UT to Town Creek Restoration Project – Option A
Final Year 6 Monitoring Report

Stanly County, North Carolina

DMS Project ID Number – 94648; NC DEQ Contract No. 003277

Yadkin Pee-Dee River Basin: 03040105060040

Project Info:	Monitoring Year: 6 Year of Data Collection: 2021 Year of Completed Construction: 2016 Submission Date: December 2021
Submitted To:	NCDEQ – Division of Mitigation Services 1625 Mail Service Center Raleigh, NC 27699 NCDEQ Contract ID No. 003277

Michael Baker
INTERNATIONAL

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December 17, 2021

Harry Tsomides, Project Manager
NCDEQ, Division of Mitigation Services
5 Ravenscroft Dr – Suite 102
Asheville, NC 28801

Subject: Response to DMS Comments for MY6 Draft Report
UT to Town Creek Mitigation Site, Stanly County
DMS Project #94648, DEQ Contract #3277

Mr. Tsomides:

Please find enclosed our responses to the NC Division of Mitigation Services (DMS) review comments received December 16, 2021 in reference to the UT to Town Creek Mitigation Site MY6 Draft Report. We have revised the document in response to the review comments as outlined below.

DMS MY6 Draft Report Comments:

1) References to stream "close out" should be removed or reworded. Please note that the stream portions of the project are not technically closed out yet, but are expected to close with the wetland portions in 2023; standard monitoring may cease since this is a 5-year stream project and the streams were performing well at the 2021 close out meeting. Like you state in the June 2021 meeting minutes, while standard stream monitoring may cease, any subsequent damage to the system that occurs prior to complete project closeout must be repaired.
Response: Baker has revised all sections of the report that refer to the stream portion of the project as being closed-out and has also specifically noted that any damage must be repaired.

2) Please make final changes to the stream and wetland maps and associated credits as discussed in recent communications with DMS and IRT, regarding the minor stream credit shortfall resulting from the revised/updated wetland shapes (2.680 SMU). Please note the buffer method version run and summarize in the appendix the wetland and stream updates in a single table, while leaving Table 1 Project Mitigation Components unchanged; the project credits cannot be changed without a mitigation plan addendum, which is not necessary at this time; please revise the digitals accordingly and submit a complete set of final digitals.
Response: Baker made the revisions as requested.

3) Odd pages of Table 9 are printing upside down in the hard copy.
Response: Baker will correct this error in the final printed hardcopies.

4) Please optimize/compress the report PDF if possible.
Response: Baker has compressed the report PDF as much as possible.

As requested, two final hardcopies will be submitted to you along with a flash drive containing the report PDF along with all digital support files. Please do not hesitate to contact me should you have any questions regarding our response submittal.

Sincerely,

Scott King, LSS, PWS

UT to Town Creek Restoration Project – Option A
Final Year 6 Monitoring Report

Stanly County, North Carolina

DMS Project ID Number – 94648; NC DEQ Contract No. 003277

SAW-2013-01280; DWR#14-1024

Yadkin Pee-Dee River Basin: 03040105060040

Report Prepared and Submitted by Michael Baker Engineering, Inc.

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*Note: The figures and tables marked above with an asterisk are not included as part of this Year 6 Monitoring Report, but were left listed in the Table of Contents to explain the otherwise out-of-sequence figure/table numbering and appendix designations. For clarity, Michael Baker wishes to preserve the continuity of the labeling for these features between monitoring years to avoid confusion. These figures and tables have been included in past reports but will no longer be included again as the stream portion of this project no longer has standard stream monitoring.

1.0 EXECUTIVE SUMMARY

Michael Baker Engineering, Inc., (Michael Baker) restored 5,554 linear feet (LF) and enhanced 791 LF (447 LF of Enhancement I and 344 LF of Enhancement II) of perennial and intermittent stream along an Unnamed Tributary (UT) to Town Creek and three additional unnamed tributaries. Also as part of this Project, Michael Baker restored and created 4.12 acres of riparian wetlands and enhanced 1.00 acre of riparian wetlands and constructed two wetland best management practices (BMPs) upstream of the mitigation areas. Though no mitigation credit is being sought for wetland enhancement, additional stream mitigation credit is being sought for the inclusion of the proposed stormwater BMPs and the extended riparian buffer width within the conservation easement. This report documents and presents the Year 6 monitoring data as required during the monitoring period.

The primary goals of the Project were to improve aquatic habitat degradation by improving ecologic functions and reducing non-points source loads from agricultural run-off to the impaired areas as described in the Lower Yadkin – Pee Dee River Basin Restoration Priorities (RBRP) and as identified below:

- Improve aquatic and terrestrial habitat through increasing dissolved oxygen concentrations, reduction in nutrient and sediment loading, improving substrate and in-stream cover, and reduction of in-stream water temperature;
- Improve both aquatic and riparian aesthetics;
- Create geomorphically stable conditions along UT to Town Creek and its tributaries through the Project area;
- Prevent cattle from accessing the project area thereby protecting riparian and wetland vegetation and reducing excessive bank erosion;
- Restore historical wetlands, create new wetlands, and enhance/preserve existing wetlands to improve terrestrial habitat and reduce sediment and nutrient loading to UT to Town Creek and the Little Long Creek Watershed.

To accomplish these goals, the following objectives were identified:

- Restore, enhance, create, and protect riparian wetlands and buffers to reduce nutrient and pollutant loading by particle settling, vegetation filtering and nutrient uptake;
- Construct wetland BMPs on the upstream extent of Reaches 4 and 7 to improve water quality by capturing and retaining stormwater run-off from the adjacent cattle pastures to allow for the biological removal of nutrient pollutant loads and for sediment to settle out of the water column;
- Restore existing incised, eroding, and channelized streams by creating stable channels with access to their geomorphic floodplains;
- Improve in-stream habitat by providing a more diverse bedform with riffles and pools, creating deeper pools and areas of water re-aeration, and reducing bank erosion;
- Control invasive species vegetation within the project reaches;
- Establish native stream bank, riparian floodplain, and wetland vegetation, protected by a permanent conservation easement, to increase stormwater runoff filtering capacity, improve bank stability, shade the stream to decrease water temperature, and provide improved wildlife habitat quality.

UT to Town Creek Restoration Project – Option A (site) is located in Stanly County, approximately 1.7 miles west of the Town of New London, within cataloging unit 03040105 of the Yadkin Pee-Dee River Basin (see Figure 1). The site is located in a North Carolina Division of Mitigation Services (NCDMS) - Targeted Local Watershed (03040105060040). The Project involved stream restoration and enhancement, as well as wetland restoration, creation, and enhancement along UT to Town Creek and several of its tributaries, which had been impaired due to historical pasture conversion and cattle grazing.

On June 3rd of 2021, the IRT held an on-site meeting to review early closeout for wetland credits and normal closeout for stream credits. As detailed in the meeting minutes found in Appendix F, it was ultimately decided that the wetland portion of the project will require continued monitoring through Year 7. As a result, while the stream portion of the project was performing well and no longer requires the standard monitoring protocols, it has not officially closed-out and any subsequent damage to the system must be repaired. Monitoring reports for Years 6 and 7 will therefore consist of vegetation assessments within the wetland areas, wetland gauge monitoring, and invasive species management.

During Year 6 monitoring, vegetation conditions were performing at over 90% for planted acreage and close to 100% for invasive/encroachment area categories. As noted in Table 6b, an area (VPA6-1) of low herbaceous vegetation and poor growth rates has continued to persist from MY2. This area is located along Reach 2 between Vegetation Plot 14 and 13 and consists of approximately 0.06 acres. This area was supplemental planted with gallon plants, annual seed, perennial grass plugs and appropriate amount of lime in May 2020, but due to harsh temperatures and compacted clay soils this area is expected to have a high mortality. Michael Baker plans to continue seed and soil amendments to this area as noticeable improvements are being made. VPA data and photographic documentation collected during Year 6 monitoring are located in Appendix B. See Tables 6a through 6b for VPA data documentation.

For Monitoring Year 6, no areas of invasive species were reported as none of the areas exceed the mapping threshold of 1,000 square feet (SF) and due to successful treatments conducted throughout 2021. Two treatment sessions were performed in April 2021 treating invasive species throughout the entire site. Species targeted consist of primarily Chinese privet (*Ligustrum sinese*) along with multi-flora rose (*Rosa multiflora*), princess tree (*Paulownia tomentosa*), and parrot feather *(Myriophyllum aquaticum)*. The presence of these invasive species tend to occur predominantly in areas of the easement where mature woody vegetation is present and along the easement fence line with the exception of parrot feather found within the stream channel. These species will continue to be monitoring and treated as necessary for the remaining monitoring years.

Based on data collected from the fourteen monitoring plots located within the credited wetland areas during Year 6 monitoring the density of total planted stems per plot ranges from 445 to 769 stems per acre with a tract mean of 604 stems per acre. Therefore, the Year 6 data demonstrate that the site has exceeded the minimum success criteria of 260 trees per acre by the end of Year 5 and is expected to meet in Year 7. The presence of volunteer woody vegetation was noted in vegetation plots; however, these species were not included in the average vegetation plot densities calculated for assessing the project's interim success criteria. Vegetation stem counts are summarized in Tables 7 and 9 of Appendix C.

Groundwater monitoring data collected during the growing season (March 27 through November 5) of Years 2, 3, 4, 5, and 6 documented that all ten groundwater monitoring wells exhibited soil saturation within 12 inches of the ground surface for the minimum success criteria hydroperiod of nine percent (9%) or 20 consecutive days during the growing season. Five of the ten groundwater wells' hydroperiods exceeded 50% with a high of 83.8%. The lowest hydroperiod was for well 8 at 12.6%. See Appendix E for a plot of wetland gauge data as it relates to monthly precipitation for Monitoring Year 6 (Figure 6). The Monitoring Year 6 wetland restoration success results are depicted in Table 12, and a summary of wetland attainment for all ten monitoring gauges is depicted in Table 12a. See Figure 2 (CCPV) in Appendix B for a depiction of wetland mitigation areas and corresponding gauge locations.

Also, as explained in detail in the Wetland Boundary Adjustment memo found in Appendix G, a small area of additional wetland has been added as Creation (0.192 ac) as suggested by the IRT to compensate for the small

area of Restoration removed (0.047 ac) following the IRT site visit in June of 2019. This new area is but a small subset of the originally expanded Creation area submitted for addition in February 2021 as part of the MY5/Closeout report. Based on IRT comments on these areas during their field visit in June of 2021, much of these have been removed. The small area retained for Creation was the wettest looking portion and was readily accepted by the IRT in the field. It is also located very near the Restoration area being removed and was the area specifically pointed out by Mac Haupt (DEQ) during the June 2019 field visit as wetlands he suggested Michael Baker add. For these reasons, only this small, revised wetland area is being requested for addition as Creation (at a 3:1 ratio) to help ensure a smooth closeout of wetland credits next year.

However, as a consequence of the revised Creation wetland boundary, the results from the USACE Stream Buffer Credit Calculator spreadsheet tool were affected as well. The additional credited wetland Creation area must be accounted for in the tool. As per DMS/IRT instruction, the same tool version (1/19/2018) that had been originally used for credit calculation was used here again for the revised analysis. The results indicate that by adding that small wetland Creation area, the project loses 2.68 SMUs as compared to the original analysis conducted in 2018 for the mitigation plan. For a more detailed explanation of this analysis, please see the Wetland Boundary Adjustment memo in Appendix G for the spreadsheet tool results and maps. The report e-submission provides the Excel spreadsheet and GIS shapefiles as well.

The reduction of credits from the revised buffer tool was raised with the Corps by email along with a detailed explanation of all of the revisions that lead to the change. In their response on 12/13/21, the Corps stated that our current wetland boundary adjustment approach was acceptable and that the slight reduction in credits from the buffer tool would not result in reduced closeout stream credits (given the small number of credits involved). The email exchange is also included in the Wetland Boundary Adjustment memo in Appendix G.

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 NCDMS website. All raw data supporting the tables and figures in the appendices is available from NCDMS upon request.

2.0 METHODOLOGY

The monitoring plan for the site includes criteria to evaluate the success of the stream, wetland, and vegetation components of the project. Complete stream and vegetation monitoring was successfully conducted for five years, while wetland monitoring will be conducted for seven years. A reduced monitoring protocol is now being conducted for the stream and vegetation portion of the project until final closeout approval with the wetlands in Year 7. Monitoring methods used will follow the NCDMS Monitoring Report Template, Version 1.2.1 – 12/01/09 and are based on the design approaches and overall project goals. To evaluate success criteria associated with a geomorphically stable channel, hydrologic connectivity, and aquatic habitat diversity, geomorphic monitoring methods will be conducted for project reaches that involve Restoration and Enhancement Level I mitigation. The success criteria for the proposed Enhancement Level II reaches/sections will follow the methods described in sections 2.1.3, 2.1.4, and 2.2, whereas, wetland restoration and creation mitigation will follow those outlined in sections 2.3. The specific locations of monitoring features, such as vegetation plots, permanent cross-sections, reference photograph stations, ground water gauges, flow gauges, and crest gauges, are shown on the CCPV sheets found in Figure 2 of Appendix B.

Year 6 monitoring data were collected from September through November 2021. Vegetation data and plot photos were collected on September 14th of 2021.

2.1 Stream Monitoring

As noted in the meeting minutes from the June 2021 IRT field visit, the stream portion of the project has performed well and a reduced monitoring protocol consisting of visual inspections has been allowed for the

final two monitoring years, though the stream credits are not yet closed out. As such, any impacts to stream function (bank scour, invasive species, etc.) will still be required to be addressed.

2.2 Vegetation Monitoring

To determine if the criteria are achieved, vegetation-monitoring quadrants were installed and are monitored across the restoration site in accordance with the CVS-NCDMS Protocol for Recording Vegetation, Level 1, Version 4.2 (Lee 2008). The total number of quadrants was calculated using the CVS-NCEEP Entry Tool Database version 2.3.1 (CVS-NCEEP 2012) with twenty (20) plots established randomly within the planted riparian buffer areas. No monitoring quadrants were established within the undisturbed wooded areas of the project area. The size of individual quadrants are 100 square meters for woody tree species.

Level 1 CVS vegetation monitoring was conducted between spring, after leaf-out has occurred, and fall prior to leaf fall. Individual quadrant data provided during subsequent monitoring events includes species composition, density, survival, and stem height. Relative values were calculated, and importance values were determined. Individual seedlings were marked to ensure that they can be found in succeeding monitoring years. Mortality was determined from the difference between the previous year's living, planted seedlings and the current year's living, planted seedlings.

2.3 Wetland Monitoring

Ten groundwater monitoring stations were installed in restored, created, and enhanced wetland areas similar to those from preconstruction monitoring to document hydrologic conditions at the Project site. The wetland gauges are depicted on the CCPV figures (Figure 2) found in Appendix B. Installation and monitoring of the groundwater stations have been conducted in accordance with the USACE standard methods outlined in the *ERDC TN-WRAP-05-2* (USACE 2005). To determine if the rainfall is normal for the given year, rainfall amounts were tallied using data obtained from the Stanly County WETS Station (USDA 2021) and from the automated weather station at the North Stanly Middle School (NEWL) in New London, approximately 1.5 miles southeast of the project site on Old Salisbury Road. Data from the NEWL station was obtained from the CRONOS Database located on the State Climate Office of North Carolina's website (2021).

Success criteria for wetland hydrology is met when each wetland site is saturated within 12 inches of the soil surface for 9 percent of the growing season as documented in the approved Mitigation Plan. To document the hydrologic conditions of the restored site, each groundwater monitoring station has been monitored for five years post-construction or until wetland success criteria are met. Visual inspection of proposed wetland areas was conducted to document any visual indicators that would be typical of jurisdictional wetlands. This could include, but is not limited to, vegetation types present, surface flow patterns, stained leaves, and ponded water. Wetland plants are documented along with other visual indicators noted above. Wetland restoration and creation areas that exhibit all three wetland indicators (the presence of hydric soils, wetland hydrology, and wetland vegetation) after construction and through the monitoring period validate wetland restoration and creation success.

2.4 BMP Monitoring

The wetland BMPs located at the upstream extent of Reaches 4 and 7 will be visually monitored for vegetative survivability and permanent pool storage capacity during the remaining monitoring period. Maintenance measures will be performed as necessary.

3.0 REFERENCES

Lee, M., Peet R., Roberts, S., Wentworth, T. 2008. CVS-EEP Protocol for Recording Vegetation Level 1-2 Plot Sampling Only. Version 4.2.

North Carolina Division of Mitigation Services (formerly NC Ecosystem Enhancement Program). 2011. Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation. November 7, 2011.

2009. Lower Yadkin Pee-Dee River Basin Restoration Priorities, revised January 2009. Raleigh, NC.

2009. Procedural Guidance and Content Requirements for EEP Monitoring Report, v. 1.2.1. Raleigh, NC.

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

State Climate Office of North Carolina, 2021. CRONOS Database, North Stanly Middle School (NEWL), Stanly County, NC. http://climate.ncsu.edu/cronos/?station=NEWL&temporal=sensormeta

United States Department of Agriculture, 2021. WETS Table. Climate Data for Stanly County, NC. Wets Station: Albemarle, NC 0090, FIPS: 37167, 1971 - 2018. http://agacis.rcc-acis.org/37167/wets

United States Army Corps of Engineers. 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

Project Vicinity Map and Background Tables

DIRECTIONS TO SITE FROM RALEIGH, NC:
Take I-40 West toward Sanford/Wake Forest. Take Exit 293 (I-440/US-64 W/US-1) toward Sanford/Wake Forest. Keep left at the fork toward US-1 S/US-64 W. Take Exit 293A for US-1 S/US-64 W toward Sanford/Asheboro. Keep left at the fork toward US-1 S/US-64 W. Continue on US-1 S/US-64 W towards Apex/Sanford/Asheboro. Take exit 98B to merge onto US-64 W towards Pittsboro/Asheboro. After 62 miles, turn left onto Connector Rd. Turn right onto NC 49 S. After 28.4 miles, take a slight left onto N Main St. After 1.1 miles, turn left onto Old Salisbury Rd. Follow Old Salisbury Rd. for approximately 2.0 miles to its intersection with Misenheimer Rd. / Steakhouse Rd. Go through the intersection and continue on Old Salisbury Rd. for approximately 0.4 miles and the Project site is on the right accessed via a dirt farm road.

The subject project site is an environmental restoration site of the NCDEQ Division of Mitigation Services (DMS) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with DMS.

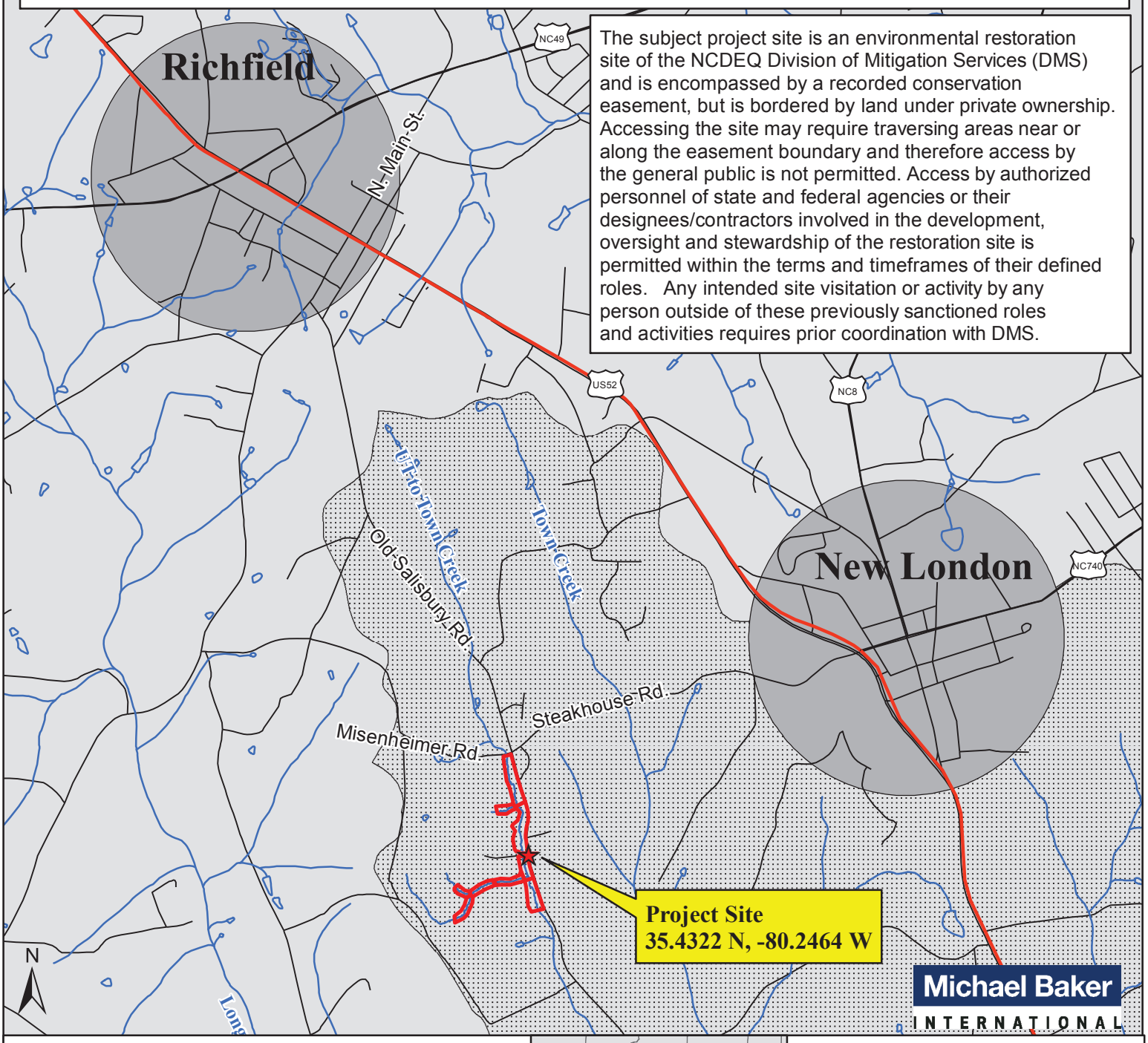


Figure 1. Vicinity Map

UT to Town Creek Restoration Project - Option A

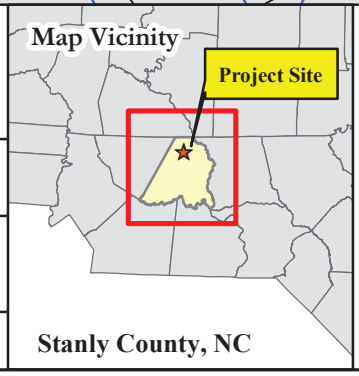
Stanly County, NC

Reference: NCDOT 02 & NC One Map

NC DMS Project No. 94648
NCDEQ Contract No. 003277

2021

0 1,500 3,000 Feet 1" = 3000'



LEGEND

- Project Area
- Streams
- US Highways
- Roads
- Major Waterways
- Municipalities
- Yadkin (HUC 03040105060-040)

Table 1. Project Mitigation Components
UT to Town Creek Restoration Project - Option A: DMS Project No ID. 94648

Project Component (reach ID, etc.)	Wetland Position and Hydro Type	Existing Footage or Acreage	Stationing	Restored Footage, Acreage, or SF	Creditable Footage, Acreage, or SF*	Restoration Level	Approach		Mitigation Credits	Notes/Comments
							Priority Level	Mitigation Ratio (X:1)		
Reach 1		1181	10+00 - 22+04	1,204	1,204	R	PI	1:1	1204.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, and Permanent Conservation Easement. Mitigation ratio of 1:1.0668 for buffer widths in excess of 50-ft.
Reach 2		1672	22+04 - 40+46	1,842	1,782	R	PI	1:1	1782.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement, and a 60-ft culverted farm road crossing. Mitigation ratio of 1:1.07 for buffer widths in excess of 50-ft.
Reach 3		721	40+46 - 48+75	829	829	R	PI	1:1	829.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, and Permanent Conservation Easement. Mitigation ratio of 1:1.1 for buffer widths in excess of 50-ft.
Reach 4		404	10+00 - 14+47	447	447	EI	PIII	1:1	447.000	Dimension and Profile modified in keeping with reference, Planted Buffer, Livestock Exclusion, Permanent Conservation Easement, and Headwater Constructed Wetland. Mitigation Ratio of 1:1 as result of water quality benefits from the implementation of headwater constructed wetland.
Reach 5		324	10+00 - 13+44	344	344	EII	PIV	2.5:1	137.600	Dimension modified and structure implementation in keeping with reference, Planted Buffer, Livestock Exclusion, and Permanent Conservation Easement.
Reach 6		1349	14+47 - 28+13	1,366	1,340	R	P1	1:1	1340.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement, and a 26-ft culverted farm road crossing.
Reach 7		386	10+00 - 13+99	399	399	R	P1	1:1	399.000	Headwater Constructed Wetland, Full Channel Restoration, Planted Buffer, Livestock Exclusion, and Permanent Conservation Easement.
Reach 1, 2, 3		-	-	-	-	-	-	-	265.000	Additional stream credits calculated and approved by DMS on 6/21/18 for buffers in excess of 50-ft along Reach 1 - 3.
Wetland Group 1 (WG1)	RNR	0		2.560	2.560	R		1:1	2.560	Minor floodplain grading, of 12-inches or less, to restore floodplain hydrolgy and remediate compaction, based on hydric soil investigation. Planted, Excluded Livestock and Permanent Conservation Easement.
Wetland Group 2 (WG2)	RNR	0		1.560	1.560	C		3:1	0.520	Floodplain grading, of 12-inches or greater, to restore relic floodplain hydrolgy and remediate compaction, based on hydric soil investigation. Planted, Excluded Livestock and Permanent Conservation Easement.

Length and Area Summations by Mitigation Category

Restoration Level	Stream	Riparian Wetland		Non-riparian Wetland	Credited Buffer
	(linear feet)	(acres)		(acres)	(square feet)
		Riverine	Non-Riverine		
Restoration	5554.000	2.560			
Enhancement					
Enhancement I	447.000				
Enhancement II	344.000				
Creation		1.560			
Preservation					
High Quality Pres					

* Creditable stream footage is based on as-built lengths as approved in the Mitigation Plan.

Overall Assets Summary

Asset Category	Overall Credits
Stream (ft)	**6,403.600**
RP Wetland (ac)	**3.080**

General Note - The above component table is intended to be a close complement to the asset map. Each entry in the above table should have clear distinction and appropriate symbology in the asset map.

1 - **Wetland Groups** represent pooled wetland polygons in the map with the same wetland type and restoration level. If some of the wetland polygons within a group are in meaningfully different landscape positions, soil types or have different community targets (as examples), then further segmentation in the table may be warranted. **Buffer groups** represent pooled buffer polygons with common restoration levels.

2 - **Wetland Position and Hydro Type** - Indicates Riparian Riverine, (RR) , riparinan non-riverine (RNR) or Non-Riverine (NR)

3- **Restored** Footage, Acreage or Square Feet (SF)

4 - **Creditible Footage**, Acreage or Square feet - creditible anounts after

Table 2. Project Activity and Reporting History
UT to Town Creek Restoration Project - Option A: DMS Project No ID. 94648

Activity or Report	Scheduled Completion	Data Collection Complete	Actual Completion or Delivery
Mitigation Plan Prepared	N/A	N/A	Apr-2014
Mitigation Plan Amended	N/A	N/A	Dec-2014
Mitigation Plan Approved	N/A	N/A	Dec-2014
Final Design – (at least 90% complete)	N/A	N/A	Jan-2015
Construction Begins	N/A	N/A	Jul-2015
Temporary S&E mix applied to entire project area	N/A	N/A	Jan-2016
Permanent seed mix applied to entire project area	N/A	N/A	Jan-2016
Planting of live stakes	Feb-2016	N/A	Mar-2016
Planting of bare root trees	Feb-2016	N/A	Mar-2016
Planting of herbaceous plugs	Jun-2016	N/A	May-2016
End of Construction	Dec-2016	N/A	Jan-2016
Survey of As-built conditions (Year 0 Monitoring-baseline)	Apr-2016	May-2016	Jun-2016
Baseline Monitoring Report	May-2016	Jun-2016	Nov-2016
Year 1 Monitoring	Dec-2016	Nov-2016	Dec-2016
Invasive Treatment	N/A	N/A	Mar-2017
Year 2 Monitoring	Dec-2017	Nov-2017	Dec-2017
Additional Riparian Planting	N/A	N/A	Mar-2018
Invasive Treatment	N/A	N/A	Apr-2018
Year 3 Monitoring	Dec-2018	Nov-2018	Dec-2018
Year 4 Monitoring	Dec-2019	Nov-2019	Jan-2020
Additional Riparian Planting	N/A	N/A	Sep-2019
Invasive Treatment	N/A	N/A	Jun-2019
Year 5 Monitoring	Dec-2020	Dec-2020	Jan-2021
Additional Riparian Planting	N/A	N/A	Jan-2020
Invasive Treatment	N/A	N/A	Apr-2020
Year 6 Wetland Monitoring	Dec-2021	Nov-2021	Dec-2021
Invasive Treatment	N/A	N/A	Apr-2021
Year 7 Wetland Monitoring	Dec-2022	N/A	N/A

Table 3. Project Contacts UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648	
Designer	
Michael Baker Engineering, Inc.	8000 Regency Parkway, Suite 600 Cary, NC 27518 Contact: Kathleen M. McKeithan, PE, Tel. 919-481-5703 Scott King, PWS, Tel. 828-412-6102
Construction Contractor	
Wright Contracting, LLC.	160 Walker Road Lawndale, NC 28090 Contact: Joe Wright, Tel. 919-663-0810
Planting Contractor	
H.J. Forest Service	P.O. Box 458 Holly Ridge, NC 28445 Contact: Matt Hitch, Tel. 910-512-1743
Seeding Contractor	
Wright Contracting, LLC.	160 Walker Road Lawndale, NC 28090 Contact: Joe Wright, Tel. 919-663-0810
Seed Mix Sources	Green Resources, Tel. 336-855-6363 Mellow Marsh Farm, Tel. 919-742-1200
Nursery Stock Suppliers	Mellow Marsh Farm, Tel. 919-742-1200 Foggy Mountain Nursery, Tel. 336-384-5323 ArborGen, Tel. 843-528-3203
Monitoring Performers	
Michael Baker Engineering, Inc.	8000 Regency Parkway, Suite 600 Cary, NC 27518
Stream Monitoring Point of Contact	Contact: Andrew Powers, Tel. 919-481-5732
Vegetation Monitoring Point of Contact	Andrew Powers, Tel. 919-481-5732

Table 4. Project Attributes
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Project County	Stanly						
Physiographic Region	Piedmont						
Ecoregion	Carolina Slate Belt						
Project River Basin	Yadkin - Pee Dee						
USGS HUC for Project (14 digit)	03040105060040						
NCDWQ Sub-basin for Project	03-07-13						
Within Extent of DMS Watershed Plan	Lower Yadkin RBRP, 2009						
WRC Class (Warm Cool Cold)	Warm						
% Project Easement Fenced/Demarcated	100%						
Beaver activity observed during design phase	No activity observed						
Restoration Component Attribute Table							
	Reach 1	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 5**	**Reach 6**	**Reach 7**
Drainage Area (ac.)	532.1	616.6	766.7	53.7	48.9	127.8	29.2
Stream Order	2	2	3	1	1	2	1
Restored Length (LF)	1,204	1,782	829	447	344	1,340	399
Perennial (P)/Intermittent (I)	P	P	P	I	I	I	I
Watershed Type (Rural, Urban, etc.)	R	R	R	R	R	R	R
Watershed LULC Distribution							
Rural Residential	6%	1%	0%	1%	2%	0%	0%
Ag-Row Crop	8%	0%	0%	14%	4%	0%	10%
Ag-Livestock	57%	85%	70%	59%	17%	88%	64%
Forested	8%	0%	0%	17%	62%	0%	21%
Other/Open Area	8%	0%	0%	0%	9%	0%	0%
Commercial	10%	0%	0%	0%	0%	0%	0%
Roadway	3%	4%	2%	3%	<1%	0%	0%
Wooded-Livestock	0%	10%	28%	6%	4%	12%	5%
Open Water	0%	0%	0%	0%	<1%	0%	0%
Watershed Impervious Cover (%)	19%	5%	2%	4%	<4%	<1%	<1%
NCDWR AU/Index#	13-17-31-1-1						
NCDWQ Classification	C						
303(d) Listed	No						
303 (d) Listing Stressor	N/A						
Total Acreage of Easement	5.35	8.01	3.79	1.97	1.06	3.55	1.36
Total Vegetated Easement Acreage	4.81	6.97	3.48	1.63	0.94	3.22	1.26
Total Planted Acreage for Restoration	4.81	6.97	3.48	1.63	0.94	3.22	1.26
	Reach 1	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 5**	**Reach 6**	**Reach 7**
Rosgen Classification (existing)	E4	E4	E4	B4	B4	B4	B4a
Rosgen Classification (as-built)	C4	C4	C4	B4	B4	C4b	B4a
Valley Type	VIII	VIII	VIII	II	II	II	II
Valley Slope	0.0092	0.0092	0.0089	0.023	0.0447	0.0243	0.0495
Trout Waters Designation	No						
Species of Concern, edangered etc. (Y/N)	No*, Yes**						
Dominant Soil Series and Characteristics							
Series	OaA	OaA	OaA	GoF	GoF	GoF	BaD
Depth	46”	46”	46”	36”	36”	36”	40”
Clay %	10-35%	10-35%	10-35%	5-27%	5-27%	5-27%	Oct-55
K	0.28	0.28	0.28	0.05	0.05	0.05	0.15-0.24
T	4	4	4	4	4	4	3

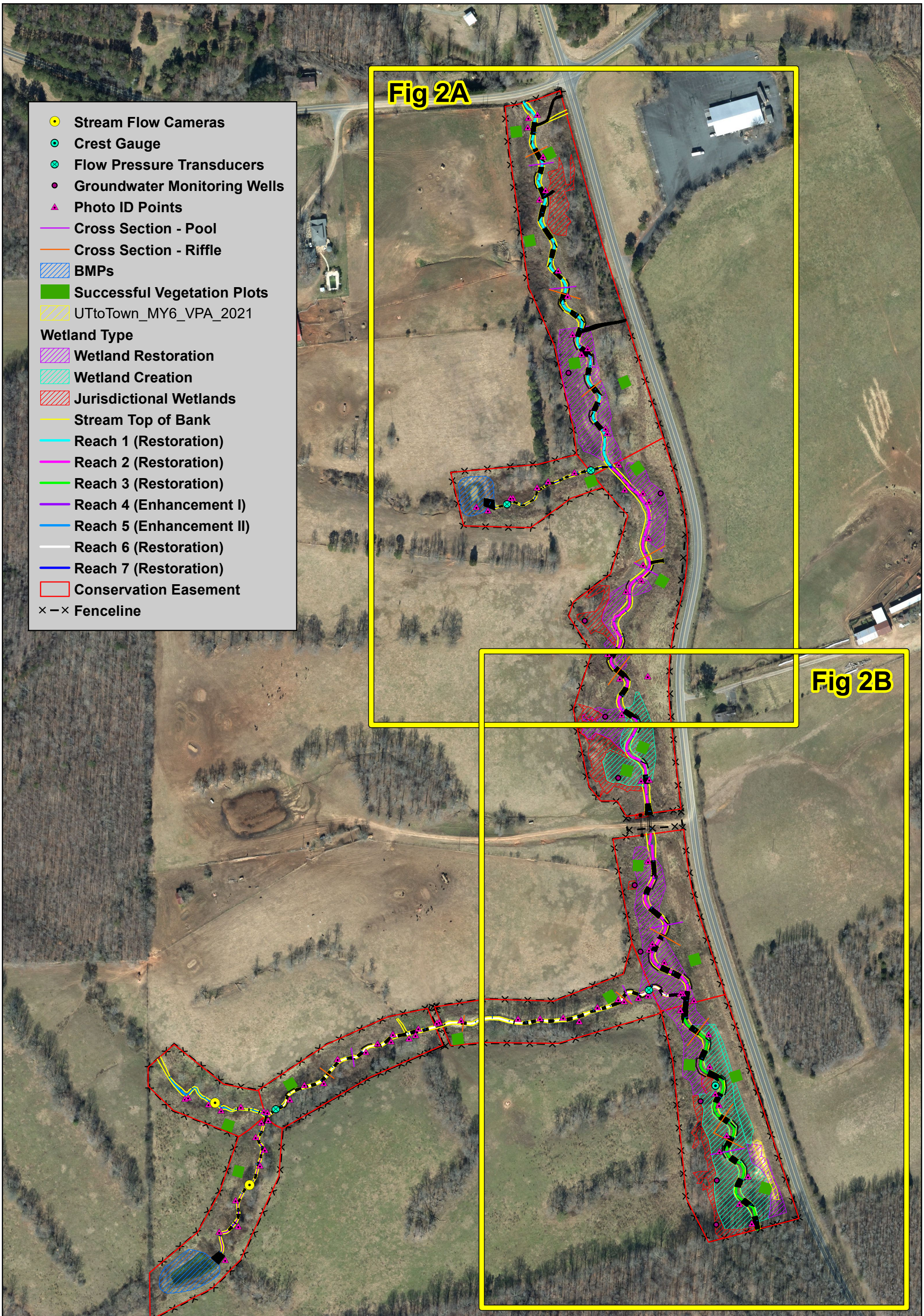
* Bald Eagle (*Haliaeetus leucocephalus*) a BGEPA species is listed as occurring in Stanly County; however, suitable habitat is not located within the Project area or within two miles of the Site.

** Schweinitz’s Sunflower (*Helianthus schweinitzii*) A federally endangered species is listed as occurring within Stanly County and though suitable habitat is present, a field study was conducted and no species were located within the Project area. NCNHP database indicated there are no known populations of these species within two miles of the study area.

(NRCS, 2010a; NCDENR, 2007 & 2008; USFWS, 2012; NCNHP, 2012)

APPENDIX B

Visual Assessment Data



Michael Baker INTERNATIONAL

North Carolina Division of Mitigation Services

N

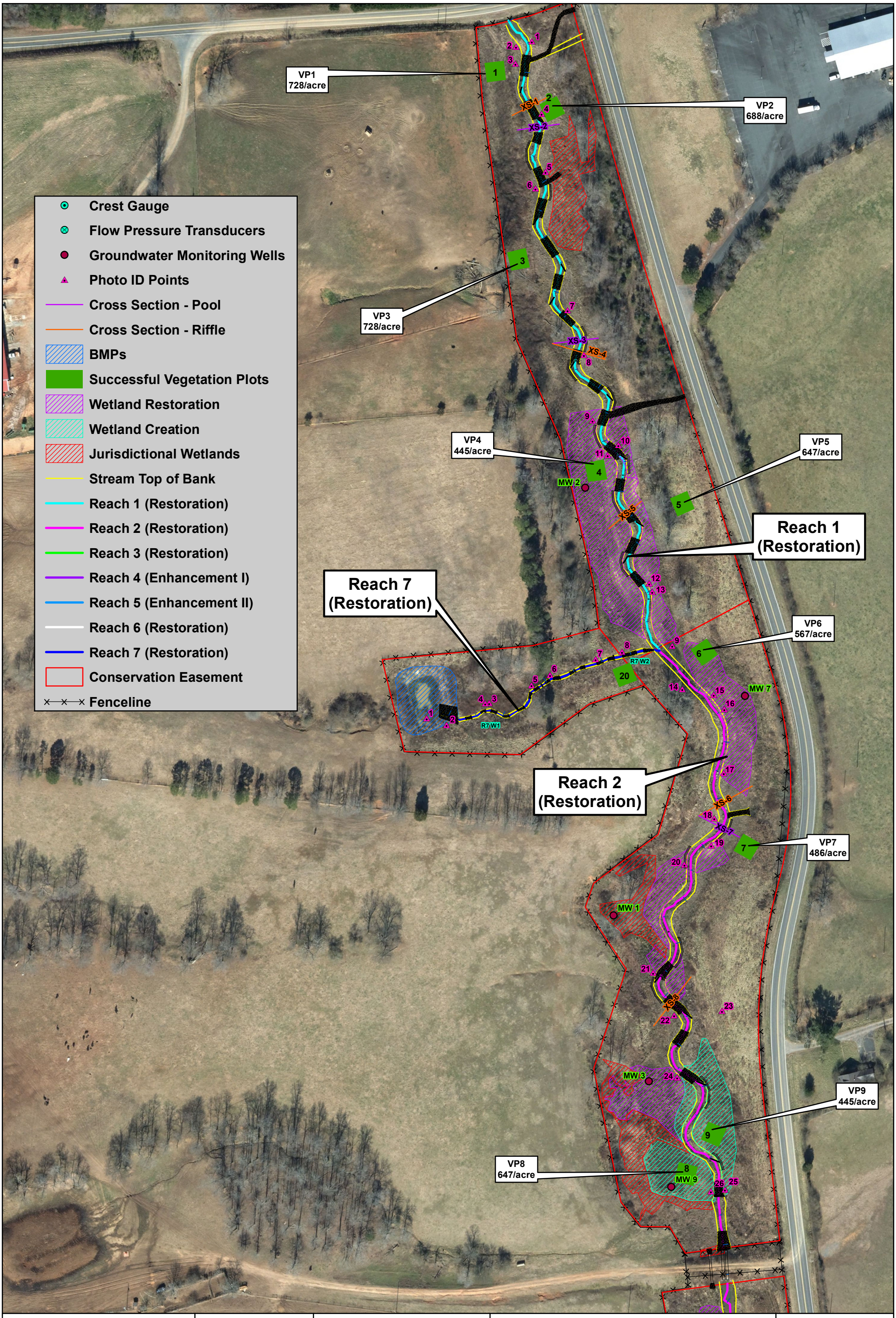
0 125 250 Feet

1" = 250'

Figure 2 Overview
Current Condition Plan View

UT to Town Creek Restoration Project - Option A
Stanly County, NC

DMS Project No.	94648
Monitoring Year:	6
Drawn By:	ADP
Date:	2021
Sheet:	1 of 3



Michael Baker INTERNATIONAL

North Carolina Division of Mitigation Services

N 0 62.5 125 Feet

1" = 125'

Figure 2A
Current Condition Plan View

UT to Town Creek Restoration Project - Option A
Stanly County, NC

DMS Project No. 94648
Monitoring Year: 6
Drawn By: ADP
Date: 2021
Sheet 2 of 3

- Crest Gauge
- Flow Pressure Transducers
- Groundwater Monitoring Wells
- Photo ID Points
- Cross Section - Pool
- Cross Section - Riffle
- BMPs
- Successful Vegetation Plots
- Vegetation Problem Area
- Wetland Restoration
- Wetland Creation
- Jurisdictional Wetlands
- Stream Top of Bank
- Reach 1 (Restoration)
- Reach 2 (Restoration)
- Reach 3 (Restoration)
- Reach 4 (Enhancement I)
- Reach 5 (Enhancement II)
- Reach 6 (Restoration)
- Reach 7 (Restoration)
- Conservation Easement
- Fenceline

MW 9
8
26
25
VP10
728/acre
27
10
MW 8
XS-9
XS-10
28
MW 4
29
30
11
VP11
769/acre
XS-15
XS-16
R6 W2
15
22
23
24
25
31
26
20
21
16
17
18
19
32
XS-11
33
VP12
486/acre
12
34
13
VP13
486/acre
35
MW 5
36
XS-12
37
XS-13
38
XS-14
VPA 6-1
VP14
607/acre
MW 10
39
14
40
MW 6
41

Reach 3
(Restoration)

NC Center for Geographic Information & Analysis, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Michael Baker INTERNATIONAL	North Carolina Division of Mitigation Services	N 0 62.5 125 Feet 1" = 125'	**Figure 2B** **Current Condition Plan View** UT to Town Creek Restoration Project - Option A Stanly County, NC	DMS Project No. 94648 Monitoring Year: 6 Drawn By: ADP Date: 2021 Sheet: 3 of 3

Table 6a. Vegetation Condition Assessment
UT to Town Creek Restoration Project: Project No. 94648

Reach ID	**Reaches 1 - 7**					
Planted Acreage	**22.31**	**Assessment Date 9/30/2021**				
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	VPA6-1	1	0.06	0.3%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY4 or 5 stem count criteria.	0.1 acres	N/A	0	0.00	0.0%
			Total	1	0.06	0.4%
3. Areas of Poor Growth Rates or Vigor*	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	VPA6-1	1	0.06	0.3%
			Cumulative Total	2	0.12	0.7%
Easement Acreage	**25.09**					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000 SF	N/A	0	0.00	0.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	N/A	N/A	0	0.00	0.0%

Table 6b. Vegetation Problem Areas
UT to Town Creek Restoration Project: Project No. 94648

Feature Issue	Station No.	Suspected Cause	Problem Area / Photo Number
Reach 1			
Invasive/Exotic Populations	Reachwide in various locations	Myriophyllum aquaticum (parrot feather) growing in various locations along the channel reach due low flow conditions present during the monitoring assessment.	No VPA was associated with this problem area because it is a reachwide issue that's been treated since MY3.
Reach 2			
Invasive/Exotic Populations	Reachwide in various locations	Myriophyllum aquaticum (parrot feather) growing in various locations along the channel reach due low flow conditions present during the monitoring assessment.	No VPA was associated with this problem area because it is a reachwide issue that's been treated since MY3.
Reach 3			
Invasive/Exotic Populations	Reachwide in various locations	Myriophyllum aquaticum (parrot feather) growing in various locations along the channel reach due low flow conditions present during the monitoring assessment.	No VPA was associated with this problem area because it is a reachwide issue that's been treated since MY3.
Bare Areas	46+50 - 48+60	Poor soils noted in an area where supplemental seeding were installed durning MY5.	VPA 6-1
Poor growth rates	46+50 - 48+60	Poor growth rates were noted in this area with very dense compacted clay soils.	VPA 6-1
Reach 4			
Invasive/Exotic Populations	N/A	*Ligustrum sinese* (Chinese privet)	No VPA was associated with this problem area because very minimal amounts are scattered throughout the reach with continual treatments.
Reach 5			
Invasive/Exotic Populations	N/A	*Ligustrum sinese* (Chinese privet)	No VPA was associated with this problem area because very minimal amounts are scattered throughout the reach with continual treatments.
Reach 6			
Invasive/Exotic Populations	N/A	*Ligustrum sinese* (Chinese privet)	No VPA was associated with this problem area because very minimal amounts are scattered throughout the reach with continual treatments.
Reach 7			
Invasive/Exotic Populations	N/A	*Ligustrum sinese* (Chinese privet)	No VPA was associated with this problem area because very minimal amounts are scattered throughout the reach with continual treatments.

Note: The first digit in the Photo Number column references the monitoring year and the second digit references the problem area or photo (which would be identical to a prior years problem area/photo number when persisting from a previous monitoring year).

Vegetation Problem Area Photos

VPA 6-1– Photo of poor growth rates. (11/22/21)

VPA 6-1 – Photo of poor growth rates. (11/22/21)

VPA 6-1 – Photo of bare areas and areas of poor growth rates. (9/30/21)

VPA 6-1 Photo of poor growth rates. (11/22/21)

APPENDIX C

Vegetation Plot Data

Table 7. Vegetation Plot Mitigation Success Summary
UT to Town Creek Restoration Project: Project No. 94648

Wetland/Stream Vegetation Totals (per acre)				
Plot #	**Stream/Wetland Stems[2]**	**Volunteers[3]**	**Total[4]**	**Success Criteria Met?**
VP1	728	567	1295	Yes
VP2	688	202	890	Yes
VP3	728	202	931	Yes
VP4	445	243	688	Yes
VP5	647	0	647	Yes
VP6	567	162	728	Yes
VP7	486	162	647	Yes
VP8	647	243	890	Yes
VP9	445	162	607	Yes
VP10	728	81	809	Yes
VP11	769	40	809	Yes
VP12	486	364	850	Yes
VP13	486	283	769	Yes
VP14	607	202	809	Yes
Project Avg	**604**	**208**	**812**	**Yes**

[1]Buffer Stems: Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.

[2]Stream/ Wetland Stems: Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines.

[3]Volunteers: Native woody stems. Not planted. No vines.

[4]Total: Planted + volunteer native woody stems. Includes live stakes.

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Table 8. CVS Vegetation Plot Metadata	
Report Prepared By	Drew Powers
Date Prepared	9/21/2021 14:37
database name	UTtoTown_84648_MY6_cvs-eep-entrytool-v2.3.1_2021.mdb
database location	C:\Users\Andrew.Powers\Desktop
computer name	CARYLAPOWERS1
file size	51433472
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	94648
project Name	UT to Town Creek Restoration Project - Option A
Description	This project proposes to restore 5,597 linear feet (LF) and enhance 791 LF (444 LF of Enhancement I and 347 LF of Enhancement II) of stream along an Unnamed Tributary (UT) to Town Creek and three additional unnamed tributaries and to restore, enhance, and
River Basin	Yadkin-Pee Dee
length(ft)	
stream-to-edge width (ft)	
area (sq m)	101576
Required Plots (calculated)	20
Sampled Plots	20

Table 9. CVS Stem Count of Planted Stems by Plot and Species
UT to Town Creek Restoration Project: Project No. 94648

			Current Plot Data (MY6 2021)																						
			94648-KS&DH-0001			94648-KS&DH-0002			94648-KS&DH-0003			94648-KS&DH-0004			94648-KS&DH-0005			94648-KS&DH-0006			94648-KS&DH-0007			94648-KS&DH-0008		
Scientific Name	Common Name	Species Type	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T
Acer rubrum	Red maple	Tree											1	1												
Acer negundo	boxelder	Tree							1		1															
Alnus serrulata	hazel alder	Shrub																								
Asimina triloba	pawpaw	Tree																								
Baccharis	baccharis	Shrub																	3	3						
Betula nigra	river birch	Tree	1		1	1		1	4		4	2	1	3	2		2	4		4						
Callicarpa americana	American beautyberry	Shrub	1		1													2		2	5		5		1	1
Carpinus caroliniana	American hornbeam	Tree	1		1	2		2	1		1	2		2												
Carya glabra	pignut hickory	Tree																								
Cephalanthus occidentalis	common buttonbush	Shrub																								
Cercis canadensis	eastern redbud	Tree																			1		1			
Cornus amomum	silky dogwood	Shrub										3		3							4		4			
Cornus florida	flowering dogwood	Tree																								
Diospyros virginiana	common persimmon	Tree	4	4	8	3	1	4							4		4							1		1
Fraxinus pennsylvanica	green ash	Tree										1		1												
Liquidambar styraciflua	sweetgum	Tree		5	5																	3	3		2	2
Liriodendron tulipifera	tuliptree	Tree		5	5		3	3				1		1					1	1						
Nyssa sylvatica	blackgum	Tree											1	1												
Platanus occidentalis	American sycamore	Tree	1		1	1		1	4		4	1		1	2		2	4		4				12		12
Populus deltoides	eastern cottonwood	Tree					1	1		2	2		1	1												
Quercus alba	white oak	Tree																			2		2			
Quercus falcata	southern red oak	Tree	2		2	1		1				1	1	2				1		1						
Quercus lyrata	overcup oak	Tree	1		1										1		1									
Quercus michauxii	swamp chestnut oak	Tree	5		5				2		2				1		1									
Quercus pagoda	cherrybark oak	Tree				3		3	1		1															
Quercus phellos	willow oak	Tree	2		2	6		6	5		5				6		6	3		3				2		2
Quercus rubra	northern red oak	Tree																								
Rhus glabra	smooth sumac	shrub																								
Salix nigra	black willow	Tree											1	1										1		1
Sambucus canadensis	Common Elderberry	Shrub																								
Sambucus nigra	European black elderberry	Shrub								3	3															
Ulmus alata	winged elm	Tree																								
Ulmus americana	American elm	Tree																				1	1		3	3
Unknown		Shrub or Tree																								
	Stem count		18	14	32	17	5	22	18	5	23	11	6	17	16	0	16	14	4	18	12	4	16	16	6	22
	size (ares)		1			1			1			1			1			1			1			1		
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
	Species count		9	3	11	7	3	9	7	2	9	7	6	11	6	0	6	5	2	7	4	2	6	4	3	7
	Stems per ACRE		728	567	1295	688	202	890	728	202	931	445	243	688	647	0	647	567	162	728	486	162	647	647	243	890

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

P = Planted
V = Volunteers
T = Total

Table 9. CVS Stem Count of Planted Stems by Plot and Species - Continued
UT to Town Creek Restoration Project: Project No. 94648

			Current Plot Data (MY6 2021)																	
			94648-KS&DH-0009			94648-KS&DH-0010			94648-KS&DH-0011			94648-KS&DH-0012			94648-KS&DH-0013			94648-KS&DH-0014		
Scientific Name	Common Name	Species Type	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T
Acer rubrum	Red maple	Tree																		
Acer negundo	boxelder	Tree																		
Alnus serrulata	hazel alder	Shrub																		
Asimina triloba	pawpaw	Tree																		
Baccharis	baccharis	Shrub														5	5			
Betula nigra	river birch	Tree										3		3						
Callicarpa americana	American beautyberry	Shrub				2		2												
Carpinus caroliniana	American hornbeam	Tree	2		2															
Carya glabra	pignut hickory	Tree																		
Cephalanthus occidentalis	common buttonbush	Shrub							5		5	2		2						
Cercis canadensis	eastern redbud	Tree				1		1												
Cornus amomum	silky dogwood	Shrub	1		1	2		2	1		1				1		1	3		3
Cornus florida	flowering dogwood	Tree	3		3															
Diospyros virginiana	common persimmon	Tree							3		3				7	1	8			
Fraxinus pennsylvanica	green ash	Tree	1		1	8		8				2		2	2		2	2		2
Liquidambar styraciflua	sweetgum	Tree		4	4								2	2					2	2
Liriodendron tulipifera	tuliptree	Tree	1		1				1	1	2	3	2	5				3		3
Nyssa sylvatica	blackgum	Tree				1		1	3		3	2		2	1		1		2	2
Platanus occidentalis	American sycamore	Tree							1		1							3		3
Populus deltoides	eastern cottonwood	Tree																		
Quercus alba	white oak	Tree	1		1	2		2												
Quercus falcata	southern red oak	Tree	1		1															
Quercus lyrata	overcup oak	Tree	1		1										1		1	1		1
Quercus michauxii	swamp chestnut oak	Tree																		
Quercus pagoda	cherrybark oak	Tree							5		5							2		2
Quercus phellos	willow oak	Tree														1	1	1		1
Quercus rubra	northern red oak	Tree																		
Rhus glabra	smooth sumac	shrub																		
Salix nigra	black willow	Tree											5	5						
Sambucus canadensis	Common Elderberry	Shrub																		
Sambucus nigra	European black elderberry	Shrub				2		2												
Ulmus alata	winged elm	Tree																		
Ulmus americana	American elm	Tree					2	2											1	1
Unknown		Shrub or Tree																		
	Stem count		11	4	15	18	2	20	19	1	20	12	9	21	12	7	19	15	5	20
	size (ares)		1			1			1			1			1			1		
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02		
	Species count		8	1	9	7	1	8	7	1	7	5	3	7	5	3	7	7	3	10
	Stems per ACRE		445	162	607	728	81	809	769	40	809	486	364	850	486	283	769	607	202	809

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

P = Planted
V = Volunteers
T = Total

Table 9. CVS Stem Count of Planted Stems by Plot and Species - Continued
UT to Town Creek Restoration Project: Project No. 94648

			Annual Totals																			
			MY6 (2021)			MY5 (2020)			MY4 (2019)			MY3 (2018)			MY2 (2017)			MY1 (2016)			MY0 (2016)		
Scientific Name	Common Name	Species Type	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T
Acer rubra	Red Maple	Tree		1	1		5	5															
Acer negundo	boxelder	Tree	1		1	1	2	3	1	1	2	1	1	2	1		1						
Alnus serrulata	hazel alder	Shrub								1	1												
Asimina triloba	pawpaw	Tree				3		3	3		3	3		3	2		2	6		6	5		5
Baccharis	baccharis	Shrub		8	8																		
Betula nigra	river birch	Tree	15	1	16	18		18	18		18	17		17	17		17	18		18	21		21
Callicarpa americana	American beautyberry	Shrub	10	1	11	10		10	10		10	10		10	13		13	16		16	7		7
Carpinus caroliniana	American hornbeam	Tree	6		6	9		9	10		10	10	2	12	10		10	10		10	16		16
Carya glabra	pignut hickory	Tree								1	1												
Cephalanthus occidentalis	common buttonbush	Shrub	7		7	11		11	11		11	11		11	10		10	8		8	5		5
Cercis canadensis	eastern redbud	Tree	2		2	15	2	17	18		18	18		18	20		20	24		24	29		29
Cornus amomum	silky dogwood	Shrub	12		12	29		29	29	1	30	30	1	31	30		30	29		29	31		31
Cornus florida	flowering dogwood	Tree	3		3	5		5	7		7	7		7	9		9	13		13	21		21
Diospyros virginiana	common persimmon	Tree	22	6	28	34	1	35	35	4	39	34		39	32		32	29		29	7		7
Fraxinus pennsylvanica	green ash	Tree	15		15	37	2	39	39	5	44	39	2	41	39		39	40		40	43		43
Liquidambar styraciflua	Sweetgum	Tree		18	18		1	1															
Liriodendron tulipifera	tuliptree	Tree	8	12	20	11	4	15	13	16	29	14	21	35	12		12	11		11	12		12
Nyssa sylvatica	blackgum	Tree	7	3	10	12	5	17	12	2	14	11		11	13		13	12		12	9		9
Platanus occidentalis	American sycamore	Tree	28		28	31	6	37	31	1	32	31	1	32	30		30	29		29	31		31
Populus deltoides	eastern cottonwood	Tree		4	4																		
Quercus alba	white oak	Tree	5		5	8		8	9		9	9		9	10		10	10		10	12		12
Quercus falcata	southern red oak	Tree	5	1	6	7	2	9	7		7	7		7	7		7	19		19	15		15
Quercus lyrata	overcup oak	Tree	5		5	6		6	7		7	7	1	8	15		15	10		10	16		16
Quercus michauxii	swamp chestnut oak	Tree	8		8	9		9	9		9	9		9	9		9	14		14	29		29
Quercus pagoda	cherrybark oak	Tree	11		11	11	1	12	11	1	12	11		11	8		8	4		4			
Quercus phellos	willow oak	Tree	25	1	26	32		32	33		33	33		33	32		32	29		29	27		27
Quercus rubra	northern red oak	Tree																2		2			
Rhus glabra	smooth sumac	Shrub					1	1															
Salix nigra	black willow	Tree	1	6	7	1		1	1		1	1	8	9	1		1						
Sambucus canadensis	Common Elderberry	Shrub																6		6	19		19
Sambucus nigra	European black elderberry	Shrub	2	3	5	4		4	5		5	5		5	11		11	7		7			
Ulmus alata	Winged elm	Tree					8	8															
Ulmus americana	American elm	Tree		7	7					3	3												
Unknown		Shrub or Tree																			7		7
		Stem count	198	72	270	304	40	344	319	36	355	318	42	360	331	0	331	346	0	346	365	0	365
		size (ares)	14			20			20			20			20			20			20		
		size (ACRES)	0.35			0.49			0.49			0.49			0.49			0.49			0.49		
		Species count	21	14	26	7	1	7	22	11	25	22	9	22	22	0	22	22	0	22	21	0	21
		Stems per ACRE	572	208	780	615	81	696	645	73	718	643	85	728	670	0	670	700	0	700	739	0	739

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

P = Planted
V = Volunteers
T = Total

Vegetation Plot Photos

Vegetation Plot 1 (9/14/2021)

Vegetation Plot 2 (9/14/2021)

Vegetation Plot 3 (9/14/2021)

Vegetation Plot 4 (9/14/2021)

Vegetation Plot 5 (9/14/2021)

Vegetation Plot 6 (9/14/2021)

Vegetation Plot 7 (9/14/2021)

Vegetation Plot 8 (9/14/2021)

Vegetation Plot 9 (9/14/2021)

Vegetation Plot 10 (9/14/2021)

Vegetation Plot 11 (9/14/2021)

Vegetation Plot 12 (9/14/2021)

Vegetation Plot 13 (9/14/2021)

Vegetation Plot 14 (9/14/2021)

Appendix D

Stream Survey Data

***No Stream Survey monitoring was required for Year 6.**

Appendix E

Hydrologic Data

Figure 6. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

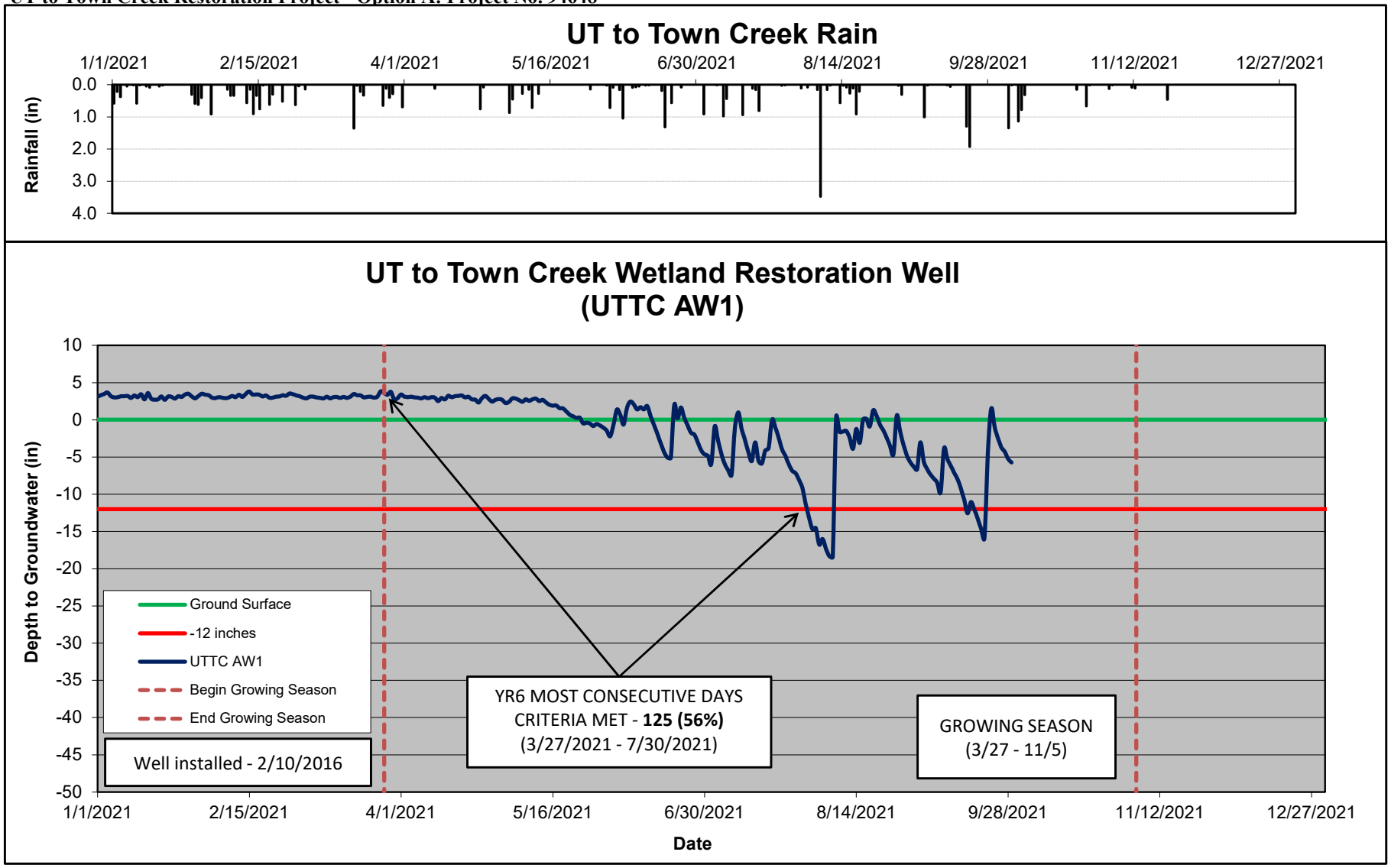


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

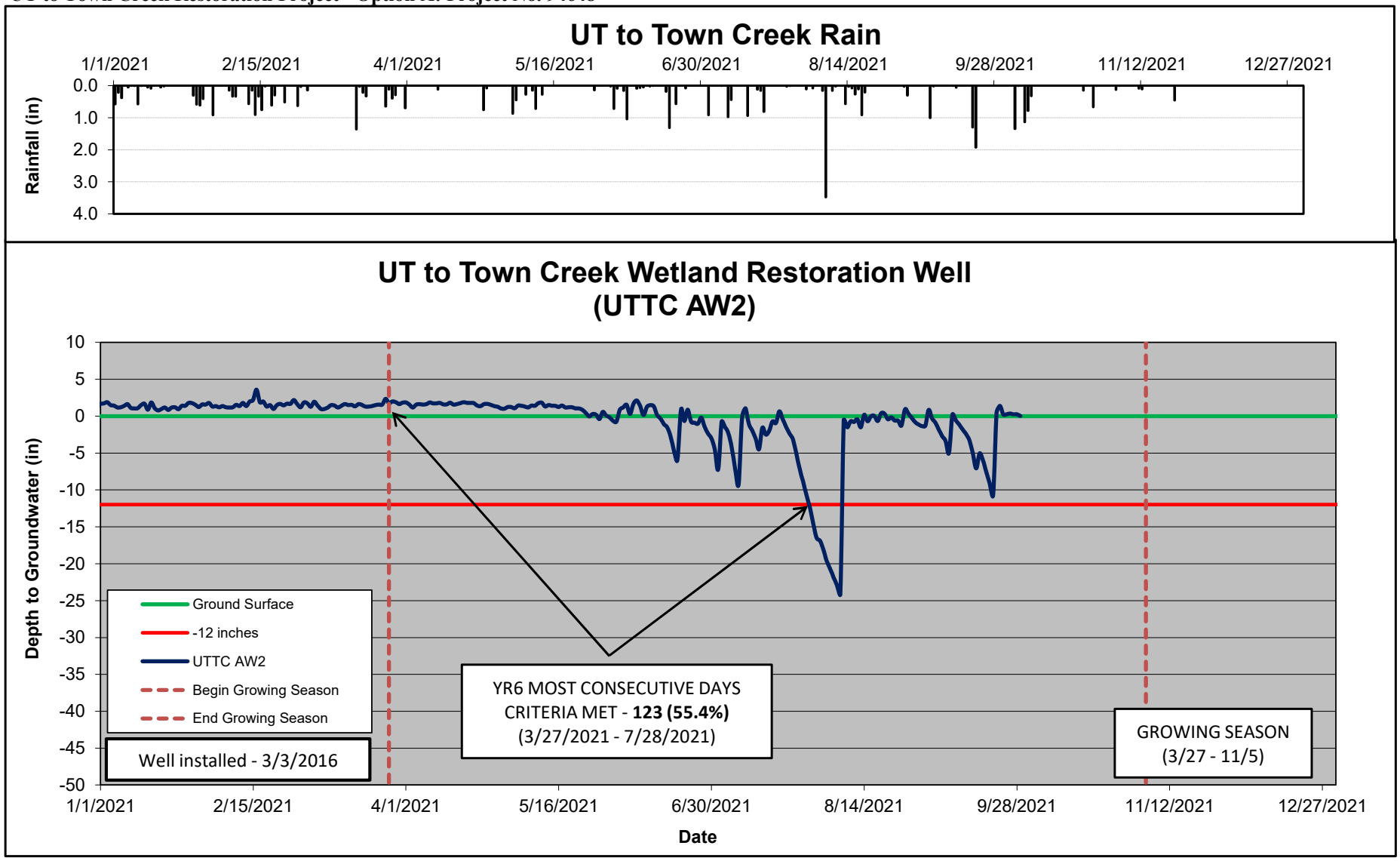


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

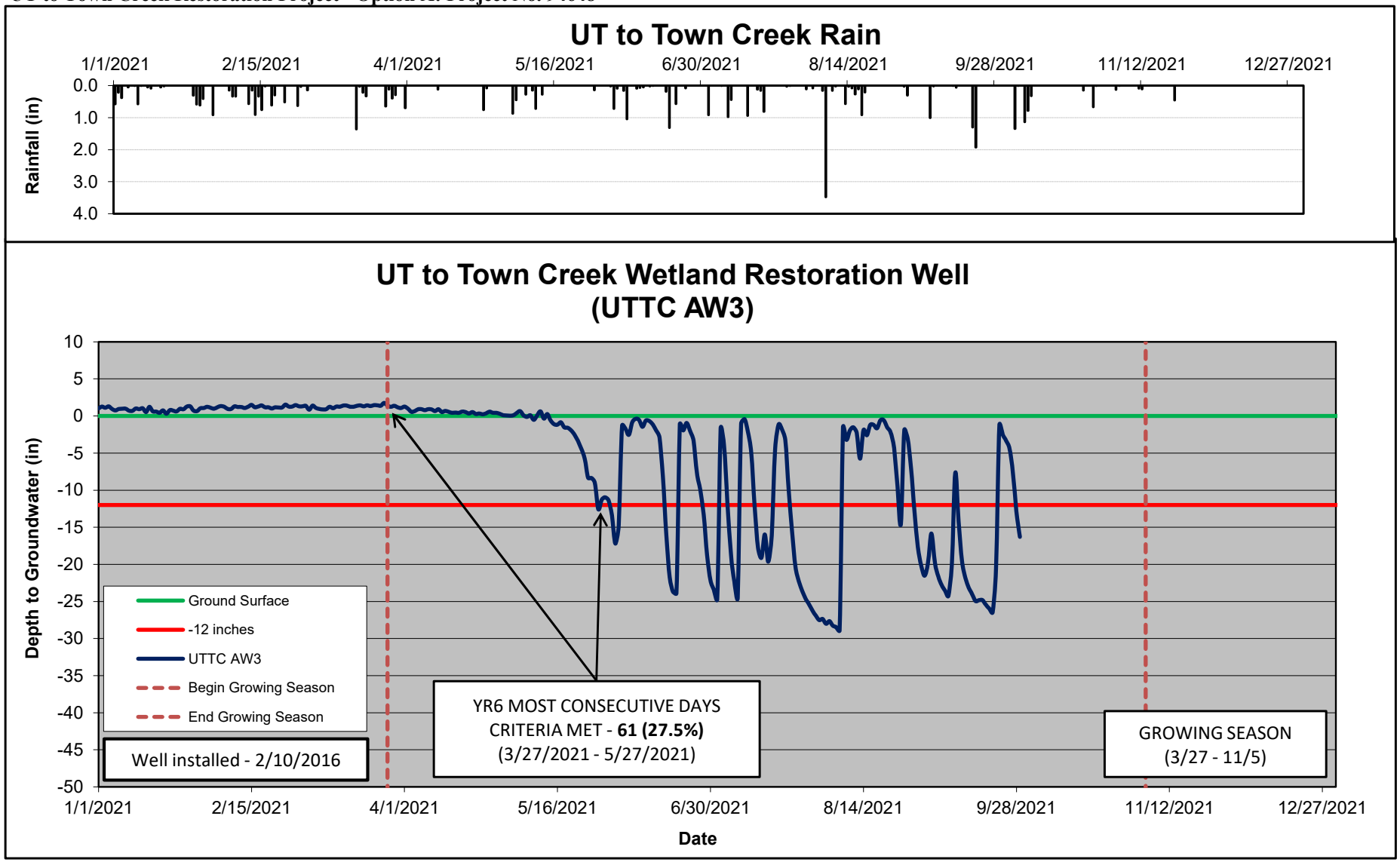


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

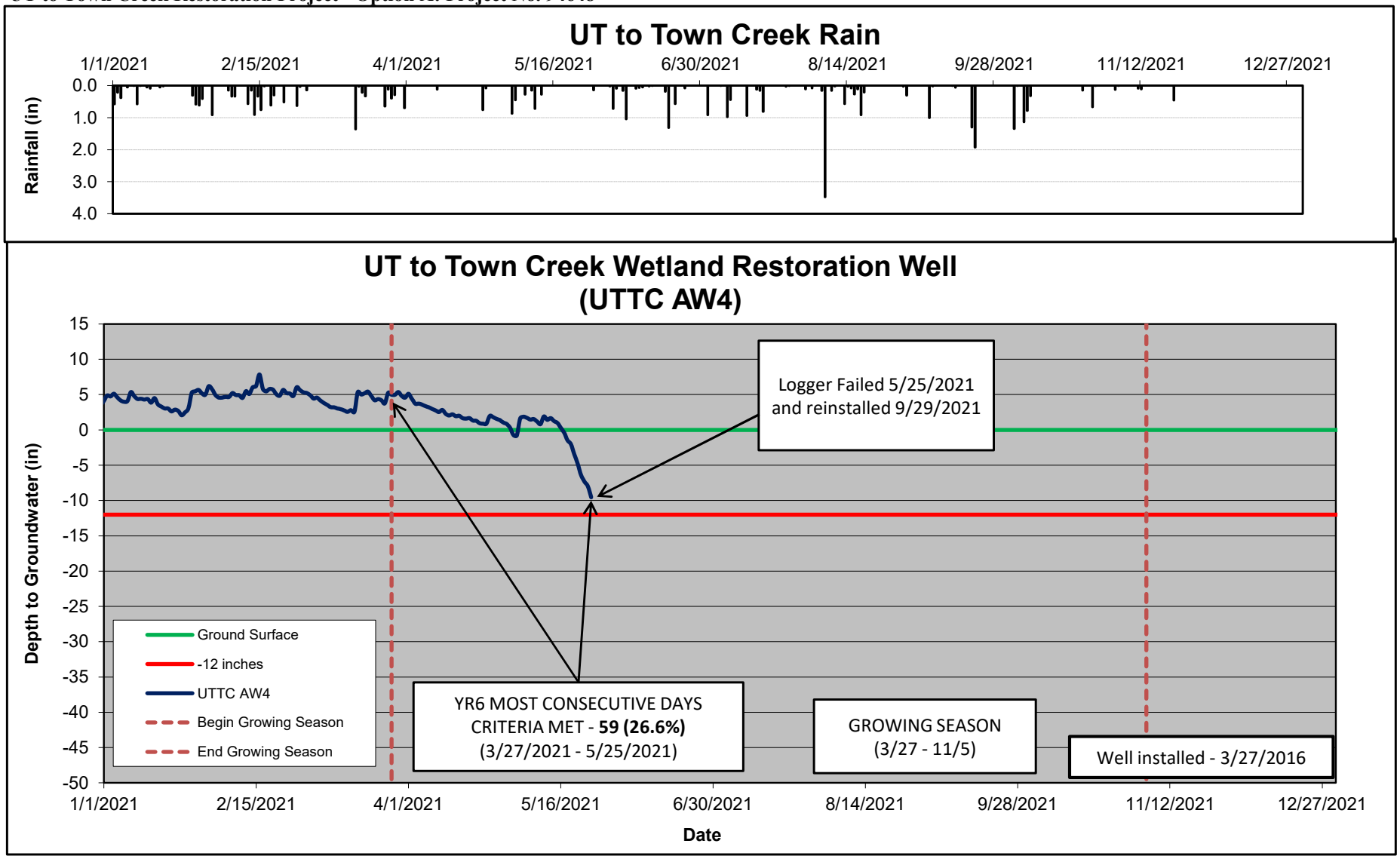


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

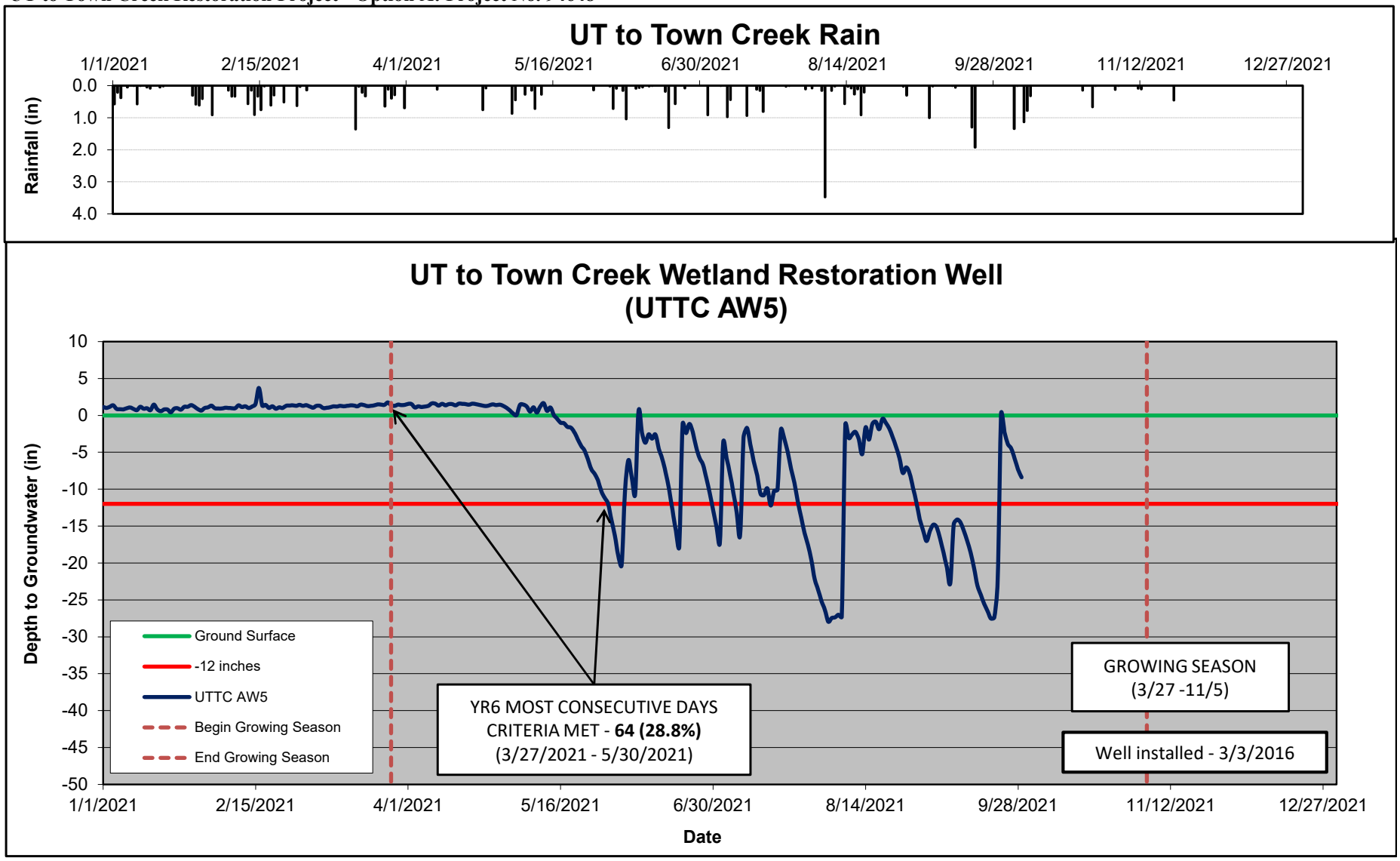
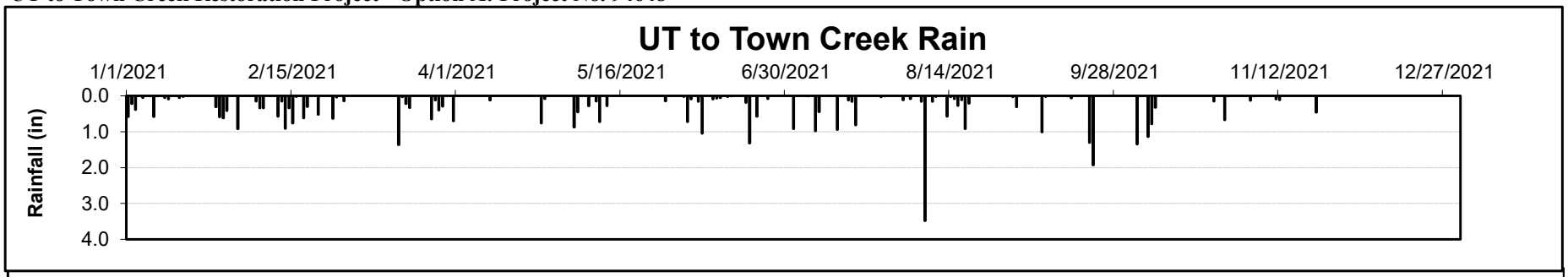


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648



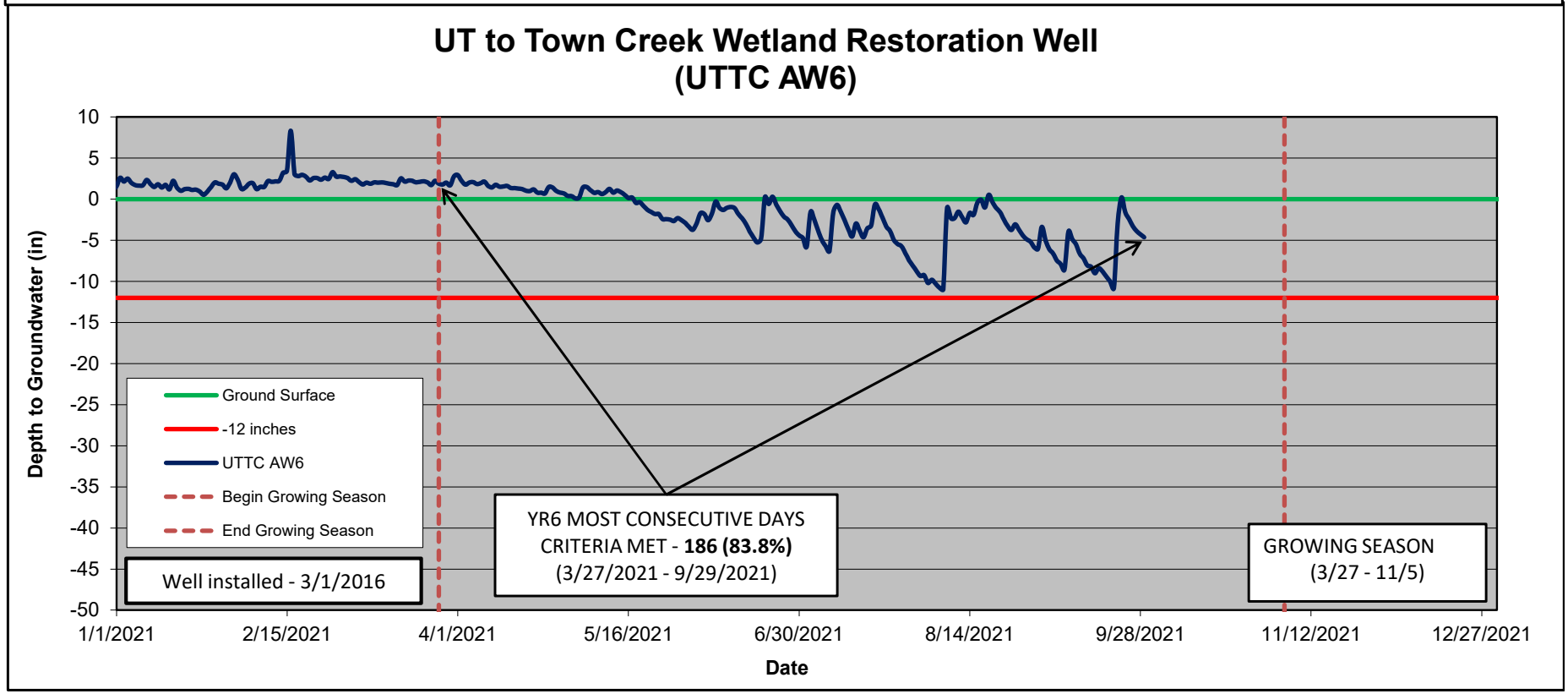


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

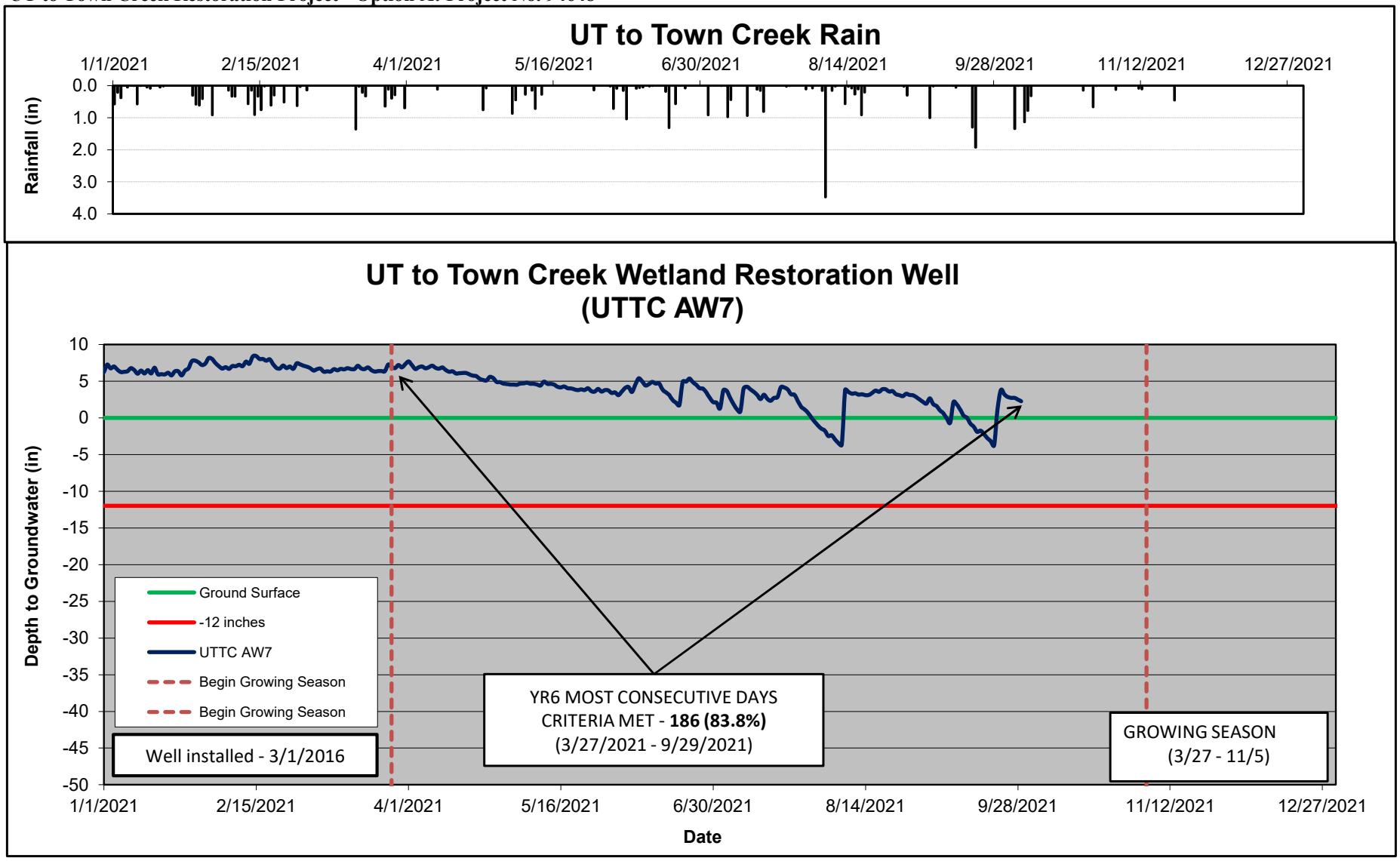


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

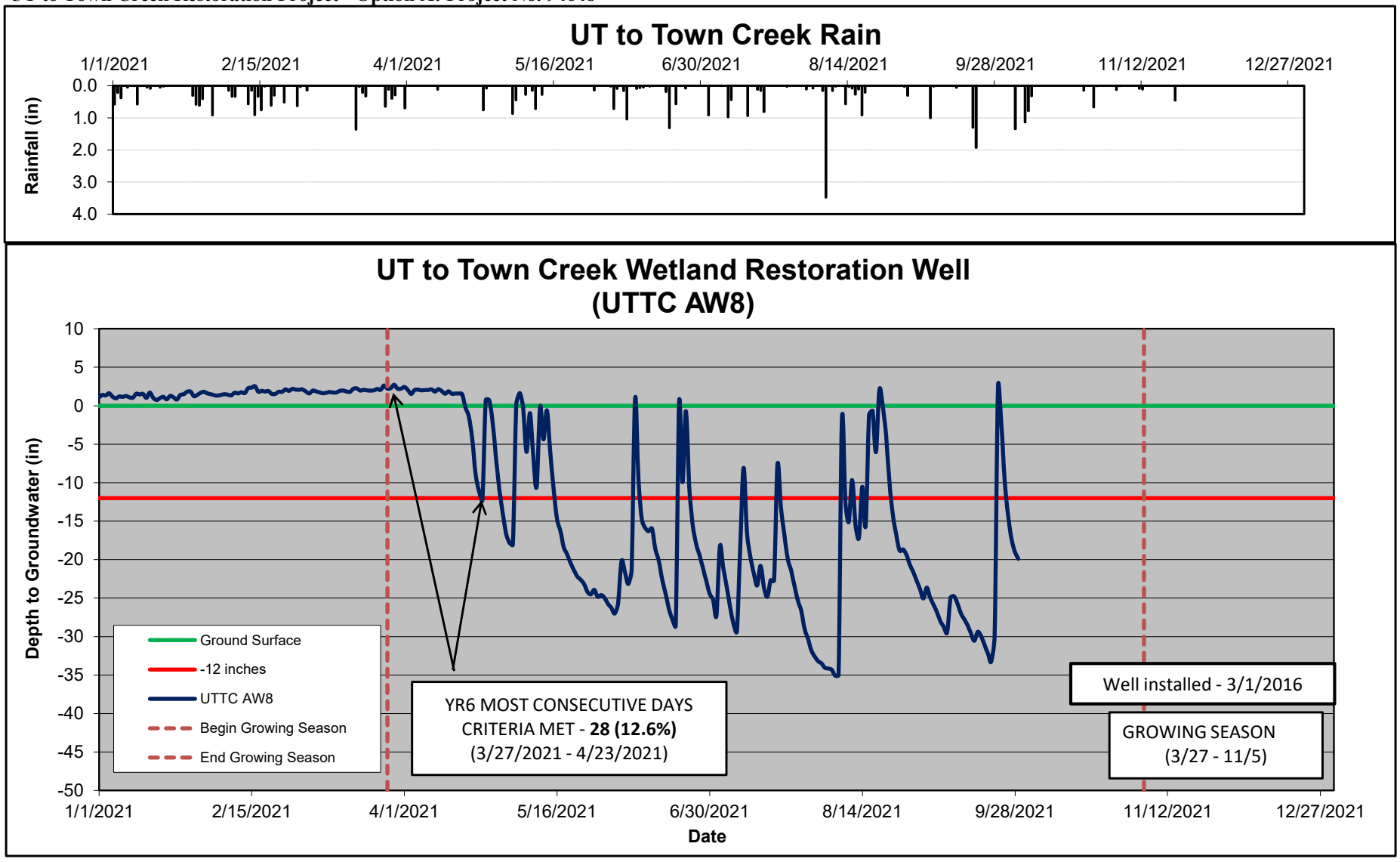


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

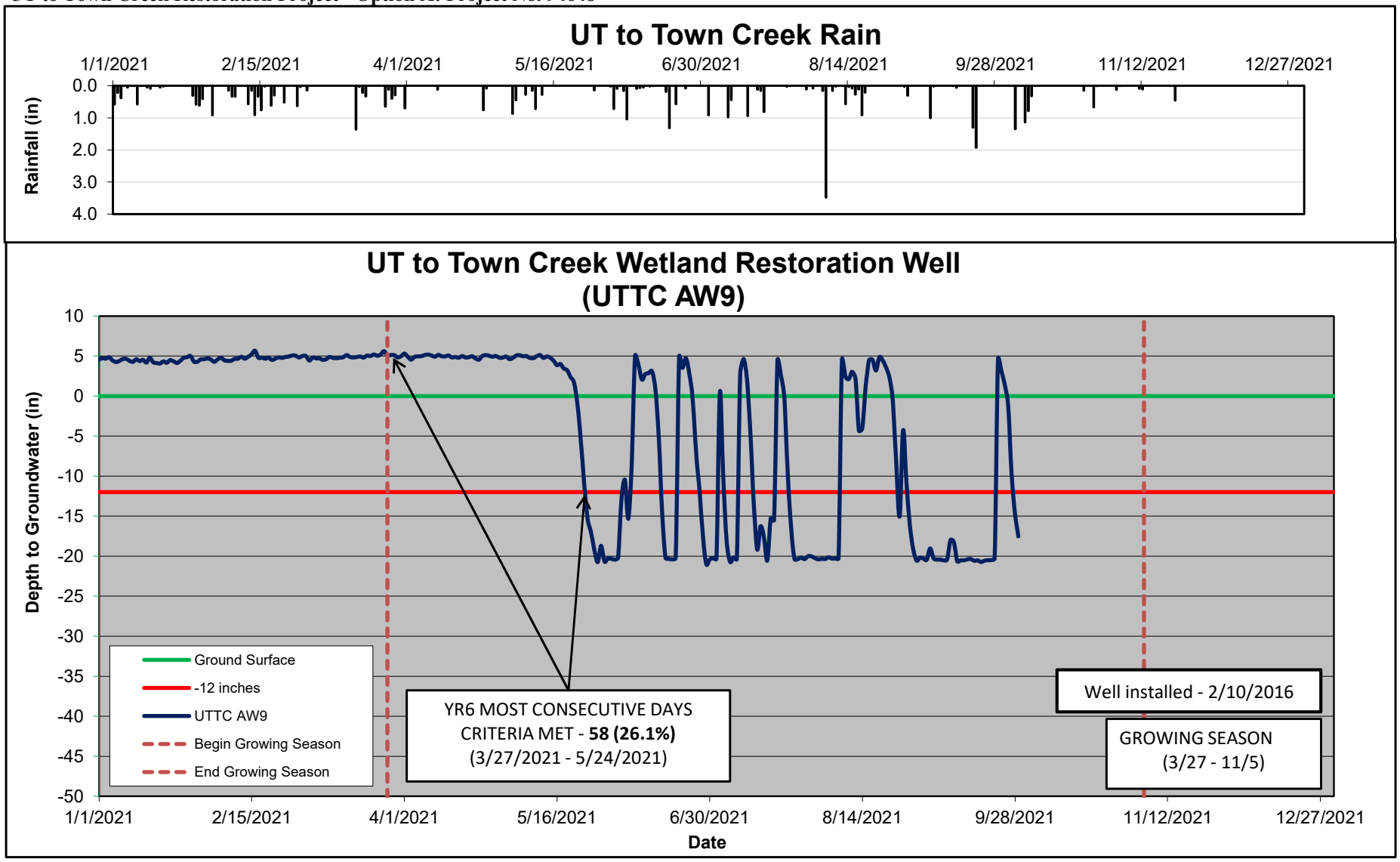


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

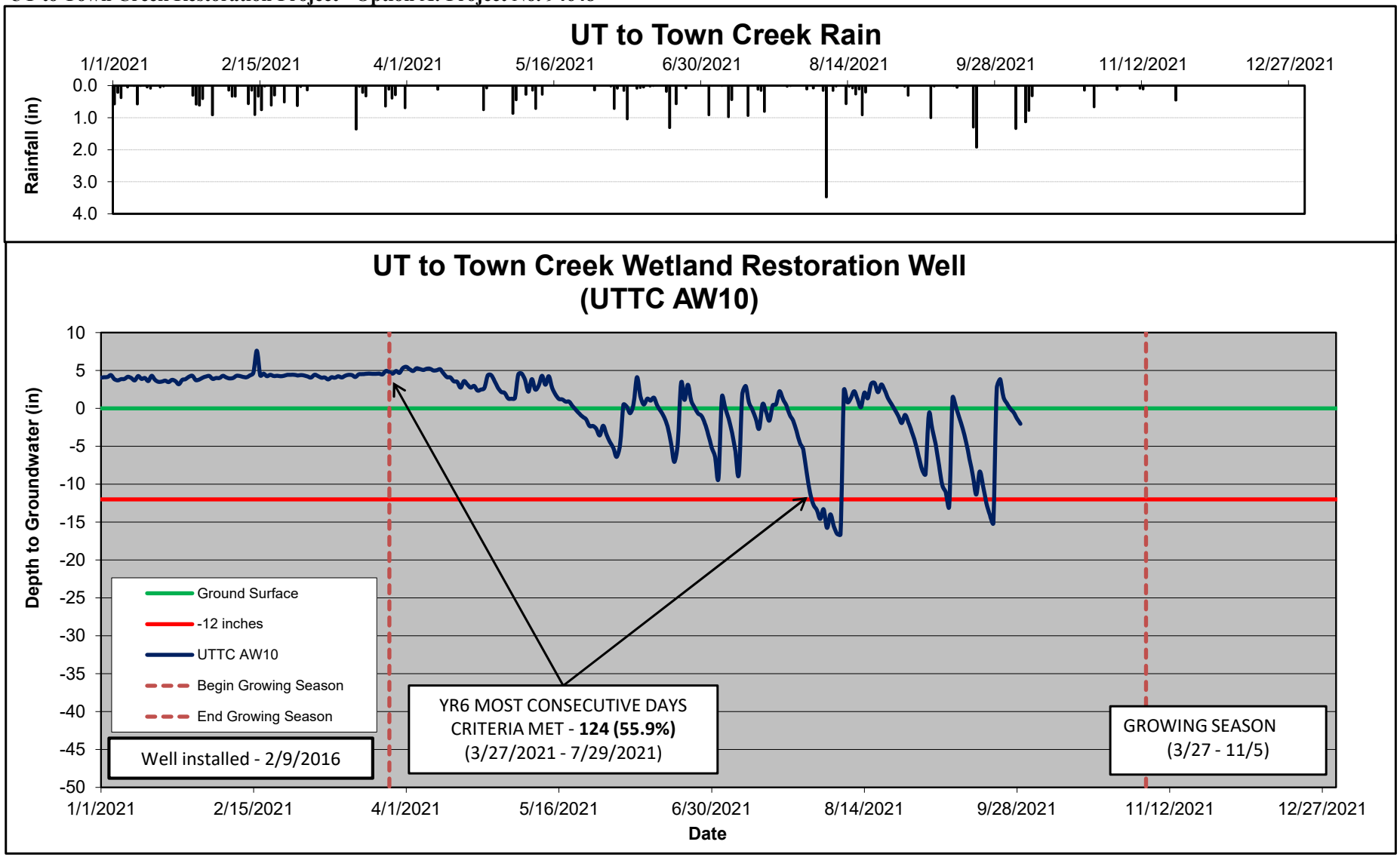
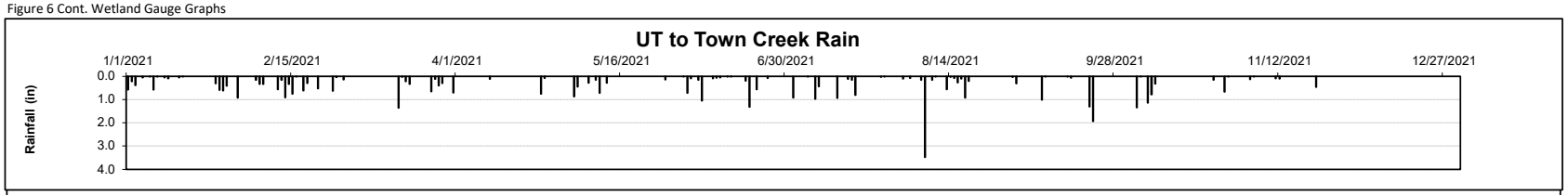


Figure 6 Cont. Wetland Gauge Graphs



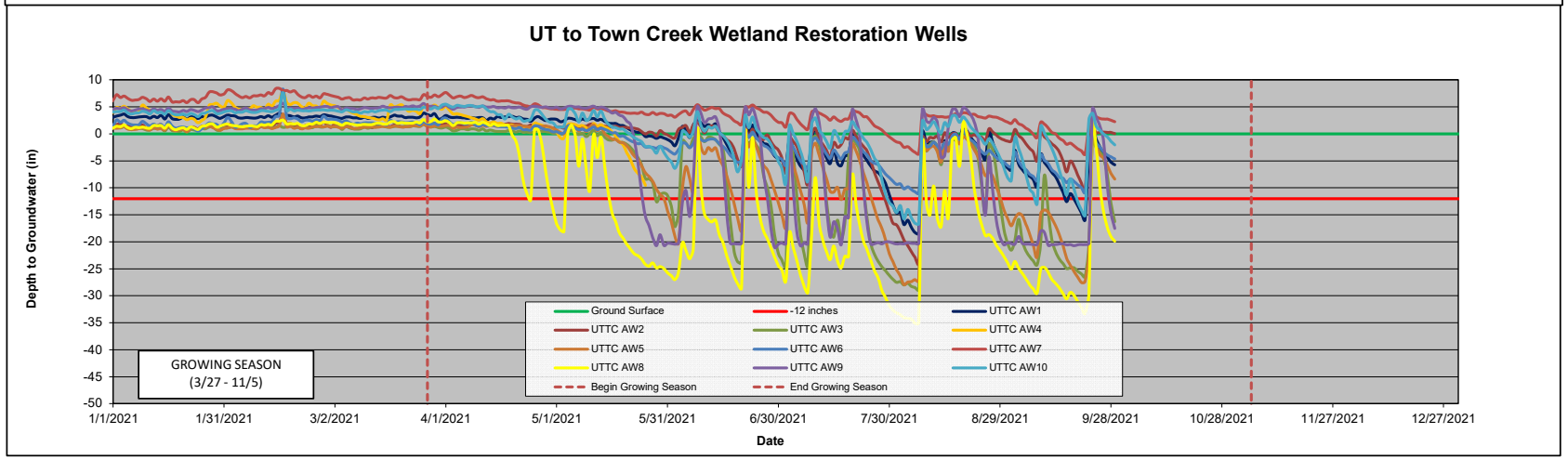
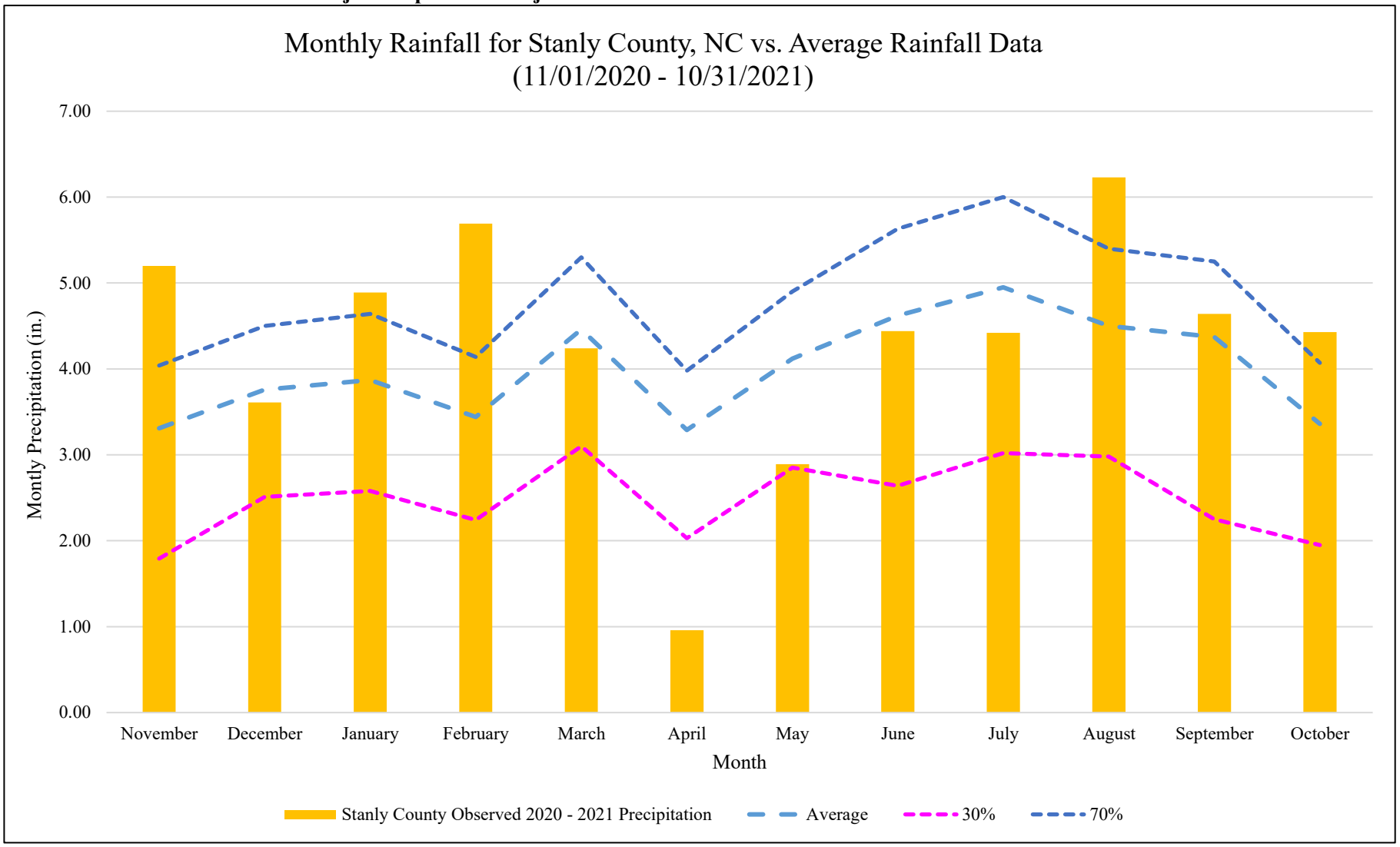


Figure 8. Monthly Rainfall Data
UT to Town Creek Restoration Project - Option A: Project No. 94648



Historic rainfall data from WETS Station : ALBEMARLE, NC0090

Observed 2020 - 2021 Precipitaion from CHRONOS Station NEWL, North Stanly Middle School

Table 12. Wetland Restoration Area Well Success
UT to Town Creek Restoration Project - Option A: Project No. 94648

Well ID	Automated Well Type	Wetland Mitigation Type	*Percentage of Consecutive Days <12 inches from Ground Surface[1]	Most Consecutive Days Meeting Criteria[2]	*Percentage of Cumulative Days <12 inches from Ground Surface[1]	Cumulative Days Meeting Criteria[3]	Number of Instances where Water Table rose to <12 inches from Ground Surface[4]
Cross-sectional Well Arrays							
UTTC AW1	Reference	Jurisdictional	56.3	125.0	78.8	175.0	4
UTTC AW2	Groundwater	Restoration	55.4	123.0	79.3	176.0	2
UTTC AW3	Groundwater	Restoration	27.5	61.0	55.0	122.0	11
UTTC AW4	Groundwater	Restoration	26.6	59.0	26.6	59.0	1
UTTC AW5	Groundwater	Creation	28.8	64.0	61.3	136.0	8
UTTC AW6	Reference	Jurisdictional	83.8	186.0	83.8	186.0	1
UTTC AW7	Groundwater	Restoration	83.8	186.0	83.8	186.0	1
UTTC AW8	Groundwater	Restoration	12.6	28.0	29.7	66.0	12
UTTC AW9	Groundwater	Creation	26.1	58.0	49.1	109.0	10
UTTC AW10	Groundwater	Creation	55.9	124.0	77.9	173.0	4

Notes:

[1]Indicates the percentage of most consecutive number of days within the monitored growing season with a water 12 inches or less from the soil surface.

[2]Indicates the most consecutive number of days within the monitored growing season with a water table 12 inches or less from the soil surface.

[3]Indicates the cumulative number of days within the monitored growing season with a water table 12 inches or less from the soil surface.

[4]Indicates the number of instances within the monitored growing season when the water table rose to 12 inches or less from the soil surface.

Growing season for Stanly County is from March 27 to November 5 and is 222 days long.

Growing season percentage for success is 9% of 222 days = 20 days; where water table is 12 inches or less from the ground surface

HIGHLIGHTED indicates wells that *did not* to meet the success criteria for the most consecutive number of days within the monitored growing season with a water 12 inches or less from the soil surface.

All In-Situ groundwater monitoring dataloggers were installed by 3/27/2016. Installation of the dataloggers was completed following construction in Spring 2016 when groundwater levels are normally closer to the ground surface.

Table 12a. Wetland Gauge Attainment Data
UT to Town Creek Restoration Project - Option A: Project No. 94648

Summary of Groundwater Gauge Results for MY1-MY6						
Gauge	**Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)**					
	MY 1 (2016)	**MY2 (2017)**	**MY3 (2018)**	**MY4 (2019)**	**MY5 (2020)**	**MY6 (2021)**
UTTC AW1	No/10 days (5%)	Yes/25 days (12%)	Yes/ 110.0 days (49.5%)	Yes/ 114 days (51.1%)	Yes/ 222 days (100%)	Yes/ 125 days (56.3%)
UTTC AW2	Yes/218 days (100%)	Yes/218 days (100%)	Yes/ 115.5 days (52%)	Yes/ 95 days (42.6%)	Yes/ 222 days (100%)	Yes/ 123 days (55.4%)
UTTC AW3	Yes/188 days (86%)	Yes/218 days (100%)	Yes/ 73.5 days (33.1%)	Yes/ 64 days (28.6%)	Yes/ 121 days (54.5%)	Yes/ 61 days (27.5%)
UTTC AW4	Yes/200 days (92%)	Yes/218 days (100%)	Yes/ 97.5 days (43.9%)	Yes/ 67 days (30.0%)	Yes/ 222 days (100%)	Yes/ 59 days (26.6%)
UTTC AW5	No/10 days (5%)	Yes/25 days (12%)	Yes/ 79.5 days (35.8%)	Yes/ 69 days (30.9%)	Yes/ 222 days (100%)	Yes/ 64days (28.8%)
UTTC AW6	Yes/218 days (100%)	Yes/218 days (100%)	Yes/ 108.5 days (48.9%)	Yes/ 116 days (52.0%)	Yes/ 222 days (100%)	Yes/ 186 days (83.8%)
UTTC AW7	Yes/188 days (86%)	Yes/218 days (100%)	Yes/ 222.0 days (100%)	Yes/ 186 days (83.6%)	Yes/ 222 days (100%)	Yes/ 186 days (83.8%)
UTTC AW8	Yes/200 days (92%)	Yes/218 days (100%)	Yes/ 52.0 days (23.4%)	Yes/ 51 days (22.7%)	Yes/ 79 days (35.6%)	Yes/ 28 days (12.6%)
UTTC AW9	Yes/188 days (86%)	Yes/218 days (100%)	Yes/ 72.5 days (32.7%)	Yes/ 63 days (28.2%)	Yes/ 121 days (54.5%)	Yes/ 58 days (26.1%)
UTTC AW10	Yes/200 days (92%)	Yes/218 days (100%)	Yes/ 82.5 days (37.2%)	Yes/ 90 days (40.3%)	Yes/ 222 days (100%)	Yes/ 124 days (55.9%)

*Gauge 1 and 5 were not working properly during much of the 2016 growing season.

**Growing season percentage for success is 9% of 222 days = 20 days

UT to Town Creek – Wetland Photos

UTTC AW1 – (9/30/2021)

UTTC AW2 – (9/30/2021)

UTTC AW3 – (9/30/2021)

UTTC AW4 – (9/30/2021)

UTTC AW5 – (9/30/2021)

UTTC AW6 – (9/30/2021)

UTTC AW7 – (9/30/2021)

UTTC AW8 – (9/30/2021)

UTTC AW9 – (9/30/2021)

UTTC AW10 – (9/30/2021)

Appendix F
IRT Meeting Minutes

Michael Baker
INTERNATIONAL

Meeting Minutes

UT to TOWN RESTORATION PROJECT

DMS Project ID. 94648
NC DEQ Contract# 003277
USACE Action ID: 2008-02655
Yadkin Pee-Dee River Basin: 03040105060040

Date Prepared:	June 13, 2019
Meeting Date, Time, Location:	June 11, 2019, 2:00 PM On-site (Stanly County, NC)
Attendees:	USACE – Todd Tugwell, Steve Kichefski DWR – Mac Haupt DMS – Matthew Reid, Paul Wiesner Baker – Drew Powers, Katie McKeithan, Scott King
Subject:	Credit release site walkover with IRT
Recorded By:	Drew Powers, Katie McKeithan, Scott King

An on-site meeting was held on June 11th, 2019 at 2:00 PM to discuss UT to Town Restoration Project (Full Delivery) in Stanly County, NC. The purposes of this meeting were to:

1. Discuss credits to be released and to get ready for project closeout; and
2. Identify and discuss potential concerns/issues based on field observations.

General recent weather conditions have been hot and dry for several weeks in the area apart from a few recent afternoon showers.

The group met at the entrance of the path leading to the site off Old Salisbury Road (in the middle of the project) in Albemarle, NC. A general site overview and map orientation was provided and discussed.

Reach 4

The group then started walking into the site towards the top of Reach 4 to discuss the intermittent flow and overall condition of the wetland BMP. Upon assessing Reach 4 it was noted that there was minimum vegetation growing in the stream bed and sediment is being flushed out of the system. Mac, Todd, and Steve discussed with Scott that it will be helpful to install either a flow gauge or flow camera to help document the flow of Reach 4 and 5, about ¾ of the way up each reach.

We then walked up the reach to look at the BMP. It was commented that the concrete level spreaders are no longer the preferred method for BMP outlets, but that it appears to be functioning well. There was a significant amount of clear, standing water present within the deep pool section of the BMP. No gullies or rills were observed flowing into the BMP, and established vegetation is present all around the BMP. Upon observation in this low-water condition the group did not feel the functioning of the BMP was threatened by excess sedimentation and no maintence was suggested. The group did express some

concern that the BMP was fairly deep, and that it may be reducing the amount of water flowing into its downstream system.

We then walked downstream to the confluence of Reaches 4 and 5 to look at the flow gauge and it the stream condition. There was no water present in the stream, but staining on the PVC pipe and streambed along with a general lack of streambed vegetation implies that water is routinely in the channel.

Reach 6

The group congregated at the pipe crossing where Travis Wilson (WRC) had a concern with the installation of the pipe. In the as-built plans it was noted that the pipe was installed on top of bedrock; and therefore the pipe is perched above the downstream water surface. DMS, USACE, and DWR all agreed that there is not much that we can do about the situation now and that resetting the pipe would not be needed. It was also commented that for future sites that a bottomless pipe could be a good option, though the general consensus was that in this specific case it does not appear that would have helped as the native bedrock in this section appears to be naturally perched in this location. The group continued down the reach to the confluence of Reach 6 and 3.

Reach 3

When looking at Reach 3 it was commented that the vegetation looked good, especially for the slate belt region. It was apparent that many of the trees were growing with good height for a 4-year project and the smaller trees were ones that were supplemental planted in 2018. A bare area located on the left bank at the bottom of Reach 3 was noted in the MY3 report shown as a vegetation problem area (VPA). We commented that we have reseeded and replanted it and will continue to monitor this area. Mac took a soil sample on the left flood plain in a wetland area upstream of the confluence with Reach 6 and down to ~6 inches did not see the expected hydric soils. He commented that we will need to revisit the site and do a thorough inspection of our wetland boundaries prior to closeout, adjusting the exact, final boundaries to our field assessments. Mac pointed out that final boundaries may have shifted some and pointed out areas that looked wetter near where he took his soil boring. Todd then inspected nearby Well 5 and saw no issues with the installation of the well and measured 11 inches to water surface in the well. Mac did another soil sample near the well and saw very hydric soils throughout the sample. Paul stated that the well success criteria is 9% and all wells for this site have met that criteria for all monitoring years. We then walked upstream to the double culverts located at the break of Reach 2 and 3 where Todd and Mac commented that they did not like how wide the downstream section of channel was constructed and asked this be avoided in the future. However, we showed that both the construction and as-built plans indicated it was built as designed and the stream was stable. It was noted that this section of channel is all bedrock.

Paul Wiesner pointed out that problem areas of invasive species (privet and parrot feather) were noted in the MY3 report, primarily along sections of the main channel. We replied that two treatment efforts have been made so far this year starting in March 2019 to address all invasive species throughout the site, and we plan to continue to monitor and treat these species for the life of the project.

Reach 7

The group then headed to Reach 7 to inspect the intermittent channel and wetland BMP. Towards the middle of the reach water was flowing in the channel with good vegetation establishing along the banks

and within the buffer. We then walked to the top of the reach to the BMP. Harry had commented on the MY3 report that he had observed turbid water and potential sedimentation following a rain event during his winter inspection, and asked how Michael Baker planned to monitor the BMP for any potential maintenance needs. The group inspected the BMP under the current, low water-level conditions and noted that the there is only a small amount of sediment (roughly 6" of a primarily silt/clay material) captured in the deeper pool portion of the BMP. The standing water that was present at the bottom of the pool was quite turbid. However, after observation in this low-water condition the group did not feel the functioning of the BMP was threatened by excess sedimentation and no maintence was suggested at this time. No gullies or rills were observed flowing into the BMP, and established vegetation is present all around the BMP. Scott explained that both of the project BMPs were designed to a depth in anticipation of some sedimentation for the period after construction before vegetation could establish when some amount of erosion can usually be expected. Scott also mentioned that we will keep an eye on the sedimentation/fill and confirm that ample storage room is maintained within both of the project BMP's. We can do that through visual inspections in the dry season when remaining storage capacity can be directly observed. The group also expressed some concern that the BMP may be reducing the amount of water flowing into its downstream system, though given the flowing water observed in the channel downstream this was not as much of a concern here.

Paul brought up that it was noted on the MY3 report that a tree or two was down on Reach 1 and we confirmed that they have been cleaned up and that all fencing is in good condition.

This concluded the walkover and below are a few notes that were discussed back at the vehicles before departure.

- Credit release: Todd and Mac agreed to all credits being released for MY3
- A gauge or flow camera should be installed on Reach 4 and 5 (about ¾ of the way up)
- The wetland boundaries need to be re-evaluated to represent the actual boundaries in the field, particularly with regard to hydric soil formation
- The pipe crossing on Reach 6 is sufficient
- A photo point of each project culvert location will be added to the monitoring report

This represents Michael Baker Engineering's best interpretation of the meeting discussions. If anyone should find any information contained in these meeting notes to be in error and/or incomplete based on individual comments or conversations, please notify me with corrections/additions as soon as possible.

Most sincerely,

Andrew Powers
Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 600
Cary, NC 27518
Phone: 919-481-5732
Email: Andrew.Powers@mbakerintl.com

Michael Baker
INTERNATIONAL

Meeting Minutes

UT to Town Creek Restoration Project

DMS Project ID. 94648
NC DEQ Contract# 003277
USACE Action ID: SAW-2013-01280
DWR# 20141024
Yadkin Pee-Dee River Basin: 03040105-060040

Meeting Date, Time, Location:	June 3, 2021, 9:00 AM On-site (Stanly County, NC)
Attendees:	USACE – Todd Tugwell, Casey Haywood DEQ – Erin Davis DMS – Melonie Allen, Paul Wiesner, Harry Tsomides Baker – Katie McKeithan, Drew Powers, Scott King
Subject:	Closeout site walkover with IRT
Recorded By:	Scott King and Katie McKeithan

An on-site meeting was held on June 3, 2021 at 9:00 AM to review the UT to Town Creek site for closeout of stream credits and early closeout for wetland credits. Recent weather conditions have been hot and dry throughout the spring and summer in this area. For your convenience, please find included here figures from the most recent CCPV from MY5 along with the wetlands map from the wetland adjustment report.

The group met at the crossing between Reaches 2 and 3 and began by walking down Reach 3, inspecting both the stream and the adjusted wetland area proposed in the MY5 monitoring report. The wetlands added to the credited area (all as Creation) in the report were closely evaluated by the IRT. The areas added adjacent to the existing Restoration areas (upstream of XS-11 roughly) were well received by the group. Those added below this point and adjacent to the existing Creation areas were considered more questionable. The existing Creation area located closer to the channel is noticeably wetter with some standing water observed and more herbaceous wetland species present. Tree vigor is clearly lower in this area, though there is no height requirement with this project. Plant density was also noticeably lower here than other portions of the project but is still well above the MY5 performance standard of 260 stems/acre (based on all veg plot data and transects conducted by Baker). Hydric soil was found within both the original and newly added Creation areas, though Todd correctly noted that this was an area where a floodplain was cut so the hydric soils may not be indicative of a high water table (this is why this area was originally classified as Creation and not Restoration). Todd investigated a couple of riffle sections in Reach 3 and noted good channel bed features in both but found a pocket of parrot feather in one. Baker has treated this twice a year for several years and have reduced the parrot feather

present to a remarkable degree. Harry noted that the system had been choked with it before we began treatment.

We then began walking up Reach 6 for a relatively short distance before turning back after a brief inspection that met to everyone's satisfaction. The group then hiked outside the easement up to Reach 7, hopped the fence to inspect the middle of Reach 7 (which was flowing and quickly deemed to be acceptable) then moved downstream to its confluence with Reach 2. We then walked downstream back to the vehicles at the crossing, moving between the left and right floodplains. The stream was noted to be in good condition and accepted by the group. Some of the wetlands along the left floodplain had visual similarities to those at the lower section of Reach 3, though Scott emphatically noted that this area appears much wetter throughout the winter and into spring, with significant standing water present for extended periods. The trees are notably shorter here than in other areas (again, no height requirement on this project) but their density is good. Herbaceous vegetation is present here but not as thick as most of the rest of the site. Other wetland areas along the right floodplain looked very good to the group, though notably they are usually so wet as to be nearly impassable with deep muddy conditions. The very dry spring clearly resulted in all wetland areas visually appearing much different than is normal. Scott noted that this project is located within the Slate Belt, which under normal conditions will dry up quickly during the spring and summer. Thus, many of the wetlands did not 'present themselves' visually as well as they do normally. However, the combined acreage of the questioned wetland areas make up only a small portion of the overall wetlands and a very small portion of the project as a whole. All of the groundwater wells met their performance standards, with hydrology percentages averaging 30-50% for the past three years (for MY5 virtually 100%!), far exceeding the set success criteria of 12%.

The group then stopped near the crossing to discuss the project evaluation and IRT conclusions and then left to meet at the Town Creek project located close by.

Summary Points:

- The remaining Stream Credits are approved for closeout by the IRT, though DMS will still withhold 10% of the total stream credits until final project closeout. All stream monitoring may cease, though any subsequent damage to the system that occurs until complete project closeout must be repaired.

- The remaining Wetland Credits are not released for early closeout and should be monitored for the remaining two years (MY6 and MY7). If the Creation wetlands of concern (those areas added adjacent to the original Creation areas roughly below XS-11) are used for credit in the final revised wetland adjustment, then the IRT will require the installation of a groundwater well to demonstrate hydrology. However, Baker intends to remove all of those questionable Creation areas (cited above) that had been added in the wetland adjustment report to facilitate a smoother closeout. Baker will submit a final, revised wetland credited area adjustment report with the MY6 monitoring report for IRT review.

- The MY6 report will also include a revised calculation of additional stream credits for wider buffers using the same January 2018 methodology that was previously used to determine the credits (the previous calculation has been subsequently affected by the modification of credited wetland boundaries).

- Treatment of invasive species, particularly parrot feather, will continue until complete project closeout.

- While MY6 monitoring typically focuses on a more visual inspection (with the reduced monitoring requirements found in MY4 and MY6) Baker will still monitor all wetlands in full and will run vegetation transects within all newly added wetland credit areas.

- Vegetation data collected for MY7 can focus on the veg plots located within and adjacent to the wetland areas.

- This represents Baker's best interpretation of the meeting discussions. If anyone should find any information contained in these meeting notes to be in error and/or incomplete based on individual comments or conversations, please notify me with corrections/additions as soon as possible.

Most sincerely,

Scott King, LSS, PWS

Scott.King@mbakerintl.com
919-219-6339

Appendix G
Wetland Boundary Adjustment

Michael Baker
INTERNATIONAL

Memorandum

UT to Town Creek Restoration Project: Wetland Boundary Adjustment

DMS Project ID. 94648
NC DEQ Contract# 003277
USACE Action ID: SAW-2013-01280, DWR# 14-1024
Yadkin Pee-Dee River Basin: 03040105-060040

Date Prepared:	December 16, 2021
Subject:	Revisions to wetland boundary adjustment
Recorded By:	Scott King

This memo serves as a revision to the previous wetland boundary adjustment submitted on 1/15/21. The UT to Town Creek Restoration Project originally proposed to Restore a total of 2.56 acres of wetlands and Create an additional 1.56 acres of wetlands within the floodplains along both sides of Reaches 1, 2, and 3. The groundwater well monitoring conducted over the previous five years has demonstrated that all the wetlands have clearly met the hydrology success criteria of 9% as stated in the mitigation plan (often by a substantial margin – the lowest performing well in MY5 had a hydroperiod of 35%). However, during an IRT field visit during the monitoring phase on 6/11/19 a few soil borings dug in the general vicinity of groundwater well #4 appeared to be more marginal to upland in appearance. The borings were dug in this location as the area appeared to be less 'wet' overall than the rest of the surrounding wetland area and had dense/gravelly soil. The IRT suggested conducting a closer review of the wetlands prior to closeout to adjust the boundary as needed. It was suggested that while some of the area of concern seemed likely to be removed as credited wetland, there certainly appeared to be plenty of wet areas adjacent to these potentially removed areas. Figure 1 shows the original wetland boundaries for the southern portion of project around the area in question. The IRT encouraged Baker to look for and add any new wetland areas to make up for any upland area that required removal. As such, Baker conducted a thorough field and GIS evaluation of the area and modified the wetland boundary to remove the questionable area (0.047 ac) and add new wetland area (as Creation) as detailed in the original boundary adjustment memo dated 1/15/21.

However, during the IRT site visit as part of project closeout activities on 6/3/21, a portion of the newly added areas of Wetland Creation at the southern extent (below XS-11) were questioned by the IRT. These areas did not appear as 'wet' as the other areas added and the IRT requested that if they were ultimately to be included as credited wetland area, they would require additional groundwater monitoring. The meeting minutes from that site visit were approved on 7/7/21 and provide a more detailed summary of the discussion that day. They can be found in the Appendix of the MY6 report.

Given the feedback from that IRT walkover, Baker elected to remove all of the Wetland Creation area that was considered questionable, as well as much of the rest of the newly added Wetland Creation area, excepting a small portion of the very wet area around XS-10 and Veg Plot 11. This area is actually quite near the Restored wetlands being removed from crediting, and was the original area specifically pointed out by Mac Haupt (of DEQ) during the first IRT walkover in 2019 as being what he would

recommend Baker add as recompense for any lost wetlands. It is also by far the wettest portion of the added Wetland Creation area, has abundant tall vegetation, and was readily accepted by the IRT during the walkover in June of 2021. At an area of 0.192 acres, it adequately covers the credits lost from the removal of the nearby Restored wetlands. Figure 2 shows this final area as well as all of the previously added Creation areas (which have subsequently been *removed* from consideration) and their previous soil borings. This very limited area of Wetland Creation (only a small subset of the original) is being submitted for the purpose of facilitating a smoother closeout after MY7. Photos of this area were collected during the previous field investigation in January 2021 and have been included again here, while more recent photos were taken of this area in November 2021 and are also included here.

Additionally, as per IRT request during the field visit in June 2021, the revised Creation area addition was assessed for vegetation through the collection of 2 temporary vegetation transects, each approximately the size of a standard monitoring veg plot. As noted above and as documented in the photolog, the area as a whole has quite tall, abundant vegetation consisting of sycamore, persimmon, blackgum, green ash, swamp chestnut oak, willow oak, box elder, tulip poplar, buttonbush, silky dogwood, and black willow, with thick herbaceous vegetation dominated by tearthumb, soft rush, and woolgrass (amongst other rushes and sedges). These species are overwhelmingly rated as wet for their facultative indicator status for the Eastern Mountains and Piedmont region. The first vegetation transect identified 14 stems (for a density of 566 stems/ac), all but 3 of which were well over 6 ft tall. The second vegetation transect identified 15 stems (for a density of 607 stems/ac), of which 8 were well over 6 ft tall (and the remainder averaging about 4 ft tall). Figure 3 shows the approximate location of the transects within the revised Creation area.

As previously noted in the original wetland adjustment memo, the Creation Wetland area being added will be credited at a 3:1 ratio, while the Restored Wetland area being removed was credited at a 1:1 ratio. The newly revised wetlands on the project total 2.513 acres for the Restoration component and 1.752 acres for the Creation component, for a total of 3.097 Riparian Wetland Credits. Baker is contracted for 3.0 wetlands credits. The revised wetland credits are shown below in Table 1:

Table 1. Adjusted Wetland Areas

	Area (ac)	Ratio	Credits
Original Wetlands			
Riparian, Restoration	2.560	1:1	2.560
Riparian, Creation	1.560	3:1	0.520
		Total Credits	3.080
Adjusted Wetlands			
Riparian, Restoration	2.513	1:1	2.513
Riparian, Creation	1.752	3:1	0.584
		Total Credits	3.097
		Riparian Wetland Credit Difference	**+0.017**

This minor adjustment of the credited wetland boundaries also affected the results of the buffer spreadsheet tool used in the mitigation plan to determine additional stream credits from the implementation of wider riparian buffers. As per IRT request, the same 2018 version of the buffer tool originally used for the mitigation plan was used again to re-evaluate the stream credit calculation, only using the new wetland boundaries. As shown below in Table 2, the analysis revealed that the addition of the Creation area results in the loss of 2.68 stream credits as compared to the original analysis (from 265.32 to 262.64 credits).

Table 2. Adjusted Stream Credits from Buffer Tool

Original Stream Credits:	
Additional Credits from Buffer Tool*	265.320
Revised Stream Credits:	
Adjusted Credits from Buffer Tool (using revised wetland boundaries)	262.640
Difference in Credits	2.680

*These additional stream credits were rounded down to 265.000 when presented in the Credit Table 1 for the mitigation plan.

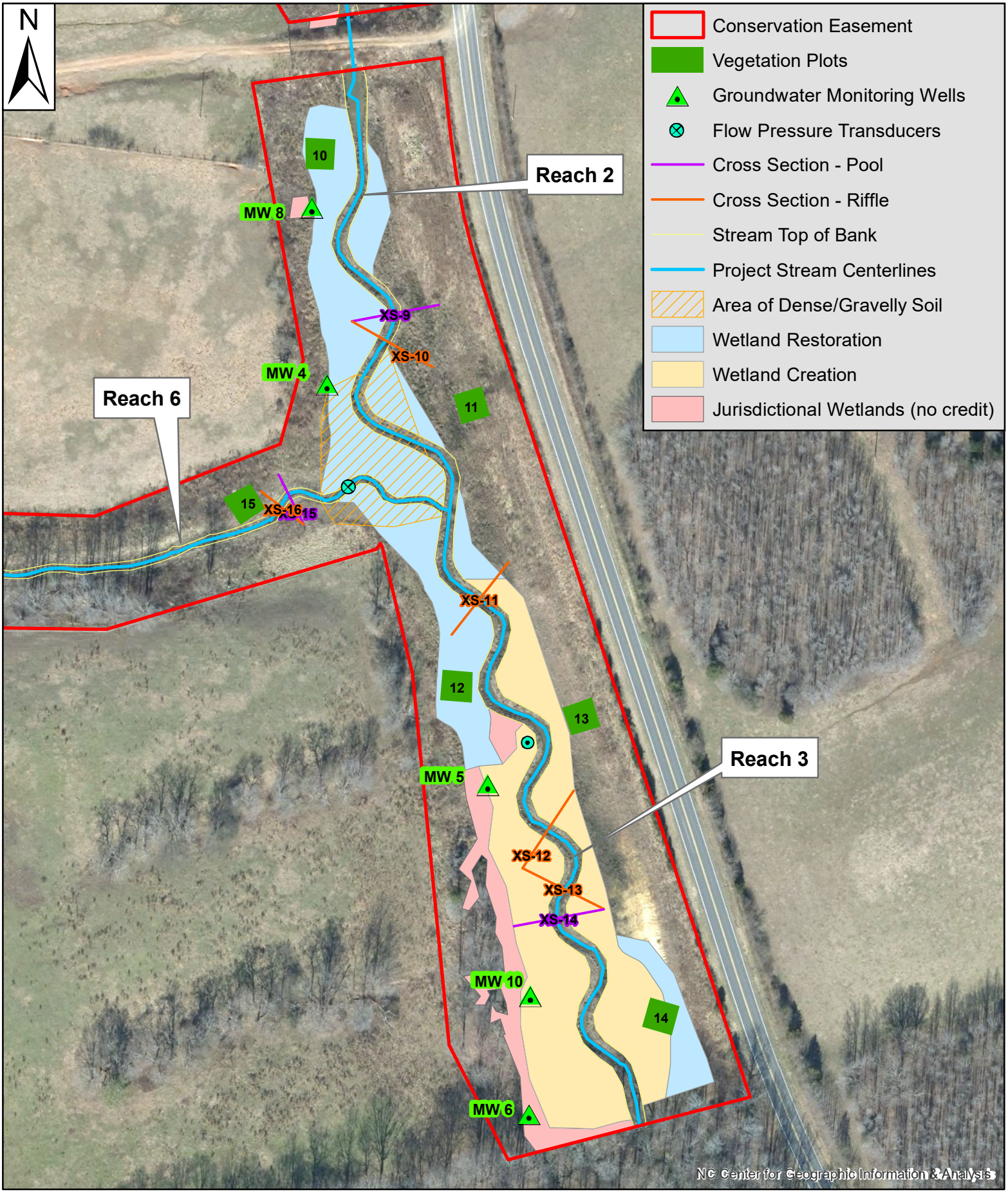
A printout of the buffer tool summary page is included with this memo, and the spreadsheet tool and GIS shapefiles used are included as part of the e-submission files for the project MY6 report. As per DMS request, the Corps was consulted on 12/9/21 about this loss of stream credits to see if they felt it would impact the final project closeout numbers. Given the small credits involved and the fairly complicated nature of any of the proposed remedies (further altering the wetland boundaries to avoid certain buffer widths and/or using the new buffer tool) the Corps responded that our current approach was acceptable and that the slight reduction in stream credits from the buffer tool would not result in reduced closeout stream credits. Thus, the project can closeout as proposed. See attached email exchange for more details of this discussion.

It should also be noted that there are an additional ~1 acre of existing jurisdictional wetlands on the project that were enhanced for *no credit* on the project. These wetlands had cattle excluded, were planted, and almost certainly experienced improved hydrology along with the adjacent restored wetlands.

Most sincerely,

Scott King, LSS, PWS

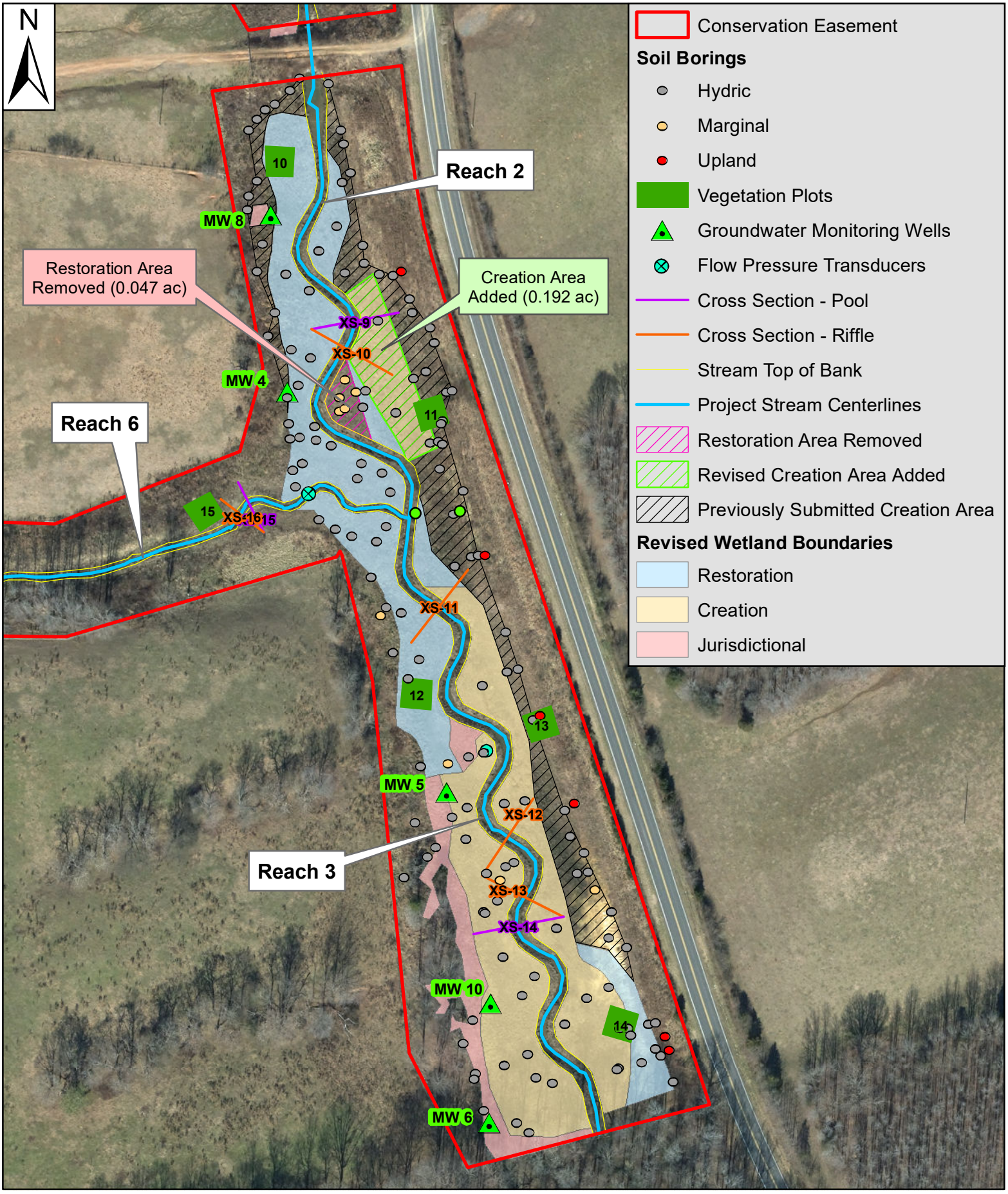
Scott.King@mbakerintl.com
919-219-6339 [M]



Michael Baker INTERNATIONAL

0 50 100 200 300 Feet

Figure 1.
UT to Town Creek
Orginal Wetland Boundaries

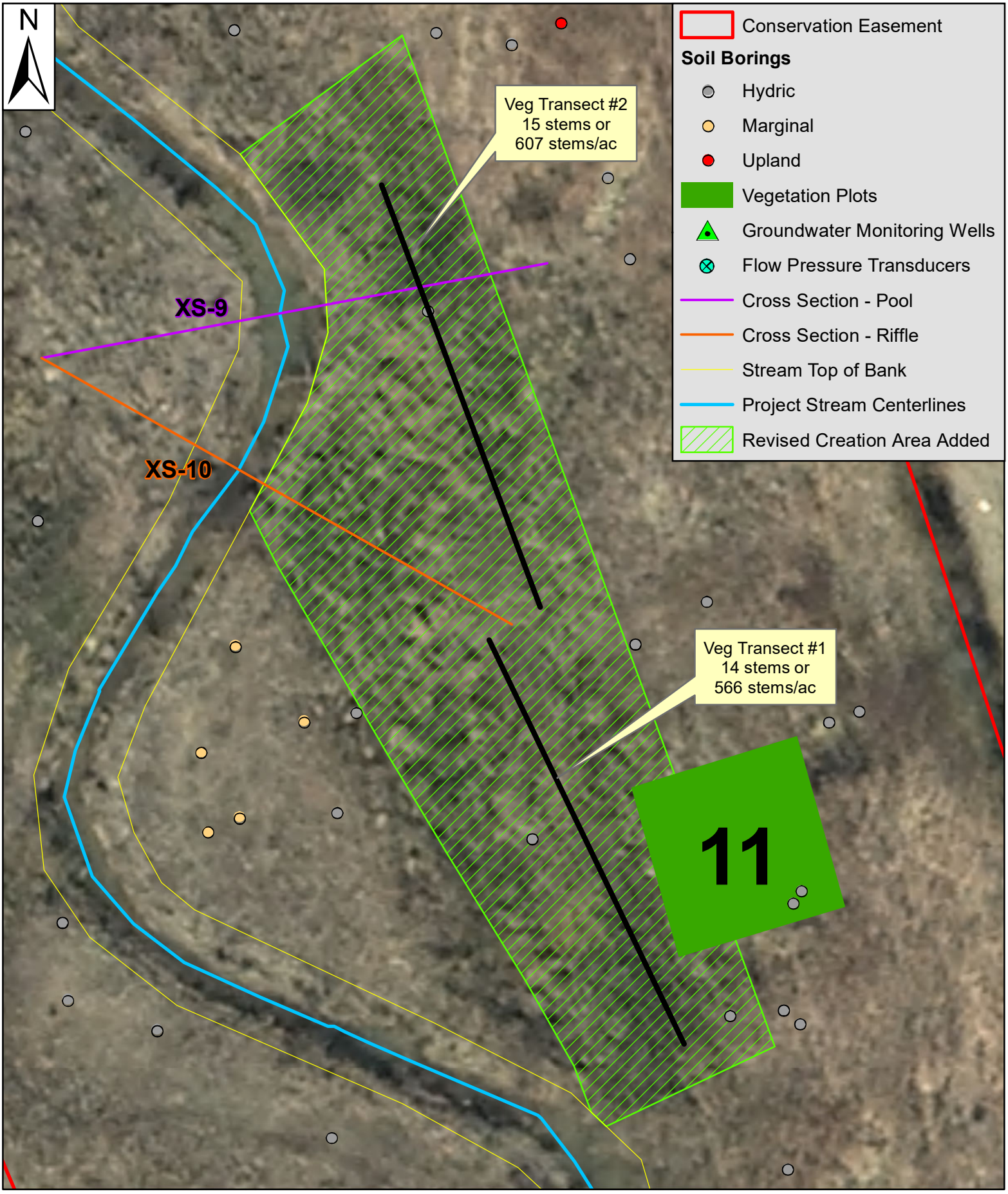


Michael Baker INTERNATIONAL

0 50 100 200 300 Feet

Figure 2.
UT to Town Creek
Wetland Boundary Adjustment

Rev: 16Dec2021



Michael Baker INTERNATIONAL

0 12.5 25 50 Feet

Figure 3.
UT to Town Creek
Wetland Boundary Adjustment

Rev: 23Nov2021

UT to Town Creek: Wetland Boundary Adjustment Photographs (from 1/12/21)

Soft rush in area with shallow standing water

Wetland vegetation and standing water in floodplain

Wetland vegetation and standing water in floodplain

Hydric soil

Wetland vegetation and standing water in floodplain

Hydric soil

UT to Town Creek: Wetland Boundary Adjustment Photographs (from 11/23/21)

Abundant, tall, diverse vegetation present

Abundant, tall, diverse vegetation present (buttonbush in foreground)

Abundant, tall, diverse vegetation present (buttonbush and sycamore in foreground)

Vegetation Transect #1

Vegetation Transect #2

Hydric soil present throughout

UT to Town Creek: Wetland Boundary Adjustment Photographs (from 11/23/21)

Abundant, tall, diverse vegetation present

Abundant, tall, diverse vegetation present

Dense herbaceous layer present dominated by tearthumb and various rushes and sedges

Dense herbaceous layer present dominated by tearthumb and various rushes and sedges

Abundant, tall, diverse vegetation present (silky dogwood in foreground)

Abundant, tall, diverse vegetation present

Wilmington District Stream Buffer Credit Calculator

Site Name:	UT to Town Creek
USACE Action ID:	SAW-2013-1280
NCDWR Project Number:	14-1024
Sponsor:	Michael Baker Engineering, Inc. - NCDMS
County:	Stanly
Minimum Required Buffer Width[1]:	50

Mitigation Type	Mitigation Ratio Multiplier[2]	Creditable Stream Length[3]	Baseline Stream Credit
Restoration (1:1)	1	5527	5527.00
Enhancement I (1.5:1)	1.5		
Enhancement II (2.5:1)	2.5	347	138.80
Preservation (5:1)	5		
Other (7.5:1)	7.5		
Other (10:1)	10		
Custom Ratio 1	1	444	444.00
Custom Ratio 2			
Custom Ratio 3			
Custom Ratio 4			
Custom Ratio 5			
Totals		**6318.00**	**6109.80**

Buffer Width Zone (feet from Ordinary High Water Mark)

Buffer Zones	**less than 15 feet**	**>15 to 20 feet**	**>20 to 25 feet**	**>25 to 30 feet**	**>30 to 35 feet**	**>35 to 40 feet**	**>40 to 45 feet**	**>45 to 50 feet**	**>50 to 75 feet**	**>75 to 100 feet**	**>100 to 125 feet**	**>125 to 150 feet**
Max Possible Buffer (square feet)[4]	189540	63180	63180	63180	63180	63180	63180	63180	315900	315900	315900	315900
Ideal Buffer (square feet)[5]	188765.5232	63169.9440	63076.3311	62775.7326	62337.4710	62106.2104	61917.4823	61752.6464	306392.9452	304924.3718	305134.0046	306325.7583
Actual Buffer (square feet)[6]	185521.2138	61481.6639	61082.9021	60471.6938	60193.8776	59895.3844	59584.1328	59116.6549	182455.0770	108745.8026	54754.2335	14600.9280
Zone Multiplier	50%	10%	10%	10%	5%	5%	5%	5%	7%	5%	4%	4%
Buffer Credit Equivalent	3054.90	610.98	610.98	610.98	305.49	305.49	305.49	305.49	427.69	305.49	244.39	244.39
Percent of Ideal Buffer	98%	97%	97%	96%	97%	96%	96%	96%	60%	36%	18%	5%
Credit Adjustment	-52.50	-16.33	-19.31	-22.42	-10.50	-10.87	-11.51	-13.04	254.68	108.95	43.85	11.65

Total Baseline Credit	**Credit Loss in Required Buffer**	**Credit Gain for Additional Buffer**	**Net Change in Credit from Buffers**	**Total Credit**
6109.80	**-156.50**	**419.14**	**262.64**	**6372.44**

[1]Minimum standard buffer width measured from the top of bank (50 feet in piedmont and coastal plain counties or 30 feet in mountain counties)

[2]Use the Custom Ratio fields to enter non-standard ratios, which are equal to the number of feet in the feet-to-credit mitigation ratio (e.g., for a perservation ratio of 8 feet to 1 credit, the multiplier would be 8

[3]Equal to the number of feet of stream in each Mitigation Type. If stream reaches are not creditable, they should be excluded from this measurement, even if they fall within the easement

[4]This amount is the maximum buffer area possible based on the linear footage of stream length if channel were perfectly straight with full buffer width. This number is not used in calculations, but is provided as a reference.

[5]Maximum potential size (in square feet) of each buffer zone measured around all creditable stream reaches, calculated using GIS, including areas outside of the easement. The inner zone (0-15') should be measured from the top of the OHWM or the edge of the average stream width if OHWM is not known. Non-creditable stream reaches within the easement should be removed prior to calculating this area wtih GIS.

[6]Square feet in each buffer zone, as measured by GIS, excluding non-forested areas, all other credit type (e.g., wetland, nutrient offset, buffer), easement exceptions, open water, areas failing to meet the vegetation performance standard, etc. Additional credit is given to 150 feet in buffer width, so areas within the easement that are more than 150 feet from creditable streams should not be included in this measurement. Non-creditable stream reaches within the easement should be removed prior to calculating this area wtih GIS

UT to Town Creek

Reach	As-Built Footage	Approach	Ratio Factor	SMU
1	1,192	R	1	1,192
2	1783	R	1	1,783
3	803	R	1	803
4	444	EI	1	444
5	347	EII	2.5	139
6	1350	R	1	1,350
7	399	R	1	399
Total	**6,318**			**6,110**

	Creditable Stream Length (ft)	Baseline Stream Credit
Restoration (1:1)	5,527	5527
Enhancement I (1:1)	444	444
Enhancement II (2.5:1)	347	139
Total	6,318	6110

Buffer Zones Jan2018

Buffer Zone	Ideal Buffer (sq ft)	Actual Buffer (sq ft)
<15 ft.	188765.5232	185521.2234
>15-20 ft.	63169.9440	61481.6639
>20-25 ft.	63076.3311	61082.9021
>25-30 ft.	62775.7326	60471.6938
>30-35 ft.	62337.4710	60193.8776
>35-40 ft.	62106.2104	59895.3844
>40-45 ft.	61917.4823	59584.0931
>45-50 ft.	61752.6464	59164.6369
>50-75 ft.	306392.9452	184069.5392
>75-100 ft.	304924.3718	108881.0473
>100-125 ft.	305134.0046	54814.3114
>125-150 ft.	306325.7583	14611.8397
>150 ft.	615548.9857	3764.6359

Revised Buffer Zones 08Dec2022

Buffer Zone	Actual Buffer (revised)	Difference from Ideal Buffer
<15 ft.	185521.2138	3244.3094
>15-20 ft.	61481.6639	1688.2801
>20-25 ft.	61082.9021	1993.4290
>25-30 ft.	60471.6938	2304.0389
>30-35 ft.	60193.8776	2143.5934
>35-40 ft.	59895.3844	2210.8260
>40-45 ft.	59584.1328	2333.3495
>45-50 ft.	59116.6549	2635.9915
>50-75 ft.	182455.0770	123937.8682
>75-100 ft.	108745.8026	196178.5692
>100-125 ft.	54754.2335	250379.7711
>125-150 ft.	14600.9280	291724.8302
>150 ft.	3764.6288	611784.3569

Contracted Credits: 6465

Credit Table 1. Total SMU's: 6403.600

Original Additional SMU from Buffer Tool (2018): 265.32

Credit Table 1 Additional SMU from Buffer Tool: 265.00

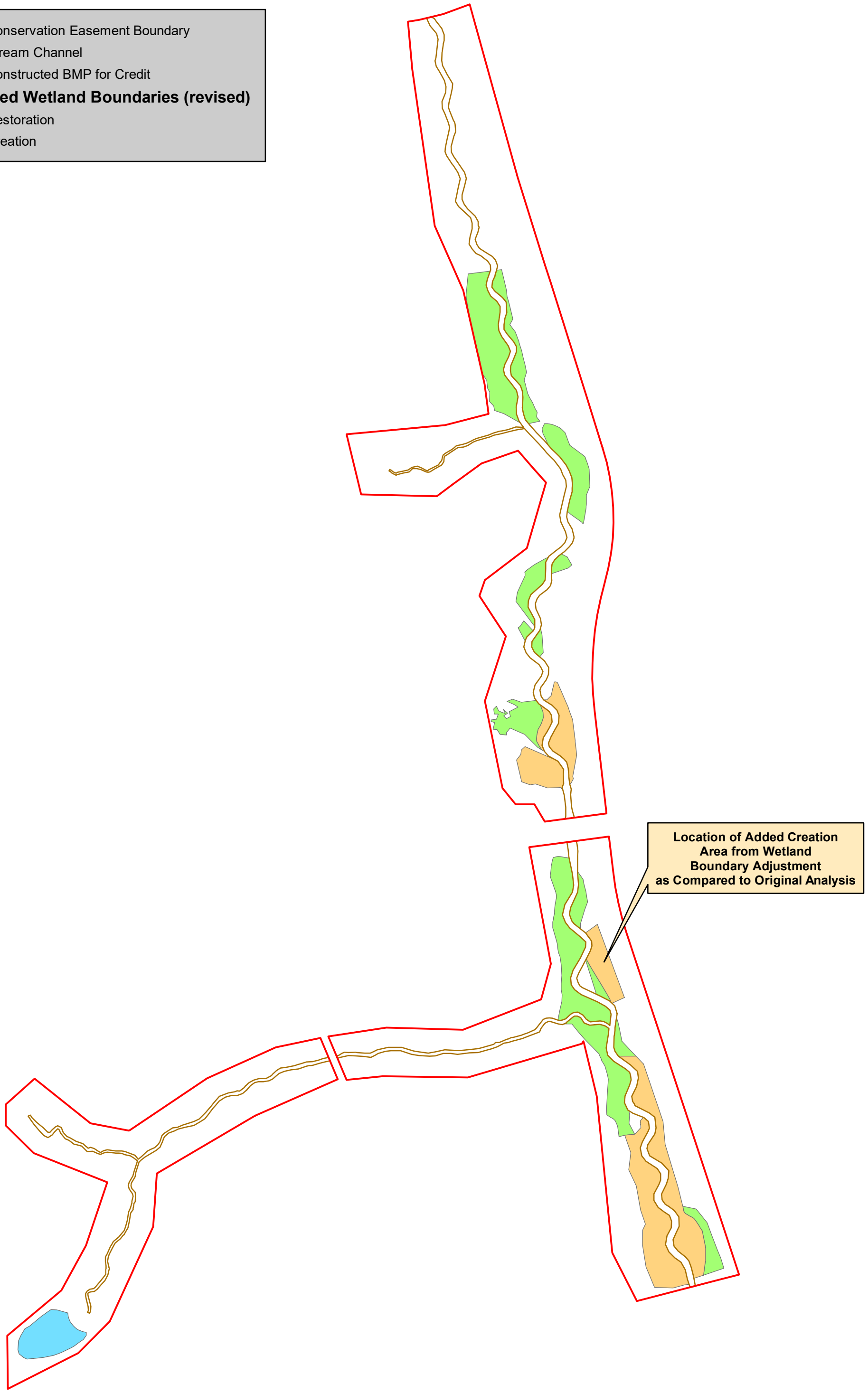
Revised Additional SMU from Buffer Tool (2021): 262.64

Difference from Original: 2.68

Conservation Easement Boundary
Stream Channel
Constructed BMP for Credit

Credited Wetland Boundaries (revised)

Restoration
Creation



Michael Baker INTERNATIONAL

0 125 250 500 Feet

N

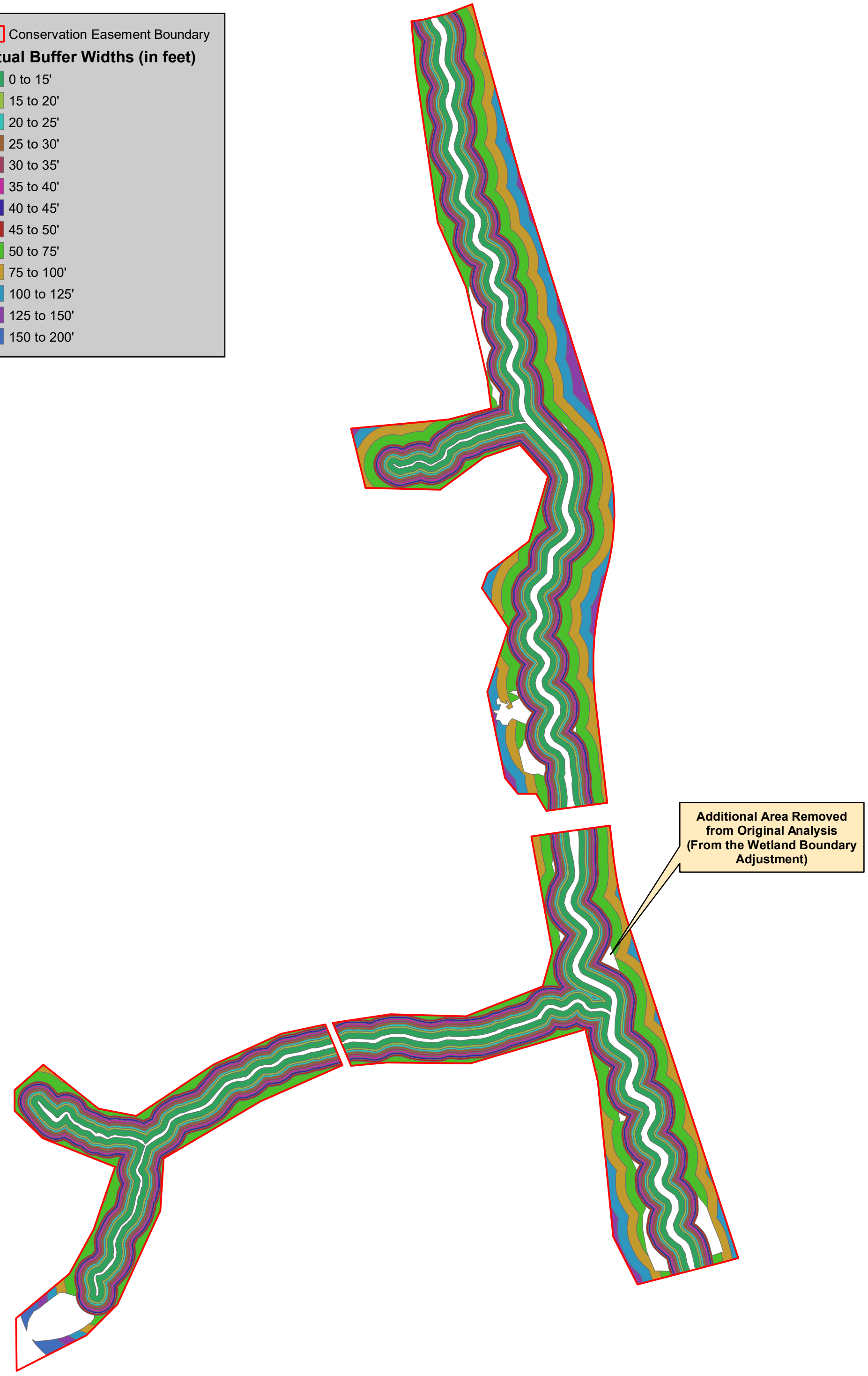
Figure 1. Stream Channel, Credited Wetlands, BMPs Buffer Analysis (Rev 08Dec2021)
UT to Town Creek Restoration Project - Option A
Stanly County, NC

DMS Project No. 94648
Baker Project No. 120857
Date: 08Dec2021
Monitoring Year: 6 of 7
Drawn By: RWM/SEK
Sheet: 1 of 1

Conservation Easement Boundary

Actual Buffer Widths (in feet)

- 0 to 15'
- 15 to 20'
- 20 to 25'
- 25 to 30'
- 30 to 35'
- 35 to 40'
- 40 to 45'
- 45 to 50'
- 50 to 75'
- 75 to 100'
- 100 to 125'
- 125 to 150'
- 150 to 200'



Michael Baker INTERNATIONAL

0 125 250 500 Feet

N

Figure 2. Actual Buffer Zones with Applicable Credited Areas Removed
Buffer Analysis (Rev 08Dec2021)
UT to Town Creek Restoration Project - Option A
Stanly County, NC

DMS Project No. 94648
Baker Project No. 120857
Date: 08Dec2021
Monitoring Year: 6 of 7
Drawn By: RWM/SEK
Sheet: 1 of 1

King, Scott

From: Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Sent: Monday, December 13, 2021 02:14 PM
To: King, Scott
Cc: Davis, Erin B; Haywood, Casey M CIV USARMY CESAW (USA); Tugwell, Todd J CIV USARMY CESAW (USA); Wiesner, Paul; Tsomides, Harry
Subject: EXTERNAL: RE: UT to Town Creek project questions
Attachments: UTtoTownCreek_WetlandBoundaryAdjustments_Fig2_rev_2021Dec08.pdf

Hi Scott
Thanks for all the information. The wetland adjustment plan is acceptable to the IRT. Given that 2.680 credits is a small amount, and removing sections of wetlands and applying the new buffer tool complicates the issue, no further mitigation plan or contract adjustments will be needed. We'll plan on closing the site out as originally proposed.

Thanks
Kim

Kim Browning
Mitigation Project Manager, Regulatory Division I U.S. Army Corps of Engineers

-----Original Message-----
From: King, Scott <Scott.King@mbakerintl.com>
Sent: Thursday, December 09, 2021 11:54 AM
To: Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Cc: Davis, Erin B <erin.davis@ncdenr.gov>
Subject: [Non-DoD Source] UT to Town Creek project questions

Good morning Kim,

In making some adjustments to the UT to Town Creek project in Stanly County, Harry Tsomides of DMS has asked me to run a couple of things by you (and the IRT in general) to confirm them before we finalize the MY6 report. If the IRT has any concerns, we'd like to have them sorted them out now rather than next year at closeout. We had an IRT field visit back in June of this year and I see from our meeting summary memo that you weren't actually in attendance that day. That's a shame. I was specifically asked to coordinate with you as I understand Todd has a temporary re-assignment coming up(?). However, we can include him in on the conversation if you think that's prudent and he wouldn't be bothered by that. I have also included Erin Davis of DEQ as she was there and part of the discussion as well.

Basically, we have a situation where at a previous field visit back in 2019, Mac Haupt discovered a small pocket (0.047 ac) within our wetland restoration area that hadn't developed hydric soils and suggested we pull it out and add-in an adjacent area that was very wet. As per DMS suggestion, we ended up doing a larger scale re-delineation of a much broader area, adding significantly more proposed wetlands (as Creation at 3:1) to the project. At the recent field visit in June of this year, much of this wetland area was accepted except for a narrow section at the southern end. It does not visually look as wet as the upper portions we added. As such, we were asked to either remove this portion from our new proposed wetland area or install a groundwater well or two and document the area much more thoroughly. As we didn't need all the newly added wetland area anyway to compensate for the lost area, and didn't want to have install a well for the next two years, we decided to remove this controversial area entirely and simply propose keeping only the minimum area needed to compensate for the lost wetlands. We ended up dropping almost all of the originally proposed

wetland addition and have only kept the wettest area that had been readily accepted in the field that day (about 0.20 ac). The area we kept is also the exact location that Mac suggested we add back in 2019! I had hoped by making these changes the wetlands would be more readily acceptable by the IRT and easier on Baker as the area is small and simpler to document (veg and soils) and wouldn't require any more groundwater wells, etc (please see the attached Figure). However, by using this small area of added wetland as compensation, it altered the results of the buffer tool analysis which we had used to obtain extra stream credits for the project. We had been told to re-run the analysis using the older version of the buffer tool (the same one we had used originally) just with the new wetland area. It has resulted in the loss of 2.680 SMU, putting us below our official Table 1 credit numbers. So, with all that background in place, here are the questions DMS wanted me to run by you:

-As we are now technically down 2.680 SMU from our official credit table from the loss of buffer tool credits, DMS is concerned that there will need for mit plan or contract adjustments and Baker is concerned about loss of credits for payment. DMS suggested that if the number is really that small that the IRT might just let it slide and closeout with full credits intact, meaning no further mit plan or contract adjustments needed. Is that possible? If so, we will keep the wetland area as we now have it and move forward. However, if that's not acceptable I would offer an easy solution to make things simpler all around. I can adjust the proposed wetland boundary to kick out a small triangle of about 1,400 ft2 in size that is affecting the buffer tool credit results (see the attached figure). We would still be able to compensate for the wetland loss but not lose any SMU. I had thought about that a while back but felt uncomfortable obviously skewing a boundary for that purpose. It felt like I was gerrymandering the boundary for a self-centered intent! However, with the IRT's permission, I could do that and it would solve that issue. But if being off by 2.680 SMU isn't a big deal to you then we can just go with what we have.

-DMS had suggested that IF the loss of 2.680 SMU must be addressed and IF my proposed wetland boundary adjustment isn't acceptable (where I cut out a small triangle) then maybe we could be allowed to us the newer buffer tool, which I am told allows for more credit around stream terminals and so would easily allow for more stream credits. Honestly, I would prefer not to have get ahold of the new tool and start from scratch though.

-And finally, is the overall wetland adjustment plan acceptable to the IRT? Any questions or concerns? I had previously contacted Todd back in July about my plan and he was agreeable to it (see attached email) but that was before I had anything finalized to show him. It was just theoretical. I have also attached the meeting minutes from the June 2021 IRT field visit as well.

I totally understand this is A LOT to throw at you! I would love to discuss this further over the phone (or Teams or Zoom) if you like but I wanted both of you to have the full discussion and explanation in text first. And again, we can certainly get up with Todd too if you feel that's needed. Erin, I'm glad to have you as part of the conversation as well as you were there in June 2021. If either of you have any questions, please give me a call on my cell 919-219-6339.

Thank you very much!

Scott

Scott King, LSS, PWS | Soil Scientist - Ecosystem Restoration Group | Michael Baker International
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