MY02 MONITORING REPORT

Dales Creek Restoration Site
Buncombe County, North Carolina
French Broad River Basin - 06010105

DMS Project #100128
DMS Contract #7910
DMS RFP #16-007724 (Issue Date: November 13, 2018)
USACE AID #: SAW 2019-00834 DWR #: 20190864
Monitoring Data Collected: 2023

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

Monitoring and Design Firm

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ENGINEERS • SCIENTISTS • SURVEYORS • CONSTRUCTION MANAGERS
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MEMORANDUM

Date: February 14, 2024
To: Harry Tsomides, DMS Project Manager
From: Adam Spiller, Project Manager
KCI Associates of North Carolina, PA
Subject: MY-02 Monitoring Report Comments
Dales Creek DMS #7910, Contract 100128
French Broad River Basin CU 06010105
Buncombe County, North Carolina

Please find below our responses in italics to the MY-02 Monitoring Report comments from NCDMS received on January 3, 2024 for the Dales Creek Restoration Site.

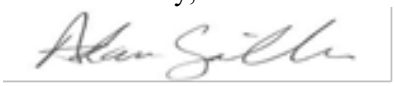
1. During a site visit in 2023 DMS observed an area (along UT1 near Photo Point 2) of steep hillslope erosion, fallen trees, and active spring flow at the base of the bank and into this project E2 reach. Attached to this comment email is a short video. DMS recommends inspecting this area next time KCI visits the site, and if needed, reporting on this area moving forward to assess its stability and if/how it is changing year to year.
KCI Response: KCI was first alerted to this issue by DMS near the beginning of 2023. The area in question has been reviewed several times since then and although the hillslope erosion and fallen trees were noted, we were unable to identify the area of spring flow (likely due to the lower than normal amounts of rainfall that the site experienced this year). A site visit is planned for early spring 2024, and will be coordinated so that it occurs shortly after a rainfall and the spring is flowing. Once KCI has had a chance to thoroughly assess this area we will develop a plan of action to ensure that this area does not pose a threat to the project.

2. E2 reaches UT1, UT1-2, UT4 and UT4 combine for over 1800 LF and are moderately sloped tributaries not included in the visual assessment tables but these reaches should be at least checked visually and reported during monitoring.
KCI Response: Although the E2 reaches are not included in the visual assessment tables, they were reviewed as part of the end of year site walk and no issues were found. A note about these reaches has been added to the monitoring report.

3. During the 2023 Credit Release review meeting the IRT asked KCI to verify the rain data in the MY2(2023) report to confirm that the offsite rain data source is applicable to the project site. Please provide more detail on the rain data source and how it correlates with site rainfall. Also, if possible please provide the 30-70 Percentile Graph for the rain data.
KCI Response: The 30-70 has been added to the report as well as a discussion of the rainfall on site in 2023. Rainfall data is obtained from the nearest weather station (Station ID: UNCA) which is located approximately 10 miles east of the site. Comparing the response of the streams on-site to the reported rainfall showed a correlation between large rain events and rises in the stream level/bankfull events. The 2023 data from this station was also compared with the next 4 closest stations to the site. This analysis found that rainfall across the region was generally uniform, with a daily average standard deviation of 0.07 inches and a monthly average standard deviation of 0.5 inches. Based on this analysis and the on-site response to the reported rainfall,

KCI is confident that the rain data provided by the UNCA station is correlated with the site rainfall.

Sincerely,



Adam Spiller
Project Manager

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PROJECT SUMMARY

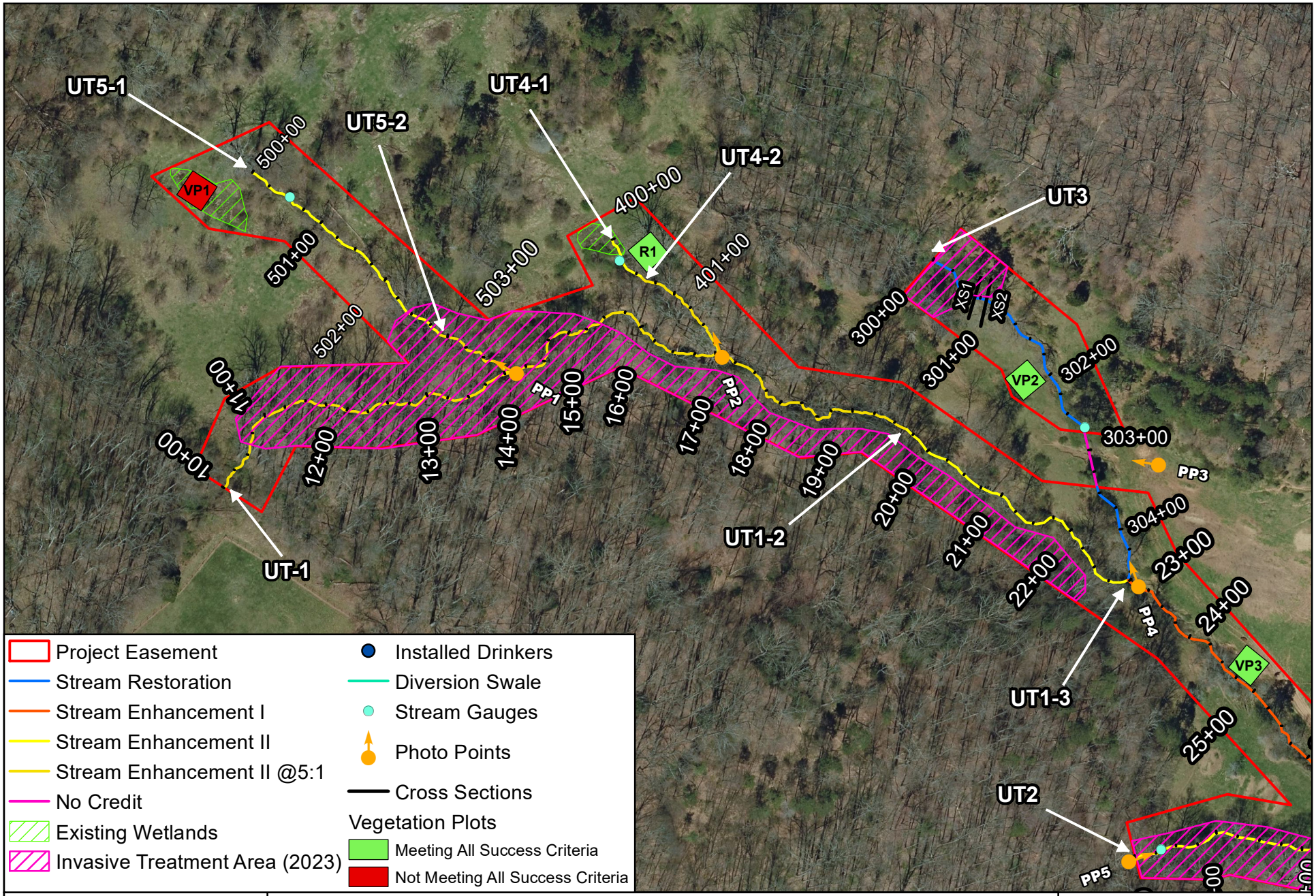
The Dales Creek Restoration Site (DCRS) was completed in April 2022 and restored and enhanced a total of 3,978 linear feet of stream. The DCRS is a riparian system in the French Broad River Basin (06010105 8-digit cataloging unit) in Buncombe County, North Carolina. This riparian stream system had been substantially modified through livestock impacts and removal of the riparian buffer. This site offers the chance to restore streams impacted by agriculture to a stable headwater ecosystem with a functional riparian buffer and floodplain access, while also reducing incoming nutrients from livestock. Project planting and construction were completed in April 2022 and the monitoring components were installed in April 2022.

Table 1. Dales Creek Restoration Site (ID-100128) Project Mitigation Quantities and Credits

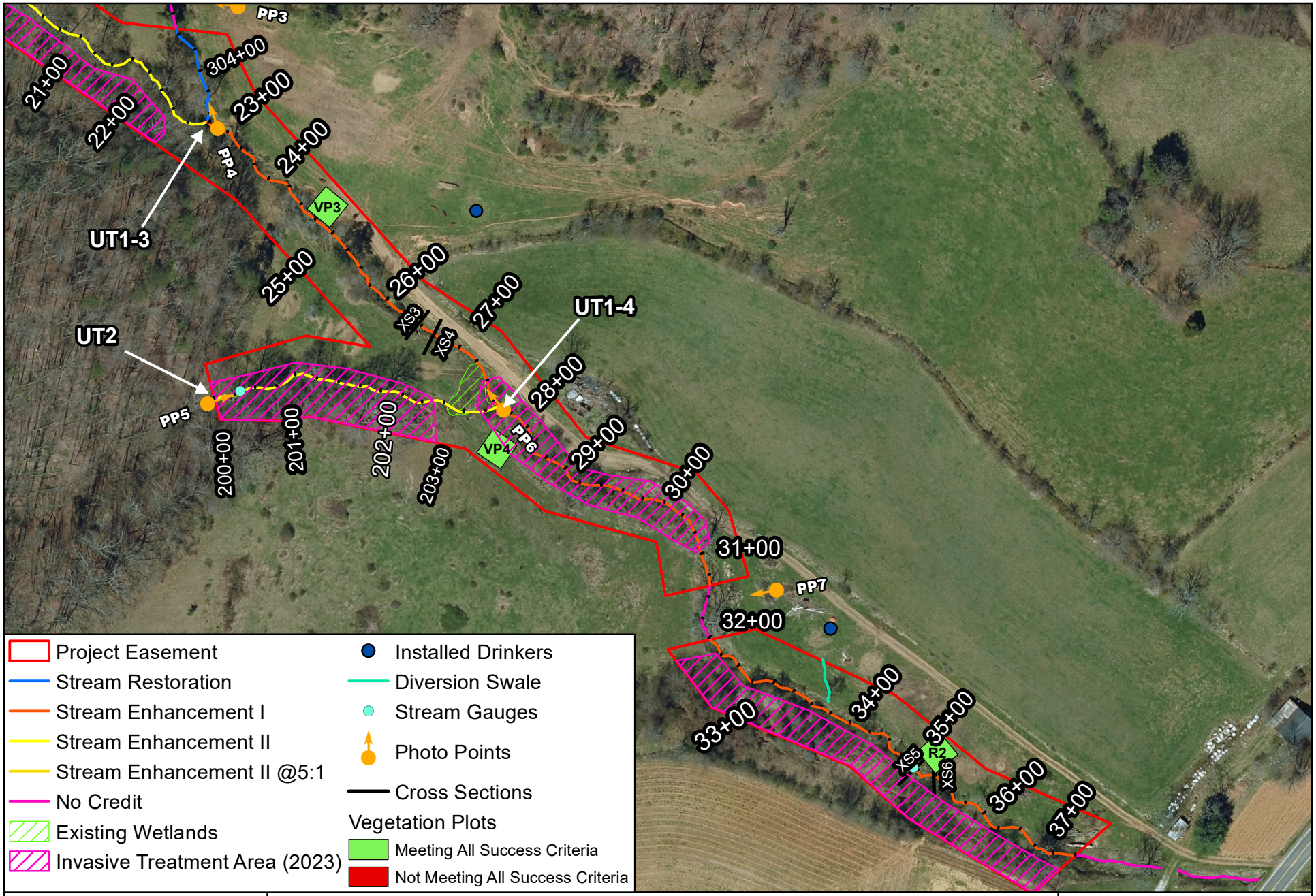
Project Segment	Original Mitigation Plan Ft/Ac	As-Built Ft/ Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits		Comments
Stream								
UT1 Reach 1	967	967	Cool	EII	5.00000	193.400		
UT1 Reach 2	332	332	Cool	EII	2.50000	132.800		
UT1 Reach 3	488	478	Cool	EI	1.50000	325.333		
UT1 Reach 4	873	869	Cool	EI	1.50000	582.000		Crossing exception at STA 31+37 to 32+03
UT2	343	343	Cool	EII	2.50000	137.200		
UT3	396	388	Cool	R	1.00000	396.000		Crossing exception at STA 302+79 to 303+43
UT4 Reach 1	56	58	Cool	EII	2.50000	22.400		
UT4 Reach 2	134	134	Cool	EII	5.00000	26.800		
UT5 Reach 1	290	290	Cool	EII	2.50000	166.000		
UT5 Reach 2	99	99	Cool	EII	5.00000	19.800		
					Total:	**1,951.733**		

Project Credits

Restoration Level	Stream			Riparian Wetland	Non-Riparian Wetland	Coastal Marsh
	Warm	Cool	Cold			
Restoration		396.000				
Re-establishment						
Rehabilitation						
Enhancement						
Enhancement I		907.333				
Enhancement II		648.400				
Creation						
Preservation						
Total		1951.733				



CURRENT CONDITIONS PLAN VIEW
DALES CREEK RESTORATION SITE
BUNCOMBE COUNTY, NC



CURRENT CONDITIONS PLAN VIEW
DALES CREEK RESTORATION SITE
BUNCOMBE COUNTY, NC

Table 2. Dales Creek Restoration Site (ID-100128) Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Restore channelized and livestock impacted streams to stable B-type channels	-Relocate or stabilize channelized and/or incised streams to connect to a floodplain or floodprone area -Install a bankfull-sized channel cross-section - Create bedform diversity with pools, riffles, and habitat structures	Dispersion of high flows on the floodplain, increase in biogeochemical cycling within the system, and recharging of riparian wetlands.	BHR<1.2, ER>2.2, and no change >10% in BHR or ER between monitoring events; 4 bankfull events; continuous flow for at least 30 days each year	6 cross-section surveys, 5 pressure transducer stream gauges (measuring bankfull events on UT1-4 and stream flow on UT2, UT3, UT4, and UT5), annual visual inspection of stream banks and bed	All XS with a BHR<1.2; 5/6 XS with an ER>2.2
Restore a forested riparian buffer to provide bank stability filtration and shading	-Fence out livestock to reduce nutrient, bacterial, and sediment impacts from adjacent grazing and farming practices to the project tributaries. -Plant the site with native trees and shrubs and a herbaceous seed mix	Reduction in floodplain sediment inputs from runoff, increased bank stability, increased LWD and organic material in streams.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7.	6 vegetation monitoring plots, annual visual inspection of fencing and vegetation condition (including vigor and presence of invasive species)	All plots >320 stems/acre; 5/6 plots ≥4 native species

Table 3. Dales Creek Restoration Site (ID-100128) Project Attribute Table

Project Name	Dales Creek Restoration Site		
County	Buncombe County		
Project Area (acres)	7.692		
Project Coordinates (latitude and longitude decimal degrees)	35.5991°N, -82.7466°W		
Project Watershed Summary Information			
Physiographic Province	Mountain		
River Basin	French Broad		
USGS Hydrologic Unit 8-digit	06010105		
DWR Sub-basin	04/03/02		
Project Drainage Area (acres)	139		
Project Drainage Area Percentage of Impervious Area	<1%		
Land Use Classification	Forest (73%), Pasture/Farmland (26%), and Low-density Residential Development (1%).		
Reach Summary Information			
Parameters	**All Reaches Combined**		
Pre-project length (feet)	4,114		
Post-project (feet)	4,088		
Valley confinement (Confined, moderately confined, unconfined)	Partially confined to confined		
Drainage area (acres)	139		
Perennial, Intermittent, Ephemeral	Intermittent – Perennial		
NCDWR Water Quality Classification	C		
Dominant Stream Classification (existing)	F4		
Dominant Stream Classification (proposed)	B4a		
Dominant Evolutionary class (Simon) if applicable	Stage IV		
Parameters	**W1**	**W2**	**W3**
Pre-project (acres)	0.07	0.03	0.04
Post-project (acres)	0.07	0.03	0.04
Wetland Type (non-riparian, riparian)	Riparian	Riparian	Riparian
Mapped Soil Series	Toecan-Tusquitee Complex	Toecan-Tusquitee Complex	Tate
Soil Hydric Status	Non-hydric	Non-hydric	Non-hydric
Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	SAW-2019-00834
Water of the United States - Section 401	Yes	Yes	DWR# 19-0864
Endangered Species Act	Yes	Yes	USFWS
Historic Preservation Act	No	N/A	NCSHPO
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

MONITORING RESULTS

The site was planted in April 2022. The MY02 vegetation monitoring was conducted on August 2, 2023. Five out of the six vegetation monitoring plots have met all of the success criteria. The plot that did not meet all of the success criteria, was Plot 1, which only had 2 native hardwood species. This plot is located in an area with many mature trees in close proximity to it and KCI expects that native volunteer species will colonize the plot in future monitoring years to correct this low level of diversity. Several invasive species (primarily Chinese privet – *Ligustrum sinense* and multiflora rose – *Rosa multiflora*) were noted on site during 2023. These species were treated on August 7-8, 2023 with manual cutting and herbicide. KCI will continue to monitor the invasive species on site and treat as necessary.

The MY02 cross-section survey was completed on August 2, 2023. Between the baseline survey and MY01, as part of the stream settling after construction, small amounts of aggradation (approximately 0.3') developed within the beds of XS2 and XS3 and along the banks of XS4. The MY02 survey found that these areas have remained stable since MY01 and have not aggraded further. Overall the stream survey found the stream function as designed with only slight deviations, as is typical for a stream restoration project. No areas of bank erosion or other problem areas were identified during MY02.

Daily rainfall data is obtained from the UNC Asheville weather station, located approximately 10 miles east of the project. In 2023, the months of January, February, April, June, August, and December experienced average rainfall. The months of March, July, September, October, and November experienced below average rainfall, and the month of May experienced above average rainfall. Overall the site experienced slightly below average rainfall during the second monitoring year.

During 2023, the stream gauge on T1 recorded did not record any bankfull events. In 2023, the stream gauges on UT2, UT3, and UT4 recorded a maximum of 109, 67, and 44 consecutive days of flow, respectively. Due to the small size and steep grade of UT5, the gauge on this reach did not provide data that was usable for determining consecutive days of flow. KCI is planning on reinstalling this gauge in early 2024 to better capture flow data for this reach. Cameras were installed in the vicinity of all 4 stream flow gauges on February 28, 2023. These cameras were set to record a short video once a day and were intended to supplement the data obtained from the flow gauges. Due to the small size and steep grade of the streams in question, the cameras often provide more reliable data than the gauges, although during the growing season they are often obscured by vegetation. In 2023, all 4 of the cameras recorded greater than 30 consecutive days of flow, achieving 139, 135, 101, and 100 days on UT2, UT3, UT4, and UT5 respectively.

The site boundaries were inspected on December 11, 2023. No areas of encroachment or trespass were noted. The fence is intact, and signs are present at regular intervals around the boundary. All of the stream reaches on site (including the E2 reaches UT1-1, UT1-2, UT2 and UT4) were also inspected during this site visit. While no areas of stream instability were noted during this inspection, one area of hillslope erosion adjacent to the stream was identified. This area is located on the left side of UT1-1, just upstream from the confluence with UT2. KCI is evaluating this area to determine if further stabilization is necessary.

REFERENCES

NCDENR, Ecosystem Enhancement Program. 2009. French Broad River Basin Restoration Priorities 2009. Raleigh, NC. https://deq.nc.gov/media/8060/download

NCDEQ, Division of Mitigation Services. June 2017. "As-built Baseline Monitoring Report Format, Data and Content Requirement." https://files.nc.gov/ncdeq/Mitigation%20Services/Document%20Management%20Library/Guidance%20and%20Template%20Documents/6_AB_Baseline__Rep_Templ_June%202017.pdf

NCIRT. October 24, 2016. "Wilmington District Stream and Wetland Compensatory Mitigation Update." https://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

USACE, Sprecher, S. W.; Warne, A. G. 2000. "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology." https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/ADA378910.xhtml

APPENDIX A

Visual Assessment Data

Table 4. Dales Creek Resotration Site (ID-100128) Visual Stream Stability Assessment

Reach UT1 Reach 3
Assessed Stream Length 488
Assessed Bank Length 976 Assessment Date: 12/11/2023

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	4	4		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	4	4		100%

Table 4. Dales Creek Resotration Site (ID-100128) Visual Stream Stability Assessment

Reach UT1 Reach 4
Assessed Stream Length 873
Assessed Bank Length 1746 Assessment Date: 12/11/2023

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	N/A	N/A		N/A

Table 4. Dales Creek Resotration Site (ID-100128) Visual Stream Stability Assessment

Reach UT3
Assessed Stream Length 396
Assessed Bank Length 792 Assessment Date: 12/11/2023

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	1	1		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	1	1		100%

Table 5. Dales Creek Restoration Site (ID-100128) Visual Vegetation Assessment

Planted acreage **4.11** Assessment Date: 12/11/2023

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10acres	0.00	0.0%
Total			0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10 acres	0.00	0.0%
Cumulative Total			0.00	0.0%

Easement Acreage **7.69**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.10 acres	0.00	0.0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	# Encroachments noted	

Photo Reference Photos

PP1 – MY-00 – 4/27/22

PP1 – MY-02 – 12/11/23

PP2 – MY-00 – 4/27/22

PP2 – MY-02 – 12/11/23

PP3 – MY-00 – 4/27/22

PP3 – MY-02 – 12/11/23

PP4 – MY-00 – 4/27/22

PP4 – MY-02 – 12/11/23

PP5 – MY-00 – 4/27/22

PP5 – MY-02 – 12/11/23

PP6 – MY-00 – 4/27/22

PP6 – MY-02 – 12/11/23

PP7 – MY-00 – 4/27/22

PP7 – MY-02 – 12/11/23

Culvert on T1 upstream – MY-02 – 12/11/23

Culvert on T1 downstream – MY-02 – 12/11/23

Culvert on T3 upstream – MY-02 – 12/11/23

Culvert on T3 downstream – MY-02 – 12/11/23

Vegetation Monitoring Plot Photos

Vegetation Plot 1 – MY-00 – 7/14/22

Vegetation Plot 1 – MY-02 – 8/2/23

Vegetation Plot 2 – MY-00 – 4/27/22

Vegetation Plot 2 – MY-02 – 8/2/23

Vegetation Plot 3 – MY-00 – 4/27/22

Vegetation Plot 3 – MY-02 – 8/2/23

Vegetation Plot 4 – MY-00 – 4/27/22

Vegetation Plot 4 – MY-02 – 8/2/23

Vegetation Plot R1 – MY-02 – 8/2/23

Vegetation Plot R2 – MY-02 – 8/2/23

APPENDIX B

Vegetation Plot Data

Table 6. Vegetation Plot Data
Dales Creek Restoration Site (ID-100128)

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 1 R	Veg Plot 2 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total
Species Included in Approved Mitigation Plan	Aesculus flava	yellow buckeye	Tree	FACU					1	1	1	2		1
	Alnus serrulata	hazel alder	Tree	OBL	1	3								1
	Betula lenta	sweet birch	Tree	FACU			2	2	5	15	1	1		
	Carya glabra	pignut hickory	Tree	FACU									1	
	Cornus amomum	silky dogwood	Shrub	FACW					1	1				1
	Lindera benzoin	northern spicebush	Tree	FAC									5	
	Liriodendron tulipifera	tuliptree	Tree	FACU			2	2			2	2	1	
	Nyssa sylvatica	blackgum	Tree	FAC	4	5								
	Nyssa Sylvatica													1
	Platanus occidentalis	American sycamore	Tree	FACW			5	6	5	6				3
	Quercus alba	white oak	Tree	FACU			1	1			2	2		
	Quercus falcata	southern red oak	Tree	FACU			2	2			1	1		
	Quercus rubra	northern red oak	Tree	FACU									3	2
	Quercus sp.						1	1	1	1				
	Salix nigra	black willow	Tree	OBL						1				
Sum	Performance Standard				5	8	13	14	13	25	7	8	10	9
Post Mitigation Plan Species	*Acer rubrum*	*red maple*	*Tree*	*FAC*									*1*	
	Callicarpa americana	*American beautyberry*	*Shrub*	*FACU*				*3*						
	Juglans nigra	*black walnut*	*Tree*	*FACU*						*1*			*1*	
Sum	Proposed Standard				5	8	13	14	13	25	7	8	10	9
Mitigation Plan Performance Standard	Current Year Stem Count					8		14		25		8	10	9
	Stems/Acre					283		567		931		324	405	364
	Species Count					2		6		6		5	4	6
	Dominant Species Composition (%)					62		35		58		25	42	33
	Average Plot Height (ft.)					4		1		2		2	4	3
	% Invasives					0		0		0		0	0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Planted Acreage	4.11
Date of Initial Plant	4/11/2022
Date(s) of Supplemental Plant(s)	
Date(s) Mowing	
Date of Current Survey	8/2/2023
Plot size (ACRES)	0.0247

Vegetation Performance Standards Summary Table

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	**Av. Ht. (ft)**	**# Species**	**% Invasives**	**Stems/Ac.**	**Av. Ht. (ft)**	**# Species**	**% Invasives**	**Stems/Ac.**	**Av. Ht. (ft)**	**# Species**	**% Invasives**
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	283	4	2	0	567	1	6	0	931	2	6	0
Monitoring Year 1	283	3	2	0	567	1	6	0	729	1	6	0
Monitoring Year 0	729	2	4	0	850	1	5	0	931	1	5	0
	Veg Plot Group 4 F				**Veg Plot Group 1 R**				**Veg Plot Group 2 R**			
	Stems/Ac.	**Av. Ht. (ft)**	**# Species**	**% Invasives**	**Stems/Ac.**	**Av. Ht. (ft)**	**# Species**	**% Invasives**	**Stems/Ac.**	**Av. Ht. (ft)**	**# Species**	**% Invasives**
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	324	2	5	0	405	4	4	0	364	3	6	0
Monitoring Year 1	526	1	7	0	324	3	6	0	405	2	6	0
Monitoring Year 0	891	1	8	0								

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

APPENDIX C

Stream Geomorphology Data

Table 8. Baseline Stream Data Summary Dales Creek, UT1 Reach 3										
Parameter	**Pre-Existing Condition (if applicable)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	4.6			22.2	2	6.8		4.9		1
Floodprone Width (ft)	8.9			26.0	2	18.3		11.7		1
Bankfull Mean Depth (ft)	0.3			0.8	2	0.5		0.3		1
Bankfull Max Depth (ft)	0.4			1.2	2	0.8		0.6		1
Bankfull Cross Sectional Area (ft^2)	3.5			6.3	2	3.4		1.7		1
Width/Depth Ratio	6.0			77.7	2	13.5		14.7		1
Entrenchment Ratio	1.2			2.0	2	2.7		2.4		1
Bank Height Ratio	1.7			3.8	2	1.0		1.0		1
Max part size (mm) mobilized at bankfull	151					111		74		
Rosgen Classification	G4/B4a					B4a		B4a		
Bankfull Discharge (cfs)	24.5					24.7		24.7		
Sinuosity (ft)	1.1					1.1		1.1		
Water Surface Slope (Channel) (ft/ft)	0.074					0.074		0.075		
Other										

Table 8. Baseline Stream Data Summary Dales Creek, UT1 Reach 4										
Parameter	**Pre-Existing Condition (if applicable)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	5.1	6.9	7.3	7.8	4	8.0		8.6		1
Floodprone Width (ft)	10.1	13.3	12.8	17.4	4	20		27.9		1
Bankfull Mean Depth (ft)	0.5	0.7	0.7	0.8	4	0.6		0.9		1
Bankfull Max Depth (ft)	1.0	1.1	1.1	1.1	4	0.9		1.4		1
Bankfull Cross Sectional Area (ft^2)	3.8	3.4	4.2	5.3	4	4.8		7.8		1
Width/Depth Ratio	6.3	11.2	11.2	16.1	4	13.2		9.5		1
Entrenchment Ratio	1.4	2.0	1.9	2.6	4	2.5		3.2		1
Bank Height Ratio	1.0	2.4	1.4	6.0	4	1.0		1.0		1
Max part size (mm) mobilized at bankfull	79					84		121		
Rosgen Classification	G4/B4a					B4a		B4a		
Bankfull Discharge (cfs)	27.7					31.2		31.2		
Sinuosity (ft)	1.1					1.1		1.1		
Water Surface Slope (Channel) (ft/ft)	0.048					0.048		0.047		
Other										

Table 8. Baseline Stream Data Summary Dales Creek, UT3										
Parameter	**Pre-Existing Condition (if applicable)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	2.0	3.4	2.9	6.3	5	5.0		4.7		1
Floodprone Width (ft)	3.0	6.2	5.5	12.6	5	15.5		18.7		1
Bankfull Mean Depth (ft)	0.3	0.4	0.4	0.5	5	0.4		0.5		1
Bankfull Max Depth (ft)	0.4	0.6	0.6	0.8	5	0.6		0.9		1
Bankfull Cross Sectional Area (ft^2)	1.0	1.2	1.2	1.6	5	1.9		2.3		1
Width/Depth Ratio	3.8	10.0	7.1	24.6	5	13.5		9.5		1
Entrenchment Ratio	1.2	1.9	1.6	3.3	5	3.1		4.0		1
Bank Height Ratio	1.0	2.4	1.9	4.9	5	1.0		1.0		1
Max part size (mm) mobilized at bankfull	100					115		147		
Rosgen Classification	G4					B4a		B4a		
Bankfull Discharge (cfs)	6.6					12.9		12.9		
Sinuosity (ft)	1.1					1.1		1.1		
Water Surface Slope (Channel) (ft/ft)	0.104					0.105		0.108		
Other										

Table 9. Cross-section Morphology Monitoring Summary
Dales Creek Restoration Site (ID-100128)

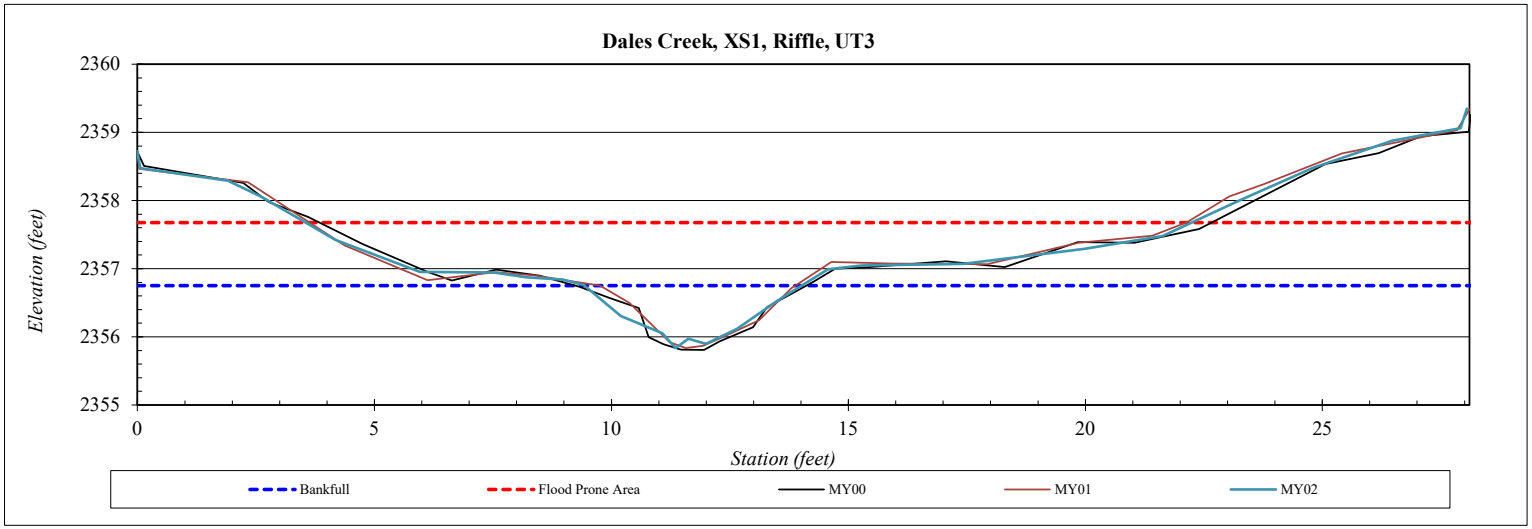
	Cross Section 1 (Riffle - UT3)							Cross Section 2 (Pool - UT3)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull Area	2356.7	2356.8	2356.8					2355.3	2355.6	2355.6				
Bank Height Ratio - Based on AB Bankfull Area	1.0	1.0	1.0					---	---	---				
Thalweg Elevation	2355.8	2355.8	2355.8					2354.5	2355.0	2354.9				
LTOB Elevation	2356.7	2356.8	2356.8					2355.3	2355.7	2355.7				
LTOB Max Depth (ft)	0.9	0.9	0.9					0.9	0.8	0.8				
LTOB Cross Sectional Area (ft^2)	2.3	2.2	2.4					2.8	3.7	3.6				
	Cross Section 3 (Riffle - UT1-3)							Cross Section 4 (Pool - UT1-3)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull Area	2286.9	2287.0	2287.1					2285.8	2285.8	2285.9				
Bank Height Ratio - Based on AB Bankfull Area	1.0	0.6	0.6					---	---	---				
Thalweg Elevation	2286.3	2286.5	2286.6					2284.8	2284.8	2284.8				
LTOB Elevation	2286.9	2286.9	2286.9					2285.8	2286.0	2285.9				
LTOB Max Depth (ft)	0.6	0.3	0.4					1.1	1.2	1.1				
LTOB Cross Sectional Area (ft^2)	1.7	0.9	1.0					3.0	3.9	3.0				
	Cross Section 5 (Riffle - UT1-4)							Cross Section 6 (Pool - UT1-4)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull Area	2242.6	2242.7	2242.7					2241.4	2241.4	2241.4				
Bank Height Ratio - Based on AB Bankfull Area	1.0	0.9	0.9					---	---	---				
Thalweg Elevation	2241.2	2241.2	2241.2					2240.6	2240.6	2240.7				
LTOB Elevation	2242.6	2242.6	2242.6					2241.4	2241.5	2241.5				
LTOB Max Depth (ft)	1.4	1.4	1.4					0.7	0.9	0.8				
LTOB Cross Sectional Area (ft^2)	7.8	6.4	6.4					2.8	3.2	3.0				

Cross-Section Plots

River Basin:	French Broad
Site:	Dales Creek
XS ID	XS1
Drainage Area (sq mi):	0.02
Date:	8/2/2023
Field Crew:	TS, CK

Station	Elevation
0.0	2358.72
0.1	2358.48
1.9	2358.29
2.6	2358.06
4.2	2357.42
6.0	2356.95
7.5	2356.94
8.2	2356.88
9.0	2356.84
9.4	2356.76
10.2	2356.31
10.8	2356.14
11.1	2356.05
11.4	2355.84
11.6	2355.97
12.0	2355.90
12.7	2356.12
13.5	2356.53
14.6	2356.99
15.3	2357.05
17.4	2357.07
20.0	2357.29
21.6	2357.48
23.3	2358.01
24.8	2358.48
26.5	2358.88
27.9	2359.06
28.0	2359.35

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	2356.75
Bankfull Cross-Sectional Area:	2.3
LTOB Cross-Sectional Area:	2.4
Bankfull Width:	4.6
Flood Prone Area Elevation:	2357.68
Flood Prone Width:	18.7
LTOB Max Depth	0.9
LTOB Mean Depth	0.5
W / D Ratio:	8.9
Entrenchment Ratio:	4.1
Bank Height Ratio:	1.0
Thalweg Elevation:	2355.84

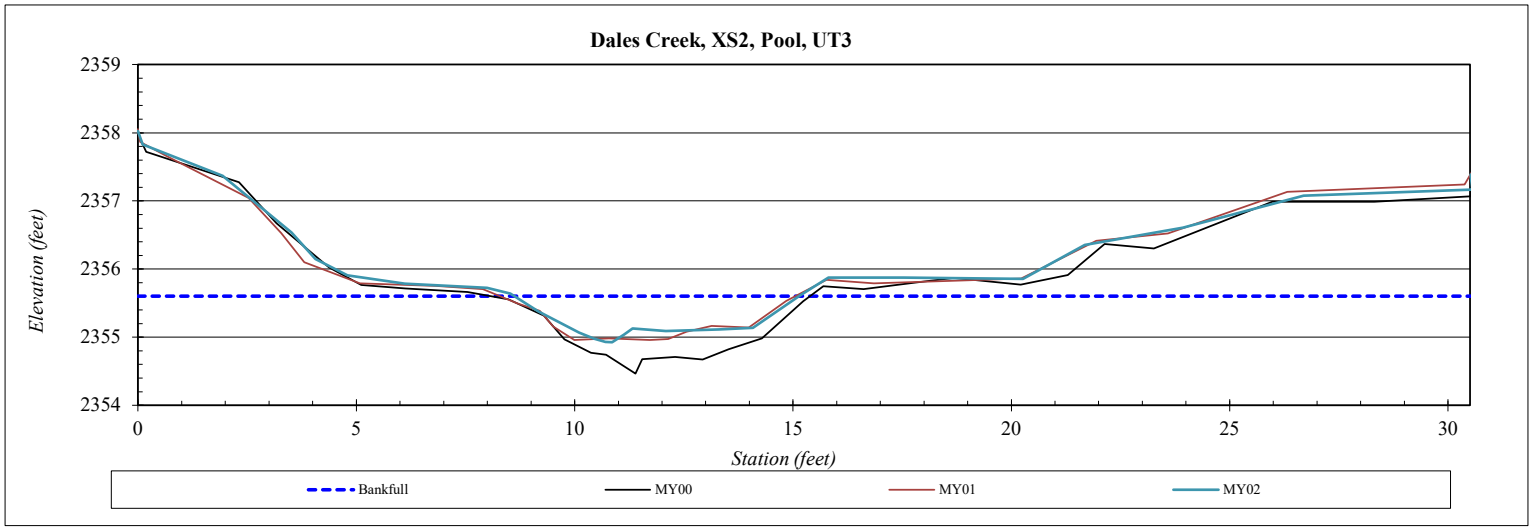


Cross-Section Plots

River Basin:	French Broad
Site:	Dales Creek
XS ID	XS2
Drainage Area (sq mi):	0.02
Date:	8/2/2023
Field Crew:	TS, CK

Station	Elevation
0.0	2358.02
0.1	2357.83
1.9	2357.37
3.5	2356.54
4.1	2356.15
4.8	2355.91
6.1	2355.79
8.0	2355.72
8.5	2355.64
9.2	2355.38
10.1	2355.07
10.4	2354.98
10.7	2354.93
10.9	2354.93
11.1	2355.04
11.3	2355.13
12.1	2355.09
13.3	2355.11
14.1	2355.14
15.2	2355.61
15.8	2355.87
17.5	2355.87
20.3	2355.86
21.7	2356.36
23.9	2356.61
26.7	2357.08
30.6	2357.17
30.5	2357.39

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	2355.60
Bankfull Cross-Sectional Area:	2.8
LTOB Cross-Sectional Area:	3.6
Bankfull Width:	6.5
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth	0.8
LTOB Mean Depth	0.6
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---
Thalweg Elevation:	2354.93

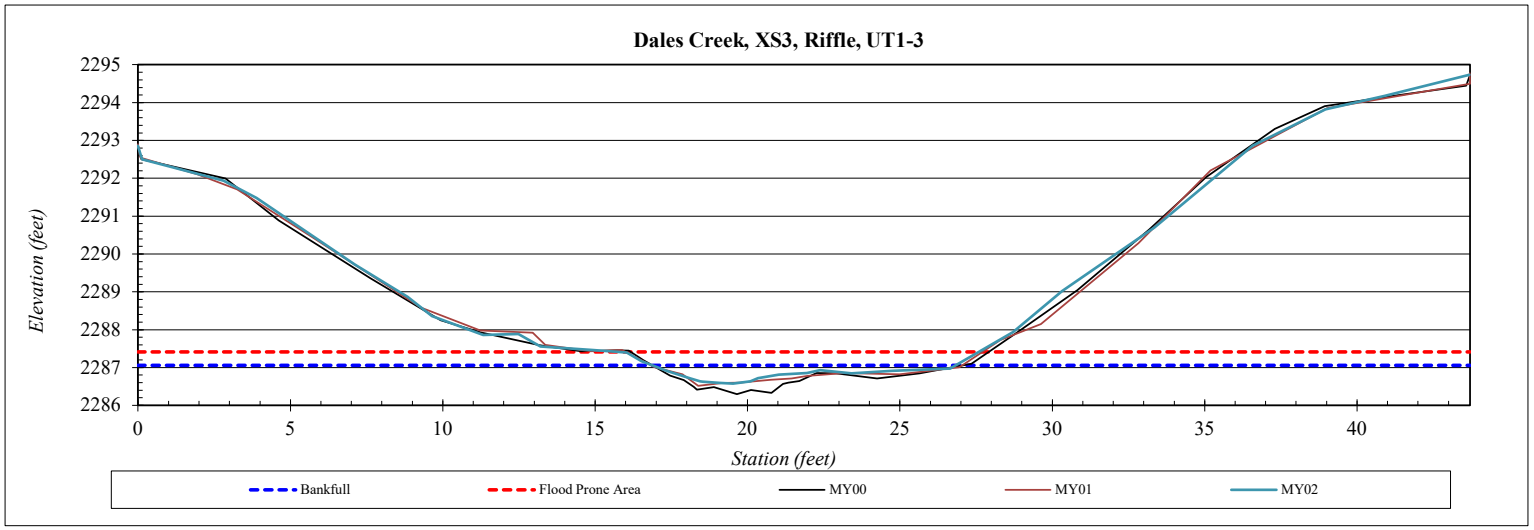


Cross-Section Plots

River Basin:	French Broad
Site:	Dales Creek
XS ID	XS3
Drainage Area (sq mi):	0.15
Date:	8/2/2023
Field Crew:	TS, CK

Station	Elevation
0.0	2292.86
0.1	2292.50
2.8	2291.94
3.9	2291.48
7.1	2289.72
8.9	2288.87
9.6	2288.36
11.3	2287.86
12.5	2287.88
13.2	2287.56
14.9	2287.47
16.0	2287.40
16.5	2287.17
17.3	2286.91
18.1	2286.71
18.4	2286.64
18.5	2286.62
19.1	2286.59
19.5	2286.58
20.1	2286.64
20.3	2286.72
21.0	2286.81
21.9	2286.86
22.4	2286.93
23.4	2286.84
24.8	2286.92
26.6	2286.97
28.7	2287.94
30.3	2289.02
33.4	2290.70
36.6	2292.86
39.0	2293.82
40.9	2294.17
43.7	2294.74

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	2287.06
Bankfull Cross-Sectional Area:	1.7
LTOB Cross-Sectional Area:	1.0
Bankfull Width:	5.5
Flood Prone Area Elevation:	2287.41
Flood Prone Width:	11.8
LTOB Max Depth	0.4
LTOB Mean Depth	0.2
W / D Ratio:	30.5
Entrenchment Ratio:	2.1
Bank Height Ratio:	0.6
Thalweg Elevation:	2286.58

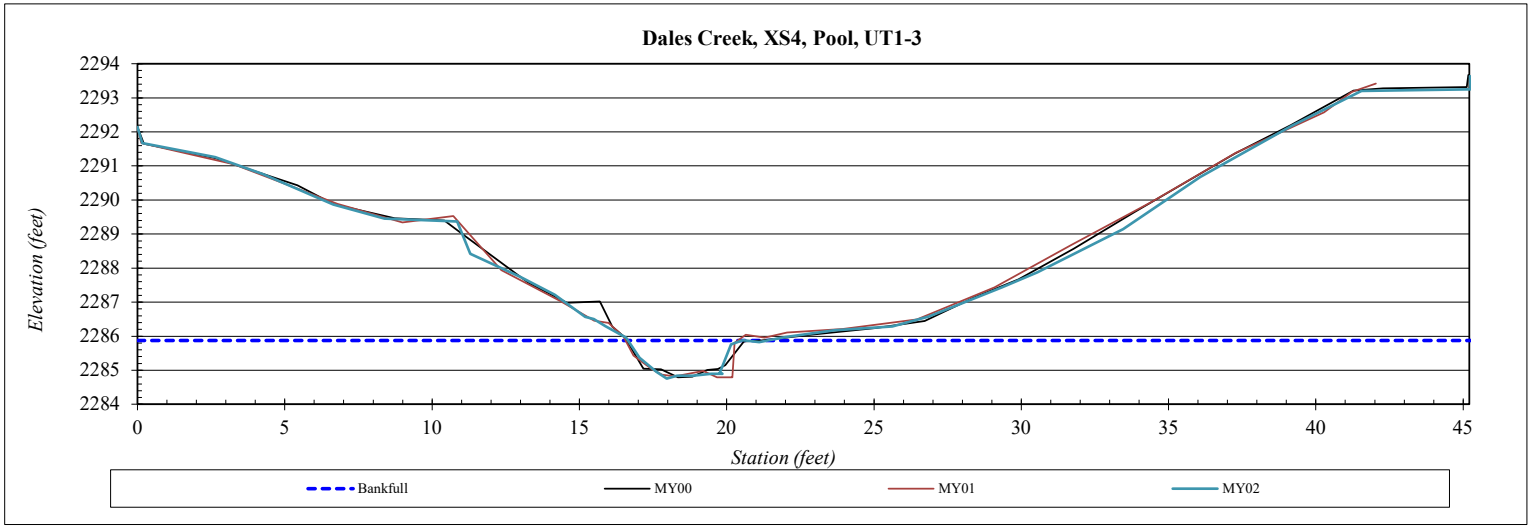


Cross-Section Plots

River Basin:	French Broad
Site:	Dales Creek
XS ID	XS4
Drainage Area (sq mi):	0.15
Date:	8/2/2023
Field Crew:	TS, CK

Station	Elevation	Station	Elevation
0.0	2292.14	45.2	2293.64
0.2	2291.67		
2.6	2291.26		
4.3	2290.76		
6.7	2289.87		
8.4	2289.45		
10.9	2289.37		
11.3	2288.42		
13.0	2287.74		
14.2	2287.22		
15.2	2286.57		
15.5	2286.51		
15.9	2286.30		
16.6	2285.96		
17.0	2285.37		
17.6	2284.96		
18.0	2284.75		
18.3	2284.84		
18.8	2284.84		
19.5	2284.90		
19.9	2284.90		
19.8	2284.91		
20.2	2285.76		
20.6	2285.89		
21.1	2285.83		
22.0	2285.98		
23.7	2286.18		
25.6	2286.29		
26.9	2286.57		
29.3	2287.44		
30.6	2287.88		
33.5	2289.14		
36.1	2290.67		
39.2	2292.18		
41.6	2293.20		
45.2	2293.25		

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	2285.88
Bankfull Cross-Sectional Area:	3.0
LTOB Cross-Sectional Area:	3.0
Bankfull Width:	4.6
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth	1.1
LTOB Mean Depth	0.7
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---
Thalweg Elevation:	2284.75

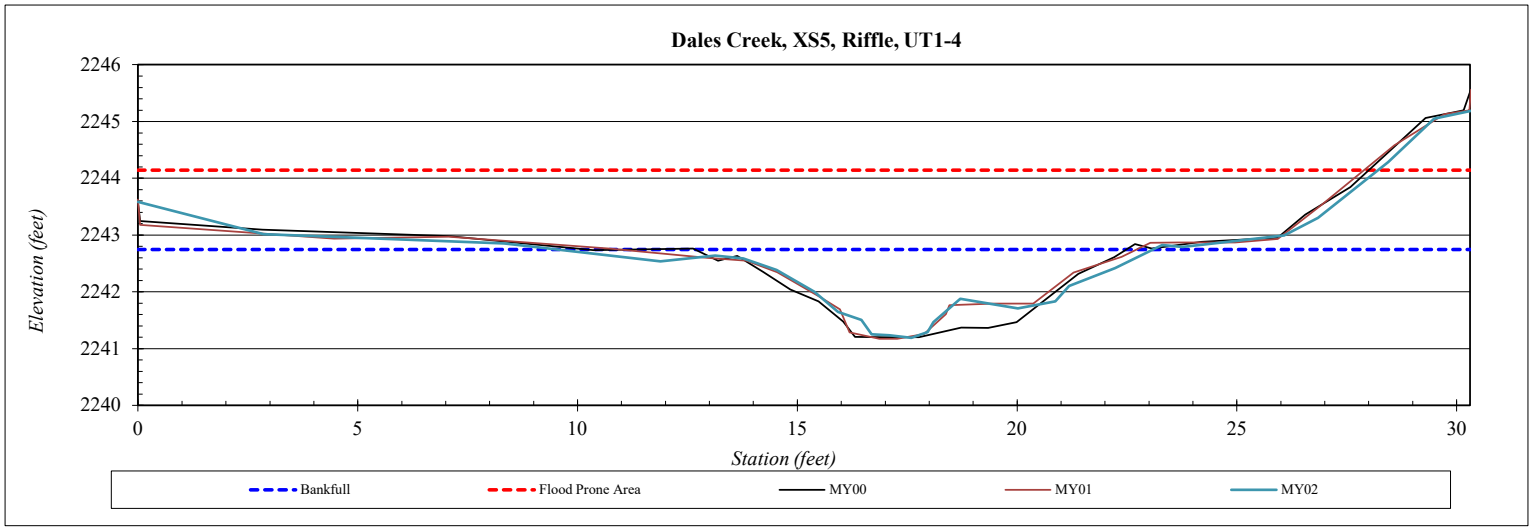


Cross-Section Plots

River Basin:	French Broad
Site:	Dales Creek
XS ID	XS5
Drainage Area (sq mi):	0.22
Date:	8/2/2023
Field Crew:	TS, CK

Station	Elevation
0.0	2243.59
2.9	2243.02
8.3	2242.85
11.9	2242.54
13.1	2242.64
13.8	2242.59
14.5	2242.39
15.4	2242.00
15.9	2241.65
16.5	2241.51
16.7	2241.25
17.1	2241.24
17.6	2241.19
18.0	2241.29
18.1	2241.47
18.7	2241.88
20.0	2241.71
20.9	2241.83
21.2	2242.10
22.2	2242.42
23.3	2242.83
23.8	2242.79
26.1	2243.00
26.8	2243.31
28.4	2244.29
29.5	2245.05
30.4	2245.20
30.5	2245.60

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	2242.74
Bankfull Cross-Sectional Area:	7.8
LTOB Cross-Sectional Area:	6.4
Bankfull Width:	9.3
Flood Prone Area Elevation:	2244.14
Flood Prone Width:	28.2
LTOB Max Depth	1.4
LTOB Mean Depth	0.7
W / D Ratio:	13.5
Entrenchment Ratio:	3.0
Bank Height Ratio:	0.9
Thalweg Elevation:	2241.19

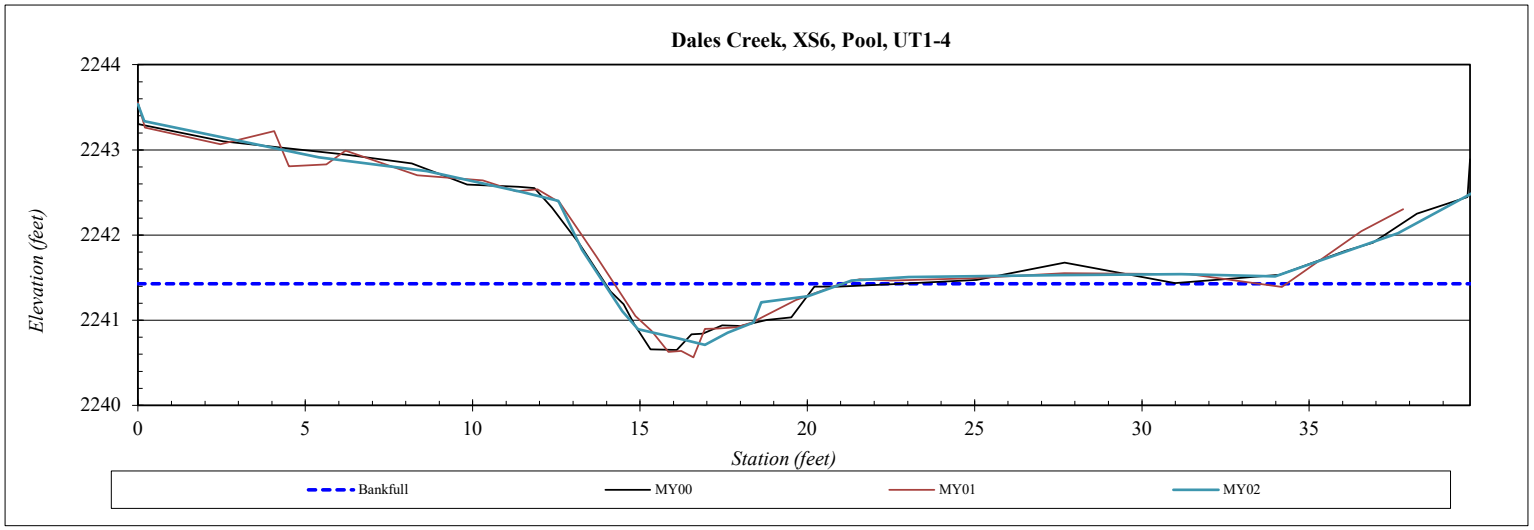


Cross-Section Plots

River Basin:	French Broad
Site:	Dales Creek
XS ID	XS6
Drainage Area (sq mi):	0.22
Date:	8/2/2023
Field Crew:	TS, CK

Station	Elevation
0.0	2243.54
0.2	2243.34
5.4	2242.91
8.6	2242.75
11.5	2242.51
12.6	2242.40
13.3	2241.83
14.5	2241.11
14.9	2240.90
16.2	2240.78
16.9	2240.71
17.6	2240.85
18.4	2240.97
18.6	2241.21
20.0	2241.28
21.3	2241.47
23.0	2241.51
27.6	2241.53
31.2	2241.54
34.0	2241.52
37.7	2242.02
39.9	2242.50
40.0	2242.92

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	2241.43
Bankfull Cross-Sectional Area:	2.8
LTOB Cross-Sectional Area:	3.0
Bankfull Width:	7.1
Flood Prone Area Elevation:	---
Flood Prone Width:	---
LTOB Max Depth	0.8
LTOB Mean Depth	0.4
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---
Thalweg Elevation:	2240.71



APPENDIX D

Hydrologic Data

Dales Creek Restoration Site
30-70 Percentile Graph
WETS Station Name: Asheville, NC

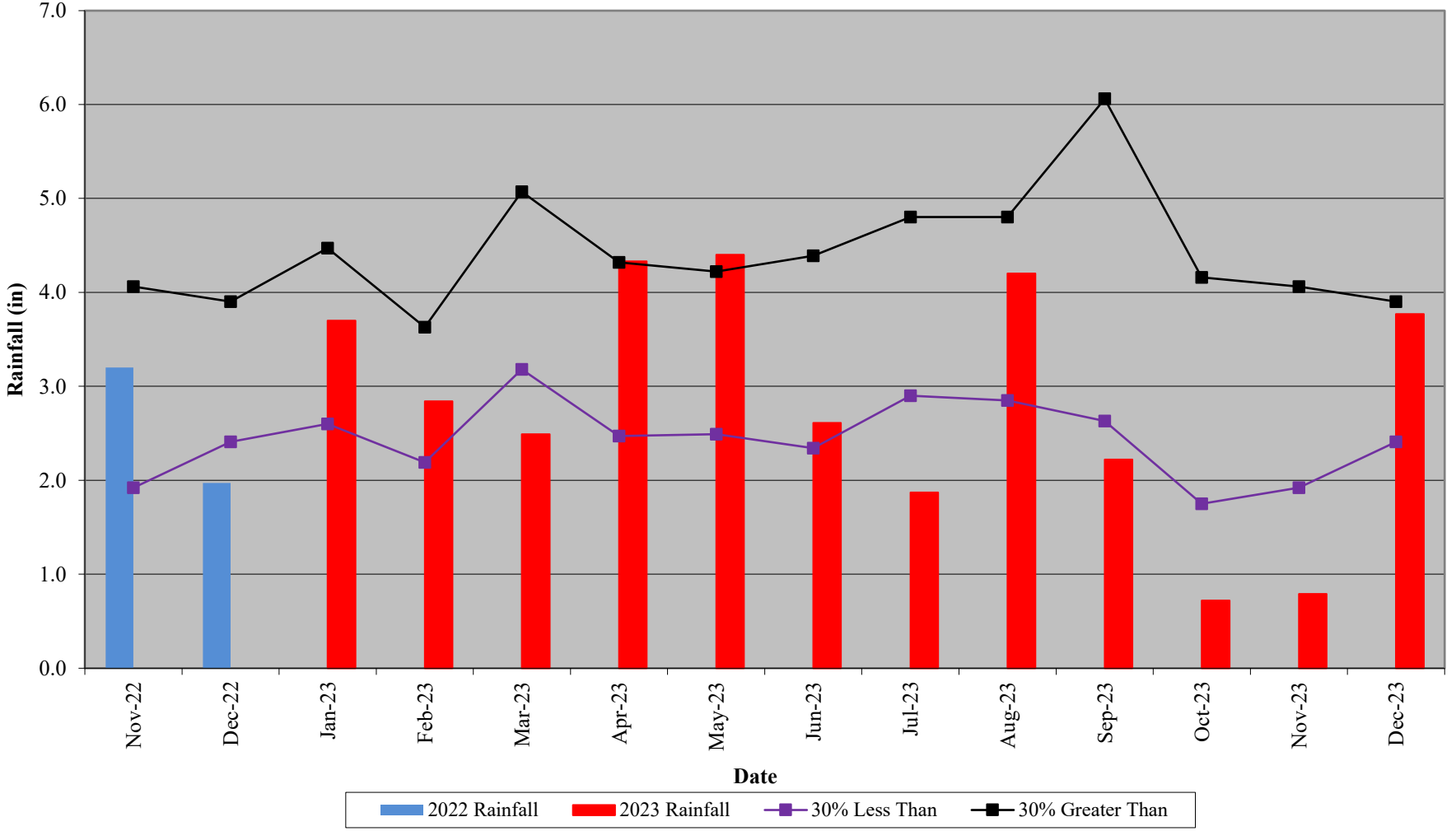


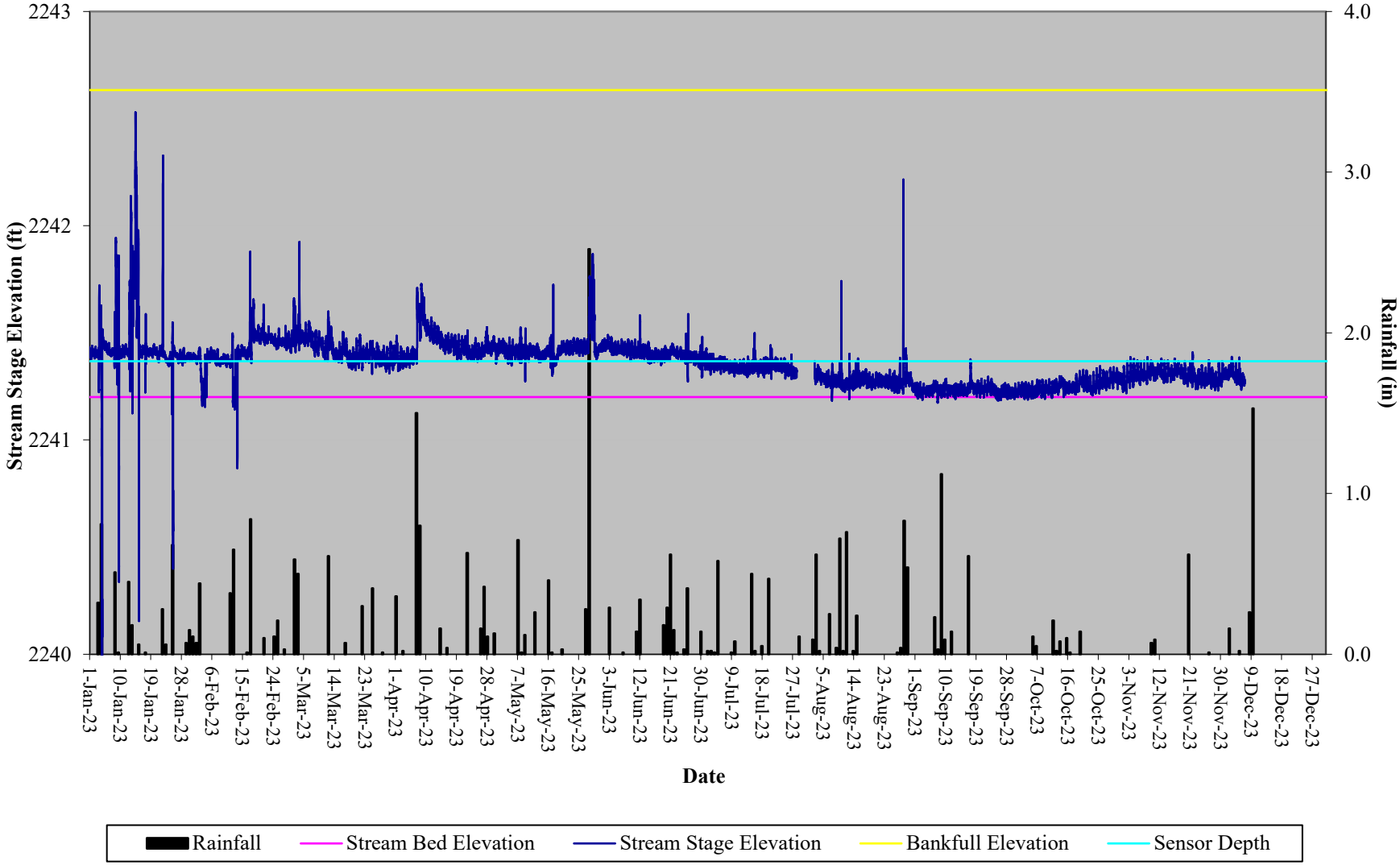
Table 10. Rainfall Summary, Dales Creek Restoration Site (ID-100128)							
	MY1 2022	MY2 2023	MY3 2024	MY4 2025	MY5 2026	MY6 2027	MY7 2028
Annual Precip Total	36.38	30.17					
WETS 30th Percentile	27.32	27.32					
WETS 70th Percentile	49.98	49.98					
Normal	Yes	No					

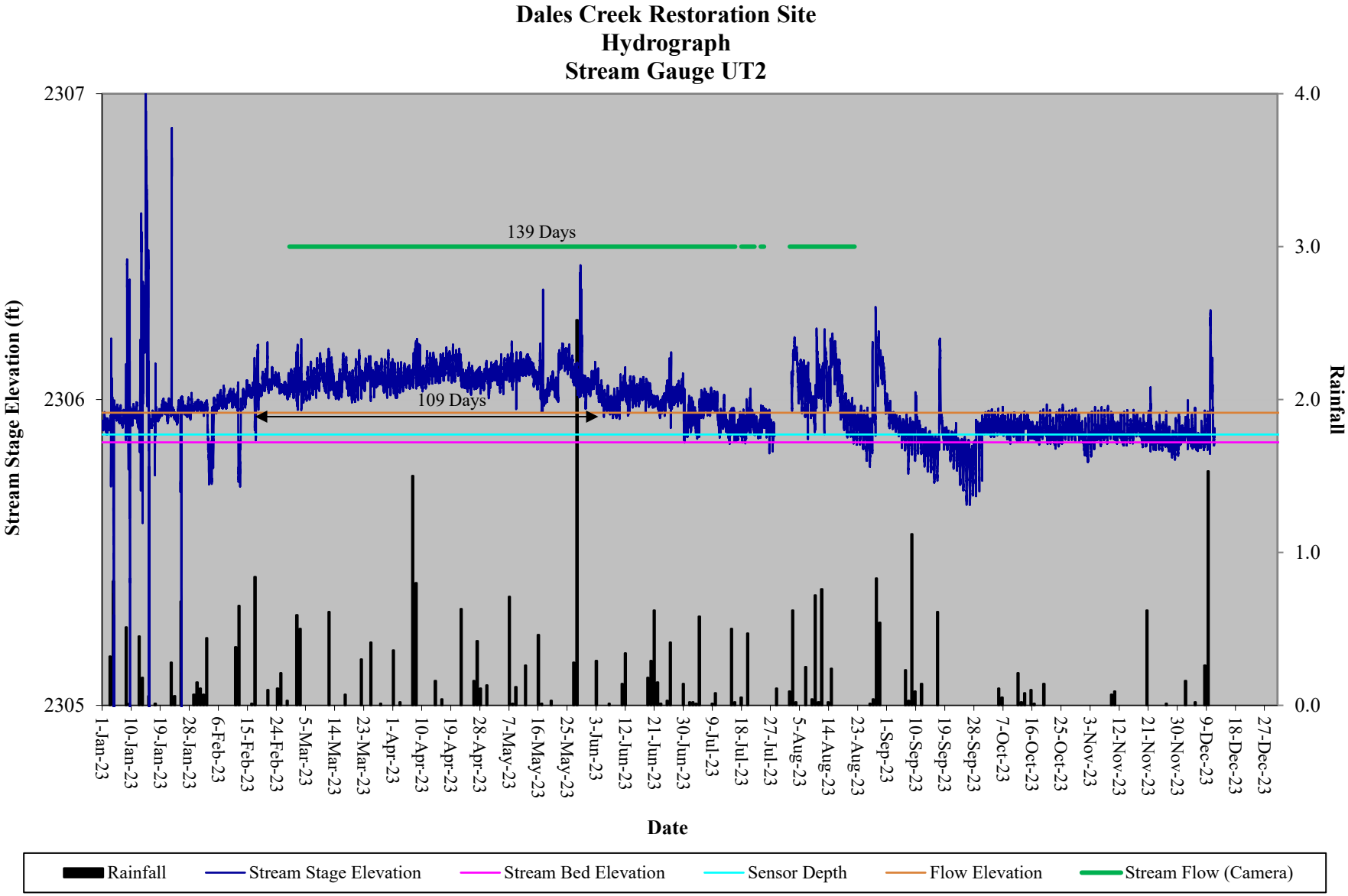
Table 11. Bankfull Events, Dales Creek Restoration Site (ID-100128)							
Gage ID	MY1 2022	MY2 2023	MY3 2024	MY4 2025	MY5 2026	MY6 2027	MY7 2028
UT1-4	3	0					
Year	Date		Reach		Method		
MY01	11/3/2022		UT1-4		On-site stream gauge		
	12/10/2022		UT1-4		On-site stream gauge		
	12/16/2022		UT1-4		On-site stream gauge		

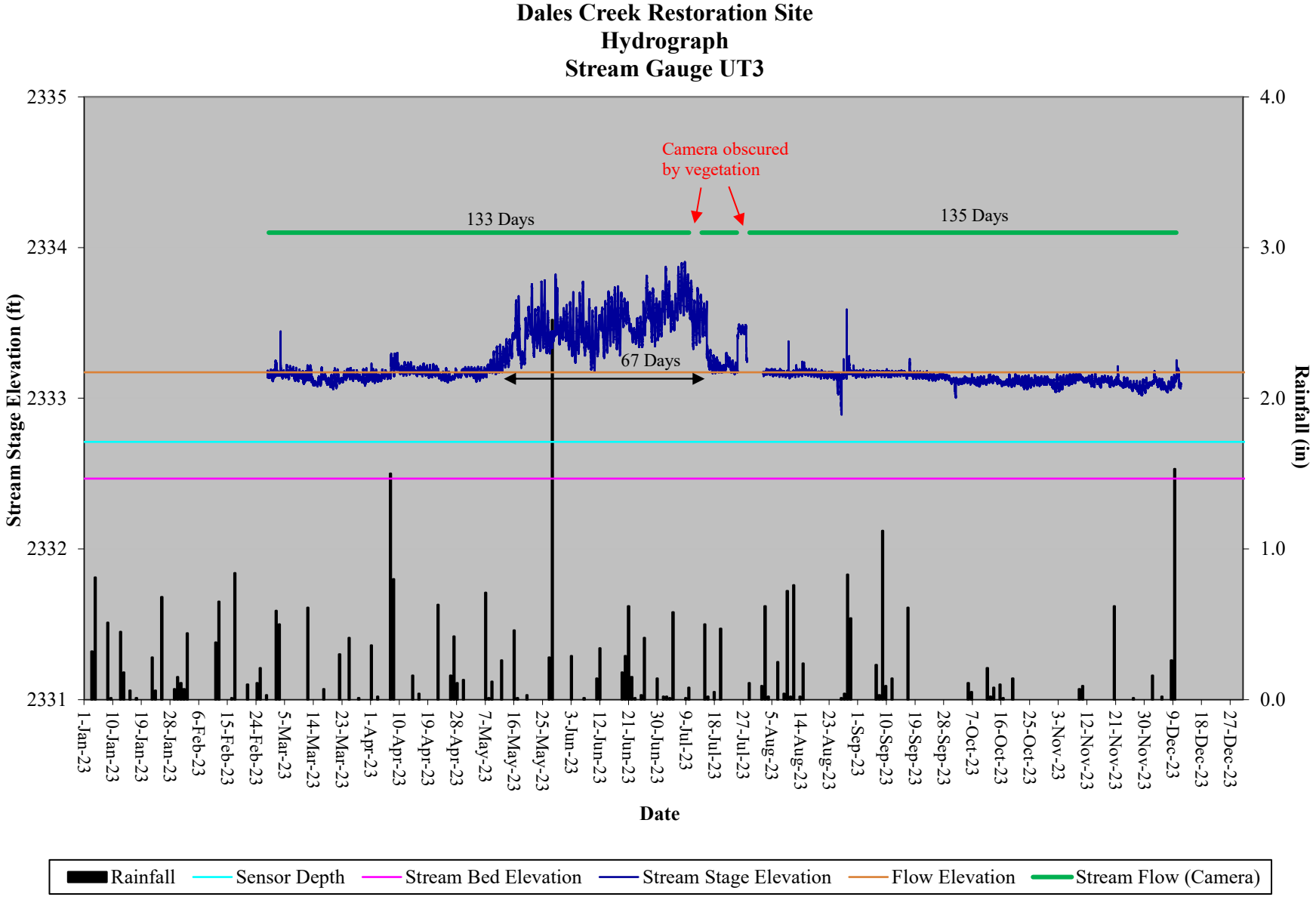
Table 12. Stream Flow Criteria Attainment, Dales Creek Restoration Site (ID-100128)							
	Greater than 30 Days of Flow/Max Consecutive Days						
Reach	MY1 2022	MY2 2023	MY3 2024	MY4 2025	MY5 2026	MY6 2027	MY7 2028
UT2 (gauge)	No/0*	Yes/109					
UT2 (camera)		Yes/139					
UT3 (gauge)	No/0*	Yes/67					
UT3 (camera)		Yes/135					
UT4-1 (gauge)	No/0*	Yes/44					
UT4-1 (camera)		Yes/101					
UT5-1 (gauge)	No/0*	No/11*					
UT5-1 (camera)		Yes/100					

*stream flowing below level that gauges can record

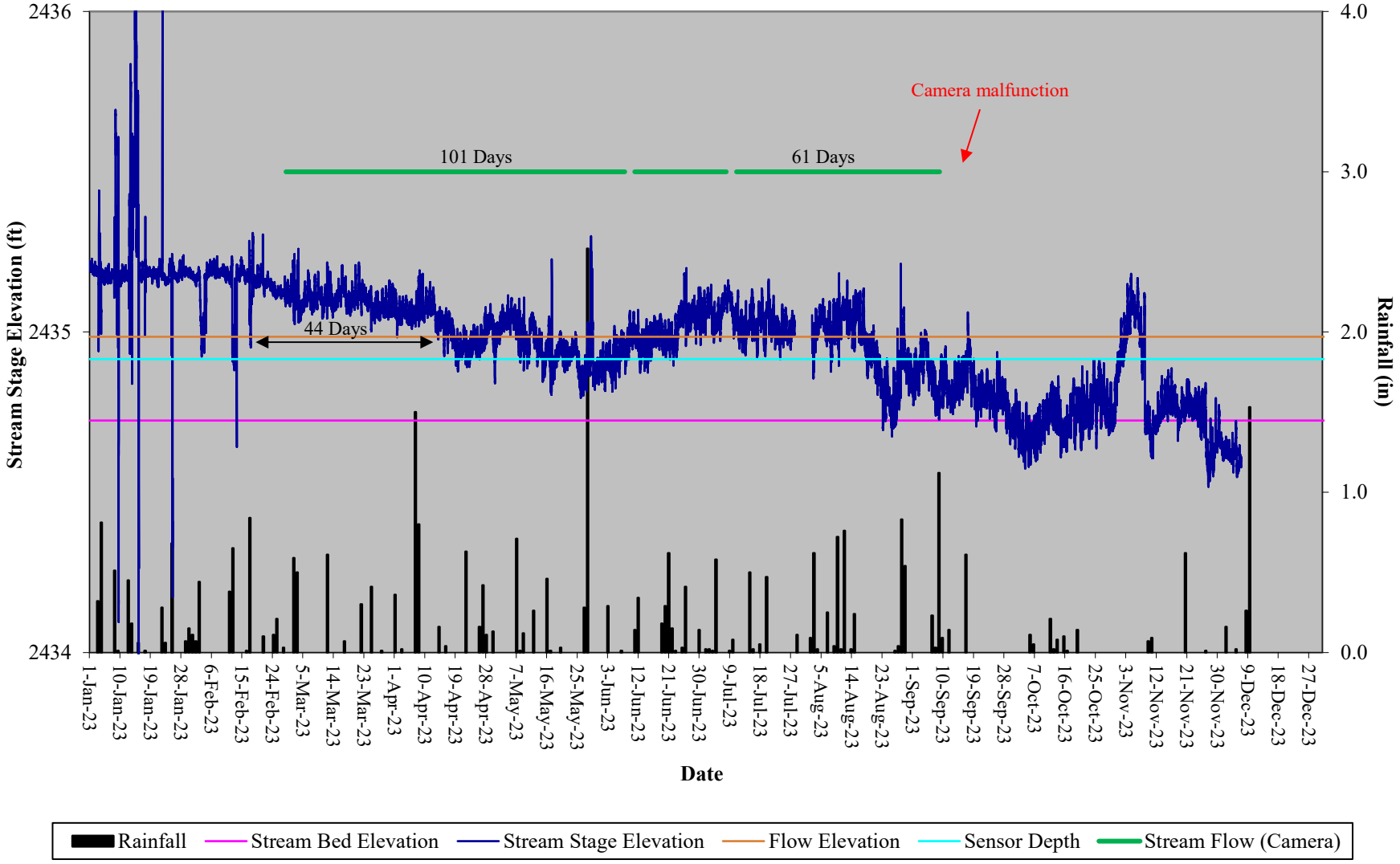
Dales Creek Restoration Site
Hydrograph
Stream Gauge UT1-4

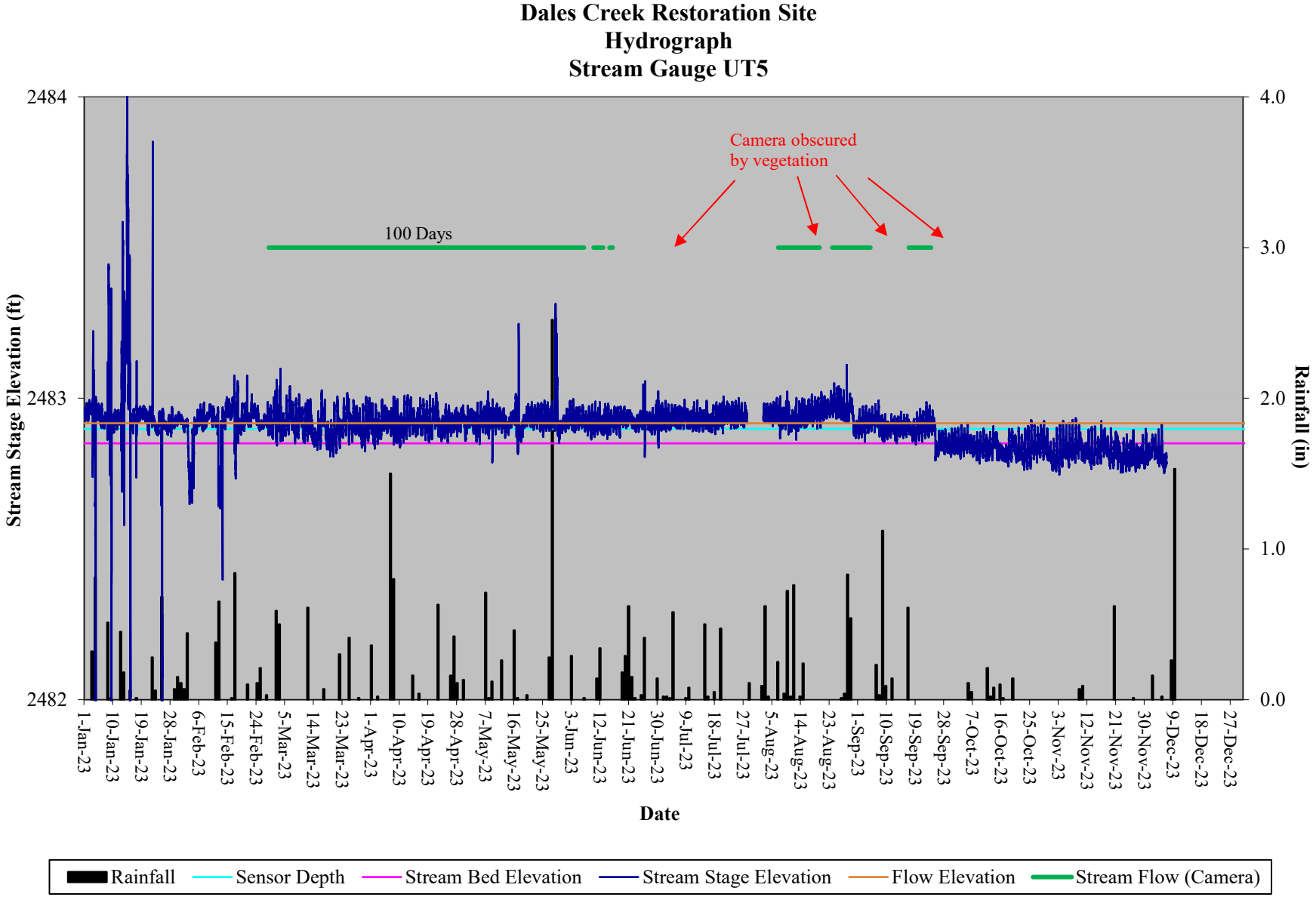



Dales Creek Restoration Site
Hydrograph
Stream Gauge UT2
Stream Stage Elevation (ft)
Rainfall
Date
2307
2306
2305
4.0
3.0
2.0
1.0
0.0
139 Days
109 Days
1-Jan-23
10-Jan-23
19-Jan-23
28-Jan-23
6-Feb-23
15-Feb-23
24-Feb-23
5-Mar-23
14-Mar-23
23-Mar-23
1-Apr-23
10-Apr-23
19-Apr-23
28-Apr-23
7-May-23
16-May-23
25-May-23
3-Jun-23
12-Jun-23
21-Jun-23
30-Jun-23
9-Jul-23
18-Jul-23
27-Jul-23
5-Aug-23
14-Aug-23
23-Aug-23
1-Sep-23
10-Sep-23
19-Sep-23
28-Sep-23
7-Oct-23
16-Oct-23
25-Oct-23
3-Nov-23
12-Nov-23
21-Nov-23
30-Nov-23
9-Dec-23
18-Dec-23
27-Dec-23
Rainfall
Stream Stage Elevation
Stream Bed Elevation
Sensor Depth
Flow Elevation
Stream Flow (Camera)


Dales Creek Restoration Site
Hydrograph
Stream Gauge UT3
Camera obscured by vegetation
133 Days
135 Days
67 Days
Stream Stage Elevation (ft)
Rainfall (in)
Date
2335
2334
2333
2332
2331
4.0
3.0
2.0
1.0
0.0
1-Jan-23
10-Jan-23
19-Jan-23
28-Jan-23
6-Feb-23
15-Feb-23
24-Feb-23
5-Mar-23
14-Mar-23
23-Mar-23
1-Apr-23
10-Apr-23
19-Apr-23
28-Apr-23
7-May-23
16-May-23
25-May-23
3-Jun-23
12-Jun-23
21-Jun-23
30-Jun-23
9-Jul-23
18-Jul-23
27-Jul-23
5-Aug-23
14-Aug-23
23-Aug-23
1-Sep-23
10-Sep-23
19-Sep-23
28-Sep-23
7-Oct-23
16-Oct-23
25-Oct-23
3-Nov-23
12-Nov-23
21-Nov-23
30-Nov-23
9-Dec-23
18-Dec-23
27-Dec-23
Rainfall
Sensor Depth
Stream Bed Elevation
Stream Stage Elevation
Flow Elevation
Stream Flow (Camera)

Dales Creek Restoration Site
Hydrograph
Stream Gauge UT4




Dales Creek Restoration Site
Hydrograph
Stream Gauge UT5
Camera obscured by vegetation
100 Days
Stream Stage Elevation (ft)
Rainfall (in)
2484
2483
2482
4.0
3.0
2.0
1.0
0.0
1-Jan-23
10-Jan-23
19-Jan-23
28-Jan-23
6-Feb-23
15-Feb-23
24-Feb-23
5-Mar-23
14-Mar-23
23-Mar-23
1-Apr-23
10-Apr-23
19-Apr-23
28-Apr-23
7-May-23
16-May-23
25-May-23
3-Jun-23
12-Jun-23
21-Jun-23
30-Jun-23
9-Jul-23
18-Jul-23
27-Jul-23
5-Aug-23
14-Aug-23
23-Aug-23
1-Sep-23
10-Sep-23
19-Sep-23
28-Sep-23
7-Oct-23
16-Oct-23
25-Oct-23
3-Nov-23
12-Nov-23
21-Nov-23
30-Nov-23
9-Dec-23
18-Dec-23
27-Dec-23
Date
Rainfall
Sensor Depth
Stream Bed Elevation
Stream Stage Elevation
Flow Elevation
Stream Flow (Camera)

APPENDIX E

Project Timeline and Contact Info

Table 13. Project Activity & Reporting History Dales Creek Restoration Site, DMS Project #100128		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Site Instituted		May 23, 2019
Mitigation Plan		Feb. 19, 2021
Final Design - Construction Plans		Aug. 25, 2021
Construction Grading Completed		April 1, 2022
Planting Completed		April 11, 2022
As-built Survey		April 29, 2022
Baseline Monitoring/Report		May 2022
Vegetation Monitoring	April 27, 2022	
Stream Survey	April 28, 2022	
Invasive Species Treatment		August 23, 2022
Year 1 Monitoring		December 2022
Vegetation Monitoring	October 31, 2022	
Stream Survey	December 20, 2022	
Year 2 Monitoring		
Vegetation Monitoring	August 2, 2023	
Stream Survey	August 2, 2023	
Invasive Species Treatment		August 7-8, 2023

Table 14. Project Contacts Dales Creek Restoration Site, DMS Project #100128	
Design Firm	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2512 Fax: (919) 783-9266
Construction Contractor	Chatham Civil Contracting, LLC 811 Archie Johnson Road Siler City, NC 27344 Contact: Mr. Stephen James Phone: (919)704-4442
Planting Contractor	Shenandoah Habitats 1983 Jefferson Highway Waynesboro, VA 22980 Contact: Mr. David Coleman Phone: (540) 941-0067
Monitoring Performers	
	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller