
Buffer Preservation TOB to 100'	N/A	175,029	Buffer Preservation TOB to 100'	0.10	175,029	17,503
				TOTAL BUFFER CREDITS		480,338

* Crossings have been removed from creditable linear footage for all project streams.



DIRECTIONS TO SITE

From Raleigh, follow I–40 East. Take exit 319 and turn left onto US–210 E. After a mile, take a right onto Raleigh Road and follow for 2.2 miles. Take a right onto Federal Road and follow for 2.3 miles. Sharp left onto Elevation Road and follow for about 0.2 mile. Take a right into the driveway for 4045 Elevation Road and follow down to the project stream.

Prepared in the Office of:

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

GARY M. MRYNCZA, PE
PROJECT ENGINEER

ALEX FRENCH
PROJECT DESIGNER

Prepared for:

NCDEQ – DIVISION OF MITIGATION SERVICES

LINDSAY CROCKER
DMS PROJECT MANAGER

LIN XU
DMS REVIEW COORDINATOR

PROJECT SURVEYOR

SIGNATURE: *P.E.*

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

SIGNATURE: *P.E.*

GENERAL NOTES:

THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARENT TRACTS. THE PARENT TRACT BOUNDARIES ADJACENT TO THIS EASEMENT ARE NOT CHANGED BY THIS PLAT.

DISTANCES SHOWN ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.

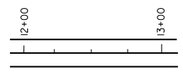
THE BASIS OF THE MERIDIANS AND COORDINATES FOR THIS PLAT IS THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83), BASED ON DIFFERENTIAL GPS OBSERVATIONS. ALL DISTANCES ARE GROUND UNLESS OTHERWISE NOTED.

NO UNDERGROUND UTILITY LOCATING PERFORMED DURING THE COURSE OF THIS SURVEY.

CONTROL POINTS

DESC.	NORTHING	EASTING	ELEV.
KCI#27	618367.2470	2141562.051	198.4900
KCI#70	618647.1690	2141408.330	215.5190
KCI#71	618910.1740	2141115.861	277.1050
KCI#79	618217.9490	2142061.939	194.4710
KCI#90	618209.5420	2141067.742	201.9430
KCI#300	618178.5924	2142094.378	192.3853
KCI#301	618590.2717	2142474.796	185.2785
KCI#302	619120.0287	2142959.327	179.2967
KCI#303	619333.5622	2143164.350	177.1733
KCI#304	619462.2658	2142986.297	180.6263
KCI#305	619680.7375	2142807.789	183.4926
KCI#306	619507.7895	2143539.344	173.8932
KCI#401	617998.2136	2140619.690	208.7900
KCI#90CHK	618209.6074	2141067.627	201.8893
KCI#640	618335.4015	2141177.787	200.5566
KCI#641	618110.9101	2140889.317	204.7602
NL	618008.3538	2140585.509	208.5186
NL	618163.5139	2140377.491	225.0919
NL	619953.0220	2142386.066	196.3783
NL	619615.5746	2143665.436	174.2422
NL	619741.1450	2144001.311	191.5167

PROJECT LEGEND:

Proposed Thalweg w/Approximate Bankfull Limits ..... 

Proposed Riffle Enhancement ..... 

Proposed Riffle Grade Control ..... 

Proposed Step Pool ..... 

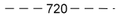
Proposed Live Lift ..... 

Existing Channel to be Filled ..... 

Proposed Channel Block ..... 

Existing Tree Line ..... 

Minor Contour Line .....

Major Contour Line ..... 

REVISIONS

DESCRIPTION	DATE	SYM.

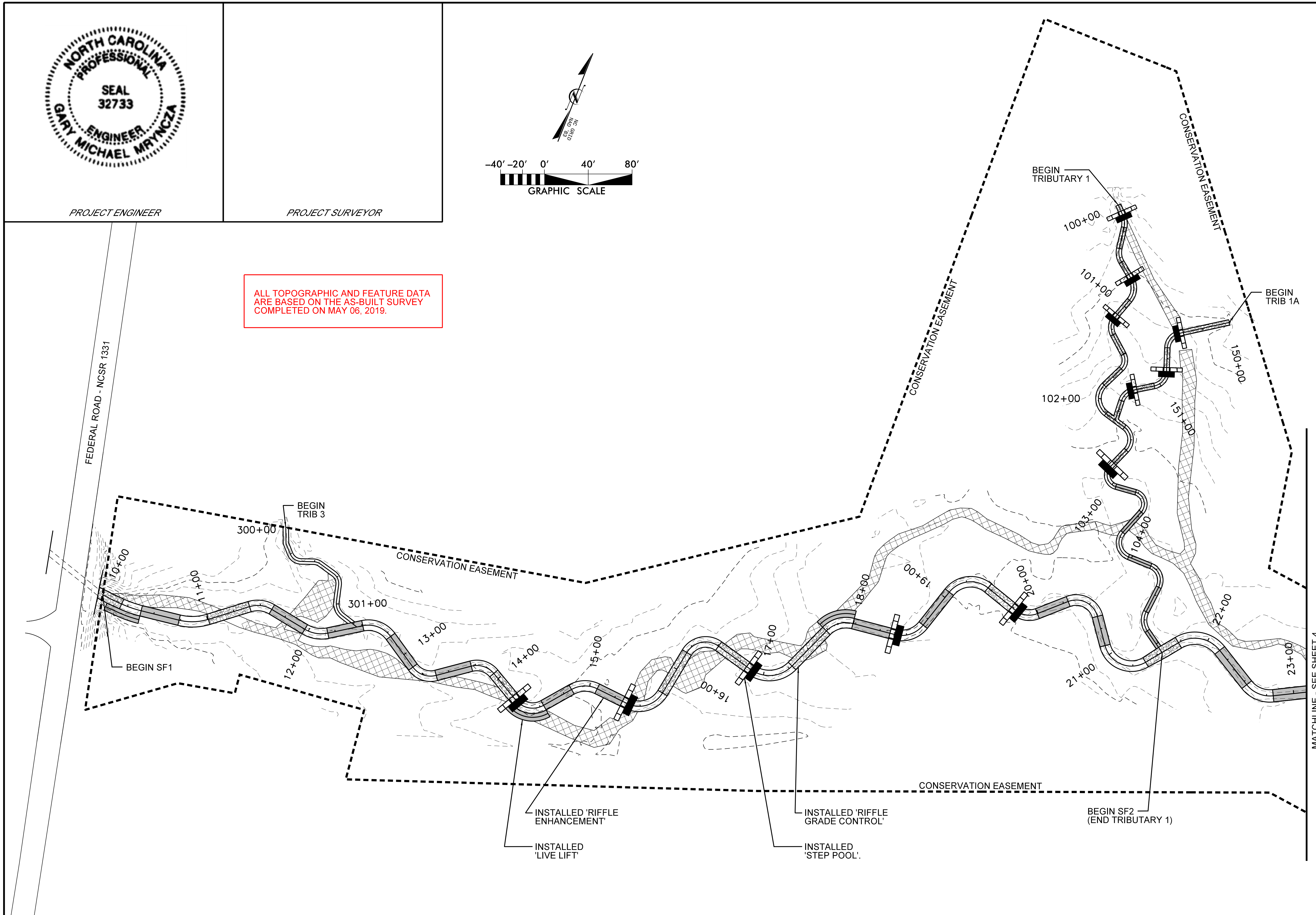
NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

STONY FORK
STREAM RESTORATION SITE
AS-BUILT PLANS
JOHNSTON COUNTY, NORTH CAROLINA

DATE: MAY 2019
SCALE: N.T.S.

GENERAL NOTES & PROJECT LEGEND


NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA
PROJECT ENGINEER
PROJECT SURVEYOR
NC GRID NAD 83
-40' -20' 0' 40' 80'
GRAPHIC SCALE
ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON MAY 06, 2019.
FEDERAL ROAD - NCSR 1331
CONSERVATION EASEMENT
CONSERVATION EASEMENT
CONSERVATION EASEMENT
CONSERVATION EASEMENT
BEGIN TRIBUTARY 1
BEGIN TRIB 1A
BEGIN TRIB 3
BEGIN SF1
100+00
101+00
102+00
103+00
104+00
150+00
151+00
300+00
301+00
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
INSTALLED 'RIFFLE ENHANCEMENT'
INSTALLED 'LIVE LIFT'
INSTALLED 'RIFFLE GRADE CONTROL'
INSTALLED 'STEP POOL'.
BEGIN SF2 (END TRIBUTARY 1)
MATCHLINE - SEE SHEET 4

SYM.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ – DIVISION OF MITIGATION SERVICES

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4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

STONY FORK
STREAM RESTORATION SITE
AS-BUILT PLANS
JOHNSTON COUNTY, NORTH CAROLINA

DATE: MAY 2019
SCALE: GRAPHIC

SITE PLAN

REACH:
SF1, SF2 &
T1, T1A, T3

SHEET 3 OF 8

ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON MAY 06, 2019.

EXISITNG GRAVEL ACCESS DRIVE

EXISITNG ASPHALT DRIVE

MATCHLINE - SEE SHEET 3

MATCHLINE - SEE SHEET 5

INSTALLED 'RIFFLE ENHANCEMENT'

INSTALLED 'LIVE LIFT'

INSTALLED 'STEP POOL'.

INSTALLED 'RIFFLE GRADE CONTROL'

INCOMING DRAINAGE STABILIZED

INCOMING DRAINAGE STABILIZED

CONSERVATION EASEMENT

CONSERVATION EASEMENT

CONSERVATION EASEMENT

CONSERVATION EASEMENT

55' WIDE EASEMENT EXCEPTION

FUTURE ASPHALT DRIVE BY OTHERS

FUTURE RIGHT OF WAY (BY OTHERS)

24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00 37+00 38+00 39+00

NO DATA ON DISK

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

PROJECT SURVEYOR

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

DATE	DESCRIPTION	SYM.

NC NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

STONY FORK
STREAM RESTORATION SITE
AS–BUILT PLANS
JOHNSTON COUNTY, NORTH CAROLINA

DATE: MAY 2019
SCALE: GRAPHIC

SITE PLAN

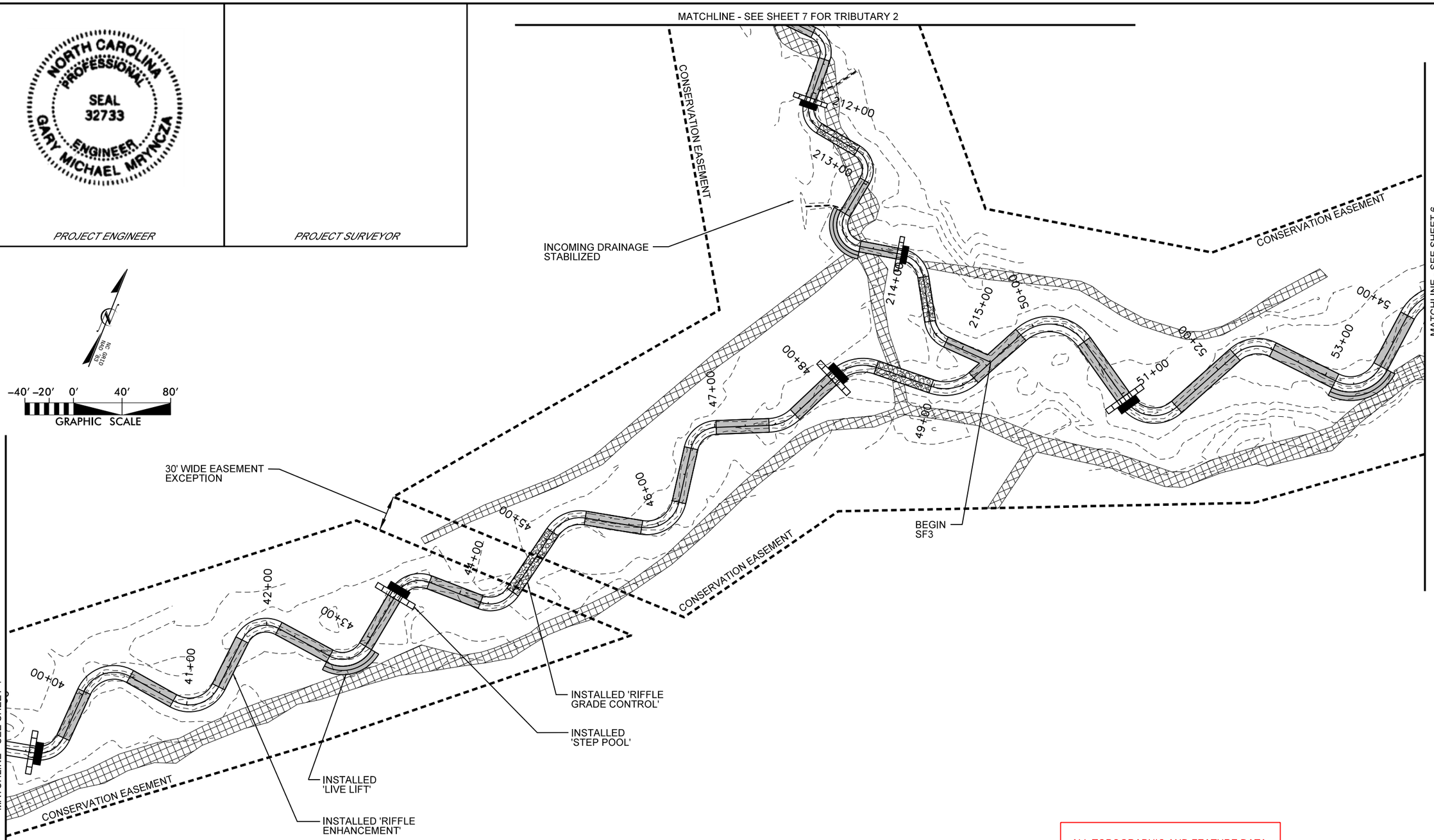
REACH:
SF2

SHEET 4 OF 8

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

PROJECT ENGINEER

PROJECT SURVEYOR



ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON MAY 06, 2019.

REVISIONS		
SYM.	DESCRIPTION	DATE

NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

STONY FORK STREAM RESTORATION SITE

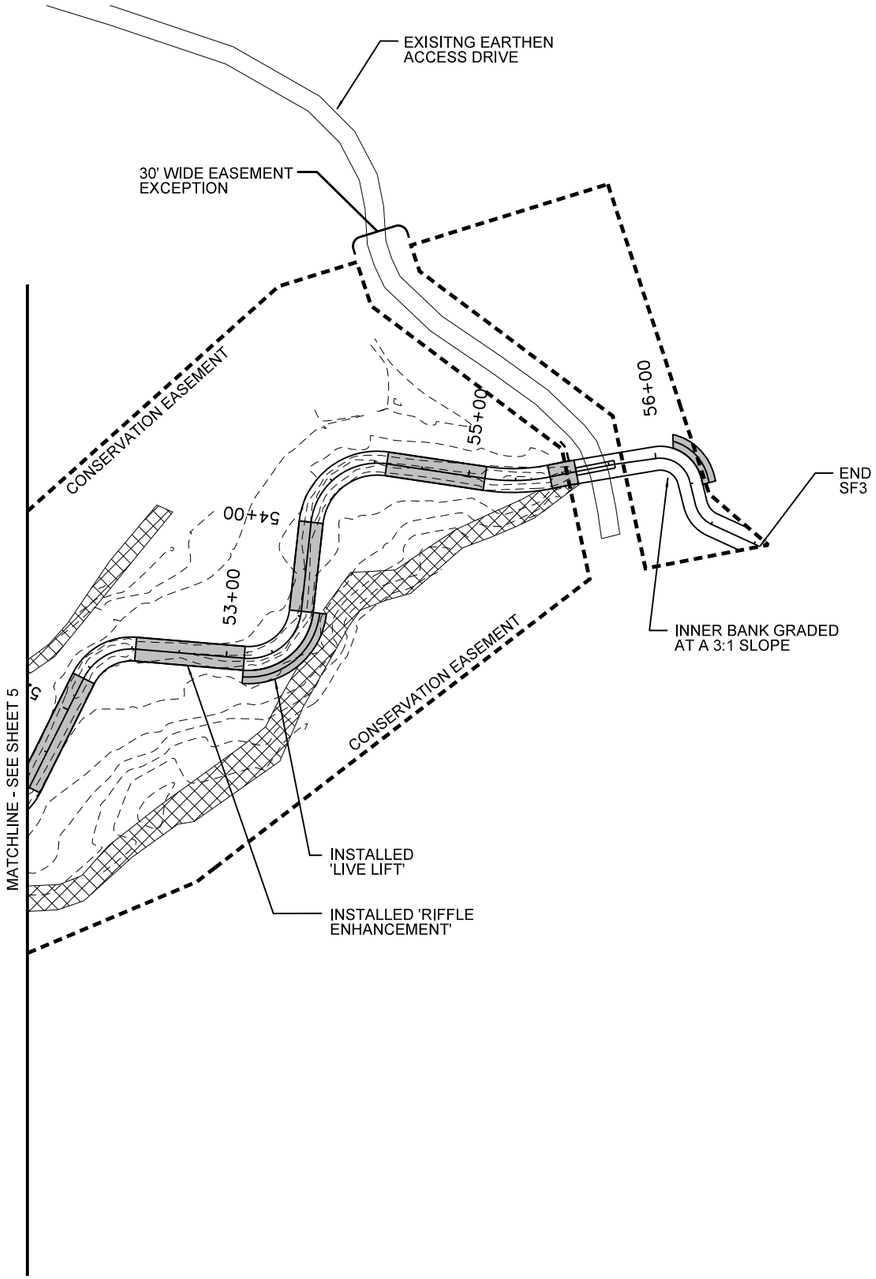
AS–BUILT PLANS

JOHNSTON COUNTY, NORTH CAROLINA

DATE: MAY 2019
SCALE: GRAPHIC

SITE PLAN

REACH: SF2 & SF3



PROJECT SURVEYOR

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

PROJECT ENGINEER

ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON MAY 06, 2019.

NC GRID NAD '83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

REVISIONS

SYM.	DESCRIPTION	DATE

NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
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RALEIGH, NORTH CAROLINA 27609

STONY FORK
STREAM RESTORATION SITE
AS-BUILT PLANS
JOHNSTON COUNTY, NORTH CAROLINA

DATE: MAY 2019
SCALE: GRAPHIC

SITE PLAN

REACH:
SF3

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

PROJECT ENGINEER

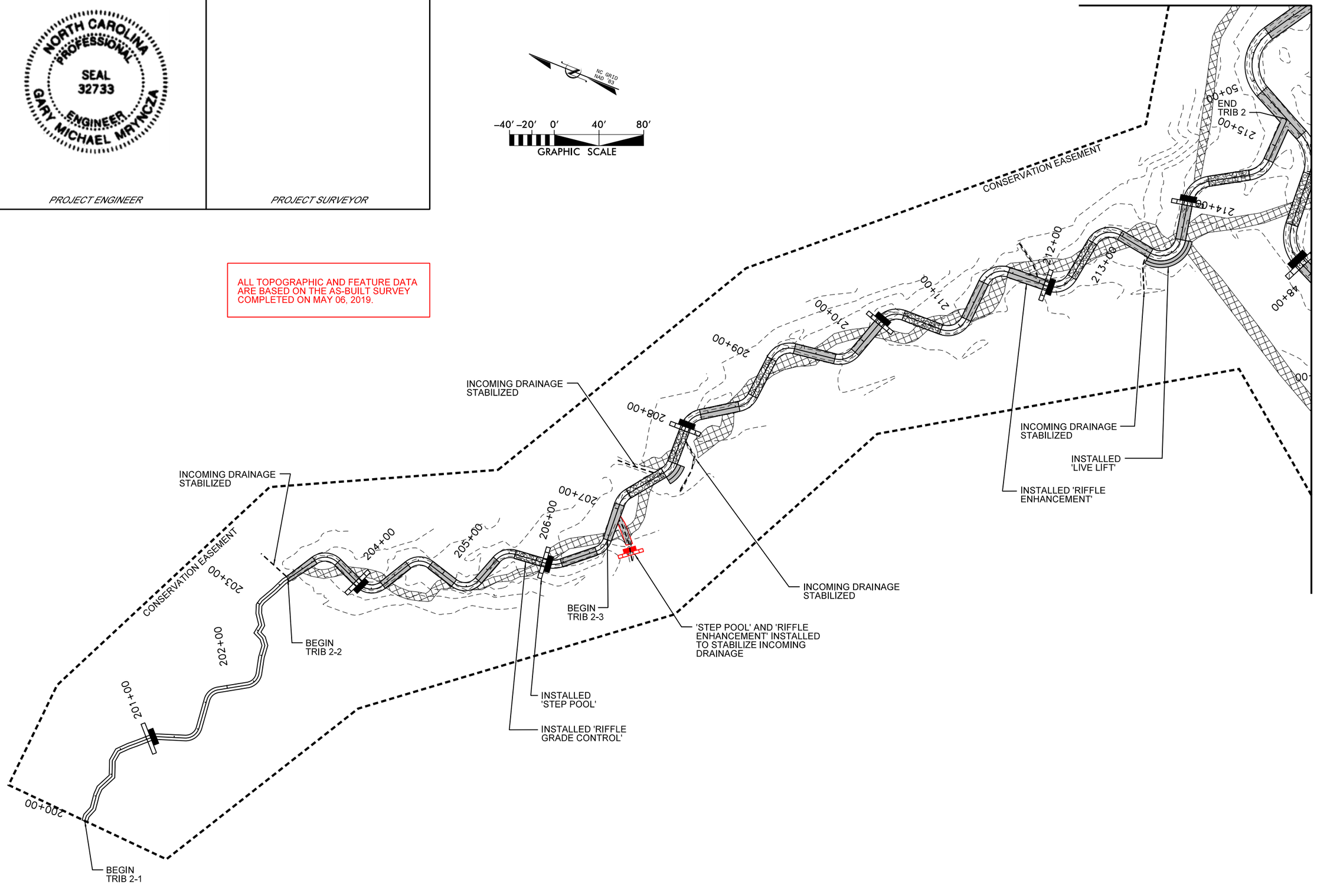
PROJECT SURVEYOR

ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON MAY 06, 2019.

NC GRID NAD 83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE



MATCHLINE - SEE SHEETS 3 - 6 FOR MAINSTEM (SF1, SF2, SF3)

SYM.	DESCRIPTION	DATE
	REVISIONS	

NC NCDEQ – DIVISION OF MITIGATION SERVICES

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STONY FORK
STREAM RESTORATION SITE
AS–BUILT PLANS
JOHNSTON COUNTY, NORTH CAROLINA

DATE: MAY 2019
SCALE: GRAPHIC

SITE PLAN

REACH:
TRIB 2-1, 2-2, 2-3

SHEET 7 OF 8

RIPARIAN FOREST PLANTING:

PLANTING ZONE 1 = 13.4 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS	FACW	24	3,120
~~SWAMP CHESTNUT OAK~~	~~QUERCUS MICHAUXII~~	~~FACW~~	~~20~~	~~2,600~~
SILKY DOGWOOD	CORNUS AMMOMUM	FACW	3	400
BALD CYPRESS	TAXODIUM DISTICHUM	OBL	3	400
GREEN ASH	FRAXINUS PENNSYLVANICA	FACW	21	2,720
RIVER BIRCH	BETULA NIGRA	FACW	24	3,120
WILLOW OAK	QUERCUS PHELLOS	FAC	14	1,820
TULIP POPLAR	LIRIODENDRON TULIPIFERA	FACU	11	1,420
				13,000

PLANTING ZONE 2 = 9.5 ACRES

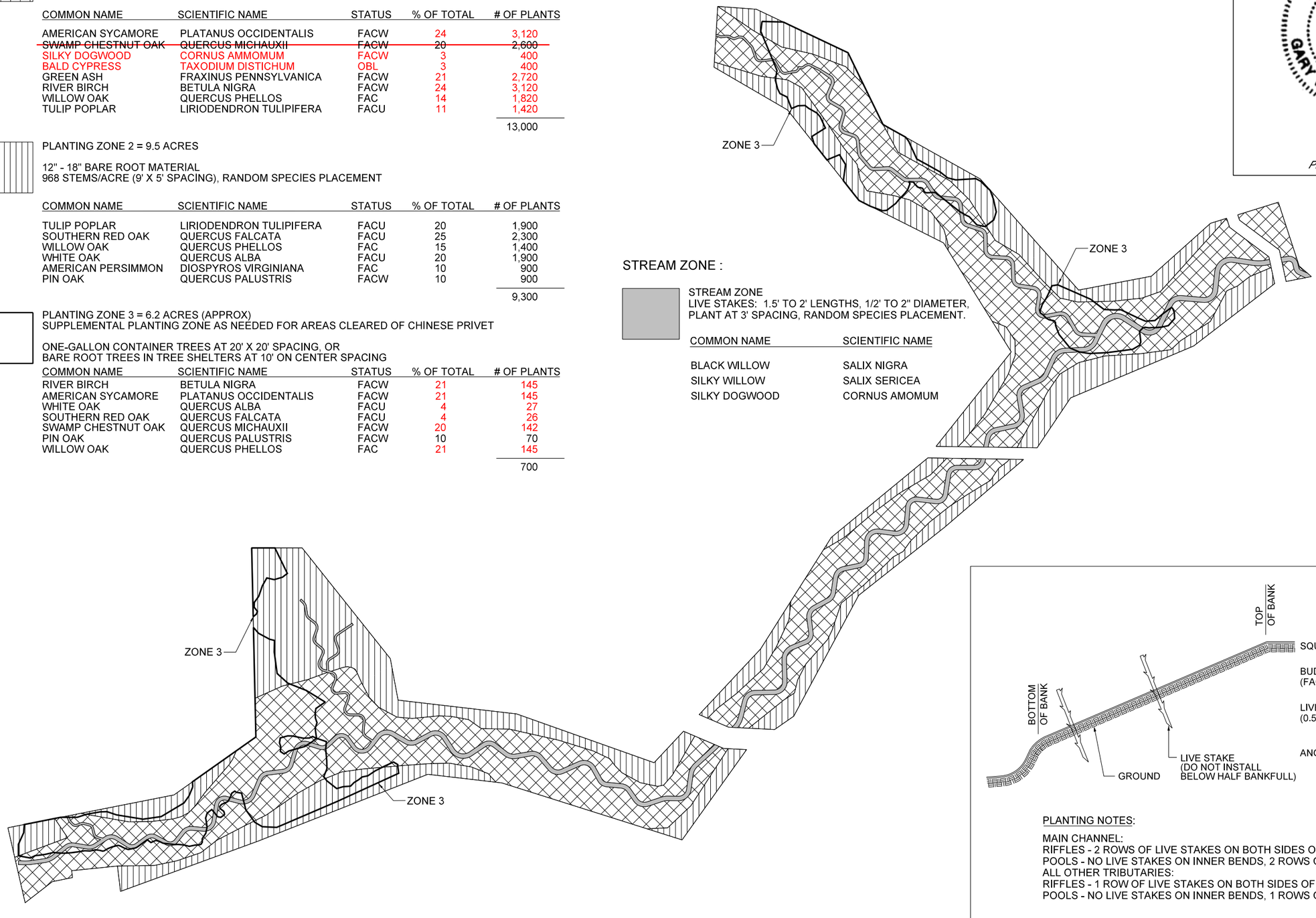
12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
TULIP POPLAR	LIRIODENDRON TULIPIFERA	FACU	20	1,900
SOUTHERN RED OAK	QUERCUS FALCATA	FACU	25	2,300
WILLOW OAK	QUERCUS PHELLOS	FAC	15	1,400
WHITE OAK	QUERCUS ALBA	FACU	20	1,900
AMERICAN PERSIMMON	DIOSPYROS VIRGINIANA	FAC	10	900
PIN OAK	QUERCUS PALUSTRIS	FACW	10	900
				9,300

PLANTING ZONE 3 = 6.2 ACRES (APPROX)
SUPPLEMENTAL PLANTING ZONE AS NEEDED FOR AREAS CLEARED OF CHINESE PRIVET

ONE-GALLON CONTAINER TREES AT 20' X 20' SPACING, OR
BARE ROOT TREES IN TREE SHELTERS AT 10' ON CENTER SPACING

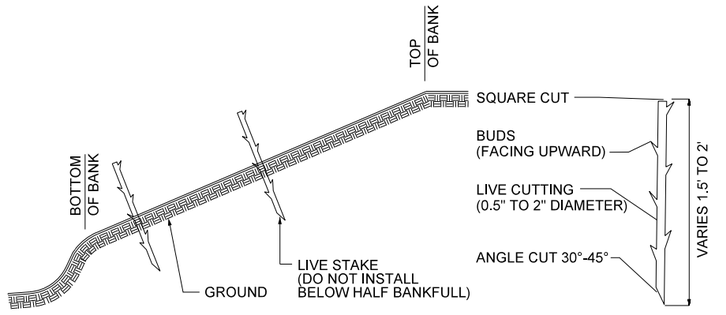
COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
RIVER BIRCH	BETULA NIGRA	FACW	21	145
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS	FACW	21	145
WHITE OAK	QUERCUS ALBA	FACU	4	27
SOUTHERN RED OAK	QUERCUS FALCATA	FACU	4	26
SWAMP CHESTNUT OAK	QUERCUS MICHAUXII	FACW	20	142
PIN OAK	QUERCUS PALUSTRIS	FACW	10	70
WILLOW OAK	QUERCUS PHELLOS	FAC	21	145
				700



STREAM ZONE :

STREAM ZONE
LIVE STAKES: 1.5' TO 2' LENGTHS, 1/2' TO 2" DIAMETER,
PLANT AT 3' SPACING, RANDOM SPECIES PLACEMENT.

COMMON NAME	SCIENTIFIC NAME
BLACK WILLOW	SALIX NIGRA
SILKY WILLOW	SALIX SERICEA
SILKY DOGWOOD	CORNUS AMOMUM



PLANTING NOTES:

MAIN CHANNEL:
RIFFLES - 2 ROWS OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 2 ROWS ON OUTER BENDS.
ALL OTHER TRIBUTARIES:
RIFFLES - 1 ROW OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 1 ROWS ON OUTER BENDS.

LIVE STAKES

SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

PROJECT ENGINEER

REVISIONS

NUM.	DESCRIPTION	DATE

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

STONY FORK
STREAM RESTORATION SITE
AS-BUILT PLANS
JOHNSTON COUNTY, NORTH CAROLINA

DATE: MAY 2019
SCALE: GRAPHIC

PLANTING PLAN