## **Russell Gap Stream Mitigation Project Year 1 (2020) Monitoring Report FINAL**

DMS Project ID No. 100003, DEQ Contract No. 6980 USACE Action ID No. SAW-2017-00826, DWR# 20150416 Alexander County, North Carolina, Catawba River Basin: 03050101-120010 MY1 Data Collection Period: September – November 2020



Submitted to/Prepared for:

NC Department of Environmental Quality Division of Mitigation Services (DMS) 1652 Mail Service Center Raleigh, North Carolina 27699-1652

### **Michael Baker**

INTERNATIONAL Submission Date: December 2020

This document was printed using 30% recycled paper.

Russell Gap 100003 Catawba 03050101 Alexander USACE Action ID DWR Permit Date Project Instituted Stream/Wet. Service Area Date Printed 2015-00826 2015-0416 9/15/2016 Catawba 03050101 9/14/2020

BROWNING.KIMBERLY.DANIELLE.1527683510 Digitally signed by BROWNING.KIMBERLY.DANIELLE.1527683510 Date: 2020.10.06 08:35:35 - 04'00'

Signature of Official Approving Credit Release

Credit Release Milestone	Warm Stream Credits									
Project Credits	Scheduled Releases %	Estimated Scheduled Release #	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date			
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
2 - Year 0 / As-Built	30.00%	2,750.085	2,750.085	0.000	2,750.085	2020	9/14/2020			
3 - Year 1 Monitoring	10.00%	916.695				2021				
4 - Year 2 Monitoring	10.00%	916.695				2022				
5 - Year 3 Monitoring	10.00%	916.695				2023				
6 - Year 4 Monitoring	5.00%	458.347				2024				
7 - Year 5 Monitoring	10.00%	916.695				2025				
8 - Year 6 Monitoring	5.00%	458.347				2026				
9 - Year 7 Monitoring	10.00%	916.695				2027				
Stream Bankfull Standard	10.00%	916.695				2022				
			Totals		2,750.085					

Total Gross Credits	9,166.949
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	2,750.085
Total Percentage Released	30.00%
Remaining Unreleased Credits	6,416.864

Credit Release Milestone	Riparian Credits									
Project Credits	Scheduled Releases %	Estimated Scheduled Release #	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date			
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
2 - Year 0 / As-Built	30.00%	2.116	2.116	0.000	2.116	2020	9/14/2020			
3 - Year 1 Monitoring	10.00%	0.705				2021				
4 - Year 2 Monitoring	10.00%	0.705				2022				
5 - Year 3 Monitoring	15.00%	1.058				2023				
6 - Year 4 Monitoring	5.00%	0.353				2024				
7 - Year 5 Monitoring	15.00%	1.058				2025				
8 - Year 6 Monitoring	5.00%	0.353				2026				
9 - Year 7 Monitoring	10.00%	0.705				2027				
Stream Bankfull Standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
	•	-	Totals		2.116					

Total Gross Credits	7.053
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	2.116
Total Percentage Released	30.00%
Remaining Unreleased Credits	4.937



January 7, 2021

Matthew Reid, Project Manager NCDEQ, Division of Mitigation Services 5 Ravenscroft Dr., Suite 102 Asheville, NC 28801

**Subject:** Response to DMS Comments for DRAFT MY1 Report Russell Gap Mitigation Project, Alexander County DMS Project # 100003, DEQ Contract #6980, Catawba River Basin

Mr. Reid:

Please find enclosed our responses to the NC Division of Mitigation Services (DMS) review comments dated December 11, 2020 in reference to the Russell Gap Mitigation Project - DRAFT MY1 Report. We have revised the draft document in response to the review comments as outlined below.

#### **Report Comments/Questions:**

- Please include discussion regarding wetland performance and flow gauge performance in Section 1.4 Monitoring Results and Project Performance.
   Response: Revision made as requested.
- While no vegetation problem areas were identified, please acknowledge this and include short discussion of VPA including invasive species, bare areas, areas of poor growth, etc. in section 1.4. **Response: Revision made as requested.**
- A total of 81.4 inches of rainfall was observed for the project. Please include what station was used for this measurement and also add in Section 1.5 Technical and Methodological Descriptions. **Response: Revision made as requested.**
- CCPV: Previous Random Veg Plots are shown on the CCPV. Please turn off and only show the Random Plots from MY1.
   Response: Revision made as requested.
- Table 5: All streams are functioning at 100% based on the metrics measured by Table 5. This is impressive for a site of this size and considering the numerous storm events the region experienced this year. This will likely raise questions during the 2021 Credit Release Meeting. Please be prepared to discuss this at the meeting.
   Response: At the time of monitoring no Stream Problem Areas were documented. We will be prepared to discuss this at the 2021 Credit Release Meeting.
- Table 6: Please fill out the top of the table. It is currently blank and appears that it may have been neglected. NA, 0 and 0.0% is adequate if there is nothing to note. **Response: Revision made as requested.**



- Cross-section plots: Please turn off markers for Asbuilt data and only show markers for current monitoring year data.
   Response: Revision made as requested.
- Table 8: Please add grid lines to aid in reviewing report. **Response: Revision made as requested.**
- Wetland Monitoring Well Graphs: Consider adding a note indicating the hydroperiod performance criteria that was approved in the Mitigation plan of "12% of 234 is 28 days" or something similar. **Response: Revision made as requested.**
- Flow Gauge Graphs: The note for the Daily Rain portion indicates data is from onsite gauge from the Browns Summit site. Please revise.
   Response: Revision made as requested.
- Figure 7: Please use bars for the "Observed Project Rainfall". Response: Revision made as requested.
- Figure 7: Please specify what weather station(s) was used to compile data. **Response: Revision made as requested.**

#### Electronic Deliverables:

- Please submit random veg plots as polygons.
   Response: Random veg plots have been included as polygons.
- Please include photos as jpegs in the final submittal. Response: Microsoft Word versions of photo logs containing jpeg files have been included.
- Please submit the data that supports the groundwater gauge and surface water gauge figures, including the precipitation data.
   Response: Raw data from groundwater, flow gauges, and rain data have been included.
- If available, please submit features that characterize the mitigation plan design lengths. **Response: Mitigation plan design lengths were derived from AUTO CADD provided when the mitigation plan was submitted.**

As requested, Michael Baker has provided one (1) hardcopy of the FINAL report, and the updated e-submission digital files will be sent via secure ftp link. A full final electronic copy with electronic support files have been included on a USB drive. Please do not hesitate to contact me (Jason.york@mbakerintl.com 828-412-6101) should you have any questions regarding our response submittal. Sincerely,

Jason York Environmental Scientist

Enclosure: Final MY1 Report Russell Gap Mitigation Project

### TABLE OF CONTENTS

1.0	PROJECT SUMMARY	3
1.1	PROJECT DESCRIPTION	
1.2	GOALS AND OBJECTIVES	3
1.3	Project Success Criteria	
1.4	MONITORING RESULTS AND PROJECT PERFORMANCE	4
1.5	TECHNICAL AND METHODOLOGICAL DESCRIPTIONS	5
1.6	References	5
1.0		••••

### APPENDICES

Appendix	Α	Backgro	und T	Tables and Figures
		Figure	1	Vicinity Map
		Figure	2	Project Asset Map
		Table	1	Project Components and Mitigation Credits
		Table	2	Project Activity and Reporting History
		Table	3	Project Contacts
		Table	4	Project Attributes
Appendix	В	Visual A	ssessi	ment Data
		Figure	3	Current Condition Plan View (CCPV) Map
		Table	5	Visual Stream Morphology Stability Assessment
		Table	6	Vegetation Condition Assessment
		Stream S	Statio	n Photo-Points
		Vegetati	on Pl	ot Photographs
		Monitor	ing G	auges and Overbank Photographs
Appendix	С	Vegetati	on Pl	ot Data
		Table	7	Planted Stem Counts by Plot and Species
Appendix	D	Stream (	Geom	orphology Data
		Figure	4	Cross-Sections with Annual Overlay
		Table	8	Baseline Stream Data Summary
		Table	9	Cross-Section Morphology Data Summary
Appendix	Е	Hydrolo	gic D	ata
		Table	10	Verification of Bankfull Events
		Figure	5	Wetland Monitoring Well Graphs
		Table	11	Wetland Hydrology Summary Data
		Figure	6	Flow Gauge Graphs
		Table	12	All Years Flow Gauge Success
		Figure	7	Observed Rainfall Versus Historic Averages

### 1.0 PROJECT SUMMARY

#### **1.1 Project Description**

Michael Baker Engineering, Inc. (Michael Baker) restored approximately 4,209 linear feet of existing stream, enhanced 8,857 linear feet of stream along Unnamed Tributaries (UTs) to Davis Creek, the East Prong Lower Little River, and UTs to the East Prong Lower Little River. Michael Baker also restored and/or enhance approximately 7.3 acres of riparian wetland in the Catawba River Watershed. The project is located in the Catawba River Basin, within the Hydrologic Unit Code (HUC) 03050101-120010, which is identified as a Targeted Local Watershed (TLW) in the NC Division of Mitigation Services' (DMS) 2009 *Upper Catawba River Basin Restoration Priorities* (RBRP) report.

The Russell Gap Stream Mitigation project is located on an active cattle farm in Alexander County, North Carolina, 10 miles northwest of the Town of Taylorsville as shown on the Project Vicinity Map (Figure 1). Historic agriculture uses on the project site include cattle production, row crops, and apple orchards. These activities had negatively impacted both water quality and streambank stability along the project streams and their tributaries (Table 4). The project is being conducted as part of the NCDMS Full Delivery In-Lieu Fee Program and is anticipated to generate at close-out a total of 9,166.949 stream mitigation credits (contracted for 9,400) and up to 7.053 riparian wetland mitigation units (contracted for 4.0) (Table 1) and is protected by a 35.97-acre permanent conservation easement.

#### **1.2** Goals and Objectives

The goals of this project are identified below:

- Establishment of geomorphically stable conditions along all project reaches,
- Improvement of water quality by reducing nutrient and sediment inputs,
- Restoration of natural stream and floodplain interactions,
- Restoration and enhancement of riparian wetland functions,
- Restoration and protection of riparian buffer functions and corridor habitat,
- Improvement of in-stream aquatic habitat, and
- Establishment of a permanent conservation easement on the entire project.

To accomplish these goals, the following objectives were identified:

- To restore appropriate bankfull dimensions, remove spoil berms, and/or raise channel beds, by utilizing either a Priority I Restoration approach or an Enhancement Level I approach.
- To construct streams of appropriate dimensions, pattern, and profile in restored reaches, slope stream banks and provide bankfull benches on enhanced streams and utilize bioengineering to provide long-term stability.
- Construct a correct channel morphology to all streams increasing the number and depths of pools, with structures including geo-lifts with brush toe, log vanes/weirs, root wads, and/or J-hooks.
- Raise ground water levels in delineated hydric soils areas through the implementation of Priority I restoration and the filling of ditches. Wetland vegetation will also be planted.
- Establish riparian buffers at a 50-foot minimum width along all stream reaches, planted with native tree and shrub species.
- Establish a permanent conservation easement restricting land use in perpetuity. This will prevent site disturbance and allow the project to mature and stabilize.

#### **1.3 Project Success Criteria**

The success criteria and performance standards for the project will follow the North Carolina Interagency Review Team (NCIRT) guidance document *Wilmington District Stream and Wetland Compensatory Mitigation Update* dated October 24, 2016 and as described in Section 7 of the approved Mitigation Plan. All specific monitoring activities will follow those outlined in detail in Section 8 of the approved Mitigation Plan and will be conducted for a period of seven years unless otherwise noted. Annual monitoring reports will follow the DMS document *Annual Monitoring Report Format, Data Requirements, and Content Guidance* from April 2015. The performance standards for the riparian buffer assets will be held in accordance with 15A NCAC 02B.0295(n)(2)(B) and 15A NCAC 02B.0295(n)(4), and annual monitoring reports will be submitted at the end of each of the seven monitoring years.

### 1.4 Monitoring Results and Project Performance

The Year 1 monitoring survey data of the twenty-six permanent cross-sections indicates that these stream sections are geomorphically stable and are within the lateral/vertical stability and in-stream structure performance categories. All reaches are stable and performing as designed and are rated at 100 percent for all the parameters evaluated (Table 5 in Appendix B). There were no Stream Problem Areas (SPAs) identified.

During Year 1 monitoring, the planted acreage performance categories were functioning well overall. The planted stems endured longer than usual saturated growing conditions in their first year, with multiple heavy rain events throughout the spring, summer, and fall. However, the average density of total planted stems, based on data collected from the 20 permanent and 9 random monitoring plots for the Year 1 monitoring conducted in October and November 2020 was 621 stems per acre (Table 7 in Appendix C). Thus, the Year 1 vegetation data demonstrate that the Site is on track to meet the minimum success interim criteria of 320 trees per acre by the end of Year 3. No vegetation problem areas (VPAs) were identified as exceeding the reportable mapping threshold of 0.1 acres. Minor areas of poor growth will be supplemental planted and seeded where needed during MY2 at a rate of 200 stems per acre. Scattered stems of privet (*Ligustrum spp.*) and multiflora rose (*Rosa multiflora*) are located throughout the site and will be mechanically removed and/or treated with herbicide during MY2 and future monitoring years.

During Year 1 monitoring, two separate post-construction bankfull events were observed (see Table 10 in Appendix E and the Overbank Photographs in Appendix B). The first occurred on 5/28/20 as documented through photographs of the manual cork crest gauge located on Reach 4 along with post-flood visual evidence such as debris jams, flow scour, and wrack lines in the floodplain. The second event, Hurricane Zeta, occurred on 10/29/20 and 10/30/20 as documented through photographs of the manual cork crest gauges located on Reach 1 and Reach 4, and from visual evidence in the floodplain. Crest gauges located on R6 and R9 did not record an overbank event during MY1.

As the observed monthly rainfall data for the project presented in Figure 6 in Appendix E demonstrates, the past 12 months have varied dramatically as compared to historic average precipitation. A total of 81.4 inches of rainfall was observed for the project, while Alexander County averages 47.2 inches of annual rainfall, an excess of 34.2 inches. All observed project rainfall was collected from the North Carolina Climate Office Weather Climate Database CRONOS station TAYL, located in Taylorsville, NC.

During Year 1 monitoring, the twelve automated groundwater monitoring wells met or exceeded the minimum hydroperiod performance criteria approved in the Mitigation Plan of 12% of the 234-day growing season (28 or more consecutive days). The five automated flow gauges met or exceeded the minimum 30-day performance criteria during MY1.

Summary information/data related to the Site and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report Appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report

and in the Mitigation Plan available on the DMS website. Any raw data supporting the tables and figures in the Appendices is available from DMS upon request.

This report documents the successful completion of the Year 1 monitoring activities for the postconstruction monitoring period.

#### **1.5** Technical and Methodological Descriptions

Stream survey data was collected to a minimum of Class C Vertical and Class A Horizontal Accuracy using a Leica TS06 Total Station and was georeferenced to the NAD83 State Plane Coordinate System, FIPS3200 in US Survey Feet, which was derived from the MY-1 Survey. The survey data from the permanent project cross-sections were collected and classified using the Rosgen Stream Classification System to confirm design stream type (Rosgen 1994 and 1996).

The twenty permanent and nine annual random vegetation-monitoring quadrants (plots) were installed across the site in accordance with the CVS-DMS Protocol for Recording Vegetation, Version 4.1 (Lee 2007) and the data collected from each was input into the CVS-DMS Data Entry Tool v. 2.3.1 (CVS 2012).

Nine automated groundwater monitoring wells were installed in the floodplain along Reach R1 following USACE protocols (USACE 2005). Three additional groundwater monitoring wells were installed in the floodplain along R9. Flow gauges were installed on R11, R13, R14, R19 and R20. Collective data will document that these intermittent streams continue to exhibit base flow for at least thirty consecutive day throughout each monitoring year. The gauges themselves are all Van Essen DI800 BARO Diver data loggers. Four manual cork crest gauges were installed on R1, R4, R6, and R9.

All observed project rainfall was collected from the North Carolina Climate Office Weather Climate Database CRONOS station TAYL, located in Taylorsville, NC approximately nine miles south of the project at 35.9139, -81.19087.

The specific locations of monitoring features, such as vegetation plots, permanent cross-sections, reference photograph stations, and crest gauges, are shown on the CCPV map found in Appendix B.

#### 1.6 References

- Carolina Vegetation Survey (CVS) and NC Division of Mitigation Services (DMS). CVS-DMS Data Entry Tool v. 2.3.1. University of North Carolina, Raleigh, NC. 2012.
- Lee, M., Peet R., Roberts, S., Wentworth, T. 2007. CVS-DMS Protocol for Recording Vegetation, Version 4.1.
- North Carolina Division of Mitigation Services. 2010. Neuse River Basin Restoration Priorities. NC Department of Environmental Quality. Raleigh, NC.
- North Carolina Division of Mitigation Services. 2016. Neuse River Basin Restoration Priorities: Neuse-01 Catalog Unit *Update*. NC Department of Environmental Quality. Raleigh, NC.
- North Carolina Division of Mitigation Services. 2017. Annual Monitoring Report Format, Data Requirements, and Content Guidance June 2017. NC Department of Environmental Quality. Raleigh, NC.
- North Carolina Interagency Review Team (NCIRT). 2016. Guidance document "Wilmington District Stream and Wetland Compensatory Mitigation Update". October 24, 2016

Rosgen, D.L. 1994. A Classification of Natural Rivers. Catena 22:169-199.

Rosgen, D.L. 1996. Applied River Morphology. Wildlands Hydrology. Pagosa Springs, CO.

United States Army Corps of Engineers (USACE). 2005. "Technical Standard for Water-Table Monitoring of Potential Wetland Sites," WRAP Technical Notes Collection (ERDC TN-WRAP-05-2), U.S. Army Engineer Research and Development Center. Vicksburg, MS.

# **APPENDIX** A

**Background Tables and Figures** 









## Figure 2 Project Asset Map Russell Gap Project

### Table 1. Project Components and Mitigation Credits Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Project Component	Wetland Position and	Existing Footage or		As-Built CL Restored Footage,	As-Built CL w/o Xing Footage,	Mitigation Plan Designed	Restoration	Approach Priority	Mitigation	Mitigation Plan
(reach ID, etc.)	HydroType	Acreage	Stationing	or SF <sup>1</sup>	or SF <sup>2</sup>	Footage	Level	Level	Ratio (X:1)	Credits 3
Reach R1		2,142	10+00 - 29+45.90	1,946	1,910.90	1,841.60	R	PI	1.0	1,841.60
Reach R2		288	10+00 - 11+65.62	166	165.62	174.21	R	P2	1.0	174.21
Reach R3		388	32+28.36 - 36+34.66	406	406.30	388.74	R	P2	1.0	388.74
Reach R4a		299	10+00 - 13+00.00	300	300.00	300.00	EII	-	2.5	120.00
Reach R4		2,245	10+00 - 32+28.36	2,228	2,038.36	2,063.32	EI	-	1.5	1,375.55
Reach R5		256	10+00 - 12+10.00 w/o pipe	193	193.00	193.00	EII	-	2.5	77.20
Reach R5 Pipe Removal		17	10+32 - 10+49 pipe	17	17.00	17.00	R	Pl	1.0	17.00
Reach R6		631	12+10.00 - 19+57.36	747	747.36	741.05	R	Pl	1.0	741.05
Reach R7a		155	19+57.36- 20+61.17	104	103.81	110.12	EII		2.5	44.05
Reach R7b		1,170	20+61.17 - 33+51.48	1,290	1,216.31	1,202.37	EI	_	1.5	801.58
Reach R8		463	33+75.40 - 38+28.55	453	453.15	455.79	EII		2.5	182.32
Reach R9		403	38+65.34 - 43+10.91	455	455.15	455.79	R	- P1	1.0	445.52
Reach R10a		371		367	366.54		EII	FI	2.0	188.06
			10+08.40 - 13+74.94			376.11				
Reach R10b		0	13+74.94 - 14+79.77	105	104.83	112.65	R	P1	1.0	112.65
Reach R11		481	10+00 - 17+31.85	732	711.85	725.83	EI	-	1.5	483.89
Reach R12		86	10+00 - 11+01.78	102	101.78	120.02	R	P1	1.0	120.02
Reach R13 Reach R14		124 528	10+00 - 11+45.00	145 570	145.00 569.80	145.00 572.27	EI R	- P1/2	1.5	96.67 572.27
Reach R15		528 226	11+45.00 - 17+14.80 10+00 - 13+02.77	303	283.77	281.80	EII	P1/2	2.5	5/2.2/
Reach R17		130	10+00 - 13+02.77	107	106.64	104.44	EII	-	2.5	41.78
Reach R18		130	10+00 - 12+03.31	203	176.31	179.01	EII		2.5	71.60
Reach R19		481	9+86.00 - 13+75.96	390	352.96	359.49	EI		1.5	239.66
Reach R20		206	10+00 - 12+52.61	253	252.61	252.68	R	- P1	1.0	252.68
Reach R21		67	10+00 - 10+91.76	92	91.76	89.11	EII	-	2.5	35.64
Reach R22		161	10+00 - 11+19.46	119	119.46	136.87	EII	-	2.5	54.75
Reach R22a		68	10+60 - 11+28.42	68	68.42	68.42	EII	-	2.5	27.37
Reach R25		422	10+00 - 14+30.52 (w/o pipe)	403	402.52	399.05	EI	-	1.5	266.03
Reach R25 Pipe Removal		28	12+62 - 12+90 pipe	28	28.00	28.00	R	P1	1.0	28.00
Reach R26		548	10+00 - 14+72.96	473	472.96	472.13	EII	-	2.5	188.85
Reach R27		165	10+00 - 11+63.76	164	163.76	163.76	EII	-	2.5	65.50
Wetland Group 1	RR	0		5.285		5.285	Restoration		1.0	5.285
Wetland Group 2	RR	0		1.488		1.488	Restoration		1.0	1.488
Wetland Group 3	RR	0.261		0.261		0.261	Enhancement		2.0	0.131
Wetland Group 4	RR	0.156		0.156		0.156	Enhancement		2.0	0.078
Wetland Group 5	RR	0.034		0.034		0.034	Enhancement		2.0	0.017
Wetland Group 6	RR	0.108		0.108		0.108	Enhancement		2.0	0.054

1 All stream stationing and restored footage numbers reported here, discussed in the report text, and shown in the as-built plan sheets use survey values.

2 The stream footage reported here uses the as-built stream entertime survey values and have all easement breaks removed from their totals. Buffer group values

reported here are the creditable areas as allowed for each group as described in detail in the mitigation plan.

3 Credits reported here are taken directly from the approved mitigation plan Table 11.1

#### Table 1.1

#### As-Built Centerline Length and Area Summations by Mitigation Category

	0		, 0	0,	
Restoration Level	Stream (linear feet)		Riparian Wetland (acres)	Wetland (acres)	Credited Buffer (square feet)
		Riverine	Non-Riverine		
Restoration	4,063	6.773			
Enhancement		0.559			
Enhancement I	5,760				
Enhancement II	2,684				
Creation					
Preservation					
High Quality Pres					

Table 1.2

Asset Category	Overall Credits
Stream	9,166.949
RP Wetland	7.053
NR Wetland	
Buffer	

## Table 2. Project Activity and Reporting HistoryRussell Gap Stream Mitigation Project - NCDMS Project No. 100003

Elapsed Time Since grading complete:	
Elapsed Time Since planting complete:	
Number of Reporting Years <sup>1</sup> :	

Activity or Deliverable	Data Collection Complete	Completion or Delivery
404 permit date	N/A	Dec-18
Mitigation Plan	N/A	Sep-18
Final Design – Construction Plans	N/A	Sep-18
Construction Grading Completed	N/A	Feb-20
As-Built Survey	May-20	May-20
Livestake and Bareroot Planting Completed	N/A	Mar-20
As-Built Baseline Monitoring Report (MY0)	Mar-20	Sep-20
Year 1 Monitoring	Nov-20	Dec-20
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		
Year 6 Monitoring		
Year 7 Monitoring		

10 months 9 months 1

<sup>1</sup> = The number of monitoring reports excluding the as-built/baseline report

Russell Gap Stream Mitigation Proje Designer	8000 Regency Parkway, Suite 600
2 005101	Cary, NC 27518
Michael Baker Engineering, Inc.	Contact:
include Duker Engineering, met	Katie McKeithan, Tel. 919-481-5703
Construction Contractor	5616 Coble Church Rd
construction contractor	Julian, NC 27283
KBS Earthworks, Inc.	Contact:
	Kory Strader, Tel. 336-362-0289
Survey Contractor	P.O. Box 148
	Swannanoa, NC 28778
Turner Land Surveying	Contact:
(As-Built Only)	David Turner, Tel. 919-827-0745
(	88 Central Avenue
Kee Mapping and Surveying	Asheville, NC 28801
(MY1 Survey)	Contact:
(	Brad Kee, Tel. 828-575-9021
Planting Contractor	5616 Coble Church Rd
	Julian, NC 27283
KBS Earthworks, Inc.	Contact:
,,	Kory Strader, Tel. 336-362-0289
Seeding Contractor	5616 Coble Church Rd
8	Julian, NC 27283
KBS Earthworks, Inc.	Contact:
,	Kory Strader, Tel. 336-362-0289
Seed Mix Sources	
	Telephone:
Green Resources	336-855-6363
Nursery Stock Suppliers	
Mellow Marsh Farm	Telephone: 919-742-1200
ArborGen	Telephone: 843-528-3204
Monitoring Performers	
	8000 Regency Parkway, Suite 600
Michael Baker Engineering, Inc.	Cary, NC 27518
Stream Monitoring POC	Katie McKeithan, Tel. 919-481-5703
Vegetation Monitoring POC	Katie McKeithan, Tel. 919-481-5703

#### Table 4. Project Attributes

Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Russell Gap Stream Mitigation Project - NC Project Name	JMIS I TOJECI	100.100005	Pussell Can Stream	Mitigation Project				
County		Russell Gap Stream Mitigation Project Alexander County						
Project Area (acres)			Alexande 35.	•				
Project Coordinates (latitude and longitude)			36.0091 N,					
Planted Acreage (Acres of Woody Stems Planted)								
	Project Water	29.67 Vatershed Summary Information						
Physiographic Province	rioject water	sneu Summary II		mont				
River Basin				lwba				
USGS Hydrologic Unit 8-digit 3050101	US	SGS Hydrologic U	Ŭ	03050101-120	0010			
DWR Sub-basin				8-32				
Project Drainage Area (Acres and Square Miles)		2,227 ac		es (at downstream end	d of R3)			
Project Drainage Area Percentage of Impervious Area	a		1	ervious area				
CGIA Land Use Classification			, <u> </u>	.5% rural residential,	1.4% roadway			
	Existing Rea	ch Summary Info	ormation	-				
Parameters		Reach R1	Reach R2	Reach R3	Reach R4			
Length of reach (linear feet)		2,142	288	388	2,245			
Valley confinement (Confined, moderately confined, unco	nfined)	Unconfined	Unconfined	Unconfined	Unconfined			
Drainage area (Acres)		960	1,056	2227	806			
Perennial, Intermittent, Ephemeral		Perennial	Perennial	Perennial	Perennial			
NCDWR Water Quality Classification		С	С	С	С			
Stream Classification (existing)		E4 (incised)	E4 (incised)	E4	E4			
Stream Classification (proposed)		C4	C4	C4	B4c			
Evolutionary trend (Simon)	Ι	V - Degradation and Widening	III - Degradation	III - Degradation	IV - Degradation and Widening			
FEMA classification		Zone X	Zone X	Zone X	Zone X			
	Existing Rea	ch Summary Info	ormation					
Parameters		Reach R4a	Reach R5	Reach R6	Reach R7a			
Length of reach (linear feet)		299	256	631	155			
Valley confinement (Confined, moderately confined, unco	nfined)	Unconfined	Unconfined	Unconfined	Unconfined			
Drainage area (Acres)		716	150	154	210			
Perennial, Intermittent, Ephemeral		Perennial	Perennial	Perennial	Perennial			
NCDWR Water Quality Classification		С	С	С	С			
Stream Classification (existing)		E4	C4b	G4	E4b			
Stream Classification (proposed)		B4c	C4b	B4	E4b			
Evolutionary trend (Simon)	Ι	- Stable System	I - Stable System	rv - Degradation	I - Stable System			
FEMA classification		Zone X	Zone X	Zone X	Zone X			
	Existing Rea	ch Summary Info	ormation		I.			
Parameters		Reach R7b	Reach R8	Reach R9	Reach R10(A/B)			
Length of reach (linear feet)		1,170	463	439	371			
Valley confinement (Confined, moderately confined, unco	nfined)	Unconfined	Unconfined	Unconfined	Unconfined			
Drainage area (Acres)	Ī	288	333	358	17			
Perennial, Intermittent, Ephemeral	Ī	Perennial	Perennial	Perennial	Perennial			
NCDWR Water Quality Classification		С	С	С	С			
Stream Classification (existing)	İ	E4b	C4	E4b	E4b			
Stream Classification (proposed)	İ	E4b	C4	B4	E4b-C4			
				IV - Degradation				
Evolutionary trend (Simon)	1	II - Degradation	I - Stable System	and Widening	II - Disturbance			

Existing	g Reach Summary Inf	ormation		
Parameters	Reach R11	Reach R12	Reach R13	Reach R14
Length of reach (linear feet)	481	86	124	528
Valley confinement (Confined, moderately confined, unconfined)	Confined	Unconfined	Moderately Confined	Confined (Upper) Unconfined (Lower)
Drainage area (Acres)	17	115	21	22
Perennial, Intermittent, Ephemeral	Intermittent	Perennial	Intermittent	Perennial
NCDWR Water Quality Classification	С	С	С	С
Stream Classification (existing)	B4a	Eb	C4	A4
Stream Classification (proposed)	B4a	C4b	C4	E4
Evolutionary trend (Simon)	III - Degradation	IV - Degradation and Widening	II - Disurbance	IV - Degradation and Widening
FEMA classification	Zone X	Zone X	Zone X	Zone X
Existing	Reach Summary Inf	ormation		
Parameters	Reach R15	Reach R17	Reach R18	Reach R19
Length of reach (linear feet)	226	130	185	481
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Unconfined	Unconfined	Moderately Confined
Drainage area (Acres)	19	26	24	22
Perennial, Intermittent, Ephemeral	Intermittent	Intermittent	Intermittent	Perennial
NCDWR Water Quality Classification	С	С	С	С
Stream Classification (existing)	E4b	E4b	E4b	B4a
Stream Classification (proposed)	E4b	E4b	E4b	B4a
Evolutionary trend (Simon)	I - Stable System	I - Stable System	I - Stable System	IV - Degradation and Widening
FEMA classification	Zone X	Zone X	Zone X	Zone X
Existing	g Reach Summary Inf	ormation		
Parameters	Reach R20	Reach R21	Reach R22	Reach R22a
Length of reach (linear feet)	206	67	161	68
Valley confinement (Confined, moderately confined, unconfined)	Confined	Unconfined	Moderately Confined	Moderately Confined
Drainage area (Acres and Square Miles)	9	33	3	3
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	С	С	С	С
Stream Classification (existing)	A4a+	B4	B4	B4
Stream Classification (proposed)	A4a+	B4	B4	B4
Evolutionary trend (Simon)	III - Degrading	I - Stable System	II - Channelized	II - Channelized
FEMA classification	Zone X	Zone X	Zone X	Zone X
	g Reach Summary Inf	1		
Parameters	Reach R25	Reach R26	Reach R27	
Length of reach (linear feet)	422	548	165	
Valley confinement (Confined, moderately confined, unconfined)	Moderately Confined	Unconfined	Moderately Confined	
Drainage area (Acres and Square Miles)	33	32	19	
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	
NCDWR Water Quality Classification	C	C	С	
Stream Classification (existing)	B4a	E4b	E4b	
Stream Classification (proposed)	B4a	E4b	E4b	
Evolutionary trend (Simon)	III - Degrading	I - Stable System	I - Stable System	
FEMA classification	Zone X	Zone X	Zone X	
Regulatory Considerations Parameters	Annlieghle?	Resolved?	Supporting Dec-9	
Water of the United States - Section 404	Applicable? Yes	Yes	Supporting Docs? PCN	
Water of the United States - Section 404 Water of the United States - Section 401	Yes	Yes	PCN PCN	
Endangered Species Act	Yes	Yes	Categorical Exclusion	
Historic Preservation Act	Yes	Yes	Categorical Exclusion	
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A	
FEMA Floodplain Compliance	No	N/A	N/A	

MICHAEL BAKER ENGINEERING, INC. RUSSELL GAP STREAM MITIGATION PROJECT (DMS #100003) YEAR 1 MONITORING REPORT

# **APPENDIX B**

Visual Assessment Data











#### Table 5. Visual Steam Morphology Stability Assessment

Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Reach ID: Reach R1							
Assessed Length (LF):	1,911						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing a Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	21	21	0.00	0.00	100%
1. Bed		<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	19	19			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	19	19			100%
		1. Thalweg centering at upstream of meander bend (Run)	21	21			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	19	19			100%
			•/	17			
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion		0	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected		0	0	0	100%
2. Bank	3. Mass Wasting	Banks shudeledovernanging to the extent that mass wasting is expected Banks slumping, caving or collapse		0	0	0	100%
	5. mass masung	Danks stumping, caving of collapse		Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	27	27			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	27	27			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	27	27			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	27	27			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq 1.5$ . Rootwads/logs providing some cover at low flow	24	24			100%
Reach ID: Reach R2							
Assessed Length (LF):	166						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing a Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>	Intended		0	0	100%
	invertical stability						
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	Degradation - Evidence of downcutting     Texture Substrate - Riffle maintains coarser substrate	1	1			100%
1. Bed	2. Riffle Condition	0	1	1	0 0.00	0 0.00	
1. Bed	2. Riffle Condition 3. Meander Pool Condition	1. Texture Substrate - Riffle maintains coarser substrate         1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)         2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream	1	1			100%
1. Bed		1. Texture Substrate - Riffle maintains coarser substrate         1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)         2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	1	1			100% 100% 100%
1. Bed		Texture Substrate - Riffle maintains coarser substrate     Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream     riffle)     Thalweg centering at upstream of meander bend (Run)	1	1 1 1			100% 100% 100%
1. Bed	3. Meander Pool Condition	1. Texture Substrate - Riffle maintains coarser substrate         1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)         2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	1	1			100% 100% 100%
1. Bed	3. Meander Pool Condition 4. Thalweg Position	I. Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Z. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)     I. Thalweg centering at upstream of meander bend (Run)     Z. Thalweg centering at downstream of meander bend (Glide)	1	1 1 1	0.00	0.00	100% 100% 100% 100%
	3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding	I. Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Z. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)     I. Thalweg centering at upstream of meander bend (Run)     Z. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion	1	1 1 1	0.00	0.00	100% 100% 100% 100% 100%
1. Bed 2. Bank	3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding 2. Undercut	I. Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)     I. Thalweg centering at upstream of meander bend (Run)     2. Thalweg centering at downstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks undercut/overhanging to the extent that mass wasting is expected	1	1 1 1	0.00 0 0 0	0.00	100% 100% 100% 100% 100% 100%
	3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding	I. Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Z. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)     I. Thalweg centering at upstream of meander bend (Run)     Z. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion	1		0.00 0 0 0 0	0.00	100% 100% 100% 100% 100% 100% 100%
	3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding 2. Undercut	I. Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)     I. Thalweg centering at upstream of meander bend (Run)     2. Thalweg centering at downstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks undercut/overhanging to the extent that mass wasting is expected	1	1 1 1	0.00 0 0 0	0.00	100% 100% 100% 100% 100% 100%
2. Bank	3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding 2. Undercut 3. Mass Wasting	1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion Banks undercut/overhanging to the extent that mass wasting is expected Banks slumping, caving or collapse			0.00 0 0 0 0	0.00	100% 100% 100% 100% 100% 100% 100% 100%
	3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding 2. Undercut 3. Mass Wasting 1. Overall Integrity	I. Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Z. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)     I. Thalweg centering at upstream of meander bend (Run)     Z. Thalweg centering at downstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks undercut/overhanging to the extent that mass wasting is expected     Banks slumping, caving or collapse     Structures physically intact with no dislodged boulders or logs		I I I I Totals	0.00 0 0 0 0	0.00	100% 100% 100% 100% 100% 100% 100%
2. Bank	3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding 2. Undercut 3. Mass Wasting 1. Overall Integrity 2. Grade Control	I. Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)     I. Thalweg centering at upstream of meander bend (Run)     2. Thalweg centering at downstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks undercut/overhanging to the extent that mass wasting is expected     Banks slumping, caving or collapse     Structures physically intact with no dislodged boulders or logs     Grade control structures exhibiting maintenance of grade across the sill		1 1 1 1 1 1 Totals	0.00 0 0 0 0	0.00	100% 100% 100% 100% 100% 100% 100% 100%
2. Bank	3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding 2. Undercut 3. Mass Wasting 1. Overall Integrity	I. Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Z. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)     I. Thalweg centering at upstream of meander bend (Run)     Z. Thalweg centering at downstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks undercut/overhanging to the extent that mass wasting is expected     Banks slumping, caving or collapse     Structures physically intact with no dislodged boulders or logs		I I I I Totals	0.00 0 0 0 0	0.00	100% 100% 100% 100% 100% 100% 100%

#### Table 5. Visual Steam Morphology Stability Assessment

#### Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Reach ID: Reach R3							
	406						
Assessed Length (LF): Major Channel Category	406 Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	0	0			100%
1. Bed	3. Meander Pool Condition	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream</li> </ol>	0	0			100%
		riffle)	0	0			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)     Thalweg centering at downstream of meander bend (Glide)	0	0		-	100%
			· · · ·				
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Bank	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Dalik	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	1	1			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	1	1			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	1	1			100%
		Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs					
	4. Habitat	providing some cover at low flow	0	0			100%
Reach ID: Reach R4a	-						
Assessed Length (LF):	300						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate		0			100%
1. Bed		1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)		0			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>		0			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)		0			100%
		2. Thalweg centering at downstream of meander bend (Glide)		0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion		1	0	0	100%
	1. Scoured/Eroding 2. Undercut	Bank lacking vegetative cover due to active scour and erosion Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks undercu/overhanging to the extent that mass wasting is expected Banks slumping, caving or collapse			0	0	100%
	or mass trasting	Danks stamping, curing of compact		Totals	0	0	100%
				_ ottais	· ·		10070
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs		0			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill		0			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms		0			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%		0			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs		0			100%
		providing some cover at low flow					

Reach ID: Reach R4							
Assessed Length (LF):	2,063						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	17	17			100%
1. Bed		<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	15	15			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	15	15			100%
		1. Thalweg centering at upstream of meander bend (Run)	17	17			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	15	15			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
	or mass musting	Dames stamping, curing or compact		Totals	0	0	100%
				1 Otais	v		10070
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	20	20			100%
or Engineering of detaites	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	20	20			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	20	20			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	20	20		-	100%
	5. Bank Fosition		20	20			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow	15	15			100%
Reach ID: Reach R5							
Assessed Length (LF):	193						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>	Intellatu		0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	1	1			100%
1. Bed	3. Meander Pool Condition	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream</li> </ol>	8	8			100%
		riffle)	1	1			100%
		1. Thalweg centering at upstream of meander bend (Run)	1	1			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	1	1			100%
		· · · ·	•				
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
	•						
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	1	1			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	i	i i			100%
						1	100%
		Structures lacking any substantial flow underneath or around sills or arms	1				
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms Bank erosion within the structures extent of influence <b>does not</b> exceed 15%	1	1			
		Structures lacking any substantial flow underneath or around sills or arms Bank erosion within the structures extent of influence <b>does not</b> exceed 15% Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs providing some cover at low flow	1 1 8	1 1 8			100%

Reach ID: Reach R6							
Assessed Length (LF):	747						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	9	9			100%
. Bed		<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	8	8			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	8	8			100%
		1. Thalweg centering at upstream of meander bend (Run)	9	9			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Ruh)	8	8			100%
		2. Thatweg centering at downstream of meander bend (Onde)	8	8			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion		1	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
	o. mass masulig	Danks stamping, caving or conapse		Totals		0	100%
	1			Totals	0		100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	8	8			100%
st Engineering Su detai es	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	8	8			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	8	8			100%
	3. Bank Position	Bank erosion within the structures extent of influence <b>does not</b> exceed 15%	8	8			100%
		Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq 1.5$ . Rootwads/logs					
	4. Habitat	providing some cover at low flow	8	8			100%
Reach ID: Reach R7a		providing some cover at low now					
Assessed Length (LF):	104						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate		0			100%
1. Bed		<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>		0			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>		0			100%
		1. Thalweg centering at upstream of meander bend (Run)		0			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	İ	0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs		0			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill		0			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms		0			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%		0			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs providing some cover at low flow		0			100%
	1	providing some cover at 10W 110W		1			

1.216						
1,210						
Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
	2. Degradation - Evidence of downcutting			0	0	100%
2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	9	9			100%
	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	7	7			100%
3. Meander Pool Condition		7	7			100%
		9	9			100%
4. Thalweg Position		7	7			100%
	2. Thatweg centering at downstream of meander bend (Ghde)					100%
1 Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
						100%
						100%
or mass wasting	Burks stumping, curing or compse		Totals			100%
-			Totals	0		100%
1 Overall Integrity	Structures physically intact with no dislodged boulders or logs		1			100%
						100%
						100%
						100%
4. Habitat						100%
	providing some cover at low now		1 1			
453						
Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
	2. Degradation - Evidence of downcutting			0	0	100%
2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate		0			100%
	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth &gt; 1.5)</li> </ol>		0			100%
3. Meander Pool Condition	2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream		0			100%
			0			100%
4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)		0			100%
1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
				0	0	100%
3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
			Totals	0	0	100%
			0			100%
2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill		0			100%
2a, Piping	Structures lacking any substantial flow underneath or around sills or arms		0			100%
3. Bank Position	Bank erosion within the structures extent of influence <b>does not</b> exceed 15% Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs		0			100%
		1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)         2. Degradation - Evidence of downcutting         2. Riffle Condition         1. Texture Substrate - Riffle maintains coarser substrate         1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)         3. Meander Pool Condition         2. Length - Sufficent (As Pool Depth/Mean Bkf Depth ≥ 1.5)         3. Meander Pool Condition         1. Thalweg centering at upstream of meander bend (Run)         2. Thalweg centering at upstream of meander bend (Glide)         3. Mass Wasting         Banks undercu/overhanging to the extent that mass wasting is expected         3. Mass Wasting         Bank submping, caving or collapse         1. Overall Integrity         Structures physically intact with no dislodged boulders or logs         2. Grade Control         Grade control structures exhibiting maintenance of grade across the still         2a. Piping         Structures lacking any substantial flow underneath or around stills or arms         3. Bank Position         Bank crosion within the structures extent of influence does not exceed 15%         4. Habitat         Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow         453         Channel	Channel Sub-Category         Metric         Performing as Intended           1. Vertical Stability         1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)         9           2. Riffle Condition         1. Feature Substrate - Riffle maintains courser substrate         9           3. Meander Pool Condition         1. Feature Subfrate - Riffle maintains courser substrate         9           3. Meander Pool Condition         1. Feature Sufficient (Max Pool Depth/Mean Bkt Depth 2 1.5)         7           4. Thalweg Position         2. Thalweg centering at upstream of meander bend (Run)         9           2. Indirect Max Books undercut/overfhanging to the extent that mass wasting is expected         7           3. Mass Wasting         Banks submping, caving or collapse         9           1. Overall Integrity         Structures physically intact with no disiodged boulders or logs         9           2. Grade Control         Grade control structures exthrifting maintenance of grade acros the sill         9           2. Grade Control         Grade control structures charaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow         9           4. Habitat         Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow         9           4.         1. Aggradation - Bar formation/growth	Channel Sub-Category         Metric         Performing an Interded         Total Number per As-built           1. Vertical Stability         1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point lass)         9         9           2. Riffe Condition         1. Texture Subarda - Riffe maintain coarser substrate         9         9           3. Meander Pool Condition         1. Depth - Sufficient (Max Pool DepthMean BK Depth ≥ 1.5)         7         7           4. Thalveg Position         1. Dapth - Sufficient (Max Pool DepthMean BK Depth ≥ 1.5)         7         7           4. Thalveg Position         1. Dapth - Sufficient (Max Pool DepthMean BK Depth ≥ 1.5)         7         7           5. Undercet Max         1. Dapth - Sufficient (Max Pool DepthMean BK Depth ≥ 1.5)         7         7           4. Thalveg Position         1. Tablevg centering at upstream of meander bend (Run)         9         9           2. Undercet         Banks uncerture-strained bend (Glide)         7         7           3. Max Wasting         Banks uncerture-strained bend (Glide)         7         7           4. Thalveg Position         1. SourcedE-control         7         7           3. Max Max Ting         Banks Unexture-strained bend (Glide)         7         7           4. Thalveg Position         Bank Unexture-strained	Channel Sub-Category         Metric         Performing as Assumption         Total Number per Assumption         Total Number per Assumption         Total Number per Assumption         Unstable Sements           1. Vertical Stability         1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include pionit bars)         0         0           2. Riffic Condition         1. Texture Substates - Riffe maintines coarser substate         9         9         0           3. Meander Pool Condition         1. Depth-Sufficient (Ass: Apoil Depth Nean BKI Depth 21.5)         7         7         7           4. Thalveg Position         1. Thalveg contering at upstream of meander bend (Rum)         9         9         0           1. Sourced/Eroding         Banks undercut/overhauging to the extent that mass vasting is expected         0         0         0           3. Meander Pool Condition         1. Depth-Sufficient exclusibility maintename of grade across the still         0         0         0           3. Monder User Sub-Sub-Sufficient Sub-Sub-Sub-Sub-Sub-Sub-Sub-Sub-Sub-Sub-	Channel Sub-Category         Metric         Performing al Intended         Total Mumber per Machine Supervised         Catable Point Supervised           1. Vertical Stability         1. Aggradation - Bar formation growth sufficient to significantly defice flow laterally (not to include point bar).         0         0         0           2. Briffie Condition         1. Aggradation - Bar formation growth sufficient to significantly defice flow laterally (not to include point bar).         0         0         0           3. Runder Pool Condition         1. Caterar SubArtare Alfor muntation conter substrate         9         0         0         0           4. Traduer Sub-Category         1. Caterar SubArtare Alfor multation conter substrate         9         0         0         0           4. Traduer Sub-Category         1. Traduer Sub-Category         7 <t< td=""></t<>

Reach ID: Reach R9							
Assessed Length (LF):	446						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	7	7			100%
1. Bed		<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	6	6			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	6	6			100%
		1. Thalweg centering at upstream of meander bend (Run)	7	7			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	6	6			100%
		2. That we get entering at downsteam of meander bond (onde)					
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion		1	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
	or mass masting	Dame stamping, curing of contepse		Totals	0	0	100%
				1 Otais	v		10070
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	6	6		1	100%
or Engineering of detaites	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	6	6			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	6	6		-	100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	6	6			100%
	5. Bank Fosition		0	0			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs providing some cover at low flow	6	6			100%
Reach ID: Reach R10a		providing some cover at low now					
Assessed Length (LF):	367						
Assessed Length (LF):	367		Number Stable,	1	Number of	1	% Stable.
Major Channel Category	Channel Sub-Category	Metric	Performing as Intended	Total Number per As-built	Unstable Segments	Amount of Unstable Footage	Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	0	0			100%
1. Bed		1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth $\geq 1.5$ )	0	0			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	0	0			100%
		1. Thalweg centering at upstream of meander bend (Run)	0	0			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
	-						
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
a. n	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
							_
		Structures physically intact with no dislodged boulders or logs	7	7			100%
3. Engineering Structures	1. Overall Integrity						100%
3. Engineering Structures	1. Overall Integrity 2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%
3. Engineering Structures	2. Grade Control		1	1			100%
3. Engineering Structures	2. Grade Control 2a. Piping	Grade control structures exhibiting maintenance of grade across the sill Structures lacking any substantial flow underneath or around sills or arms	1	1 1 1			100%
3. Engineering Structures	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1 1 1 0	1 1 1 0			

Table 5. Visual Steam Morphology Stability Assessment Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Reach ID: Reach R10b							
Assessed Length (LF):							
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing a Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	1	1			100%
. Bed		<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	0	0			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	0	0			100%
		1. Thalweg centering at upstream of meander bend (Run)	1	1			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
		2. That we centering at downsteam of incander bend (Onde)		0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
. Bank	3. Mass Wasting	Banks undercu/overhanging to the extent that mass washing is expected Banks slumping, caving or collapse			0	0	100%
	5. Mass Masully	banks sumpling, caving of conlapse		Totals	0	0	100%
				Totais	0	0	100%
. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	2	2		1	100%
. Engineering Structures	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%
		Structures lacking any substantial flow underneath or around sills or arms	2	2			100%
	2a. Piping						20070
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	2	2			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs	0	0			100%
Reach ID: Reach R11		providing some cover at low flow					
Assessed Length (LF):	712		Number Stable.	1	Number of	-	% Stable.
Major Channel Category	Channel Sub-Category	Metric	Performing as Intended	Total Number per As-built	Unstable	Amount of Unstable Footage	% Stable, Performing a Intended
					Segments		
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			Segments 0	0	100%
	1.Vertical Stability					0	100%
	1.Vertical Stability 2. Riffle Condition	point bars)	2	2	0		
. Bed		point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate	2 0	2 0	0		100%
. Bed		point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficent (30% of centerline distance between tail of upstream riffle and head of downstream	0	0	0		100% 100%
. Bed	2. Riffle Condition 3. Meander Pool Condition	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	0	0	0		100% 100% 100% 100%
. Bed	2. Riffle Condition	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) 1. Thalweg centering at upstream of meander bend (Run)	0	0	0		100% 100% 100% 100%
. Bed	2. Riffle Condition 3. Meander Pool Condition	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	0 0 2	0 0 2	0		100% 100% 100%
. Bed	2. Riffle Condition 3. Meander Pool Condition 4. Thalweg Position	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficient (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide)	0 0 2	0 0 2	0		100% 100% 100% 100%
	2. Riffle Condition 3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (-Nac Pool Depth/Mean Bkt Depth ≥ 1.5) 2. Length - Sufficent (-Na0% of centerline distance between tail of upstream riffle and head of downstream fiffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion	0 0 2	0 0 2	0	0	100% 100% 100% 100% 100% 100%
	2. Riffle Condition 3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding 2. Undercut	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficient (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion Banks undercut/overhanging to the extent that mass wasting is expected	0 0 2	0 0 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		100% 100% 100% 100% 100% 100% 100%
	2. Riffle Condition 3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (-Nac Pool Depth/Mean Bkt Depth ≥ 1.5) 2. Length - Sufficent (-Na0% of centerline distance between tail of upstream riffle and head of downstream fiffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion	0 0 2		0	0	100% 100% 100% 100% 100% 100% 100%
	2. Riffle Condition 3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding 2. Undercut	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficient (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion Banks undercut/overhanging to the extent that mass wasting is expected	0 0 2	0 0 2	0 0 0 0 0 0		100% 100% 100% 100% 100% 100% 100%
. Bank	2. Riffle Condition 3. Meander Pool Condition 4. Thalweg Position 1. Scoured/Eroding 2. Undercut 3. Mass Wasting	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkt Depth ≥ 1.5) 2. Length - Sufficient (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion Banks underculvorehnaging to the extent that mass wasting is expected Banks slumping, caving or collapse	0 0 2 0	0 0 2 0 Totas	0 0 0 0 0 0		100% 100% 100% 100% 100% 100% 100% 100%
. Bank	2. Riffle Condition     3. Meander Pool Condition     4. Thalweg Position     1. Scoured/Eroding     2. Undercut     3. Mass Wasting     1. Overall Integrity	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkt Depth ≥ 1.5) 2. Length - Sufficent (-30% of centerline distance between tail of upstream riffle and head of downstream riffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion Banks undercut/overhanging to the extent that mass wasting is expected Banks slumping, caving or collapse Structures physically intact with no dislodged boulders or logs	0 0 2 0 38	0 0 2 0 Totals	0 0 0 0 0 0		100% 100% 100% 100% 100% 100% 100% 100%
. Bank	2. Riffle Condition     3. Meander Pool Condition     4. Thalweg Position     1. Scoured/Eroding     2. Undercut     3. Mass Wasting     1. Overall Integrity     2. Grade Control	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion Banks undercut/overhanging to the extent that mass wasting is expected Banks slumping, caving or collapse Structures physically intact with no dislodged boulders or logs Grade control structures exhibiting maintenance of grade across the sill	0 0 2 0	0 0 2 0 Totals	0 0 0 0 0 0		100% 100% 100% 100% 100% 100% 100% 100%
1. Bed 2. Bank 3. Engineering Structures	2. Riffle Condition 3. Meander Pool Condition 4. Thalweg Position  1. Scoured/Eroding 2. Undercut 3. Mass Wasting  1. Overall Integrity 2. Grade Control 2a. Piping	point bars)         2. Degradation - Evidence of downcutting         1. Texture Substrate - Riffle maintains coarser substrate         1. Depth - Sufficent (Max Pool Depth/Mean Bkt Depth ≥ 1.5)         2. Length - Sufficent (33% of centerline distance between tail of upstream riffle and head of downstream riffle)         1. Thalweg centering at upstream of meander bend (Run)         2. Thalweg centering at downstream of meander bend (Glide)         Bank lacking vegetative cover due to active scour and erosion         Banks undercut/overhanging to the extent that mass wasting is expected         Banks slumping, caving or collapse         Structures physically intact with no dislodged boulders or logs         Structures keing any substratial flow underneath or arrows	0 0 2 0	0 0 2 0 <b>Totals</b> 38 38 38	0 0 0 0 0 0		100% 100% 100% 100% 100% 100% 100% 100%
2. Bank	2. Riffle Condition     3. Meander Pool Condition     4. Thalweg Position     1. Scoured/Eroding     2. Undercut     3. Mass Wasting     1. Overall Integrity     2. Grade Control	point bars) 2. Degradation - Evidence of downcutting 1. Texture Substrate - Riffle maintains coarser substrate 1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) 2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) 1. Thalweg centering at upstream of meander bend (Run) 2. Thalweg centering at downstream of meander bend (Glide) Bank lacking vegetative cover due to active scour and erosion Banks undercut/overhanging to the extent that mass wasting is expected Banks slumping, caving or collapse Structures physically intact with no dislodged boulders or logs Grade control structures exhibiting maintenance of grade across the sill	0 0 2 0	0 0 2 0 Totals	0 0 0 0 0 0		100% 100% 100% 100% 100% 100% 100% 100%

120						
Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1.Vertical Stability	point bars)			0	0	100%
				0	0	100%
2. Riffle Condition		2	2			100%
	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	1	1			100%
3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	1	1			100%
4 771 1 1 1 14	1. Thalweg centering at upstream of meander bend (Run)	2	2			100%
4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	1	1			100%
1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
2			Totals	0	0	100%
1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	3	3			100%
2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	3	3			100%
2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	3	3			100%
3. Bank Position	Bank erosion within the structures extent of influence <b>does not</b> exceed 15%	3	3			100%
4. Habitat		1	1			100%
145						
Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
				0	0	100%
2. Riffle Condition		0	0			100%
3. Meander Pool Condition	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream</li> </ol>	0	0			100%
	riffle)	0	0			
4 Thelmes Besition	1. Thalweg centering at upstream of meander bend (Run)	1	1			100%
4. Thatweg I osition	2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
			Totals	0	0	100%
	Structures physically intact with no dislodged boulders or logs	9	9			100%
2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	9	9			100%
A 101 1	Structures lacking any substantial flow underneath or around sills or arms	9	9			100%
2a. Piping						
3. Bank Position	Bank erosion within the structures extent of influence <b>does not</b> exceed 15% Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs	9	9			100%
	I.Vertical Stability         2. Riffle Condition         3. Meander Pool Condition         4. Thalweg Position         1. Scoured/Eroding         2. Undercut         3. Mass Wasting         1. Overall Integrity         2. Grade Control         2a. Piping         3. Bank Position         4. Habitat         145         Channel Sub-Category         1. Vertical Stability         2. Riffle Condition         3. Meander Pool Condition         4. Thalweg Position         1. Scoured/Eroding         2. Undercut         3. Mass Wasting	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)         2. Degradation - Evidence of downcutting         2. Riffle Condition         1. Texture Substrate - Riffle maintains coarser substrate         1. Depth - Sufficent (Max Pool Depth/Mean BK/ Depth ≥ 1.5)         3. Meander Pool Condition         2. Integral - Sufficent (JAx Pool Depth/Mean BK/ Depth ≥ 1.5)         4. Thalweg Position         2. Integral - Sufficent (JAx Pool Depth/Mean BK/ Depth ≥ 1.5)         2. Undercut         Banks undercut/overhanging to the extent that mass wasting is expected         3. Mass Wasting         Banks submping, caving or collapse         1. Overall Integrity         Structures a kking any substantial flow underneath or around sills or arms         3. Bank Position         Bank cosino within the structures extent of influence does not exceed 15%         Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow         145         Channel Sub-Category       Netric         1. Depth - Sufficent (Max Pool Depth/Mean BK/ Depth ≥ 1.5)         3. Meander Pool Condition       1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)         2. Degradation - Bar formation/growth sufficient to substrate       1.5. R	Intended         Intended           I.Vertical Stability         1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)         2. Dggradation - Evidence of downcutting           2. Riffle Condition         1. Texture Substrate - Riffle maintains coarser substrate         2           3. Meander Pool Condition         1. Depth - Sufficient (Abo to Dephh Mean Bkit Dephh ≥ 1.5)         1           4. Thalweg Position         1. Talakeg centering at upstream of meander bend (Run)         2           1. Thalweg Costifient         2         1. Thalweg centering at downstream of meander bend (Citide)         1           1. Scoured/Eroding         Bank lacking vegetative cover due to active scour and eroston         2         2           2. Undercent         Banks submping, caving or collapse         3         3           1. Overrall Integrity         Structures physically intact with no dislodged boulders or logs         3         3           2. Briffied Control         Grade control structures exhibiting maintenance of grade across the sill         3         3           3. Bank Position         Bank acking any substrational flow underneeth or around sills or arms         3         3           3. Grade Control         Grade control structures extent of influence does not exceed 15%         3         3           4. Habitat         Pool forming structures n	Channel Sub-Category         Metric         Performing as latended         As-built           1. Vertical Stability         1. Aggradation - Bar formation/growth sufficient to significantly deflect flow latenally (not to include point bars)         2. Degradation - Evidence of downcutting         2.         2.           2. Rifle Condition         1. Texture Subtrate - Kiffe maintains coarer subtrate         2.         2.         2.           3. Meander Pool Condition         1. Depth - Sufficent (3.% of centerine distance between tail of upstream riffle and head of downstream iffle         1         1         1           4. Thalwag Position         1. Thalwag centering at upstream of meander bend (Rim)         2         2         2           1. Scoured/Eroding         Bank lacking vegetative cover due to active scour and erosion         2         2         2           2. Undercut         Banks unsping, caving or collapse         3         3         3           2. Ordercut         Banks undercuverhanging to be extent that maxs wasting is expected         3         3         3           3. Oracle Control         Grade control structures exhibiting maintenance of grade across the sill         3         3         3           4. Habitat         Pool forming maxtures maintaining - Max Pool Depth/Mean Barkfull Depth ratio ≥ 1.5. Rootwast/logs 1         1         1           1. Overall Integrity	Channel Sub-Category         Metric         Performing as Intended         As-built         Unstable Unstable           I.Vertical Stability         1. Aggnatation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).         0         0           2. Riffe Condition         1. Texture Stability         2         2         0           3. Meander Pool Condition         1. Texture Stability (not box include point bars).         2         2         2           4. Thalveg Position         1. Texture Stability (not box include point bars).         1         1         1           4. Thalveg Position         1. Trabukeg contering at sparsam of meander bend (film).         2         2         2           1. Sourced/E-rooling         Bank kicking vegetative cover due to active scour and crossin.         0         0           2. Undercett         Banks undercutoverhanging to the extent that mass vasting is expected         3         3         3           3. Mean Position         Structures physically intext with no dislodged boulders or logs         3         3         3           2. Grade Control         Grade control structures whithing maintenance of grade across the sall         3         3         3           3. Bank Position         Bank slampting. Caving or collapse         1         1         1	Channel Sub Category         Metric         Performing as Intended         As-built         Unstable Segments         Unstable Segments         Unstable Segments           1. Vertical Stability         1. Aggradation - Bar formating growth sufficient to significantly deflect flow laterally (not to include engine)         0         0         0           2. Rift Condition         1. Texture Substrate - Rift maintain scarser substrate 1. Depth - Sufficient (Mas PD Depth Mean BH Depth - 15)         1         1         0         0           3. Maader Pool Condition         1. Texture Substrate - Rift maintain scarser substrate (Mas PD Depth Mean BH Depth - Sufficient (Mas PD Depth Mean BH Depth - 15)         1         1         1         0         0           4. Tablyeg Position         1. Tablyeg centring at upstream of meander beed (Glob)         1         1         1         0         0         0           1. Sourced/Eroding         Bask lacking vegetative cover due to active scour and ension         1         1         1         0         0         0           2. Order Control         Bask submetractive results in maintenance of grade across the sill         3         3         3         0         0         0           3. Stass Vesting         Bask submetractive results in maintenance of grade across the sill         3         3         3         3         3         3

Reach ID: Reach R14							
Assessed Length (LF):	570						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	2	2			100%
1. Bed		<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	0	0			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	0	0			100%
		1. Thalweg centering at upstream of meander bend (Run)	1	1			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
				Totals	0	0	10070
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	26	26			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	26	26			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	26	26			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	26	26			100%
		Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq 1.5$ . Rootwads/logs					
	4. Habitat	providing some cover at low flow	0	0			100%
Reach ID: Reach R15		The country country of the country o					
Assessed Length (LF):	284						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	0	0			100%
1. Bed		<ol> <li>Depth - Sufficient (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	0	0			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	0	0			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	0	0			100%
	4. Thatweg Fosition	2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Bank	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Dalik	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	8	8			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	8	8			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	8	8			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	0	0			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs providing some cover at low flow	0	0			100%
		providing some cover at low now					

Reach ID: Reach R17							
Assessed Length (LF):	107						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate		0			100%
1. Bed		<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>		0			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>		0			100%
		1. Thalweg centering at upstream of meander bend (Run)		0			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)		0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
	uso musung	and an and a composition of the second		Totals	0	0	100%
				1 Otais	v		10070
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs		0			100%
or Engineering ou detailes	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill		0			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms		0			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%		0		-	100%
	5. Dank I osidon	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs		0		-	100%
	4. Habitat	Pool forming structures maintaining - Max Pool Deptn/Mean Bankruli Deptn ratio ≥ 1.5. Rootwads/logs providing some cover at low flow		0			100%
Reach ID: Reach R18		providing some cover at low now					
Assessed Length (LF):	176						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>	menaea		0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	0	0			100%
1. Bed	3. Meander Pool Condition	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream</li> </ol>	0	0			100%
		riffle)	0	0			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	0	0			100%
	4. Thatweg I ostitoli	2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Bank	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Dalik	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
		Structures physically intact with no dislodged boulders or logs	2	2			100%
3. Engineering Structures	1. Overall Integrity						
3. Engineering Structures	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%
3. Engineering Structures			2 2	2 2			100%
3. Engineering Structures	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill					

Reach ID: Reach R19							
Assessed Length (LF):	353						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	1	1			100%
	3. Meander Pool Condition	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	0	0			100%
		<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	0	0			100%
		1. Thalweg centering at upstream of meander bend (Run)	1	1			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Bank	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
	•			- 0000			
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	26	26			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	26	26			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	26	26			100%
	3. Bank Position	Bank erosion within the structures extent of influence <b>does not</b> exceed 15%	26	26			100%
	5. Dank I Oshion	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs					
	4. Habitat	providing some cover at low flow	0	0			100%
Reach ID: Reach R20		providing some cover at low now					
Assessed Length (LF):	253						
Assessed Length (LF).	233		Number Stable,	1	Number of	1	% Stable,
Major Channel Category	Channel Sub-Category	Metric	Performing as Intended	Total Number per As-built	Unstable Segments	Amount of Unstable Footage	Performing as Intended
1. Bed	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	0	0			100%
	3. Meander Pool Condition	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	0	0			100%
		<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	0	0			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	0	0			100%
		2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Bank	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	36	36			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	36	36			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	36	36			100%
		Bank erosion within the structures extent of influence <b>does not</b> exceed 15%	36	36			100%
	3. Bank Position						
	3. Bank Position 4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq 1.5$ . Rootwads/logs providing some cover at low flow	0	0			100%

Reach ID: Reach R21							
Assessed Length (LF):	92						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate		0			100%
	3. Meander Pool Condition	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>		0			100%
		<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>		0			100%
		1. Thalweg centering at upstream of meander bend (Run)		0			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)		0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Bank	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
		·					
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs		0			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill		0			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms		0			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%		0			100%
		Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs					
1	4. Habitat	providing some cover at low flow		0			100%
Reach ID: Reach R22, R22a		In the second seco					
Assessed Length (LF):	187						
Major Channel Category		Metric	Number Stable,	Total Number per	Number of	Amount of	% Stable,
	Channel Sub-Category	Metric	Performing as Intended	As-built	Unstable Segments	Unstable Footage	
	Channel Sub-Category 1.Vertical Stability	Netric 1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)	Intended	As-built	Unstable Segments 0		Performing as Intended 100%
		1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include		As-built	Segments	Unstable Footage	Intended
		<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>		As-built 0	Segments 0	Unstable Footage	Intended 100%
1. Bed	1.Vertical Stability	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     2. Degradation - Evidence of downcutting     1. Texture Substrate - Riffle maintains coarser substrate     1. Depth - Sufficient (Max Pool Depth/Mean Bkf Depth ≥ 1.5)			Segments 0	Unstable Footage	Intended 100% 100%
1. Bed	1.Vertical Stability	Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Z. Degradation - Evidence of downcutting     I. Texture Substrate - Riffle maintains coarser substrate		0	Segments 0	Unstable Footage	Intended 100% 100% 100%
1. Bed	1. Vertical Stability 2. Riffle Condition 3. Meander Pool Condition	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     2. Degradation - Evidence of downcutting     1. Texture Substrate - Rifle maintains coarser substrate     1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)		0 0	Segments 0	Unstable Footage	Intended 100% 100% 100% 100%
1. Bed	1.Vertical Stability 2. Riffle Condition	Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Texture Substrate - Riffle maintains coarser substrate     Depth - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (530% of centerline distance between tail of upstream riffle and head of downstream		0 0 0	Segments 0	Unstable Footage	Intended 100% 100% 100% 100%
1. Bed		Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (C30% of centerline distance between tail of upstream riffle and head of downstream riffle)     I. Thalweg centering at upstream of meander bend (Run)     Z. Thalweg centering at downstream of meander bend (Glide)		0 0 0 0	Segments 0 0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100%
1. Bed		Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Texture Substrate - Riffle maintains coarser substrate     Depth > Lofficient (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Length - Sufficent (As Pool Depth/Mean Bkf Depth ≥ 1.5)     Length - Sufficent (as poslement of meander between tail of upstream riffle and head of downstream riffle)     Thalweg centering at upstream of meander bend (Run)     Thalweg centering at downstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion		0 0 0 0	Segments 0 0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100% 100% 100% 100%
1. Bed 2. Bank		Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Degradation - Evidence of downcutting     Depth - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (or 30% of centerline distance between tail of upstream riffle and head of downstream riffle)     Depth - Sufficent (at the stream of meander bend (Run)     Depth - Sufficent (at the stream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks underud/overhanging to the extent that mass wasting is expected		0 0 0 0	Segments 0 0 0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100% 100% 100%
		Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Texture Substrate - Riffle maintains coarser substrate     Depth > Lofficient (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Length - Sufficent (As Pool Depth/Mean Bkf Depth ≥ 1.5)     Length - Sufficent (as poslement of meander between tail of upstream riffle and head of downstream riffle)     Thalweg centering at upstream of meander bend (Run)     Thalweg centering at downstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion			Segments           0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100% 100% 100% 100%
		Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Degradation - Evidence of downcutting     Depth - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (or 30% of centerline distance between tail of upstream riffle and head of downstream riffle)     Depth - Sufficent (at the stream of meander bend (Run)     Depth - Sufficent (at the stream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks underud/overhanging to the extent that mass wasting is expected		0 0 0 0	Segments 0 0 0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100% 100% 100%
2. Bank		Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcuting     Degradation - Evidence of downcuting     Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Length - Sufficent (G30% of centerline distance between tail of upstream riffle and head of downstream riffle)     Depth - gate centering at upstream of meander bend (Run)     Depth - Sufficent (at workstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks undercut/overhanging to the extent that mass wasting is expected     Bank slumping, caving or collapse		0 0 0 0 0 0 Totals	Segments           0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100% 100% 100% 100% 100% 100%
	I.Vertical Stability  I.Vertical Stability  I.Riffle Condition  A. Thalweg Position  I. Scoured/Eroding  L.Undercut  Mass Wasting  I. Overall Integrity	Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)     Length - Sufficent (Saw Pool Depth/Mean Bkf Depth ≥ 1.5)     Sufficent (Saw Pool Depth ≥ 1.5)     Sufficent (Saw Pool Depth/Mean Bkf Depth ≥ 1.5)     Structures physically intact with no dislodged boulders or logs		0 0 0 0 0 0 0 Totals	Segments           0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100% 100% 100% 100
2. Bank		Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Degradation - Evidence of downcutting     Depth - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (330% of centerline distance between tail of upstream riffle and head of downstream riffle)     Depth - Sufficent (Jaby 6 of centerline distance between tail of upstream riffle and head of downstream riffle)     Thalweg centering at upstream of meander bend (Run)     Thalweg centering at downstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks undercu/overhanging to the extent that mass wasting is expected     Banks slumping, caving or collapse     Structures physically intact with no dislodged boulders or logs     Grade control structures exhibiting maintenance of grade across the sill		0 0 0 0 0 0 0 0 Totals	Segments           0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100%
2. Bank	I.Vertical Stability  I.Vertical Stability  C.Riffle Condition  Meander Pool Condition  I.Scoured/Eroding  I.Scoured/Eroding  I.Overall Integrity  C.Grade Control  Za.Piping	Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Texture Substrate - Riffle maintains coarser substrate     I. Depth - Sufficent (Max Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth/Waan Bkf Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth ≥ 1.5)     Length - Sufficent (GaNs Pool Depth ≥ 1.5)     Structures (Gans Pool Depth ≥ 1.5)     Structures (Length = Sufficent (Gans Pool Depth ≥ 1.5)     Structures (Length = Sufficent = Gans Sufficent (Gans Pool Depth ≥ 1.5)     Structures (Length = Sufficent = Gans Pool Depth ≥ 1.5)     Structures (Length = Sufficent = Gans = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent = Gans = Sufficent		0 0 0 0 0 0 Totals	Segments           0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100% 100% 100% 100
2. Bank		Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)     Degradation - Evidence of downcutting     Degradation - Evidence of downcutting     Depth - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (Max Pool Depth/Mean Bkf Depth≥ 1.5)     Length - Sufficent (330% of centerline distance between tail of upstream riffle and head of downstream riffle)     Depth - Sufficent (Jaby 6 of centerline distance between tail of upstream riffle and head of downstream riffle)     Thalweg centering at upstream of meander bend (Run)     Thalweg centering at downstream of meander bend (Glide)     Bank lacking vegetative cover due to active scour and erosion     Banks undercu/overhanging to the extent that mass wasting is expected     Banks slumping, caving or collapse     Structures physically intact with no dislodged boulders or logs     Grade control structures exhibiting maintenance of grade across the sill		0 0 0 0 0 0 0 0 Totals	Segments           0	Unstable Footage 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Intended 100% 100% 100% 100% 100% 100% 100% 100% 100% 100%

Reach ID: Reach R25							
Assessed Length (LF):	402						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	6	6			100%
	3. Meander Pool Condition	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	0	0			100%
		<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	0	0			100%
	4 <b>T</b> 1 <b>D</b> 14	1. Thalweg centering at upstream of meander bend (Run)	6	6			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
		2. That we contering at downsteam of meanaer bend (ondo)		÷			
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Bank	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks undereub verhanging to the extent that mass washing is expected Banks slumping, caving or collapse			0	0	100%
	or mass musting	sums sumping, suring of compac		Totals	0	0	100%
				Totais	v		10070
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	13	13		1	100%
or Engineering bulletures	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	13	13			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	13	13			100%
	3. Bank Position	Bank erosion within the structures extent of influence <b>does not</b> exceed 15%	13	13			100%
	5. Balik Fostuoli		15	15			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs providing some cover at low flow	0	0			100%
Reach ID: Reach R26		providing some cover at low now					
Assessed Length (LF):	473						
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	0	0			100%
	3. Meander Pool Condition	<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	0	0			100%
		<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	0	0			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	0	0			100%
		2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Bank	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	4	4			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	4	4			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	4	4			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs providing some cover at low flow	0	0			100%
## Table 5. Visual Steam Morphology Stability Assessment Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Reach ID: Reach R27							
Assessed Length (LF):							
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
	1.Vertical Stability	<ol> <li>Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	0	0			100%
1. Bed		<ol> <li>Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5)</li> </ol>	0	0			100%
	3. Meander Pool Condition	<ol> <li>Length - Sufficent (&gt;30% of centerline distance between tail of upstream riffle and head of downstream riffle)</li> </ol>	0	0			100%
	4 The laws Desident	1. Thalweg centering at upstream of meander bend (Run)	0	0			100%
	4. Thalweg Position	2. Thalweg centering at downstream of meander bend (Glide)	0	0			100%
	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
2. Bank	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
2. Dalik	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	7	7			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	7	7			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	7	7			100%
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	7	7			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio $\geq$ 1.5. Rootwads/logs providing some cover at low flow	0	0			100%

#### Table 6. Vegetation Conditions Assessment

#### Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Planted Acreage: 9.8						
Vegetation Category	Defintions	Mapping Threshold (acres)	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas *	Very limited cover both woody and herbaceous material.	0.1 acres	N/A	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	N/A	0	0.00	0.0%
			Total			
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems or a size class that are obviously small given the monitoring year.	0.25 acres	N/A	0	0.00	0.0%
	·	•	Cumulative Total			
Easement Acreage: 15.8						
Vegetation Category	Defintions	Mapping Threshold	CCPV Depiction	Number of Points	Combined Acreage	% of Planted Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale)	1000 ft <sup>2</sup>	N/A	0	0.00	0.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	none	N/A	0	0.00	0.0%

\* The bare areas reported here for MY1 do have woody stems growing in them but have sparse/scattered herbaceous cover only.



PP-1: Reach 13, view upstream Station 10+20. (November 5, 2020)



PP-3: Reach 14, view upstream Station 13+00. (November 5, 2020)



PP-2: Reach 14, view upstream toward Reach 13 at Station 11+45. (November 5, 2020)



PP-4: Reach 14, view upstream Station 13+75. (November 5, 2020)



PP-5: Reach 14, view upstream Station 15+00. (November 5, 2020)



PP-6: Reach 14, end of reach Station 16+00. (November 5, 2020)



PP-7: Reach 1, view upstream, at Station 10+20. (November 5, 2020)



PP-9: Reach 1, view upstream at Station 15+00. (November 5, 2020)



PP-11: Reach 1, view upstream at Station 20+00. (November 5, 2020)



PP-8: Reach 1, view upstream Reach 1 at Station 13+00. (November 5, 2020)



PP-10: Reach 1, view upstream at Station 17+25. (November 5, 2020)



PP-12: Reach 1, view downstream at Station 20+00. (November 5, 2020)



PP-13: Reach 1, view upstream at Station 20+75. (November 5, 2020)



PP-14: Reach 1, view downstream at Station 20+75. (November 5, 2020)



PP-15: Reach 1, view upstream at Station 21+50. (November 5, 2020)



PP-17: Reach 1, view upstream at Station 24+20. (November 5, 2020)



PP-16: Reach 1, confluence of Reach 1 and Reach 11 at Station 22+75. (November 5, 2020)



PP-18: Reach 1, view of upstream at Station 27+00. (November 5, 2020)



PP-19: Reach 1, view upstream Reach 12 at Station 29+10. (November 5, 2020)



PP-20: Reach 1, view upstream at Station 29+20. (November 5, 2020)



PP-21: Reach 11, view upstream at Station 10+20. (November 5, 2020)



PP-23: Reach 11, view upstream at Station 12+75. (November 5, 2020)



PP-22: Reach 11, view upstream at Station 11+50. (November 5, 2020)



PP-24: Reach 11, view upstream at Station 14+50. (November 5, 2020)



PP-25: Reach 10A, view upstream at Station 10+50. (November 5, 2020)



PP-26: Reach 10A, view upstream at Station 12+50. (November 5, 2020)



PP-27: Reach 10A, view upstream at Station 13+75. (November 5, 2020)



PP-29: Reach 5, view upstream at Station 11+00. (October 21, 2020)



PP-28: Reach 10B, view upstream at Station 14+50. (November 5, 2020)



PP-30: Reach 6, view upstream at Station 14+50. (October 21, 2020)



PP-31: Reach 17, view upstream at Station 11+00. (October 21, 2020)



PP-32: Reach 6, view upstream at Station 17+50. (October 21, 2020)



PP-33: Reach 6, view upstream at Station 19+50. (November 10, 2020)



PP-35: Reach 18, view upstream at Station 10+60. (October 21, 2020)



PP-34: Reach 18, view upstream at Station 12+00. (November 10, 2020)



PP-36: Reach 7A, view upstream at Station 20+00. (November 10, 2020)



PP-37: Reach 7B, view upstream at Station 21+75. (November 10, 2020)



PP-39: Reach 7B, view upstream at Station 22+25. (October 21, 2020)



PP-41: Reach 20, view upstream at Station 10+80. (November 5, 2020)



PP-38: Reach7B, view downstream at Station 22+00. (October 21, 2020)



PP-40: Reach 7B, view upstream at Station 23+50. (October 21, 2020)



PP-42: Reach 20, view upstream at Station 11+50. (October 21, 2020)



PP-43: Reach 19, view upstream at Station 10+15. (November 5, 2020)



PP-44: Reach 19, view upstream at Station 11+85. (November 5, 2020)



PP-45: Reach 19, view upstream at Station 12+80. (October 21, 2020)



PP-47: Reach 19, view upstream at Station013+80. (November 10, 2020)



PP-46: Reach 19, view upstream at Station 13+20. (November 10, 2020)



PP-48: Reach 7B, view upstream at Station 24+10. (November 10, 2020)



PP-49: Reach 7B, view downstream at Station 24+60. (November 10, 2020)



PP-50: Reach 7B, view upstream at Station 25+25. (November 10, 2020)



PP-51: Reach 22A, view upstream at Station 10+00. (November 10, 2020)



PP-53: Reach 7B, view upstream at Station 32+00. (October 21, 2020)



PP-52: Reach 22A, view of upstream at Station 11+15. (October 21, 2020)



PP-54: Reach 25, view upstream at Station 10+10. (October 21, 2020)



PP-55: Reach 25, view upstream at Station 11+20. (October 21, 2020)





PP-57: Reach 7B, view downstream at Station 33+00. (October 21, 2020)

(October 21, 2020)



PP-58: Reach 7B, view upstream at Station 33+20. (October 21, 2020)



34+00. PP-60: Reach 8, view upstream at Station 37+00. (October 21, 2020)



PP-61: Reach 8, view upstream at Station 38+00. (October 21, 2020)



PP-63: Reach 9, view upstream at Station 41+00. (October 21, 2020)





PP-64: Reach 9, view upstream at Station 42+00. (October 21, 2020)



PP-65: Reach 4A, view upstream at Station 13+00. (November 10, 2020)

PP-66: Reach 26, view upstream at Station 11+00. (October 21, 2020)



PP-67: Reach 4, view upstream at Station 11+10. (November 10, 2020)



PP-69: Reach 27, view upstream at Station 11+60. (November 10, 2020)





PP-70: Reach 4, view upstream at Station 15+00. (November 10, 2020)



PP-71: Reach 4, view upstream at Station 16+10. (November 10, 2020)



PP-72: Reach 4, view upstream at Station 19+00. (November 10, 2020)







PP-75: Reach 4, view upstream at Station 23+20. (October 21, 2020)



PP-77: Reach 4, view upstream at Station 28+30. (October 21, 2020)



PP-74: Reach 15, view upstream at Station 13+00. (October 21, 2020)



PP-76: Reach 4, view upstream at Station 25+00. (October 21, 2020)



PP-78: Reach 4, view upstream at Station 28+00. (November 10, 2020)



PP-79: Reach 4, view upstream at Station 32+00. (October 21, 2020)



PP-81: Reach 3, view upstream at Station 36+40. (October 21, 2020)



PP-80: Reach 3, view upstream at Station 33+00. (October 21, 2020)

MY1 Vegetation Monitoring Plot Photos Russell Gap - DMS Project #100003



Photo 1. Vegetation Plot 1 – (October 7, 2020).



Photo 2. Vegetation Plot 2 – (October 7, 2020).



Photo 3. Vegetation Plot 3 – (October 7, 2020).



Photo 4. Vegetation Plot 4 – (October 8, 2020).



Photo 5. Vegetation Plot 5- (October 21, 2020).



Photo 6. Vegetation Plot 6- (October 8, 2020).



Photo 7. Vegetation Plot 7 – (October 8, 2020).



Photo 8. Vegetation Plot 8 – (October 8, 2020).



Photo 9. Vegetation Plot 9 – (September 2, 2020).



Photo 11. Vegetation Plot 11 – (October 8, 2020).



Photo 10. Vegetation Plot 10 – (October 8, 2020).



Photo 12. Vegetation Plot 12 – (October 21, 2020).



Photo 13. Vegetation Plot 13 – (October 21, 2020).



Photo 14. Vegetation Plot 14 – (October 21, 2020).



Photo 15. Vegetation Plot 15 – (October 21, 2020).



Photo 16. Vegetation Plot 16 – (October 7, 2020).



Photo 17. Vegetation Plot 17 – (October 7, 2020).



Photo 18. Vegetation Plot 18 – (October 8, 2020).



Photo 19. Vegetation Plot 19 – (October 21, 2020).



Photo 21. Random Vegetation Plot 1- (November 10, 2020). Photo 22. Random Vegetation Plot 2 – (November 10, 2020).





Photo 23. Random Vegetation Plot 3 – (November 10, 2020). Photo 24. Random Vegetation Plot 4 – (November 10, 2020).



Photo 20. Vegetation Plot 20 – (October 21, 2020).







Photo 25. Random Vegetation Plot 5 – (November 10, 2020). Photo 26. Random Vegetation Plot 6 – (November 10, 2020).





Photo 27. Random Vegetation Plot 7 – (November 10, 2020). Photo 28. Random Vegetation Plot 8 – (November 10, 2020).



Photo 29. Random Vegetation Plot 9 - (November 10, 2020).

## Russell Gap MY1 Monitoring Gauges and Overbank Photographs



Monitoring Well 1. (November 5, 2020)



Monitoring Well 2. (November 5, 2020)



Monitoring Well 3. (November 5, 2020)



Monitoring Well 4. (November 5, 2020)



Monitoring Well 5. (November 5, 2020)



Monitoring Well 6. (November 5, 2020)

## Russell Gap MY1 Monitoring Gauges and Overbank Photographs



Monitoring Well 7. (November 5, 2020)

Monitoring Well 8. (November 5, 2020)



Monitoring Well 9. (November 5, 2020)



Monitoring Well 10. (November 5, 2020)



Monitoring Well 5. (November 5, 2020)



Monitoring Well 12. (November 5, 2020)



Flow Gauge 1. Reach 11. (November 5, 2020)



Flow Gauge 2. Reach 14. (November 5, 2020)



Flow Gauge 3. Reach 13. (November 5, 2020)



Flow Gauge 4. Reach 19. (November 5, 2020)



Flow Gauge 5. Reach 20. (November 5, 2020)



Crest Gauge 1 Reach 1. Flood debris. (November 5, 2020)

## Russell Gap MY1 Monitoring Gauges and Overbank Photographs



Crest Gauge 1 R1. BKF reading 18". (November 5, 2020)



Crest Gauge 2 R9. (November 5, 2020)



Crest Gauge 3 R4. Wrack lines. (November 5, 2020)



Crest Gauge 3 R4. BKF reading at 26" and 30." (November 5, 2020)



Crest Gauge 4 R6. (November 5, 2020)

# **APPENDIX C**

Vegetation Plot Data

DMS Project Code 100003	8. Project Name: Russell Gap Mitigation	Project																										
																Plot Data (N												
				57329-01-00			7329-01-00			57329-01-00			57329-01-0004			57329-01-00			57329-01-00			57329-01-0			7329-01-00		157329-	
Scientific Name	Common Name	Species Type	Р	v	т	Р	v	т	Р	v	т	Р	v	Т	Р	v	т	Р	v	т	Р	v	т	Р	V 5	<b>T</b>	P \	/ Т
Acer negundo Acer rubrum	Box Elder Red Maple	Tree Tree																							5	5		
Alnus serrulata	Tag Alder	Shrub Tree										1		1										3		3		
Asimina triloba	Common Pawpaw	Shrub Tree										1		1										5		3		
Betula nigra	River Birch	Tree	6		6	3		3	12		12	2		2				4		4	1		1	1		1		
Carpinus caroliniana	American Hornbeam	Shrub Tree	Ŭ		Ū	5		5			12	-		-				-		-	-		-	-		-		
Cercis canadensis	Redbud	Shrub Tree				1		1							1		1				3		3	5		5		
Cornus amomum	Silky Dogwood	Shrub Tree				1		1					1 1		-		-							5		5	4	4
Cornus florida	Flowering Dogwood	Shrub Tree				_																						-
Corylus americana	American Hazelnut	Shrub																										
Crataegus	Hawthorn	Shrub Tree																										
Diospyros virginiana	American Persimmon	Tree													-						4		4				2	2
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree													-												3	3
Juglans nigra	Black Walnut	Tree	1		1	1		1	l			1			1		1				1						2	2
Liriodendron tulipifera	Tulip Popolar	Tree	1	1	1	4		4	4		4	7		7	4	1	4	1	1		3	1	3				1	1
Nyssa sylvatica	Black Gum	Tree	1	1	1	1			I			1				1	1	1	1			1	1					
Platanus occidentalis	Sycamore	Tree	3		3	3		3				3		3	1		1	6		6	3		3					
Quercus alba	White Oak	Tree		1															1									
Quercus falcata	Southern Red Oak	Tree		1															1								1	1
Quercus michauxii	Swamp Chestnut Oak	Tree											1														2	2
Quercus phellos	Willow Oak	Tree	4		4	5		5	4		4				5		5	1		1	2		2	4		4		
Unknown													1														í – – – – – – – – – – – – – – – – – – –	
		Stem count	13	0	13	18	0	18	20	0	20	14	0	14	12	0	12	11	0	11	16	0	16	13	5	18	15 0	) 15
		size (ares)		1			1			1			1			1			1			1			1		· · · ·	ŀ
		size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		0.0	)2
		Species count	3	0	3	7	0	7	3	0	3	5	0	5	5	0	5	3	0	3	6	0	6	4	1	5	7 0	) 7
		Stems per ACRE	526.0913	0	526.0913	728.4342	0	728.4342	809.3713	0	809.3713	566.5599	0 5	66.5599	485.6228	8 0	485.6228	445.1542	0	445.1542	647.497	0	647.497	526.0913	202.3428	728.4342	607.0285 0	607.028
															Current	Plot Data (N	AY1 2020)											
			1	57329-01-00	010	15	7329-01-00	11	15	57329-01-00	12	15	57329-01-0013	3	1	57329-01-00	)14	15	57329-01-00	15	15	57329-01-0	016	15	7329-01-00	17	157329-	01-0018
Scientific Name	Common Name	Species Type	Р	v	т	Р	v	т	Р	v	т	Р	V	т	Р	v	т	Р	v	т	Р	v	т	Р	v	т	P \	/ Т
Acer negundo	Box Elder	Tree				1		1																				
Acer rubrum	Red Maple	Tree							1		1																	
Alnus serrulata	Tag Alder	Shrub Tree											1						10	10								
Asimina triloba	Common Pawpaw	Shrub Tree											1															
Betula nigra	River Birch	Tree	3		3	4		4	1		1							1		1	4		4					
Carpinus caroliniana	American Hornbeam	Shrub Tree										6		6				4		4								
Cercis canadensis	Redbud	Shrub Tree				3		3	3		3																	
Cornus amomum	Silky Dogwood	Shrub Tree	1		1				1		1	1		1				1		1				5		5	8	8
Cornus florida	Flowering Dogwood	Shrub Tree																										
Corylus americana	American Hazelnut	Shrub																										
Crataegus	Hawthorn	Shrub Tree																										
Diospyros virginiana	American Persimmon	Tree				1		1							1		1											
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	2		2	1		1	5		5	1		1	6		6							7		7	5	5
Juglans nigra	Black Walnut	Tree										2		2	3		3				1		1				3	3
Liriodendron tulipifera	Tulip Popolar	Tree	2		2	1		1	2		2	2		2	2		2	5		5	2		2					
Nyssa sylvatica	Black Gum	Tree																										
Platanus occidentalis	Sycamore	Tree	3		3				3	10	13				1		1				3		3					
Quercus alba	White Oak	Tree	3		3							2		2										4		4		
Quercus falcata	Southern Red Oak	Tree				3		3	4		4	1		1	1		1							6		6		
Quercus michauxii	Swamp Chestnut Oak	Tree												]														
Quercus phellos	Willow Oak	Tree							1		1	2		2	2		2	2		2	3		3					
		-	14	0	14	14	0	14	21	10	31	17	0	17	16	0	16	13	10	23	13	0	13	22	0	22	16 0	) 16
		Stem count	. 14	0			0				-		-															
Unknown		Stem count size (ares)	14	1			1			1			1			1	•		1			1	-		1		1	L L
							• • • •				-					1 0.02			1 0.02			1 0.02	4		1 0.02		0.0	
		size (ares)	6	1	6	7	1	7	9	1	9	8	1	8	7		7	5		6	5		5	4		4		)2

Table 7: CVS Density Per Plot DMS Project Code 100003. Project Name: Russell Gap Mitigation Project

														Current Plo	ot Data (MY1	2020)														
			1	57329-01-00	019	157329-01-0020			157329-01-RV1_MY1			157329-01-RV2_MY1			157329-01-RV3_MY1			157329-01-RV4_MY1			157329-01-RV5_MY1			329-01-RV6	6_MY1	1573	157329-01-RV7_MY1			
Scientific Name	Common Name	Species Type	Р	v	т	Р	V T	Р	v	Т	Р	v	т	Р	v	Т	Р	v	Т	Р	v	т	Р	v	Т	Р	v	т		
Acer negundo	Box Elder	Tree												1 1			8		8	5		5	1		1					
Acer rubrum	Red Maple	Tree	2		2									1 1						2		2								
Alnus serrulata	Tag Alder	Shrub Tree																												
Asimina triloba	Common Pawpaw	Shrub Tree																												
Betula nigra	River Birch	Tree				2	2	1		1				3		3										2		2		
Carpinus caroliniana	American Hornbeam	Shrub Tree																								1		1		
Cercis canadensis	Redbud	Shrub Tree	5		5			1		1							1		1							2		2		
Cornus amomum	Silky Dogwood	Shrub Tree	1		1	2	2				4		4	1 1						3		3	4		4					
Cornus florida	Flowering Dogwood	Shrub Tree												1 1									1		1					
Corylus americana	American Hazelnut	Shrub				1	1																							
Crataegus	Hawthorn	Shrub Tree						1		1				1 1																
Diospyros virginiana	American Persimmon	Tree															2		2				2		2					
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	1		1	3	3	1		1	3		3	1 1						1		1	4		4					
Juglans nigra	Black Walnut	Tree	2		2	6	6																							
Liriodendron tulipifera	Tulip Popolar	Tree	5		5	1	1	6		6	1		1				1		1	5		5	2		2					
Nyssa sylvatica	Black Gum	Tree				1	1	2		2							2		2				1		1	1		1		
Platanus occidentalis	Sycamore	Tree									6		6	1		1	1		1							5		5		
Quercus alba	White Oak	Tree	1	1	1	1	1		1	1			-							1		1	1							
Quercus falcata	Southern Red Oak	Tree				1	1				2		2							1		1	3		3					
Quercus michauxii	Swamp Chestnut Oak	Tree				2	2				-		-				1		1	-		-								
Quercus phellos	Willow Oak	Tree				-		1		1				4		4	-		-							7		7		
Unknown								-		-																				
		Stem count	16	0	16	19	0 19	13	0	13	16	0	16	8	0	8	16	0	16	17	0	17	18	0	18	18	0	18		
		size (ares)	10	1	10	15	1 1	15	1	15	10	1	10		1	0	10	1	10	1/	1	1/	10	1	10	10	1	10		
		size (ACRES)	-	0.02			0.02		0.02			0.02			0.02			0.02		-	0.02			0.02			0.02			
			6	0.02	6	9	0.02	7	0.02	7	5	0.02	5	3		3	7	0.02	7	6	0.02	6	8	0.02	8	6	0.02	6		
		Species count Stems per ACRE	-	-	-	768.9027			-		647.497	0	5 647.497	-	-	3.7485	647.497	0	647.497	-	-	687.9656		-	8 728.4342	-	-	728.434		
		Stellis per ACKL	047.437			Data (MY1 2		27 320.031	<b>3</b> 0		Means	0	047.497	323.7485	0 32	5.7405	047.437	U	047.437	087.905	0	087.9030	720.4342	2 0	720.4342	720.4342	0	720.434		
			157	329-01-RV8			329-01-RV9_MY1		MY1 (2020			MY0 (2020	\	-																
Scientific Name	Common Name			323-01-RV0		1573	529-01-KV9_IVIT1		10111 (2020	"		10110 (2020	)																	
		Species Type	Р	v	т	Р	V Т	Р	v	т	Р	v	т																	
	Box Elder	Species Type Tree	Р	v	т	Р	V T	P 15	V 5	<b>T</b> 20	Р	v	т	_																
Acer negundo	Box Elder Bed Maple	Tree	Р	V	Т			15	<b>V</b> 5	20	Р	V	Т			or for D	onsity				7									
Acer rubrum	Red Maple	Tree Tree	P	V	Т	Р 1	V T	15 6	5	20 6	P	V	Т	-		or for D		by 10%			1									
Acer rubrum Alnus serrulata	Red Maple Tag Alder	Tree Tree Shrub Tree	P	V	т 			15 6 4		20 6 14	P	V	T	-	Exc	eeds red	quirements		s than 10%											
Acer rubrum Alnus serrulata Asimina triloba	Red Maple Tag Alder Common Pawpaw	Tree Tree Shrub Tree Shrub Tree		V				15 6 4 1	5	20 6 14 1	P	V	T		Exc Exc	eeds red eeds red	quirements quirements,	but by less												
Acer rubrum Alnus serrulata Asimina triloba Betula nigra	Red Maple Tag Alder Common Pawpaw River Birch	Tree Tree Shrub Tree Shrub Tree Tree	Р 		<b>T</b>			15 6 4 1 54	5	20 6 14 1 54	P		T		Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana	Red Maple Tag Alder Common Pawpaw River Birch American Hornbeam	Tree Tree Shrub Tree Shrub Tree Tree Shrub Tree	4		4			15 6 4 1 54 11	5	20 6 14 1 54 11	P		T		Exc Exc Fai	eeds red eeds red s to mee	quirements quirements,	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis	Red Maple Tag Alder Common Pawpaw River Birch American Hornbeam Redbud	Tree Tree Shrub Tree Shrub Tree Tree Shrub Tree Shrub Tree				1		15 6 4 1 54 11 26	5	20 6 14 1 54 11 26	P		T		Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood	Tree Tree Shrub Tree Shrub Tree Tree Shrub Tree Shrub Tree Shrub Tree	4		4	1 1 		15 6 4 1 54 11 26 38	5	20 6 14 1 54 11 26 38	P		T		Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood	Tree Tree Shrub Tree Shrub Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree	4		4	1		15 6 4 1 54 11 26 38 2	5	20 6 14 1 54 11 26 38 2	P		T		Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut	Tree Tree Shrub Tree Shrub Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree	4		4	1 1 		15 6 4 1 54 11 26 38 2 1	5	20 6 14 1 54 11 26 38 2 1	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn	Tree Tree Shrub Tree Shrub Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree	4		4	1 1 		15 6 4 1 54 11 26 38 2 1 1	5	20 6 14 1 54 11 26 38 2 1 1	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon	Tree Tree Shrub Tree Shrub Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree	4		4	1 		15 6 4 1 54 11 26 38 2 1 1 1 12	5	20 6 14 54 11 26 38 2 1 1 1 12	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree	4		4	1 1 		15 6 4 1 54 11 26 38 2 1 1 1 12 49	5	20 6 14 1 54 11 26 38 2 1 1 1 12 49	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree			4	1 		15 6 4 1 54 11 26 38 2 1 1 1 1 12 49 21	5	20 6 14 1 54 11 26 38 2 1 1 1 1 1 22 49 21	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree	4		4	1 		15 6 4 1 54 11 26 38 2 1 1 1 1 12 49 21 62	5	20 6 14 1 54 11 26 38 2 1 1 1 1 1 22 49 21 62	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4		4			15 6 4 1 54 11 26 38 2 1 1 1 12 12 49 21 62 7	5	20 6 14 1 54 11 26 38 2 1 1 1 1 12 49 21 62 7	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree			4	1 		15 6 4 1 54 11 26 38 2 1 1 1 12 49 21 62 7 44	5	20 6 14 1 54 11 26 338 2 1 1 12 49 21 62 7 7 54	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis Quercus alba	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore         White Oak	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4		4			15 6 4 1 54 11 26 38 2 1 1 1 12 49 21 62 7 7 44 9	5	20 6 14 1 54 11 26 38 2 2 1 1 1 2 4 9 21 62 62 7 7 54 9	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis Quercus alba	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore         White Oak         Southern Red Oak	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4		4			15 6 4 1 54 11 26 38 2 1 1 1 12 49 21 62 7 7 44 9 9 25	5	20 6 14 1 54 11 26 38 2 1 1 12 49 21 62 7 7 54 9 25	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis Quercus alba Quercus falcata Quercus falcata	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore         White Oak         Southern Red Oak         Swamp Chestnut Oak	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4 1 2 1		4			15           6           4           1           54           11           26           38           2           1           12           49           21           62           7           44           9           25           5	5	20 6 14 1 54 11 26 38 2 1 1 12 49 21 62 7 7 54 9 25 5	P				Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis Quercus alba Quercus falcata Quercus michauxii Quercus michauxii	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore         White Oak         Southern Red Oak	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4		4			15 6 4 1 54 11 26 38 2 1 1 1 12 49 21 62 7 7 44 9 9 25	5	20 6 14 1 54 11 26 38 2 1 1 12 49 21 62 7 7 54 9 25					Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis Quercus alba Quercus falcata Quercus falcata	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore         White Oak         Southern Red Oak         Swamp Chestnut Oak	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4 1 2 1		4			15           6           4           1           54           11           26           38           2           1           12           49           21           62           7           44           9           25           5	5	20 6 14 1 54 11 26 38 2 1 1 12 49 21 62 7 7 54 9 25 5	P	V	T		Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis Quercus alba Quercus falcata Quercus michauxii Quercus michauxii	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore         White Oak         Southern Red Oak         Swamp Chestnut Oak	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4 1 2 1 1 4	V	4			15           6           4           1           54           11           26           38           2           1           12           49           21           62           7           44           9           25           5           52	5	20 6 14 1 54 11 26 38 2 1 1 12 49 21 62 7 7 54 9 25 5					Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis Quercus alba Quercus falcata Quercus michauxii Quercus michauxii	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore         White Oak         Southern Red Oak         Swamp Chestnut Oak	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4 1 2 1 1 4 4 12			1 2 1 6 6 1 2 1		15           6           4           1           54           11           26           38           2           1           12           49           21           62           7           44           9           25           5           52	5 10 10 10	20 6 14 1 54 11 26 38 2 2 1 1 1 1 21 62 7 7 54 9 9 25 5 5 52			388		Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis Quercus alba Quercus falcata Quercus michauxii Quercus michauxii	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore         White Oak         Southern Red Oak         Swamp Chestnut Oak	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4 1 2 1 1 4 4 12			1 2 1 6 6 1 2 1	1 1 2 1 1 2 1 1 6 1 1 2 1 1 2 1 1 1 1 0 14	15           6           4           1           54           11           26           38           2           1           12           49           21           62           7           44           9           25           5           52	5 10 10 10 10 10 25	20 6 14 1 54 11 26 38 2 2 1 1 1 1 21 62 7 7 54 9 9 25 5 5 52			388		Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										
Acer rubrum Alnus serrulata Asimina triloba Betula nigra Carpinus caroliniana Cercis canadensis Cornus amomum Cornus florida Corylus americana Crataegus Diospyros virginiana Fraxinus pennsylvanica Juglans nigra Liriodendron tulipifera Nyssa sylvatica Platanus occidentalis Quercus alba Quercus falcata Quercus michauxii Quercus phellos	Red Maple         Tag Alder         Common Pawpaw         River Birch         American Hornbeam         Redbud         Silky Dogwood         Flowering Dogwood         American Hazelnut         Hawthorn         American Persimmon         Green Ash, Red Ash         Black Walnut         Tulip Popolar         Black Gum         Sycamore         White Oak         Southern Red Oak         Swamp Chestnut Oak	Tree Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Shrub Tree Tree Tree Tree Tree Tree Tree Tree	4 1 2 2 1 4 4 4			1 2 1 6 6 1 2 1	1 1 2 1 2 1 1 6 1 6 1 1 1 1 1 0 14 1	15           6           4           1           54           11           26           38           2           1           12           49           21           62           7           44           9           25           5           52	5 10 10 10 10 10 10 10 25 29	20 6 14 1 54 11 26 38 2 2 1 1 1 1 21 62 7 7 54 9 9 25 5 5 52			388		Exc Exc Fai	eeds red eeds red s to mee	quirements quirements, et requirem	but by less ents, by les	ss than 10%	6										



# **APPENDIX D**

Stream Geomorphology Data

Year 1 Survey Collected: October 2020



Looking at the Left Bank

Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank

Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank

Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank

Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank

Looking at the Right Bank


Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020





Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank

Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank

Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Left Bank



Looking at the Right Bank



Year 1 Survey Collected: October 2020



Looking at the Right Bank



#### Table 8. Baseline Stream Data Summary

### Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Demonster		Due Endedine C			Refe	rence Re	ach(es)	Data		D				<b>A</b> 1	L	
Parameter	I	Pre-Existing C	onditio	1		Comp	oosite			Desi	gn			As-	built	
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	15.52	16.59		17.65						16.90			16.10	16.15	16.15	16.20
Floodprone Width (ft)	71.92	74.43		76.94					75.00	137.50		200.00	75.30	78.85	78.85	82.40
BF Mean Depth (ft)	1.05	1.25		1.44						1.3			1.20	1.25	1.25	1.30
BF Max Depth (ft)	2.64	2.97		3.30						1.60			1.60	1.70	1.70	1.80
BF Cross-sectional Area (ft <sup>2</sup> )	22.35	23.43		24.5						22.0			18.80	19.70	19.70	20.60
Width/Depth Ratio	10.78	13.80		16.81									12.50	13.20	13.20	13.90
Entrenchment Ratio	4.36	4.50		4.64					4.40	8.10		11.80	4.70	4.90	4.90	5.10
Bank Height Ratio	1.20	1.33		1.46	1.00	1.05		1.10		1.00			1.00	1.00	1.00	1.00
d50 (mm)																
Pattern																
Channel Beltwidth (ft)	33.00	73.50		114.00					60.00	97.50		135.00	53.11	73.15	72.84	89.22
Radius of Curvature (ft)	21.00	39.50		58.00					34.00	41.50		49.00	19.00	41.88	39.50	78.00
Rc/Bankfull width (ft/ft)	17.65	10.70		3.74	2.00	2.50		3.00	2.00	2.45		2.90	1.18	2.59	2.45	4.81
Meander Wavelength (ft)													142.35	192.15	163.81	303.38
Meander Width Ratio	1.87	4.61		7.35	3.50	5.75		8.00	3.60	5.80		8.00	3.30	4.53	4.51	5.51
Profile																
Riffle Length (ft)													33.61	50.90	49.22	64.82
Riffle Slope (ft/ft)	0.0120	0.04		0.0600					0.0110	0.0118		0.0125	0.0029	0.0111	0.0098	0.0168
Pool Length (ft)													16.67	26.35	29.91	43.15
Pool to Pool Spacing (ft)	23.00	123.50		224.00	60.00	89.50		119.00					84.80	101.00	98.09	111.38
Pool Max Depth (ft)	1.60	2.30		3.00						3.50			1.16	1.77	1.85	2.54
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / Bo%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters																
Drainage Area (SM)		1.50								1.50				1.50		
Impervious cover estimate (%)																
Rosgen Classification		C4/E4				C4				C4				C4		
BF Velocity (fps)		3.85		4.03	3.50	4.25		5.00		4.10						
BF Discharge (cfs)		90.0								90.00						
Valley Length		1,756								1,535				1,593		
Channel Length (ft)		2,142								1,842				1,911		
Sinuosity		1.22			1.20	1.30		1.40		1.20				1.20		

 Table 8. Baseline Stream Data Summary

Reach R2 - (Restoration XS-26)																
Parameter	I T	Pre-Existing C	onditio	n	Refe	rence Re	ach(es)	Data		Desi	σn			As-	built	
i arameter		TC-Existing C	onunio	u		Comp	oosite			DUSI	6 <b>1</b> 1			11,5-1	Juint	
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)		15.00								18.00				18.50		
Floodprone Width (ft)	22.00	26.00		30.00						42.00				38.00		
BF Mean Depth (ft)		1.60								1.4				1.80		
BF Max Depth (ft)														2.90		
BF Cross-sectional Area (ft <sup>2</sup> )		25.00								25.0				33.60		
Width/Depth Ratio		9.40			10.00	12.50		15.00		13.00				10.20		
Entrenchment Ratio	1.50	1.75		2.00						2.30				2.10		
Bank Height Ratio		2.30			1.00	1.05		1.10		1.00				1.00		
d50 (mm)																
Pattern																
Channel Beltwidth (ft)		N/A								N/A				24.78		
Radius of Curvature (ft)		N/A								N/A				N/A		
Rc/Bankfull width (ft/ft)		N/A			2.00	2.50		3.00		N/A				N/A		
Meander Wavelength (ft)		N/A								N/A				N/A		
Meander Width Ratio		N/A			3.50	5.75		8.00		N/A				N/A		
Profile																
Riffle Length (ft)													32.58	48.51	48.51	64.43
Riffle Slope (ft/ft)		0.0179								0.0179			0.0058	0.0113	0.0113	0.016
Pool Length (ft)													13.55	18.57	20.90	28.24
Pool to Pool Spacing (ft)	20.00	47.50		75.00					65.00	95.00		125.00	32.00	53.25	53.26	74.51
Pool Max Depth (ft)		2.50								3.50			0.43	0.95	1.05	1.66
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / Bo%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters																
Drainage Area (SM)		1.65								1.65				1.65		
Impervious cover estimate (%)																
Rosgen Classification		E4				C4				C4				C4		
BF Velocity (fps)		4.00			3.50			5.00		4.00						
BF Discharge (cfs)		100.0								100.00						
Valley Length		288								174				166		
Channel Length (ft)		288								174				166		
Sinuosity		1.00			1.20	1.30		1.40		1.00				1.00		

Reach R3 - (Restoration XS-5)																
Parameter		Pre-Existing Co	ndition	n	Refe	rence Re	ach(es)	Data		Desi	on			As-l	built	
		The Existing Co	mantiol	•		Comp				Desi	5"			110 1		1
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)		21.00								23.70				23.80		
Floodprone Width (ft)		71.00								71.00				46.50		
BF Mean Depth (ft)		2.23								2.0				1.70		
BF Max Depth (ft)		3.40								2.50				2.70		
BF Cross-sectional Area (ft <sup>2</sup> )		46.87								47.0				40.90		
Width/Depth Ratio		9.42			10.00	12.50		15.00		11.90				13.80		
Entrenchment Ratio		3.38								3.00				2.00		
Bank Height Ratio		1.20			1.00	1.05		1.10		1.00				1.00		
d50 (mm)																
Pattern																
Channel Beltwidth (ft)		N/A								N/A				22.67		
Radius of Curvature (ft)		N/A								N/A				N/A		
Rc/Bankfull width (ft/ft)		N/A			2.00	2.50		3.00		N/A				N/A		
Meander Wavelength (ft)		N/A								N/A				N/A		
Meander Width Ratio		N/A			3.50	5.75		8.00		N/A				N/A		
Profile																
Riffle Length (ft)													29.93	47.57	51.32	72.70
Riffle Slope (ft/ft)		0.0075								0.0075			0.0044	0.0158	0.0138	0.0233
Pool Length (ft)													4.28	26.01	29.94	55.59
Pool to Pool Spacing (ft)	18.00	26.00		34.00					85.00	100.00		115.00	47.04	86.95	85.53	124.01
Pool Max Depth (ft)	3.60	3.70		3.80						4.00			0.57	1.27	1.24	1.90
Substrate and Transport Parameters		5.70		5.60						4.00				1.27		
SC% / Sa% / G% / C% / Bo%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters																
Drainage Area (SM)		3.48								3.48				3.48		
Impervious cover estimate (%)																
Rosgen Classification		E4 (Incised)								C4				C4		
BF Velocity (fps)		5.00			3.50	4.25		5.00		5.00						
BF Discharge (cfs)		235.0								235.00						
Valley Length		350								350				366		
Channel Length (ft)		388								389				406		
Sinuosity		1.11			1.20	1.30		1.40		1.11				1.11		

Reach R4 - (Enhancement I XS 6-11)																
Parameter		Pre-Existing Co	nditio	n	Refe	rence Re	ach(es)	Data		Desi	an			٨٩-١	built	
i arameter		Te-Existing Co	Jiuiuo	u		Comp	osite			Desi	gn			A5-1	Junt	
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)		16.00								16.90			13.30	15.84	14.30	22.60
Floodprone Width (ft)		22.82								37.00			24.00	29.58	31.70	34.30
BF Mean Depth (ft)		1.54								1.3			0.90	1.38	1.50	1.70
BF Max Depth (ft)		2.72								1.60			2.00	2.46	2.30	3.00
BF Cross-sectional Area (ft <sup>2</sup> )		24.5								22.0			15.50	20.64	22.10	23.10
Width/Depth Ratio		10.36			12.00	15.00		18.00		13.00			8.40	13.04	10.30	26.10
Entrenchment Ratio		1.62								2.20			1.40	1.90	1.90	2.30
Bank Height Ratio		2.32			1.00	1.05		1.10		1.00			1.00	1.00	1.00	1.00
d50 (mm)																
Pattern																
Channel Beltwidth (ft)		N/A								N/A						
Radius of Curvature (ft)		N/A								N/A						
Rc/Bankfull width (ft/ft)		N/A								N/A						
Meander Wavelength (ft)		N/A								N/A						
Meander Width Ratio		N/A								N/A						
Profile																
Riffle Length (ft)													33.46	58.40	68.03	102.60
Riffle Slope (ft/ft)	0.0150	0.0250		0.0350					0.0110	0.0140		0.0170	0.0102	0.0178	0.0195	0.0289
Pool Length (ft)													2.23	14.40	20.08	37.92
Pool to Pool Spacing (ft)	55.00	167.50		280.00					85.00	100.00		115.00	33.46	103.56	113.76	194.05
Pool Max Depth (ft)	1.10			2.40						3.00			1.09	1.66	1.71	2.32
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / Bo%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters																
Drainage Area (SM)		1.26								1.26					1.26	
Impervious cover estimate (%)																
Rosgen Classification		E4 (Incised)				B4c				B4c					B4c	
BF Velocity (fps)		4.01			4.00	5.00		6.00		4.00						
BF Discharge (cfs)		87.0								87.00						
Valley Length																
Channel Length (ft) Sinuosity		2,245 1.06			 1.10	1.20		1.30		2,063 1.06				2,038 1.06		

Reach R6,R7b - (Restoration, Enhancement I XS 12-15)	1				1								r			
Parameter	1	Pre-Existing C	ondition	n	Refe	rence Re	ach(es)	Data		Desi	σn			As-l	built	
T urumeter		Te Existing C	onunioi	-		Comp	oosite			Desi	5"			710 K		
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)		8.44								10.20			11.00	12.40	12.40	13.80
Floodprone Width (ft)		17.64								22.00			45.00	45.45	45.00	45.90
BF Mean Depth (ft)		0.94								0.8			0.80	1.05	1.05	1.30
BF Max Depth (ft)		1.27								1.10			1.30	1.65	1.65	2.00
BF Cross-sectional Area (ft <sup>2</sup> )		7.9								8.0			7.20	10.80	10.80	14.40
Width/Depth Ratio		8.98			12.00	15.00		18.00		12.80			8.40	9.65	9.65	10.90
Entrenchment Ratio		2.09								2.20			4.20	4.65	4.65	5.10
Bank Height Ratio		3.10			1.00	1.05		1.10		1.00			1.00	1.00	1.00	1.00
d50 (mm)																
Pattern																
Channel Beltwidth (ft)		N/A								N/A			13.95	40.15	33.06	58.59
Radius of Curvature (ft)		N/A								N/A			20.00	46.82	43.00	86.00
Rc/Bankfull width (ft/ft)		N/A								N/A			1.82	3.78	3.47	6.23
Meander Wavelength (ft)		N/A								N/A			58.19	108.11	113.28	170.29
Meander Width Ratio		N/A								N/A			1.27	3.24	2.67	4.25
Profile																
Riffle Length (ft)													34.21	91.23	89.80	145.39
Riffle Slope (ft/ft)	0.0260	0.0430		0.0600					0.0310	0.0375		0.0440	0.0202	0.0384	0.0435	0.0667
Pool Length (ft)													17.11	20.53	21.39	25.66
Pool to Pool Spacing (ft)	53.00	159.00		265.00					25.00	37.50		50.00	31.36	90.16	138.27	245.18
Pool Max Depth (ft)	1.50	2.05		2.60						1.80			2.28	2.58	2.66	3.04
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / Bo%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters																
Drainage Area (SM)		0.29								0.29				0.2900		
Impervious cover estimate (%)																
Rosgen Classification		E4				B4				B4				B4		
BF Velocity (fps)		4.41			4.00			6.00		4.40						
BF Discharge (cfs)		35.0								35.00						
Valley Length		1,783								1,816				1,793		
Channel Length (ft)		1,801								1,943				1,919		
Sinuosity		1.01			1.10	1.15		1.20		1.07				1.07		

Table 8. B	Baseline	Stream	Data	Summary
------------	----------	--------	------	---------

Reach 9 - (Restoration XS 16-17)																
Parameter	I	Pre-Existing C	onditio	n	Refe	rence Re Comp		Data		Desi	gn			As-l	ouilt	
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)		10.40								12.70				12.10		
Floodprone Width (ft)		45.00								60.00				18.70		
BF Mean Depth (ft)		1.15								0.9				1.00		
BF Max Depth (ft)		2.25								1.20				1.40		
BF Cross-sectional Area (ft <sup>2</sup> )		12.0								12.0				11.90		
Width/Depth Ratio		9.04			12.00	15.00		18.00		13.50				12.20		
Entrenchment Ratio		4.33								4.70				1.60		
Bank Height Ratio		1.19			1.00	1.05		1.10		1.00				1.00		
d50 (mm)																
Pattern																
Channel Beltwidth (ft)		N/A								N/A			20.86	24.81	22.89	30.60
Radius of Curvature (ft)		N/A								N/A			41.00	73.83	56.00	176.00
Rc/Bankfull width (ft/ft)		N/A								N/A			3.39	6.10	4.63	2.53
Meander Wavelength (ft)		N/A								N/A			105.77	121.47	117.31	146.34
Meander Width Ratio		N/A								N/A			1.72	2.05	1.89	2.53
Profile																
Riffle Length (ft)													31.00	41.69	42.23	53.45
Riffle Slope (ft/ft)	0.0410	0.0480		0.0550					0.2600	0.1505		0.0410	0.0065	0.0218	0.0199	0.0332
Pool Length (ft)													10.49	19.56	20.03	29.57
Pool to Pool Spacing (ft)	29.00	47.50		66.00					15.00	38.50		62.00	45.71	62.03	62.51	79.31
Pool Max Depth (ft)	2.30	2.70		3.10						2.50			0.52	1.62	1.55	2.58
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / Bo%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters																
Drainage Area (SM)		0.56								0.56				0.5600		
Impervious cover estimate (%)																
Rosgen Classification		E4b								B4				B4		
BF Velocity (fps)		4.00			4.00	5.00		6.00		4.00						
BF Discharge (cfs)		48.0				B4				48.00						
Valley Length		422								429				429		
Channel Length (ft)		439								446				446		
Sinuosity		1.04			1.10	1.15		1.20		1.04				1.04		

Reach 10b - (Restoration XS-24)																
Parameter	т	Pre-Existing C	onditior		Refe	rence Re	ach(es)	Data		Desi	an			As-l	milt	
1 arameter	1	Te-Existing C	onunoi	1		Comp	oosite			Desi	gn			A5-1	Juiit	
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)		N/A								4.90				6.20		
Floodprone Width (ft)		N/A								115.00				32.00		
BF Mean Depth (ft)		N/A								0.4				0.50		
BF Max Depth (ft)		N/A								0.50				1.00		
BF Cross-sectional Area (ft <sup>2</sup> )		N/A								2.0				3.50		
Width/Depth Ratio		N/A			10.00	12.50		15.00		12.30				11.00		
Entrenchment Ratio		N/A								23.50				8.70		
Bank Height Ratio		N/A			1.00	1.05		1.10		1.00				1.00		
d50 (mm)		N/A														
Pattern																
Channel Beltwidth (ft)		N/A								N/A			10.37	13.70	11.86	18.87
Radius of Curvature (ft)		N/A								N/A			34.00	66.67	82.00	84.00
Rc/Bankfull width (ft/ft)		N/A			2.00	2.50		3.00		N/A			5.48	10.75	1.91	13.55
Meander Wavelength (ft)		N/A								N/A			29.79	49.56	59.44	59.44
Meander Width Ratio		N/A			3.50	5.75		8.00		N/A			1.67	2.21	1.91	3.04
Profile																
Riffle Length (ft)		N/A												107.07		
Riffle Slope (ft/ft)		N/A								0.0142				0.0196		
Pool Length (ft)		N/A														
Pool to Pool Spacing (ft)		N/A								38.00						
Pool Max Depth (ft)		N/A								1.00						
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / Bo%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters												-				
Drainage Area (SM)		0.26								0.26				0.2600		
Impervious cover estimate (%)										0.20				0.2000		
•																
Rosgen Classification										C4				C4		
BF Velocity (fps)					3.50	4.25		5.00		3.50						
BF Discharge (cfs)										7.00						
Valley Length																
Channel Length (ft)		0								113				105		
Sinuosity					1.20	1.30		1.40								

Table 8.	Baseline	Stream	Data	Summary	
----------	----------	--------	------	---------	--

Reach 12 - (Restoration XS-25)																
Denometer		)		-	Refe	rence Re	ach(es)	Data		Deat	~			<b>A</b> ~ 1		
Parameter	ľ	Pre-Existing C	onattion	1		Comp	osite			Desi	gn			AS-I	built	
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)		7.97								8.80				9.10		
Floodprone Width (ft)		41.00								20.00				38.20		
BF Mean Depth (ft)		0.91								0.7				0.60		
BF Max Depth (ft)		1.84								0.80				1.00		
BF Cross-sectional Area (ft <sup>2</sup> )		7.3								6.0				5.20		
Width/Depth Ratio		8.75			12.00	13.50		15.00		12.60				16.20		
Entrenchment Ratio		5.14								2.30				4.20		
Bank Height Ratio		1.63			1.00	1.05		1.10		1.00				1.00		
d50 (mm)																
Pattern																
*Channel Beltwidth (ft)		N/A								N/A			14.22	18.28	18.28	22.33
*Radius of Curvature (ft)		N/A								N/A			40.00	40.00	40.00	40.00
*Rc/Bankfull width (ft/ft)		N/A								N/A			4.40	4.40	4.40	4.40
*Meander Wavelength (ft)		N/A								N/A			61.50	68.17	68.17	74.84
*Meander Width Ratio		N/A								N/A			1.56	2.01	2.01	2.45
Profile																
Riffle Length (ft)													16.04	25.93	25.93	35.81
Riffle Slope (ft/ft)	0.0350	0.0365		0.0380					0.0150	0.0160		0.0170	0.0123	0.1365	0.1123	0.2123
Pool Length (ft)													5.88	7.24	7.24	8.59
Pool to Pool Spacing (ft)	24.00	32.00		40.00					35.00	40.00		45.00	10.16	49.98	49.98	89.80
Pool Max Depth (ft)	1.80	2.00		2.20						1.50			0.61	0.78	0.82	1.03
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters																
Drainage Area (SM)		0.18								0.18				0.1800		
Impervious cover estimate (%)																
*Rosgen Classification		E4				C4				C4				C4		
BF Velocity (fps)		4.13			3.50			5.00		5.00						
BF Discharge (cfs)		30.0								30.00						
Valley Length		83								115				98		
Channel Length (ft)		86								120				102		
Sinuosity		1.03								1.04				1.04		

Russell Gap Stream Mitigation Project: DMS Pr	oject No ID. 100003
---	---------------------

Table 8. Baseline Stream Data Summary																
Russell Gap Stream Mitigation Project: DMS Project No	ID. 1000	03														
Reach 14 - (Restoration XS 19-20)					D é	P	14	D 4								
Parameter	נ	Pre-Existing C	onditio	n	Kefe	rence Re	, ,	Data	De	esign Valı	ues Upp	ber		As-l	built	
		_				Comp				_						
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)		3.85								5.10			3.70	4.10	4.10	4.50
Floodprone Width (ft)		5.82								10.00			11.10	21.55	21.55	32.00
BF Mean Depth (ft)		0.51								0.4			0.50	0.50	0.50	0.50
BF Max Depth (ft)		0.70								0.50			0.80	0.90	0.90	1.00
BF Cross-sectional Area (ft <sup>2</sup> )		2.0								2.0			2.00	2.10	2.10	2.20
Width/Depth Ratio		7.55			12.00	15.00		18.00		12.80			6.80	7.95	7.95	9.10
Entrenchment Ratio		1.51								2.00			2.50	5.60	5.60	8.70
Bank Height Ratio		9.60			1.00	1.05		1.10		1.00			1.00	1.00	1.00	1.00
d50 (mm)																
Pattern																
*Channel Beltwidth (ft)		N/A								N/A			24.51	40.15	33.06	58.59
*Radius of Curvature (ft)		N/A								N/A			21.00	72.88	56.00	178.0
*Rc/Bankfull width (ft/ft)		N/A								N/A			5.68	17.78	13.66	39.56
*Meander Wavelength (ft)		N/A								N/A			62.14	95.04	83.77	56.00
*Meander Width Ratio		N/A								N/A			6.62	9.79	8.06	13.02
Profile																
Riffle Length (ft)													4.19	15.81	25.68	47.17
Riffle Slope (ft/ft)	0.1000	0.1400		0.1800					0.0850	0.1075		0.1300	0.0108	0.0398	0.0518	0.092
Pool Length (ft)													1.17	2.00	1.87	2.57
Pool to Pool Spacing (ft)		37.00		50.00					5.00	12.50		20.00	5.84	14.71	14.13	22.41
Pool Max Depth (ft)		0.65		0.80						0.70			0.69	1.10	1.15	1.60
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters																
Drainage Area (SM)		0.02								0.02				0.0180		
Impervious cover estimate (%)																
*Rosgen Classification		A4				B4a				B4a				B4a		
BF Velocity (fps)		4.10			4.00	D4a		6.00		4.00				D4a		
BF Velocity (ips) BF Discharge (cfs)		4.10 8.0			4.00					8.00						
Valley Length																
										572				570		
Channel Length (ft)		528			1 10			1.20								
Sinuosity		N/A			1.10			1.20		N/A				N/A		

Table 8 Baseline Stream Data Summary

Reach 19 - (Enhancement I XS-21)																		
Devenuetor	Ţ	Pre-Existing C	andition		Refe	rence Re	ach(es)	Data		Dog	<b>~</b>		As-built					
Parameter	1	re-Existing C	onanio	1		Comp	oosite			Desi	gn		AS-Dunt					
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max		
BF Width (ft)		4.31								5.40				8.80				
Floodprone Width (ft)		8.84								10.00				26.30				
BF Mean Depth (ft)		0.45								0.4				0.90				
BF Max Depth (ft)		0.91								0.50				1.50				
BF Cross-sectional Area (ft <sup>2</sup> )		1.9								2.0				7.60				
Width/Depth Ratio		9.58			12.00	15.00		18.00		13.50				10.20				
Entrenchment Ratio		2.05								1.90				3.00				
Bank Height Ratio		1.10			1.00	1.05		1.10		1.00				1.00				
d50 (mm)																		
Pattern																		
*Channel Beltwidth (ft)		N/A								N/A								
*Radius of Curvature (ft)		N/A								N/A								
*Rc/Bankfull width (ft/ft)		N/A								N/A								
*Meander Wavelength (ft)		N/A								N/A								
*Meander Width Ratio		N/A								N/A								
Profile																		
Riffle Length (ft)													2.14	19.69	40.27	78.40		
Riffle Slope (ft/ft)	0.0800	0.0950		0.1100					0.0800	0.0950		0.1100	0.0260	0.0561	0.0515	0.0771		
Pool Length (ft)													1.27	2.01	2.06	2.85		
Pool to Pool Spacing (ft)	7.00	31.50		56.00					4.00	12.00		20.00	6.35	9.34	9.34	12.33		
Pool Max Depth (ft)		0.95								1.00			0.89	1.24	1.28	1.66		
Substrate and Transport Parameters																		
SC% / Sa% / G% / C% / B%																		
d16 / d35 / d50 / d84 / d95																		
Additional Reach Parameters																		
Drainage Area (SM)		0.03								0.03				0.0300				
Impervious cover estimate (%)																		
*Rosgen Classification		B4a				B4				B4a				B4a				
BF Velocity (fps)		4.12			4.00			6.00		4.00								
BF Discharge (cfs)		8.0								8.00								
Valley Length																		
Channel Length (ft)		481								359				352				
Sinuosity		1.08			1.10			1.20		1.08				1.08				

Table 8. Baseline Stream Data Summary																
Russell Gap Stream Mitigation Project: DMS Project No	DID. 1000	03														
Reach 25 - (Enhancement I XS-23)	-				1											
Parameter	Parameter				Refe	rence Re	, ,	Data	Design As-built							
		-				Comp					-	-	<b>ļ</b>			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)		5.00								5.40				5.10		
Floodprone Width (ft)		12.00								12.00				11.10		
BF Mean Depth (ft)		0.40								0.4				0.50		
BF Max Depth (ft)		0.50								0.50				0.80		
BF Cross-sectional Area (ft <sup>2</sup> )		1.9								2.0				2.20		
Width/Depth Ratio		12.50			12.00	15.00		18.00		13.50				9.10		
Entrenchment Ratio		2.40								2.20				2.50		
Bank Height Ratio		2.00			1.00	1.05		1.10		1.00				1.00		
d50 (mm)																
Pattern																
*Channel Beltwidth (ft)		N/A								N/A						
*Radius of Curvature (ft)		N/A								N/A						
*Rc/Bankfull width (ft/ft)		N/A								N/A						
*Meander Wavelength (ft)		N/A								N/A						
*Meander Width Ratio		N/A								N/A						
Profile																
Riffle Length (ft)													6.68	17.65	18.60	30.52
Riffle Slope (ft/ft)		0.0950		0.1100	1.1000	1.4500		1.8000	0.0950	0.1025		0.1100	0.0165	0.0591	0.0564	0.0962
Pool Length (ft)													2.23	5.21	5.41	8.59
Pool to Pool Spacing (ft)	7.00	31.50		56.00					7.00	13.50		20.00	7.63	16.24	23.05	38.47
Pool Max Depth (ft)		1.20								1.20			1.16	1.75	1.68	2.19
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B%																
d16 / d35 / d50 / d84 / d95																
Additional Reach Parameters																
Drainage Area (SM)		0.30								0.30				0.3000		
Impervious cover estimate (%)	1															
*Rosgen Classification		B4a				B4				B4a				B4a		
BF Velocity (fps)		4.64			4.00			6.00		4.50				D+a		
BF Discharge (cfs)		9.0			4.00					9.00						
Valley Length																
Channel Length (ft)		422								427						
		422			1.10			1.20		1.08				431 1.08		
Sinuosity		1.09			1.10			1.20		1.08				1.08		

Stream Reach														R	each 1														
			Cro	ss-section X	-1 (Riffle)			1		Cross	-section X-2	(Pool)					Cross-	section X-3	(Riffle)			Cross-section X-4 (Pool)							
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY-	
Based on fixed baseline bankfull elevation																												T	
BF Width (ft)	16.2	15.8						24.6	18.6						16.1	16.3						22.9	16.6					1	
BF Mean Depth (ft)	1.2	1.2						1.0	1.3						1.3	1.3						1.2	1.5						
Width/Depth Ratio	13.9	13.6						24.1	14.7						12.5	12.9						18.9	11.3						
BF Cross-sectional Area (ft <sup>2</sup> )	18.8	18.4						25.1	23.6						20.6	20.6						27.7	24.4						
BF Max Depth (ft)	1.6	1.7						1.7	2.3						1.8	2.0						2.4	2.7						
Width of Floodprone Area (ft)	75.3	75.3						75.3	75.3						82.4	82.4						82.2	82.2			1		1	
Entrenchment Ratio	4.7	4.8						3.1	4.0						5.1	5.0						3.6	5.0			1		1	
Bank Height Ratio	1.0	1.1						0.9	1.0						1.0	1.0						1.1	1.1			1		1	
Wetted Perimeter (ft)	16.7	16.4						25.3	20.0						16.8	17.2						23.5	17.7			1		1	
Hydraulic Radius (ft)	1.1	1.1						1.0	1.2						1.2	1.2						1.2	1.4						
d50 (mm)																													
Stream Reach				Reach	3													Reach 4								-		-	
		Cross-section X-5 (Riffle) Cross-section X-6 (Riffle) Cross-section X-7 (Riffle)										Cross-section X-8 (Riffle)																	
				MY+	Base MY1 MY2 MY3 MY4 MY5 MY+						Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1 MY2 MY3 MY4 MY5				MY5	MY-					
Based on fixed baseline bankfull elevation	Duse		1112		10114			Duse		1112	1115	10114		1011	Duse		1112	1115	1114	10115	1011	Dase		1112	1115		10115		
BF Width (ft)	23.8	23.7						13.9	13.5						14.3	14.4						15.1	14.6			—			
BF Mean Depth (ft)	1.7	2.7						1.7	1.7						14.5	14.4						1.5	14.0			<b>├</b> ───┤		+	
Width/Depth Ratio	13.8	13.8						8.4	7.8						9.0	9.1						10.3	9.9			++			
BF Cross-sectional Area (ft <sup>2</sup> )	40.9	40.6						23.1	23.3						22.9	22.8						22.1	21.4			++			
BF Max Depth (ft)	2.7	2.7						2.8	2.8						2.3	2.5						3.0	2.8			++			
Width of Floodprone Area (ft)	46.5	47.5						24.0	23.4						31.7	30.3						34.3	33.2			++			
Entrenchment Ratio	2.0	2.5						1.7	1.6						2.2	2.1						2.3	2.2			++			
Bank Height Ratio	1.0	0.9						1.0	0.8						1.0	1.3						1.0	1.0			++			
Wetted Perimeter (ft)	25.1	25.3						15.5	15.1						15.7	16.1						16.4	16.3			<b>├</b> ───┤		<u> </u>	
Hydraulic Radius (ft)	1.6	1.6						1.5	1.5						1.5	1.4						1.4	1.3			<b>├</b> ───┤		<u> </u>	
d50 (mm)	1.0	1.0						1.5	1.5						1.5								1.5			+ +		<u> </u>	
Stream Reach											Reach 4	1												1	Reach 6	·			
Sir can Keach			C	oss-section X	7.0 (D ))			1		0	section X-10						G	section X-11	(D.61.)					C	section X-12				
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	(Kille) MY4	MY5	MY+	Base	MY1	MY2	MY3	2 (P001) MY4	MY5	MY+	
Based on fixed baseline bankfull elevation	Dase	IVI I I	WI 1 2	WI I J	WI 14	W115	INI I +	Dase	IVI I I	IVI I Z	MI15	WI 14	WI15	IVI I +	Dase	IVIII	WI 1 2	IVI I J	191 1 4	14115	IVI I +	Dase	19111	14112	W115	M14	WIT5	IVI I +	
BF Width (ft)	16.2	15.2						22.6	21.3						13.3	10.3						13.8	9.2			<b>├</b> ───┤		┼───	
BF Mean Depth (ft)	1.7	1.3				<del> </del>		0.9	0.9			ł			13.5	1.3						0.8	9.2			$\vdash$		┼───	
Width/Depth Ratio	9.7	1.3						26.1	23.4						1.2	7.9						0.8	10.8			──┤		──	
BF Cross-sectional Area (ft <sup>2</sup> )	27.2	20.5						20.1	19.4						11.4	13.6						10.5	7.9			───┦			
BF Cross-sectional Area (It-) BF Max Depth (ft)	27.2	20.5				<del> </del>		2.2	2.3			ł			2.0	2.1						11.6	1.9			$\vdash$		┼───	
Width of Floodprone Area (ft)	38.0	38.0				<del> </del>		32.0	31.5			ł			2.0	2.1						56.8	56.8			$\vdash$		+	
Entrenchment Ratio	2.3	2.5						1.4	1.5			+			1.9	2.3						5.7	6.1			──┤		+	
Bank Height Ratio	1.0	0.9						1.4	1.5						1.9	2.3						5.7	6.1 1.0			──┤			
Wetted Perimeter (ft)	1.0	16.6						23.7	22.5						1.0	1.1						1.0	9.9			──┤		+	
					1	I						l												1		<b>↓</b>		+	
Hydraulic Radius (ft)	1.6	1.2						0.8	0.9						1.1	1.2						1.1	0.8						

Russell Gap Restoration Project: DMS Project No ID. 10000	3																											
Cross-Section Morphology Data Summary           Russell Gap Restoration Project: DMS Project No ID. 100003																												
tream Reach				Reach (	6									Rea	ch 7b										Reach 9			
irtain Kath			Cros	s-section X-						Cross-	section X-14	(Riffle)		neu			Cross-	-section X-15	5 (Pool)					Cross-	-section X-16	6 (Pool)		
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY
ased on fixed baseline bankfull elevation		T		1			1		1		1													1		l l		Т
BF Width (ft)	13.8	8.2						11.0	11.7						14.0	14.3						12.9	9.0					
BF Mean Depth (ft)	0.8	0.9						1.3	1.3						1.0	0.9						1.0	0.8					
Width/Depth Ratio	10.9	9.4						8.4	9.3						14.4	15.5						12.4	11.4	'			L	_
BF Cross-sectional Area (ft <sup>2</sup> )	7.2	7.1						14.4	14.6						13.6	13.2						13.5	7.1	'	<u> </u>		<u> </u>	_
BF Max Depth (ft)	1.3	1.5						2.0	2.2						1.6	1.7						1.9	1.8	'	<b> </b> '	$ \longrightarrow$	───	_
Width of Floodprone Area (ft)	45.0	45.0						45.9	45.9						27.3	27.3						80.4	80.4	'	<b> </b> '	—	───	_
Entrenchment Ratio Bank Height Ratio	5.1 1.0	5.5		L				4.2	3.9 1.1						1.9 2.4	1.9						6.2 1.0	8.9 1.0	<b>└───</b> ′	<u> </u>	$\vdash$	<u> </u>	+
Bank Height Ratio Wetted Perimeter (ft)	9.4	8.9						1.0	1.1				1		2.4	2.4		+				1.0	1.0 9.8	<u> </u>	<b>├</b> ────'	──┤	<del> </del>	+
Hydraulic Radius (ft)	9.4	0.8			ł			12.0	12.0			ł			0.9	0.9		<del> </del>		<u>├</u>		13.8	9.8	<u> </u>	<b>├</b> ───'	───┦	<u> </u>	+
	0.0	0.0						1.2	1.2				-		0.9	0.9						1.0	0.7	<u> </u>	<u> </u> '	++	<u> </u>	+
d50 (mm)																											<u> </u>	
tream Reach				Reach 9	9						Reach 11										R	14						
	Cross-section X-17 (Riffle)						Cross-	section X-18	(Riffle)					Cross-section X-19 (Riffle)							Cross-s	section X-20	(Riffle)					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY
ased on fixed baseline bankfull elevation																										[ ]		
BF Width (ft)	12.1	12.2						8.9	7.1						4.5	3.8						3.7	3.3			1		
DEM D 4(0)	1.0	1.0						1.1	0.7						0.5	0.4						0.5	0.3		('	<b>├───</b> ┦	<u> </u>	-
BF Mean Depth (ft)																								'			L	_
Width/Depth Ratio	12.2	11.9						8.4	9.8						9.1	9.7						6.8	11.0					
BF Cross-sectional Area (ft <sup>2</sup> )	11.9	12.4						9.5	5.2						2.2	1.5						2.0	1.0		['			
BF Max Depth (ft)	1.4	1.6						1.9	1.4						0.8	0.7						1.0	0.5			[ ] [		
Width of Floodprone Area (ft)	18.7	78.1						18.6	14.7						11.1	11.1						32.0	32.0			1		
Entrenchment Ratio	1.6	6.4			1			2.1	2.1						2.5	2.9						8.7	9.6	<u> </u>	'	┝───┦	<u> </u>	
																								<u> </u>	<b>└───</b> '	<b>↓</b> ↓	<u> </u>	_
Bank Height Ratio	1.0	1.0						2.9	1.2						1.0	1.1						1.0	1.0	'			L	
Wetted Perimeter (ft)	12.6	12.7						9.8	7.7						4.8	4.1						4.2	3.5					
Hydraulic Radius (ft)	0.9	1.0						1.0	0.7						0.5	0.4						0.5	0.3				1	
d50 (mm)																												-
tream Reach				Reach 1	9						Reach 20							Reach 25				-			Reach 10b			
				s-section X-							section X-22							section X-23							section X-24			
imension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY
Based on fixed baseline bankfull elevation																								<u> </u>	<u> </u>		<u> </u>	
BF Width (ft)	8.8	8.5						3.8	4.5						5.1	4.7						6.2	5.5	'	<b> </b> '	$ \longrightarrow$	───	_
BF Mean Depth (ft) Width/Depth Ratio	0.9 10.2	0.8		L				0.5	0.4 10.2						0.6	0.6						0.6	0.5	<u> </u> '	<u> </u>	$\vdash$	<u> </u>	+
BF Cross-sectional Area (ft <sup>2</sup> )	7.6	6.6						2.0	10.2						8.1 3.2	8.2						3.5	3.0	<b>├</b> ──── <sup> </sup>	<u> </u>	┟───┤	<u> </u>	+
BF Cross-sectional Area (II-) BF Max Depth (ft)	1.5	1.5			ł			0.8	0.7			ł			5.2	0.9		<del> </del>		<u>├</u>		5.5	5.0	<u> </u>	<b>├</b> ───'	───┦	<u> </u>	+
Width of Floodprone Area (ft)	26.3	26.3						12.4	12.4				-		8.1	8.1						45.5	45.5	<u> </u>	<u> </u> '	++	<u> </u>	+
Entrenchment Ratio	3.0	3.1			1	1		3.3	2.8	1		1	1		1.6	1.7		1				7.3	8.2	<u>├</u> ────	'	┝───┥	<u> </u>	+
		1.1				1		1.0	1.0	1			1		1.0	0.9				1		1.0	1.0			<u>├</u> ──┤		1
Bank Height Ratio	1.0	1.1																1							<u> </u>	<u>.</u>	*	_
	1.0 9.4	9.1						4.3	4.7						5.7	5.2						6.6	5.9				1	
Bank Height Ratio								4.3 0.5	4.7 0.4						5.7 0.6	5.2 0.5						6.6 0.5	5.9 0.5				──	+

Stream Reach		Cross-section X-25 (Riffle)							Cross-section X-26 (Riffle)								
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+			
Based on fixed baseline bankfull elevation																	
BF Width (ft)	9.1	7.8						18.5	13.4								
BF Mean Depth (ft)	0.6	0.6						1.8	2.2								
Width/Depth Rati BF Cross-sectional Area (ft	16.2	12.8						10.2	6.1								
	5.2	4.7						33.6	29.4								
BF Max Depth (ft)	1.0	1.0						2.9	2.9								
Width of Floodprone Area (ft)	38.2	38.2						38.0	38.1								
Entrenchment Ratio	4.2	4.9						2.1	2.8								
Bank Height Ratio	1.0	0.9						1.0	0.9								
Wetted Perimeter (ft)	9.4	8.1						19.4	14.3								
Hydraulic Radius (ft)	0.5	0.6						1.7	2.1								
d50 (mm)																	

# **APPENDIX E**

Hydrologic Data

## Table 10. Verification of Bankfull Events Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Date of Data Collection	R1 Manual Cork Crest Gauge #1	R9 Manual Cork Crest Gauge #2	R4 Manual Cork Crest Gauge #3	R6 Manual Cork Crest Gauge #4	Date of Bankfull Event Occurrence	Method of Data Collection
			Year 1 Monitoring (2020	))		
6/1/2020	NA	NA	1.25 ft.	NA	5/28/2020	Manual cork measurement
11/5/2020	1.5 ft.	NA	2.5 ft	NA	10/30/2020	Manual cork measurement

Note: Manual cork crest gauge readings were corroborated with associated spikes in the automated Continuous Stage Recorder (see graph in Appendix E) and/or with photographs (Appendix B).

#### Figure 5. Wetland Monitoring Well Graphs



#### Figure 5. Wetland Monitoring Well Graphs



MICHAEL BAKER ENGINEERING, INC. YEAR 1 MONITORING REPORT RUSSELL GAP STREAM MITIGATION PROJECT (DMS PROJECT NO. 100003)




















Well ID	Percentage of Consecutive Days <12 inches from Ground Surface <sup>1</sup>						Most Consecutive Days Meeting Criteria <sup>2</sup>					Percentage of Cumulative Days <12 inches from Ground Surface						Cumulative Days Meeting Criteria <sup>3</sup>										
	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Ye: (20
											Wetla	nd Monito	ring Wells	s (Installed	March 2	020)												
GAW1	16.0							59							66.4							150						
GAW2	100.0							226							100.0							226						
GAW3	100.0							226							100.0							226						
GAW4	100.0							226							100.0							226						
GAW5	38.0							87							92.0							208						
GAW6	54.8							124							100.0							226						
GAW7	100.0							226							100.0							226						
GAW8	76.5							173							91.6							207						
GAW9	100.0							226							100.0							226						
GAW10	100.0							226							100.0							226						
GAW11	100.0							226							100.0							226						
GAW12	100.0							226							100.0							226						

# Figure 6. Flow Gauge Graphs



# Figure 6. Flow Gauge Graphs



# Figure 6. Flow Gauge Graphs











		Мо	st Consecut	ive Days M	eeting Crite	ria <sup>1</sup>	Cumulative Days Meeting Criteria <sup>2</sup>									
Flow Gauge ID	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)		
					Flow (	Gauges (In	stalled Ma	rch, 2020)								
RGFL1	64.0							209.0								
RGFL2	202.0							222.0								
RGFL3	232.0							232.0								
RGFL4	232.0							232.0								
RGFL5	232.0							232.0								
lotes:																
ndicates the number	r of consecuti	ve days withi	n the monitor	ing year wher	re flow was m	easured.										
ndicates the number	r of cumulativ	ve days withir	n the monitori	ng year where	e flow was me	easured.										

Figure 7. Observed Rainfall Versus Historic Averages



Note: Historic average annual rainfall for Alexander County, NC is 51.3 inches, while the observed project rainfall recorded a total of 81.4 inches over the previous 12 months (Dec. 2019 - Nov. 2020). Project rainfall data was collected from the NC-CRONOS station TAYL.