FINAL

UT to Town Creek Restoration Project – Option A
Year 2 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: 2 of 7 Year of Data Collection: 2017 Year of Completed Construction: 2016 Submission Date: December 2017
Submitted To:	NCDEQ – Division of Mitigation Services 1625 Mail Service Center Raleigh, NC 27699 NCDEQ Contract ID No. 003277

UT to Town Creek Restoration Project – Option A
Year 2 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.

NC Professional Engineering License # F-1084

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Michael Baker
INTERNATIONAL

We Make a Difference

January 17, 2018

Harry Tsomides, Project Manager
NCDEQ - Division of Mitigation Services
5 Ravenscroft Drive, Ste. 102
Asheville, NC 28801

Subject: Task 8: Annual Final Monitoring Report – Monitoring Year 2 & Response to Comments
UT to Town Creek Restoration Project – Option A
Yadkin River Basin – CU# 03040105 – Stanly County, NC
NCDMS Project ID No. 94648; NCDEQ Contract No. 003277

Dear Mr. Tsomides:

Please find enclosed the Final Year 2 Monitoring Report and our responses to the Division of Mitigation Services (DMS) review comments received on December 12, 2017 regarding the UT to Town Creek Restoration Project – Option A, located in Stanly County, NC. We have revised Final Year 2 Monitoring Document in response to the referenced review comments. Each response has been grouped with its corresponding comment and is outlined below.

Credits – Following the 2017 Credit Release meeting it was determined that Baker would apply an approved buffer methodology to determine project credits. If possible please run the recently updated buffer method and incorporate updated proposed credits into the MY02, along with a brief narrative explaining why (and to what degree) project credits are changing during the monitoring period.

Response – *Additional stream credits from excess buffers will be determined after the Interagency Review Team has finalized the spreadsheet for calculating the amount of additional credits generated. Updates will be included in the MY03 report and will include an updated asset table and all other necessary documentation. Please note that per direct communication with Andrea Hughes with the USACE on 10/26/17, a full credit release will be approved for monitoring year 2. This is due to the spreadsheet being developed to calculate additional credits from additional buffer widths, not being complete in time.*

Report should have Appendix tabs and front/rear protective covers (similarly to MY01).

Response – *The final report copies include Appendix tabs and front/rear protective covers, as requested.*

Tables on opposing pages should not read upside down when the report is held to one side; e.g., Tables 5b, 5d, 5f, etc. (similarly to MY01).

Response – *Front and back print settings have been adjusted. All tables have been printed right side up.*

Some page footers contain the Town Creek DMS Project Number (95026).

Response – *Page footers have been updated to reflect the correct DMS Project Number for UT to Town Creek (94648).*

Cross sections – Reported bankfull elevations have changed from MY01 to MY02. These were set and consistent from MY0 to MY01. Bankfull elevation and the bankfull depth should remain static and reflect MY0 conditions for the purposes of monitoring changes/trends in the BHR. TOB elevation (the depth from the thalweg to the low TOB) may change throughout monitoring period. Please update the cross sections and data tables accordingly.

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Response *– Bankfull elevations have been updated to reflect MY0. In addition, max BKF depth, BH ratio, and ER have been revised where appropriate. Cross-sections and cross-section morphology and have been updated to reflect changes in summary data. A footnote has been added to all associated tables to reflect these changes. For riffles the footnote is stated as follows:*

> *"* Max BKF depth was calculated from the As-built survey only for riffles. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width. **Recorded BKF elevation reflects the as-built survey BKF elevation."*

For pools the footnote is stated as follows:

> *"*Recorded BKF elevation reflects the as-built survey BKF elevation."*

Overall Assets Summary (Table 1) – Preferable that SMU should be reported to the nearest tenth to match DMS' asset data tracking.

Response *– SMUs reported in the Overall Assets Summary (Table 1) have been updated to reflect the SMU units to the nearest tenth.*

Figures 2a through 2c - Figures should be printed on 11x17 as they were in the MY01 report. Project monitoring features are not legible at the submitted print size / scale.

It would be preferable to show the stream segment for each asset type in a unique color rather than callouts to be consistent with most DMS monitoring reports. If that is not possible please show the reach breaks clearly. For example, Figure 2B shows point-callouts for Reach 2 and Reach 3 but it is not clear looking at the figure where the break point is between Reaches 2 and 3; e.g., is it the roadway/culvert or the confluence with Reach 6?

Response *– Figures 2 – 2c have been printed on 11x17 sized paper. As requested, each reach has been identified with a distinct color to clearly define the reach on the CCPV maps (Figures 2 – 2C)*

Table 6b – Please follow the format used for Stream Problem Areas; if no issues are noted for a Reach, please indicate that in the Feature/Issue field.

VPAs 3 and 6 do not have a photo and are not identified in the table. There are several reach issues noted without a photo ID. It is not necessary to have a photo for every problem area, but every problem area should have a unique ID associated with it other than the photo ID. The reader needs to connect the CCPV map with this table in order to easily know what type of problem exists in each of the called-out map locations.

Since Myriophyllum aquaticum (parrot feather) is noted in the problem area photos it could be captured in the table somehow.

Response *– The "Feature Issue" column of Table 6b has been updated to correctly reflect reaches with no problem areas. Identification for VPA 2-3 and VPA 2-6 was inadvertently omitted from Table 6b and has been updated accordingly. Notation of the presence of Myriophyllum aquaticum (parrot feather) has been included in Table 6b as requested. Because the issue is located in areas reachwide along Reach 1, Reach 2, and Reach 3 and not in discrete locations, VPAs were not assigned and were not depicted on the CCPV figures.*

Stream Station Photos – Suggestion: The photo size/clarity quality has diminished from MY01 to MY02 (gotten darker and smaller); one example is PID 9 Station 13+99 Reach 7. It is understood that vegetation gets thicker every year and the photos may not always show much depending on the light conditions but it would be good to try and minimize foreground vegetation and try to capture the stream itself to the degree

possible, using judgment to move around a little bit. Not necessary to go back and re-do photos for this report, just a comment for the future.

Response *– As suggested, Baker will be more cognizant of the clarity, size, and subject matter of each stream station photo in subsequent monitoring years, so that they better represent the stream condition and mimic photos from MY01.*

If you have any questions or concerns, please feel free to contact me at (704) 579-4828 or via my email address at ksuggs@mbakerintl.com.

Sincerely,

Kristi Suggs
Project Manager

Cc: File

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1.0 EXECUTIVE SUMMARY

Michael Baker Engineering, Inc., (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, 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 2 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 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.

During Year 2 monitoring, vegetation conditions were performing close to 100% for both the planted acreage and invasive/encroachment area categories. As noted in Table 6b, there was only one area of sparse herbaceous vegetation that exceeded the mapping threshold of 0.1 acres. This area is located along Reach 3 near Vegetation Plot 14 and consists of approximately 0.11 acres. Lack of herbaceous vegetation is likely due to poor soils that are frequently inundated by overbank storm flows and roadside drainage.

Treatment control applications for invasive species were conducted in March 2017. These treatments significantly reduced invasive species populations documented in Monitoring Year 1. In MY2, a total of five discrete areas of invasive species that exceeded the mapping threshold were documented. These areas totaled approximately 0.19 acres or 0.8% of the easement area and consisted primarily of *Rosa multiflora* (Multi-flora rose), *Ligustrum sinese* (Chinese privet), and *Paulownia tomentosa* (princess tree).

Additionally, the project is experiencing an overgrowth of *Myriophyllum aquaticum* (parrot feather) throughout the mainstem (Reaches 1, 2, and 3) of the project. Prior to restoration, the presence of the aquatic weed had been documented in the stream as well as the watershed; however, it seems that recent low flow conditions have allowed the weed to proliferate. NCDEQ has been contacted to provide recommendations for a control plan if one is available. All invasive species will continue to be monitored throughout the site and treated as needed. Tables summarizing and maps depicting the vegetative assessment problem areas can be found in Appendix B.

Based on data collected from the twenty monitoring plots during Year 2 monitoring, the average density of total planted stems per plot ranges from 486 to 890 stems per acre with a tract mean of 670 stems per acre. Therefore, the Year 2 data demonstrate that the Site is on track for meeting the minimum success interim criteria of 320 trees per acre by the end of Year 3. Vegetation stem counts are summarized in Tables 7 and 9 of Appendix C.

The nineteen (19) permanent cross-sections located throughout the Site show minimal adjustment to stream dimension since construction. Longitudinal profiles for Reach 1, 2, 3, and 6 have remained geomorphically stable throughout the Year 2 post-construction monitoring period. Pools are well maintained and grade control structures (constructed riffles, rock j-hooks, log vanes, and boulder steps) help maintain the overall profile desired. In addition, Tables 5a through 5h (Appendix B) indicate the Site has remained geomorphically stable with lateral/vertical stability and in-stream structure performance of 100% on most of the reaches. The only area where a small amount of erosion is present was along the sill of a boulder step located on the right bank of Reach 6 at Station 16+20. No other areas of bank scour and/or erosion around structures were noted. Visual observations and a review of reach-wide pebble count data collected indicates that each Reach is sufficiently moving fines through the system. Cross-sectional, longitudinal profile, and pebble count data are provided in Figures 3, 4, and 5 respectively, in Appendix D.

Groundwater monitoring data collected during the growing season (March 27 through November 5) of the Year 2 monitoring period documented that all ten groundwater monitoring wells exhibited soil saturation within 12 inches of the ground surface for the minimum success criteria of nine percent (9%) or 20 consecutive days during the growing season. UTTC AW2 exhibited the highest percentage of consecutive days (69.1%) meeting saturated conditions, as well as, the having the highest number of cumulative days (179.5) meeting conditions. UTTC AW8 had the lowest percentage of consecutive days (11.5%) meeting saturated conditions, as well as, the having the lowest number of cumulative days (89.0) meeting conditions. It should also be noted that UTTC AW8 is located in a jurisdictional wetland and outside the boundary of the wetland areas where credit is being generated (See CCPV in Appendix B). See Appendix E for a plot of wetland gauge data as it relates to monthly precipitation for Monitoring Year 2 (Figure 6) and a summary of wetland attainment for all ten monitoring

gauges (Table 12). See Figure 2 in Appendix B, for a depiction of wetland mitigation areas and corresponding gauge locations.

In-stream pressure transducers were installed on Reach 6 and 7 to document flow conditions throughout the monitoring year. During Monitoring Year 2, in-stream flow gauges on Reach 6 (R6_W1 and R6_W2) and on Reach 7 (R7_W1 and R7_W2) documented at least one period of consecutive stream flow for the required minimum of 30 days. R6_W1 experienced the longest period of consecutive stream flow with 205 days. Figure 7 in Appendix E, depict the documented flow conditions for each gauge through Monitoring Year 2 relative to local rainfall data, while Table 13 documents both the total cumulative days of flow and the maximum number of consecutives days of flow.

Two bankfull event were observed and documented during MY2. Information on bankfull events is provided in Table 14 of Appendix E.

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 North Carolina Division of Mitigation Services (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. Stream and vegetation monitoring will be conducted for five years, while wetland monitoring will be conducted for seven years. 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 2 monitoring data were collected from October through November 2017. All visual site assessment data contained in Appendix B were collected on November 8th and 9th of 2017. Vegetation data and plot photos were collected on October 4th and 5th of 2017. Sediment data were collected on November 2nd of 2017.

Stream survey data were collected from October 3rd through October 11th of 2017 and were certified on October 25th of 2017. Stream survey data were collected to meet the requirements for a topographic ground survey to the accuracy of Class C Vertical and Class A Horizontal (21 NCAC-56 section .1606) and was geo-referenced to the NAD83 State Plane Coordinate System, FIPS3200 in US Survey Feet, which was derived from the UT to Town Creek Restoration Project Option A's As-built Survey.

2.1 Stream Monitoring

Geomorphic monitoring of the Restoration and Enhancement Level I reaches will be conducted once a year for five years following the completion of construction. These activities will evaluate the success criteria associated with a geomorphically stable channel, hydrologic connectivity, and aquatic habitat diversity. The stream parameters to be monitored include stream dimension (cross-sections), profile (longitudinal profile survey), visual observation with photographic documentation, documentation of bankfull events and documentation of hydrologic conditions for restored intermittent reaches. Additionally, monitoring methods for all reaches will include those described under Photo Documentation of Site, Visual Assessment, and Vegetation Monitoring.

The methods used and related success criteria are described below for each parameter. Figure 2 shows approximate locations of the proposed monitoring devices throughout the project site.

2.1.1 Morphologic Parameters and Channel Stability

2.1.1.1 Dimension

A total of nineteen (19) permanent cross-sections, twelve (12) riffles and seven (7) pools, were installed throughout the entire project area. Cross-sections selected for monitoring included representative riffles and pools for each of the four project reaches, Reach 1, 2, 3, and 6, which implemented at least 500 linear feet of Restoration or Enhancement I activities.

Each cross-section was marked on both banks with permanent pins to establish the exact transect used. A common benchmark was also chosen to consistently reference and facilitate the comparison of year-to-year data. The cross-sectional surveys are conducted annually and include measurements of Bank Height Ratio (BHR) and Entrenchment Ratio (ER). The monitoring survey includes points measured at all breaks in slope, including top of stream banks, bankfull, inner berm, edge of channel, and thalweg, if the features are present. Riffle cross-sections are classified using the Rosgen Stream Classification System (Rosgen, 1994), and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

There should be little change in annual cross-sectional surveys from those collected during the post-construction as-built survey. If changes do take place, they will be evaluated to determine if they represent a movement toward a more unstable condition (e.g., down-cutting or erosion) or a movement toward increased stability (e.g., settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross-sectional data is presented in Figure 3 of Appendix D.

2.1.1.2 Longitudinal Profile

Longitudinal profiles were surveyed for portions of the restored lengths of Reaches 1, 2, 3, and 6 and are provided in Figure 4 of Appendix D. Longitudinal profiles will be replicated annually during the five year monitoring period.

Measurements taken during longitudinal profiles include thalweg, water surface, and the top of low bank. All measurements were taken at the head of each feature (e.g., riffle, run, pool, glide) and the maximum pool depth. Surveys were tied to a permanent benchmark.

The pools should remain relatively deep with flat water surface slopes, and the riffles should remain steeper and shallower than the pools. Bed form observations should be consistent with those observed for channels of the design stream type as well as other design information.

2.1.1.3 Substrate and Sediment Transport

After construction, there should be minimal change in the pebble count data over time given the current watershed conditions and sediment supply regime. Reachwide pebble counts were collected for Reaches 1, 2, 3, and 6. Samples collected combined with evidence provided by changes in cross-sectional data and visual assessments will reveal changes in sediment gradation that occur over time as the stream adjusts to upstream sediment loads. Bed material distribution data are located in Figure 5 of Appendix D.

2.1.2 Stream Hydrology

2.1.2.1 Bankfull Events

The occurrence of bankfull events within the monitoring period were documented by the use of a crest gauge and photographs. The crest gauge will record the highest watermark between site visits, and the gauge will be checked at each site visit to determine if a bankfull event has occurred. The crest gauge

was installed in the floodplain of Reach 3 within ten feet (horizontal) of the restored channel. Photographs will be used to document the occurrence of debris lines and sediment deposition on the floodplain during monitoring site visits.

Two bankfull flow events must be documented within a five-year monitoring period. The two bankfull events must occur in separate years; otherwise, the monitoring will continue until two bankfull events have been documented in separate years to demonstrate a floodplain connection has been restored.

2.1.2.2 Flow Documentation

A combination of photographic and flow gauge data were collected from in-stream pressure transducers and remote in-field cameras that were installed on restored intermitted reaches. R7_W1 and R7_W2 were installed Reach 7, while R6_W1 and R6_W2 were installed on Reach 6. Collected data will document that the restored intermittent stream systems continue to exhibit base flow for of at least 30 consecutive days throughout each monitoring year under normal climatic conditions. In order to determine if rainfall amounts were normal for the given year, rainfall gauge data was obtained from the nearest Stanly County weather station (CRONOS Database, NEWL – North Stanly Middle School, if available) and compared to the average monthly rainfall amounts from the Stanly County WETS Table (USDA, 2017). If a normal year of precipitation does not occur during the first five years of monitoring, flow conditions will continue to be monitored on the site until it documents that the intermittent streams have been flowing for the required duration.

Flow data and photographic documentation collected during Year 2 monitoring are located in Appendix E.

2.1.3 Photographic Documentation of Site

Photographs were used to document restoration success visually. Reference stations and cross-section photos were photographed during the as-built survey; this will be repeated for five years following construction. Reference photos were taken once a year, from a height of approximately five to six feet. Permanent markers ensure that the same locations (and view directions) are utilized during each monitoring period. Photographers will make an effort to consistently maintain the same area in each photo over time. Selected site photographs are shown in Appendix B for reference stations and Appendix D for cross-sections.

2.1.3.1 Lateral Reference Photos

Reference photo transects were taken of the right and left banks at each permanent cross-section. A survey tape was captured in most photographs which represents the cross-section line located perpendicular to the channel flow. The water line was located in the lower edge of the frame in order to document bank and riparian conditions.

2.1.3.2 Longitudinal Station Photos

Stream reaches were photographed longitudinally beginning at the upstream portion of the Site and moving downstream. Photographs were taken looking both upstream and downstream at locations throughout the restored stream valley. The photograph points were established close enough together to provide an overall view of the reach lengths, primary grade control structures, and valley crenulations. The angle of the photo depends on what angle provides the best view was noted and will be continued in future photos. Site photographs are located in Appendix B.

2.1.4 Visual Assessment

Visual monitoring assessments of all stream sections will be conducted by qualified personnel twice per monitoring year with at least five months in between each site visit. Photographs will be used to document system performance and any areas of concern related to stream bank stability, condition of

in-stream structures, channel migration, aggradation/degradation, headcuts, live stake mortality, impacts from invasive plant species or animal species, floodplain vegetative conditions, and condition of pools and riffles. The photo locations will be shown on a plan view map and descriptions will be documented in as either stream problem areas (SPAs) or vegetative problem areas (VPAs) in there associated monitoring assessment tables located in Appendix B.

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 (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 will include 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.

The interim measure of vegetative success for the site is the survival of at least 320, 3-year old, planted trees per acre at the end of Year 3 of the monitoring period. The final vegetative success criteria is the survival of 260, 5-year old, planted trees per acre at the end of Year 5 of the monitoring period.

Photographs were used to visually document vegetation success in sample plots and are located in Appendix C.

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, 2017) 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 Rd. Data from the NEWL station was obtained from the CRONOS Database located on the State Climate Office of North Carolina's website (2017).

Success criteria for wetland hydrology will be 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 will be monitored for seven years post-construction or until wetland success criteria are met. Visual inspection of proposed wetland areas will be 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 will be 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 will validate wetland restoration and creation success.

2.4 BMP Monitoring

Implementation of wetland BMPs located at the upstream extent of Reaches 4 and 7 were visually monitored for vegetative survivability and permanent pool storage capacity using photo documentation during the 5-Year monitoring period. Maintenance measures will be implemented during the 5-Year monitoring period to replace dead vegetative material and to remove excess sedimentation from permanent pools, as needed.

3.0 REFERENCES

Carolina Vegetation Survey (CVS) and NC Division of Mitigation Services (formerly NC Ecosystem Enhancement Program). 2012. CVS-NCEEP Data Entry Tool v. 2.3.1. University of North Carolina, Raleigh, NC.

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United States Department of Agriculture, 2000. WETS Table. Climate Data for Stanly County, NC. Wets Station: Albemarle, NC 0090, FIPS: 37167, 1971 - 2017. 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.

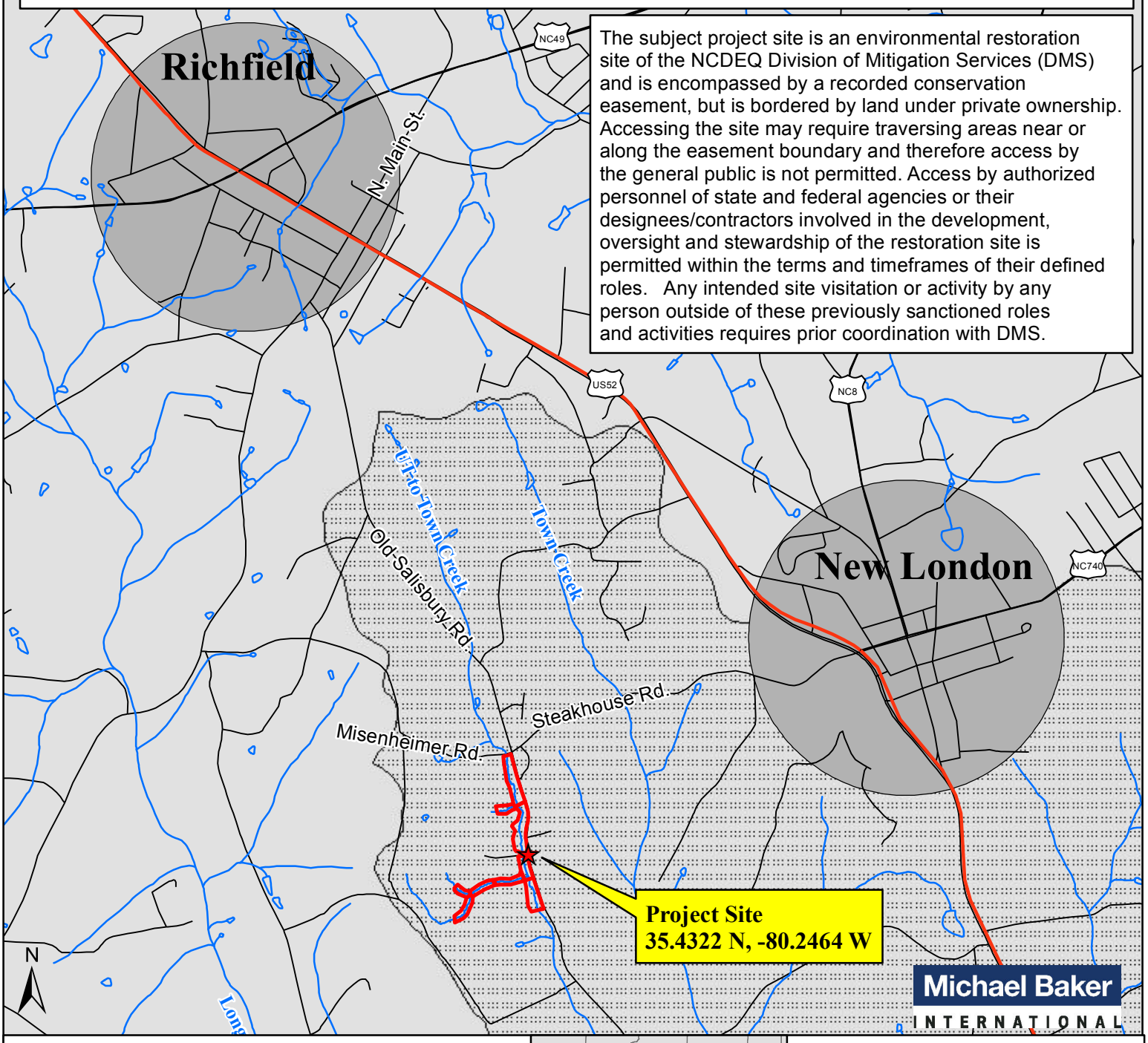


Figure 1. Vicinity Map

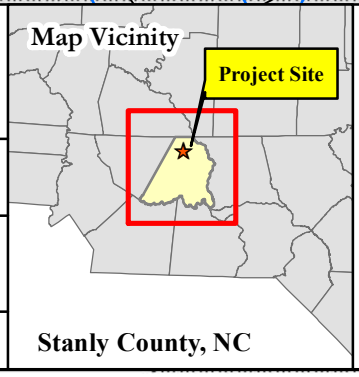
UT to Town Creek Restoration Project - Option A

Stanly County, NC

Reference: NCDOT 02 & NC One Map

NC DMS Project No. 94648
NCDEQ Contract No. 003277

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	1:1.0668	1284.4	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	1:1.08	1924.6	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	1:1.10	911.9	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	447.0	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	137.6	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	1340.0	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	399.0	Headwater Constructed Wetland, Full Channel Restoration, Planted Buffer, Livestock Exclusion, and Permanent Conservation Easement.
Wetland Group 1 (WG1)	RNR	0		2.56	2.56	R		1:1	2.6	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		1.56	1.56	C		3:1	0.5	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.
Buffer Group 1 (BG1)										
Buffer Group 2 (BG2)										
Buffer Group 3 (BG3)										

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	2.56			
Enhancement					
Enhancement I	447				
Enhancement II	344				
Creation		1.56			
Preservation					
High Quality Pres					

Overall Assets Summary

Asset Category	Overall Credits
Stream*	**6,444.5**
RP Wetland	**3.1**

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)

* Adjustment of final stream credits is pending finalized IRT guidance for additional credits associated with wider buffers.

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-14
Mitigation Plan Amended	N/A	N/A	Dec-14
Mitigation Plan Approved	N/A	N/A	Dec-14
Final Design – (at least 90% complete)	N/A	N/A	Jan-15
Construction Begins	N/A	N/A	Jul-15
Temporary S&E mix applied to entire project area	N/A	N/A	Jan-16
Permanent seed mix applied to entire project area	N/A	N/A	Jan-16
Planting of live stakes	Feb-16	N/A	Mar-16
Planting of bare root trees	Feb-16	N/A	Mar-16
Planting of herbaceous plugs	Jun-16	N/A	May-16
End of Construction	Dec-16	N/A	Jan-16
Survey of As-built conditions (Year 0 Monitoring-baseline)	Apr-16	May-16	Jun-16
Baseline Monitoring Report	May-16	Jun-16	Nov-16
Year 1 Monitoring	Dec-16	Nov-16	Dec-16
Invasive Treatment	N/A	N/A	Mar-17
Year 2 Monitoring	Dec-17	Nov-17	Dec-17
Year 3 Monitoring	Dec-18	N/A	N/A
Year 4 Monitoring	Dec-19	N/A	N/A
Year 5 Monitoring	Dec-20	N/A	N/A
Year 6 Wetland Monitoring	Dec-21	N/A	N/A
Year 7 Wetland Monitoring	Dec-22	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.	797 Haywood Road, Suite 201 Asheville, NC 28806 Contact: Jacob Byers, PE, Tel. 828-412-6101
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 Contact:
Stream Monitoring Point of Contact	Kristi Suggs, Tel. 704-665-2206
Vegetation Monitoring Point of Contact	Kristi Suggs, Tel. 704-665-2206

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

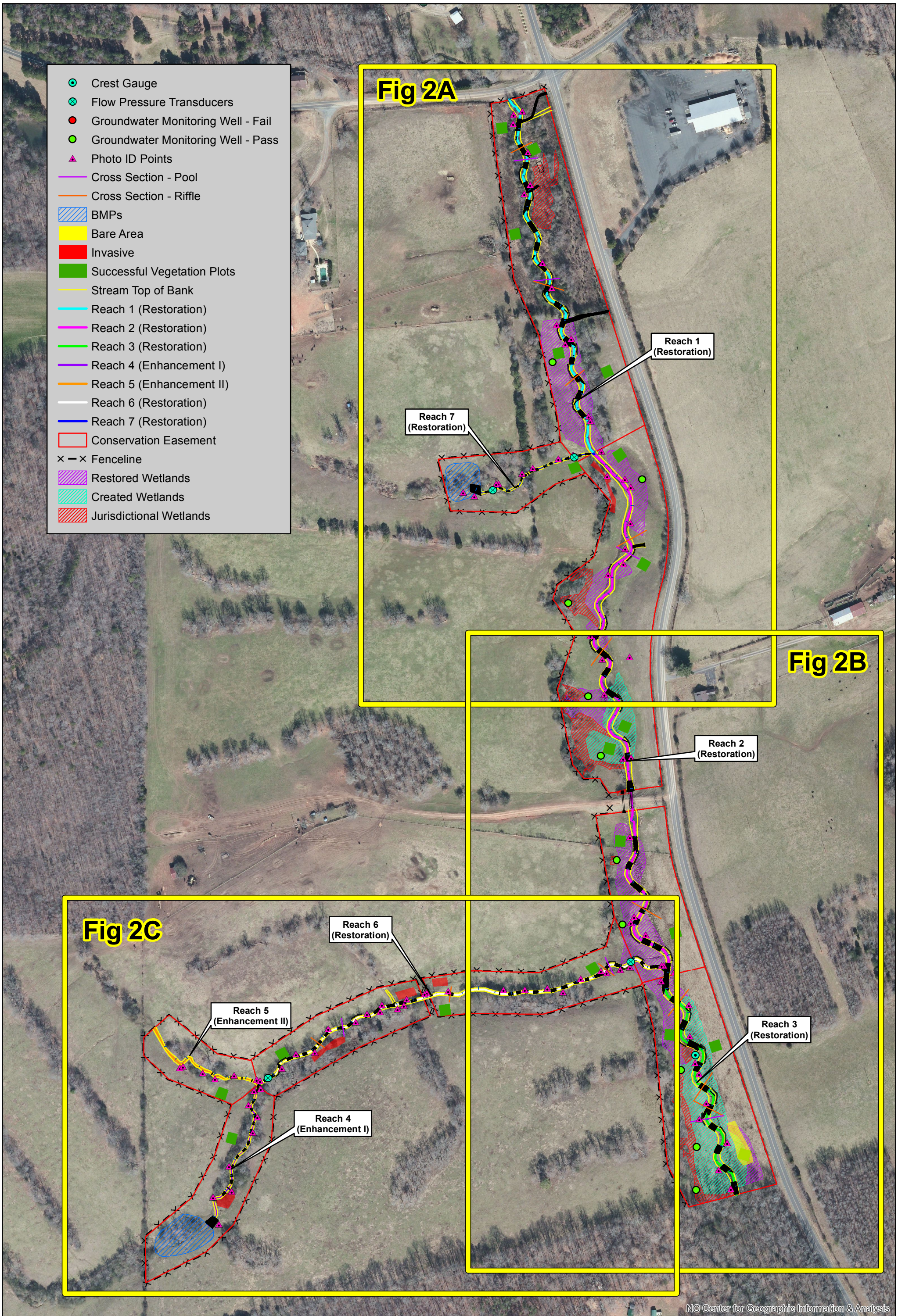
* Bald Eagle (*Haliaeetus leucocephalus*) a BGEPA species is listed as occurring in Stanly County; however, suitable habitat is not located within the Project area or within two miles of the Site.

** 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



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N

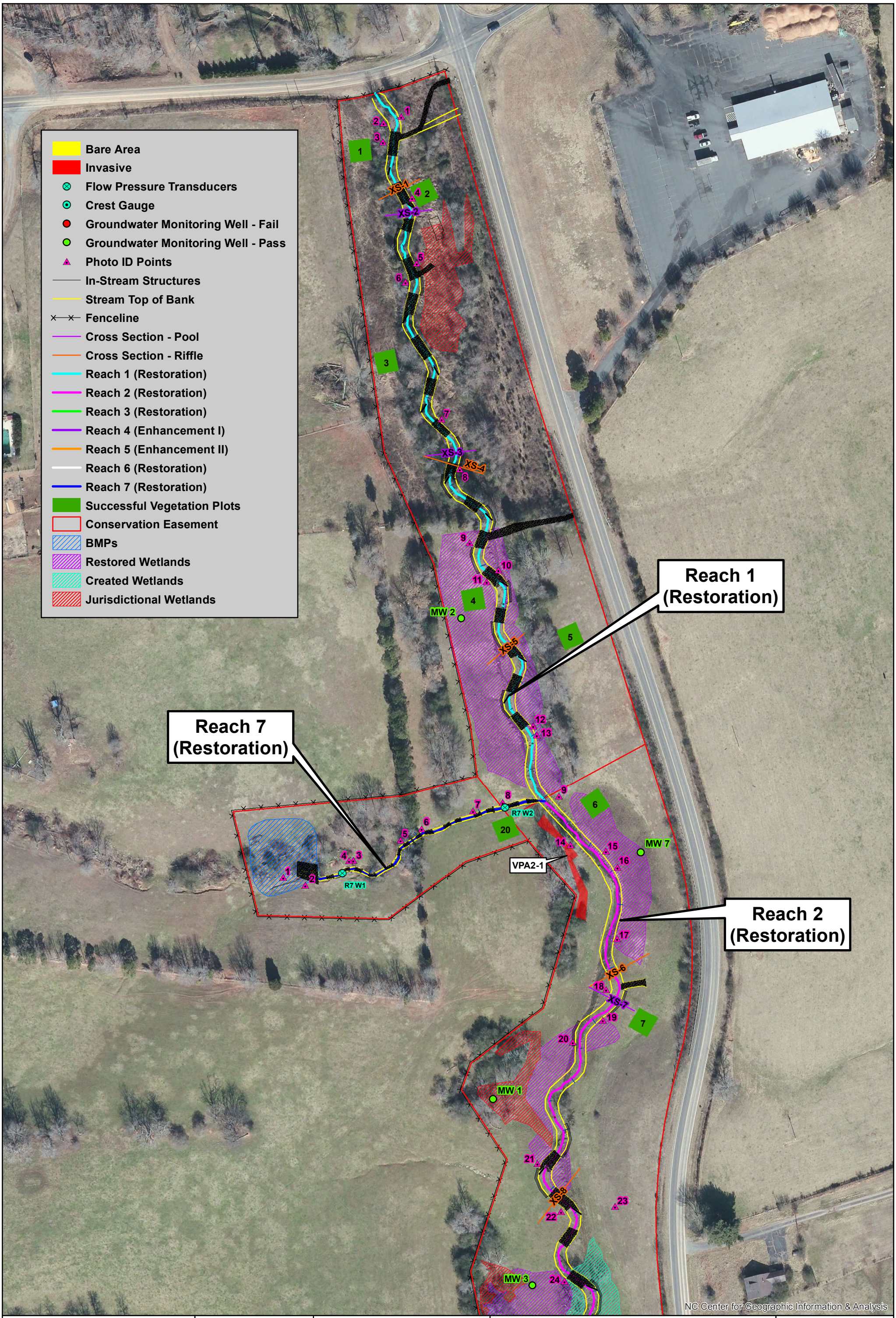
0 125 250 Feet

1" = 250'

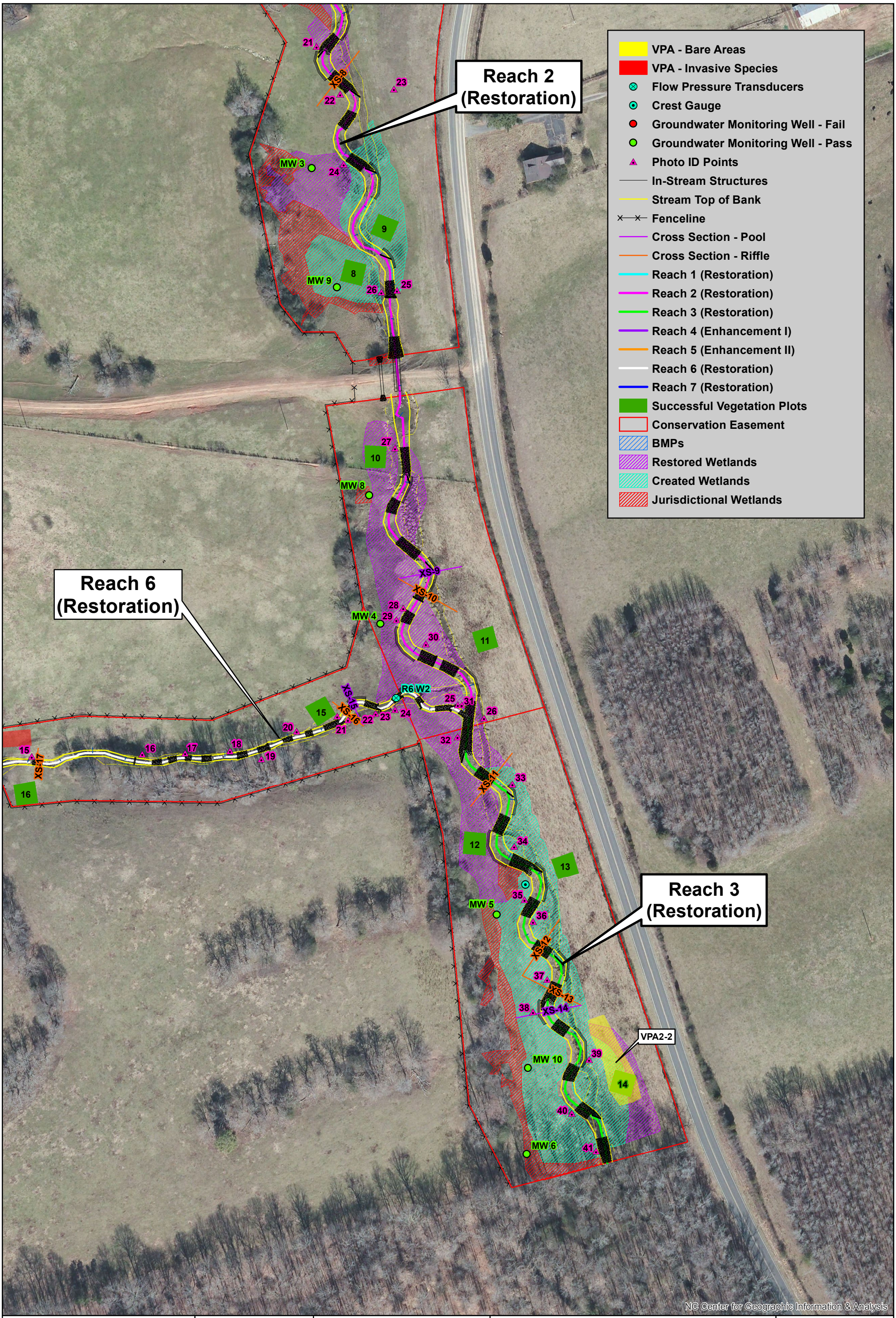
Figure 2 Overview
Current Condition Plan View

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

DMS Project No. 94648
Monitoring Year: 2 of 7
Drawn By: KLS
Date: 2017
Sheet: 1 of 4



Michael Baker INTERNATIONAL	North Carolina Division of Mitigation Services	N 0 75 150 Feet 1" = 150'	**Figure 2A** **Current Condition Plan View** UT to Town Creek Restoration Project - Option A Stanly County, NC	DMS Project No. 94648 Monitoring Year: 2 of 7 Drawn By: KLS Date: 2017 Sheet 2 of 4



Michael Baker INTERNATIONAL	North Carolina Division of Mitigation Services	N 0 75 150 Feet 1" = 150'	**Figure 2B** **Current Condition Plan View** UT to Town Creek Restoration Project - Option A Stanly County, NC	DMS Project No. 94648 Monitoring Year: 2 of 7 Drawn By: KLS Date: 2017 Sheet: 3 of 4

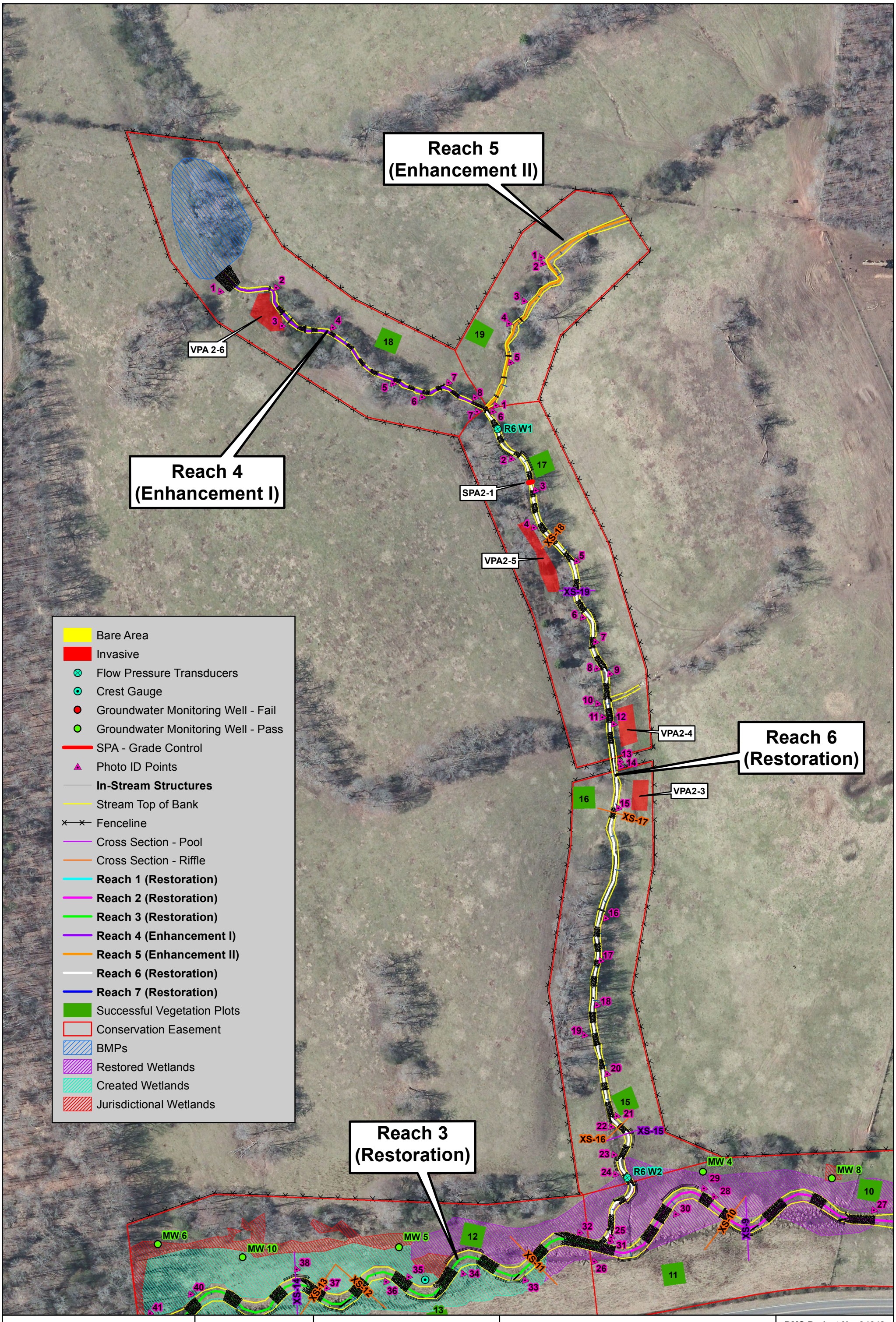


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Figure 2C
Current Condition Plan View

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

DMS Project No. 94648
Monitoring Year: 2 of 7
Drawn By: KLS
Date: 2017
Sheet: 4 of 4

Table 5a. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 1**
Assessed Length (LF)	**1,204**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1. Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	18	18			100%			
	3. Pool Condition	1. Depth	18	18			100%			
		2. Length	18	18			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	18	18			100%			
		2. Thalweg centering for pool/glide	18	18			100%			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	10	10			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	10	10			100%			

Table 5b. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 2**
Assessed Length (LF)	**1,782**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1. Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	21	21			100%			
	3. Pool Condition	1. Depth	20	20			100%			
		2. Length	20	20			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	21	21			100%			
		2. Thalweg centering for pool/glide	20	20			100%			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	9	9			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	9	9			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	9	9			100%			

Table 5c. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 3**
Assessed Length (LF)	**829**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	**1. Vertical Stability**	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	11	11			100%			
	3. Pool Condition	1. Depth	10	10			100%			
		2. Length	10	10			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	11	11			100%			
		2. Thalweg centering for pool/glide	10	10			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineering Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	6	6			100%			

Table 5d. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 4**
Assessed Length (LF)	**447**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1. Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	15	15			100%			
	3. Pool Condition	1. Depth	12	12			100%			
		2. Length	12	12			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	15	15			100%			
		2. Thalweg centering for pool/glide	12	12			100%			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	12	12			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	12	12			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	11	11			100%			

Table 5e. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 5**
Assessed Length (LF)	**344**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1. Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	4	4			100%			
	3. Pool Condition	1. Depth	4	4			100%			
		2. Length	4	4			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	4	4			100%			
		2. Thalweg centering for pool/glide	4	4			100%			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	4	4			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	4	4			100%			

Table 5f. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 6**
Assessed Length (LF)	**1,340**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	**1. Vertical Stability**	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	33	33			100%			
	3. Pool Condition	1. Depth	34	34			100%			
		2. Length	34	34			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	33	33			100%			
		2. Thalweg centering for pool/glide	34	34			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineering Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	26	26			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	19	20			95%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	20	20			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	26	26			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	20	20			100%			

Table 5g. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 7**
Assessed Length (LF)	**399**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1. Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	14	14			100%			
	3. Pool Condition	1. Depth	12	12			100%			
		2. Length	12	12			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	14	14			100%			
		2. Thalweg centering for pool/glide	12	12			100%			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	14	14			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	14	14			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	14	14			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	14	14			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	13	13			100%			

Table 5h. Stream Problem Areas
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach 1			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 2	N/A	N/A	N/A
Reach 2			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 2	N/A	N/A	N/A
Reach 3			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 2	N/A	N/A	N/A
Reach 4			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 2	N/A	N/A	N/A
Reach 5			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 2	N/A	N/A	N/A
Reach 6			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Erosion along right sill of boulder step allowing for piping around the structure.	16+20	Lack of vegetated growth on right bank at boulder sill.	SPA2-1
Reach 7			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 2	N/A	N/A	N/A

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).

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

Reach ID	**Reaches 1 - 7**
Planted Acreage	**22.31**

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	N/A	1	0.11	0.5%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	N/A	0	0.00	0.0%
			Total	1	0.11	0.5%
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	N/A	0	0.00	0.0%
			Cumulative Total	1	0.11	0.5%

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	NA	5	0.19	0.8%
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			
Reach 1			
Feature Issue	**Station No.**	**Suspected Cause**	**Problem Area / Photo Number**
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 is located in various sections along the Reach 1.
Reach 2			
Feature Issue	**Station No.**	**Suspected Cause**	**Problem Area / Photo Number**
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 is located in various sections along the Reach 1.
Invasive/Exotic Populations	22+25 - 24+25	*Ligustrum sinese* (Chinese privet) growing in easement in right floodplain	VPA 2-1
Reach 3			
Feature Issue	**Station No.**	**Suspected Cause**	**Problem Area / Photo Number**
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 is located in various sections along the Reach 1.
Bare Floodplain	46+50 - 48+00	Poor soils	VPA 2-2
Reach 4			
Feature Issue	**Station No.**	**Suspected Cause**	**Problem Area / Photo Number**
Invasive/Exotic Populations	13+80 - 14+50	*Ligustrum sinese* (Chinese Privet) and *Rosa multiflora* (Multi-flora rose) growing in easement along left bank.	VPA 2-6
Reach 5			
Feature Issue	**Station No.**	**Suspected Cause**	**Problem Area / Photo Number**
No Problems	N/A	-	-
Reach 6			
Feature Issue	**Station No.**	**Suspected Cause**	**Problem Area / Photo Number**
Invasive/Exotic Populations	16+30 - 17+60	*Ligustrum sinese* (Chinese Privet) and *Paulownia tomentosa* (Princess tree) growing in easement along right bank.	VPA 2-5
Invasive/Exotic Populations	19+60 - 20+25	*Rosa multiflora* (Multi-flora rose) growing in easement along left bank.	VPA 2-4
Invasive/Exotic Populations	21+00 - 21+50	*Rosa multiflora* (Multi-flora rose) growing in easement along left bank.	VPA 2-3
Reach 7			
Feature Issue	**Station No.**	**Suspected Cause**	**Problem Area / Photo Number**
No Problems	N/A	-	-

*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).

Stream Station Photos

UT to Town Creek – Reach 1

PID 1: Station 10+50 – Upstream (11/08/17)

PID 2: Station 10+50 – Downstream (11/08/17)

PID 3: Station 10+80 – Left Floodplain (11/08/17)

PID 4: Station 11+90 – Downstream (11/08/17)

PID 5: Station 12+85 – Upstream (11/08/17)

PID 6: Station 13+05 – Left Floodplain (11/08/17)

UT to Town Creek – Reach 1

PID 7: Station 15+30 – Upstream (11/08/17)

PID 8: Station 16+25 – Downstream (11/08/17)

PID 9: Station 17+75 – Left Floodplain (11/08/17)

PID 10: Station 18+10– Downstream (11/08/17)

PID 11: Station 18+10 – Upstream (11/08/17)

PID 12: Station 20+90 – Downstream (11/08/17)

PID 13: Station 21+00 – Upstream (11/08/17)

PID 14: Station 22+75 – Upstream (11/08/17)

PID 15: Station 23+25 – Upstream (11/08/17)

PID 16: Station 23+50 – Downstream (11/08/17)

PID 17: Station 24+60– Upstream (11/08/17)

PID 18: Station 25+30– Left Floodplain (11/08/17)

PID 19: Station 25+90 - Downstream (11/08/17)

PID 20: Station 26+50– Downstream (11/08/17)

PID 21: Station 28+75 – Downstream (11/08/17)

PID 22: Station 29+35 – Upstream (11/08/17)

PID 23: Station 29+50 – Downstream Project View from Floodplain Knoll (11/08/17)

PID 24: Station 30+60 – Upstream (11/08/17)

PID 25: Station 33+10 – Upstream (11/08/17)

PID 26: Station 33+10 – Downstream (11/08/17)

PID 27: Station 35+50 – Upstream (11/08/17)

PID 28: Station 38+30 – Upstream (11/08/17)

PID 29: Station 38+40 – Downstream (11/08/17)

PID 30: Station 39+10 – Downstream (11/08/17)

PID 31: Station 40+25 – Downstream (11/08/17)

PID 32: Station 40+80 – Upstream (11/08/17)

PID 33: Station 41+80 – Upstream (11/08/17)

PID 34: Station 43+00 – Downstream (11/08/17)

PID 35: Station 44+00 – Downstream (11/08/17)

PID 36: Station 44+25 – Upstream (11/08/17)

PID 37: Station 45+50 – Downstream (11/08/17)

UT to Town Creek – Reach 3

PID 38: Station 45+95 – Upstream (11/09/17)

PID 39: Station 46+80 – Upstream (11/09/17)

PID 40: Station 47+75 – Upstream (11/09/17)

PID 41: Station 48+60 – Downstream (11/09/17)

UT to Town Creek – Reach 4

PID 1: Station 09+80 – Upstream (11/09/17)

PID 2: Station 10+60 – Upstream (11/09/17)

PID 3: Station 11+20 – Upstream (11/09/17)

PID 4: Station 11+75 – Upstream (11/09/17)

PID 5: Station 12+95 – Upstream (11/09/17)

PID 6: Station 13+45 – Downstream (11/09/17)

UT to Town Creek – Reach 4

PID 7: Station 13+80 – Upstream (11/09/17)

PID 8: Station 14+ 20 – Upstream (11/09/17)

UT to Town Creek – Reach 5

PID 1: Station 10+70 – Upstream (11/09/17)

PID 2: Station 10+75 – Downstream (11/09/17)

PID 3: Station 11+75 – Upstream (11/09/17)

PID 4: Station 12+20 – Upstream (11/09/17)

PID 5: Station 12+65 – Upstream (11/09/17)

PID 6: Station 13+30 – Upstream (11/09/17)

PID 7: Station 13+43 – Upstream (11/09/17)

UT to Town Creek – Reach 6

PID 1: Station14+55 – Upstream (11/09/17)

PID 2: Station 15+30 – Upstream (11/08/17)

PID 3: Station 16+00 – Upstream (11/09/17)

PID 4: Station 16+50 – Upstream (11/09/17)

PID 5: Station 17+25 – Upstream (11/09/17)

PID 6: Station 18+00 – Upstream (11/09/17)

UT to Town Creek – Reach 6

PID 7: Station 18+50 – Upstream (11/09/17)

PID 8: Station 18+90 – Downstream (11/09/17)

PID 9: Station 19+05 – Upstream (11/09/17)

PID 10: Station 19+50 – Left Floodplain (11/09/17)

PID 11: Station 19+50 – Upstream (11/09/17)

PID 12: Station 19+85 – Upstream (11/09/17)

PID 13: Station 20+50 - Upstream (11/09/17)

PID 14: Station 20+50 - Downstream (11/09/17)

PID 15: Station 21+00 – Upstream (11/09/17)

PID 16: Station 22+75 – Upstream (11/09/17)

PID 17: Station 23+40 – Upstream (11/09/17)

PID 18: Station 24+00 – Upstream (11/09/17)

PID 19: Station 24+50 – Upstream (11/09/17)

PID 20: Station 23+25 – Upstream (11/09/17)

PID 21: Station 25+80 - Downstream (11/09/17)

PID 22: Station 25+85 – Upstream (11/09/17)

PID 23: Station 26+50 – Upstream (11/09/17)

PID 24: Station 26+75 – Upstream (11/09/17)

UT to Town Creek – Reach 6

PID 25: Station 28+00 – Upstream (11/09/17)

PID 26: Station 28+14 – Upstream (11/09/17)

UT to Town Creek – Reach 7

PID 1: Station 09+40: Upstream (11/08/17)

PID 4: Station 10+80 – Downstream (11/08/17)

PID 3: Station 10+70 – Upstream (11/08/17)

PID 5: Station 11+75 – Upstream (11/08/17)

PID 2: Station 09+90 – Upstream (11/08/17)

PID 6: Station 12+20 – Upstream (11/08/17)

PID 7: Station 12+90 – Upstream (11/08/17)

PID 8: Station 13+50 – Upstream (11/08/17)

PID 9: Station 13+99 – Upstream (11/08/17)

Stream Problem Area Photos

SPA2-1 – Station 16+20 - Erosion around right seal of boulder step. (11/09/17)

Vegetation Problem Area Photos

***Myriophyllum aquaticum* (Parrot feather) - Reach 1**

***Myriophyllum aquaticum* (Parrot feather) - Reach 2**

***Myriophyllum aquaticum* (Parrot feather) - Reach 3**

UT to Town Creek – Reach 2

VPA 2-1 – *Ligustrum sinese* in Right Floodplain (10/16/17)

UT to Town Creek – Reach 3

VPA 2-2 – Bare Area in Left Floodplain from Station 46+50 – 48+00 (09/19/17)

VPA2-4 – *Rosa multiflora* in Right Floodplain from Station 19+60 – 20+25 (11/09/17)

VPA 2-5 – *Paulownia tomentosa* in Left Floodplain from Station 16+30 – 17+60 (11/09/17)

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	0	728	Yes
VP2	809	0	809	Yes
VP3	728	0	728	Yes
VP4	607	0	607	Yes
VP5	688	0	688	Yes
VP6	769	0	769	Yes
VP7	607	0	607	Yes
VP8	728	0	728	Yes
VP9	526	0	526	Yes
VP10	769	0	769	Yes
VP11	890	0	890	Yes
VP12	607	0	607	Yes
VP13	526	0	526	Yes
VP14	607	0	607	Yes
VP15	728	0	728	Yes
VP16	728	0	728	Yes
VP17	607	0	607	Yes
VP18	769	0	769	Yes
VP19	486	0	486	Yes
VP20	486	0	486	Yes
Project Avg	**670**	**0**	**670**	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. Excl. exotics. Excl. vines.

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
UT to Town Creek Restoration Project: Project No. 94648

Report Prepared By	Russell Myers
Date Prepared	10/13/2017 11:40
database name	120857_UTtoTown_cvs-eep-entrytool-v2.3.1_MY1.mdb
database location	L:\projects\120857_UT Town\Monitoring\YR-2\Vegetation
computer name	ASHELRMYERS
file size	49188864
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 (MY2 2017)																					
			94648-01-VP1			94648-01-VP2			94648-01-VP3			94648-01-VP4			94648-01-VP5			94648-01-VP6			94648-01-VP7			94648-01-VP8		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree							1		1															
Asimina triloba	pawpaw	Tree																								
Betula nigra	river birch	Tree	1		1	1		1	4		4	2		2	2		2	4		4						
Callicarpa americana	American beautyberry	Shrub	1		1													2		2	5		5			
Carpinus caroliniana	American hornbeam	Tree	1		1	2		2	1		1	2		2				1		1						
Cephalanthus occidentalis	common buttonbush	Shrub																								
Cercis canadensis	eastern redbud	Tree																4		4	1		1			
Cornus amomum	silky dogwood	Shrub										4		4							4		4			
Cornus florida	flowering dogwood	Tree				1		1													3		3			
Diospyros virginiana	common persimmon	Tree	3		3	3		3							4		4							1		1
Fraxinus pennsylvanica	green ash	Tree																								
Liriodendron tulipifera	tuliptree	Tree										1		1												
Nyssa sylvatica	blackgum	Tree																								
Platanus occidentalis	American sycamore	Tree	1		1	1		1	4		4	1		1	2		2	4		4				12		12
Quercus	oak	Tree																								
Quercus alba	white oak	Tree																			2		2			
Quercus falcata	southern red oak	Tree	2		2							1		1												
Quercus lyrata	overcup oak	Tree	1		1										2		2							1		1
Quercus michauxii	swamp chestnut oak	Tree	6		6				2		2				1		1									
Quercus pagoda	cherrybark oak	Tree				4		4	1		1							1		1						
Quercus phellos	willow oak	Tree	2		2	6		6	5		5				6		6	3		3				3		3
Quercus rubra	northern red oak	Tree																								
Salix nigra	black willow	Tree																						1		1
Sambucus canadensis	Common Elderberry	Shrub																								
Sambucus nigra	European black elderberry	Shrub				2		2				4		4												
Unknown		Shrub or Tree																								
		Stem count	18		18	20		20	18		18	15		15	17		17	19		19	15		15	18		18
		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		9	8		8	7		7	7		7	6		6	7		7	5		5	5		5
		Stems per ACRE	728		728	809		809	728		728	607		607	688		688	769		769	607		607	728		728

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%

Pnols = Planted No Live Stakes
P-all = Planted Includes Live Stakes
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 (MY2 2017)																						
			94648-01-VP9			94648-01-VP10			94648-01-VP11			94648-01-VP12			94648-01-VP13			94648-01-VP14			94648-01-VP15			94648-01-VP16		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree																							
Asimina triloba	pawpaw	Tree																							
Betula nigra	river birch	Tree										3		3											
Callicarpa americana	American beautyberry	Shrub				2		2	2		2	1		1											
Carpinus caroliniana	American hornbeam	Tree	3		3																				
Cephalanthus occidentalis	common buttonbush	Shrub							3		3	1		1										4		4
Cercis canadensis	eastern redbud	Tree				1		1	1		1				1		1				6		6			
Cornus amomum	silky dogwood	Shrub	3		3	2		2	1		1	1		1	1		1	4		4	5		5	3		3
Cornus florida	flowering dogwood	Tree	3		3																				
Diospyros virginiana	common persimmon	Tree							3		3	1		1	5		5				1		1	2		2
Fraxinus pennsylvanica	green ash	Tree	1		1	9		9				2		2	2		2	2		2	2		2			
Liriodendron tulipifera	tuliptree	Tree							2		2	3		3				3		3	1		1			
Nyssa sylvatica	blackgum	Tree				1		1	3		3	3		3	1		1							4		4
Platanus occidentalis	American sycamore	Tree							1		1							2		2						
Quercus	oak	Tree																								
Quercus alba	white oak	Tree	1		1	2		2	1		1				1		1				1		1	1		1
Quercus falcata	southern red oak	Tree	1		1													1		1						
Quercus lyrata	overcup oak	Tree	1		1				5		5				1		1	2		2	1		1	1		1
Quercus michauxii	swamp chestnut oak	Tree																								
Quercus pagoda	cherrybark oak	Tree													1		1							1		1
Quercus phellos	willow oak	Tree																1		1	1		1			
Quercus rubra	northern red oak	Tree																								
Salix nigra	black willow	Tree																								
Sambucus canadensis	Common Elderberry	Shrub																								
Sambucus nigra	European black elderberry	Shrub				2		2																2		2
Unknown		Shrub or Tree																								
		Stem count	13		13	19		19	22		22	15		15	13		13	15		15	18		18	18		18
		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	7		7	7		7	10		10	8		8	8		8	7		7	8		8	8		8
		Stems per ACRE	526		526	769		769	890		890	607		607	526		526	607		607	728		728	728		728

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%

Pnols = Planted No Live Stakes
P-all = Planted Includes Live Stakes
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 (MY2 2017)												Annual Means								
			94648-01-VP17			94648-01-VP18			94648-01-VP19			94648-01-VP20			MY2 (2017)			MY1 (2016)			MY0 (2016)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree													1		1						
Asimina triloba	pawpaw	Tree	2		2										2		2	6		6	5		5
Betula nigra	river birch	Tree													17		17	18		18	21		21
Callicarpa americana	American beautyberry	Shrub													13		13	16		16	7		7
Carpinus caroliniana	American hornbeam	Tree													10		10	10		10	16		16
Cephalanthus occidentalis	common buttonbush	Shrub										2		2	10		10	8		8	5		5
Cercis canadensis	eastern redbud	Tree				6		6							20		20	24		24	29		29
Cornus amomum	silky dogwood	Shrub	1		1				1		1				30		30	29		29	31		31
Cornus florida	flowering dogwood	Tree				1		1				1		1	9		9	13		13	21		21
Diospyros virginiana	common persimmon	Tree	1		1	2		2	5		5	1		1	32		32	29		29	7		7
Fraxinus pennsylvanica	green ash	Tree	8		8	8		8	5		5				39		39	40		40	43		43
Liriodendron tulipifera	tuliptree	Tree							1		1	1		1	12		12	11		11	12		12
Nyssa sylvatica	blackgum	Tree				1		1							13		13	12		12	9		9
Platanus occidentalis	American sycamore	Tree				1		1				1		1	30		30	29		29	31		31
Quercus	oak	Tree																			3		3
Quercus alba	white oak	Tree										1		1	10		10	10		10	12		12
Quercus falcata	southern red oak	Tree										2		2	7		7	19		19	15		15
Quercus lyrata	overcup oak	Tree													15		15	10		10	16		16
Quercus michauxii	swamp chestnut oak	Tree													9		9	14		14	29		29
Quercus pagoda	cherrybark oak	Tree													8		8	4		4			
Quercus phellos	willow oak	Tree	2		2							3		3	32		32	29		29	27		27
Quercus rubra	northern red oak	Tree																2		2			
Salix nigra	black willow	Tree													1		1						
Sambucus canadensis	Common Elderberry	Shrub																6		6	19		19
Sambucus nigra	European black elderberry	Shrub	1		1										11		11	7		7			
Unknown		Shrub or Tree																			7		7
		Stem count	15		15	19		19	12		12	12		12	331		331	346		346	365		365
		size (ares)	1			1			1			1			20			20			20		
		size (ACRES)	0.02			0.02			0.02			0.02			0.49			0.49			0.49		
		Species count	6		6	6		6	4		4	8		8	22		22	22		22	21		21
		Stems per ACRE	607		607	769		769	486		486	486		486	670		670	700		700	739		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%

Pnols = Planted No Live Stakes
P-all = Planted Includes Live Stakes
T = Total

Appendix D

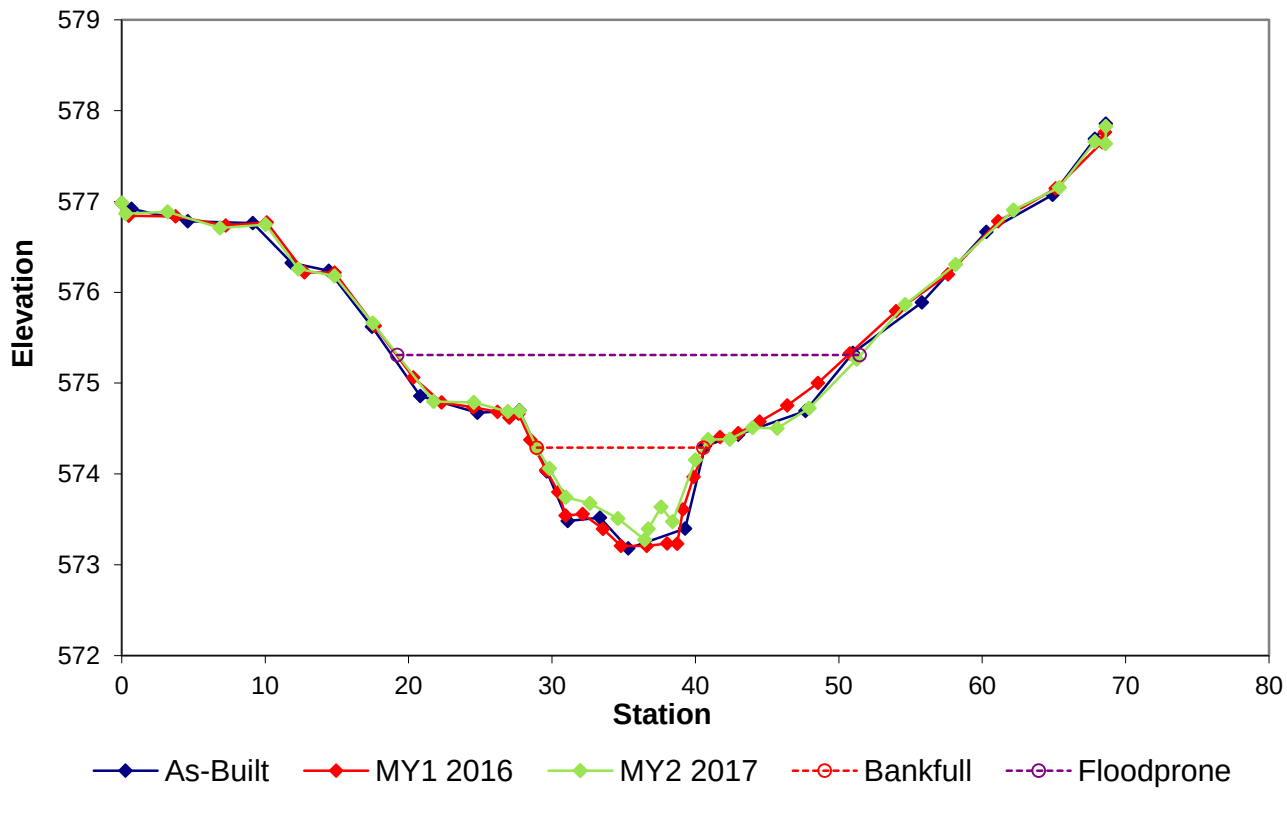
Stream Survey Data

Figure 3. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X1 - Reach 1 (Station 11+61)
Monitoring Year 2 - Collected October 2017

LEFT BANK **RIGHT BANK**

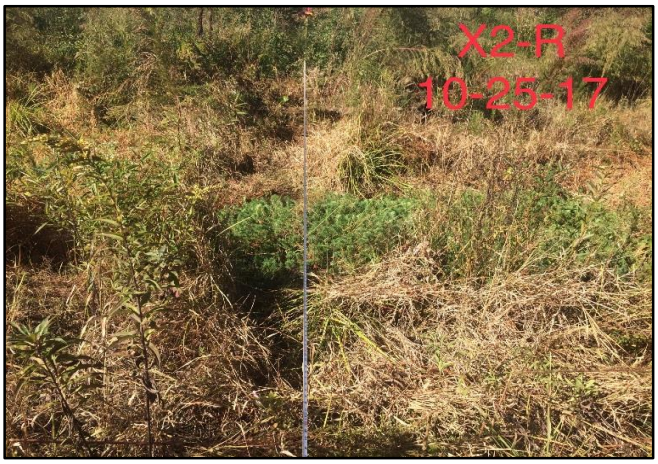
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	6.87	11.6	0.59	1.11	19.66	1.0	2.74	574.29	574.38	32.25



* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

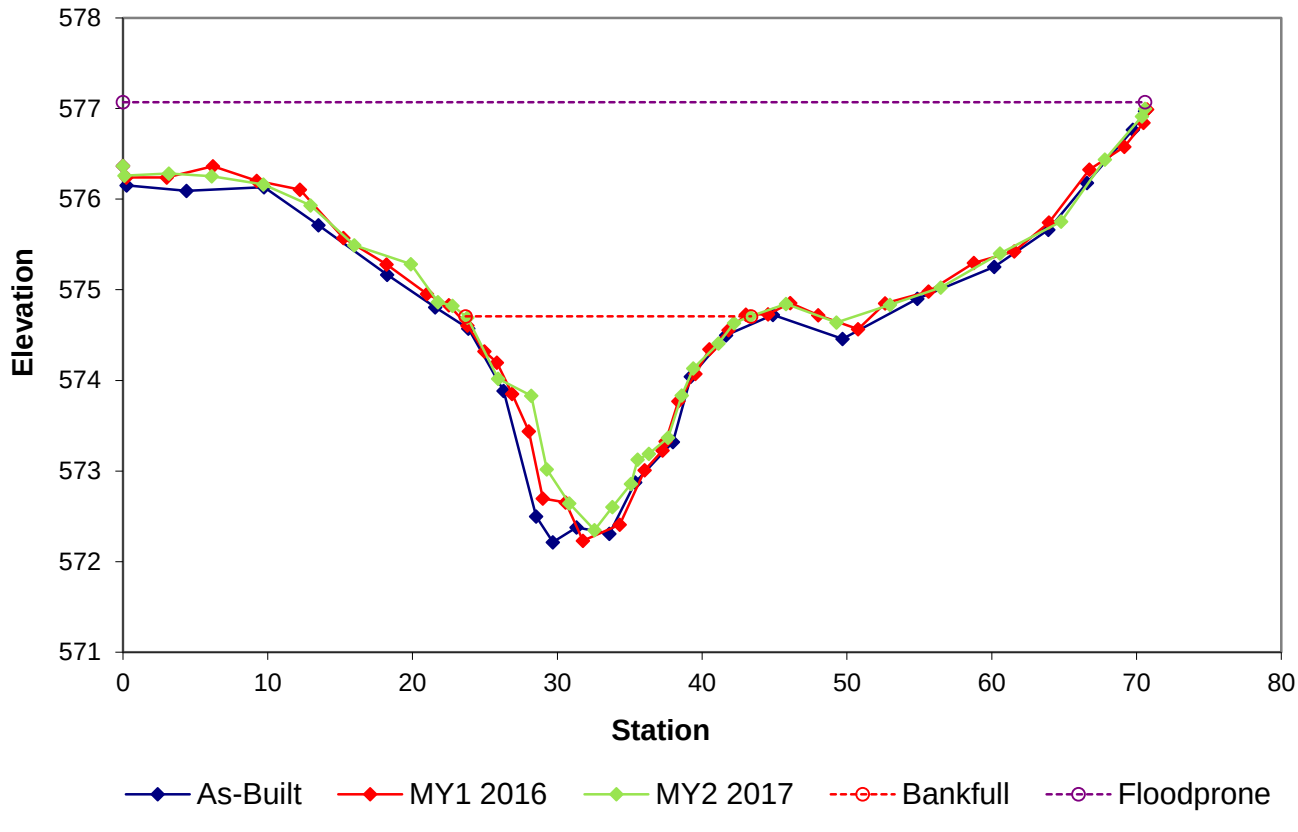
Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X2 - Reach 1 (Station 12+00)
Monitoring Year 2 - Collected October 2017



LEFT BANK **RIGHT BANK**

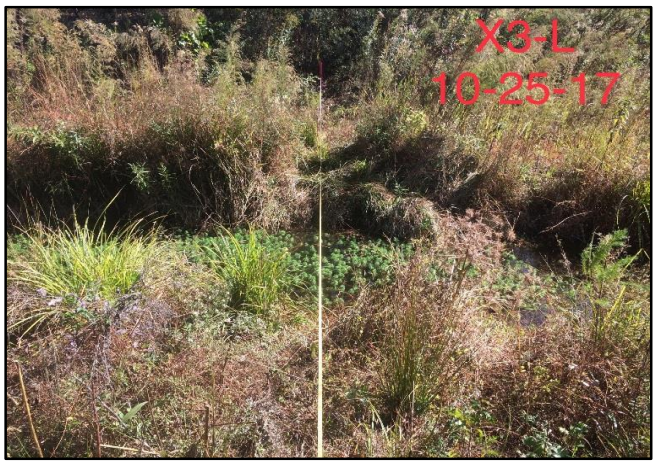
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev*	TOB Elev	WFPA
Pool		22.54	19.7	1.14	2.36	17.28	-	-	574.71	574.69	70.59

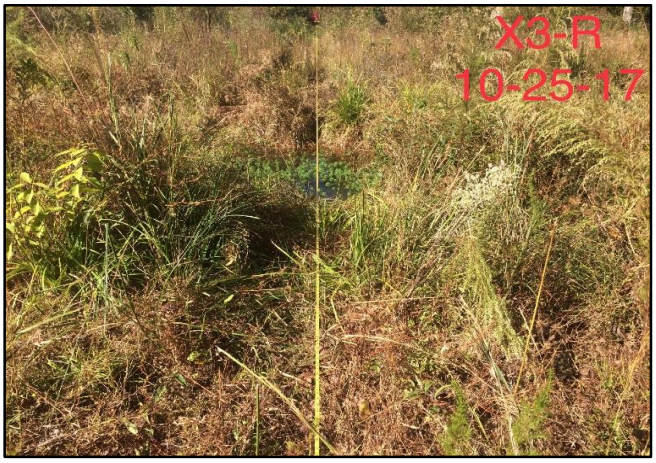


*Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

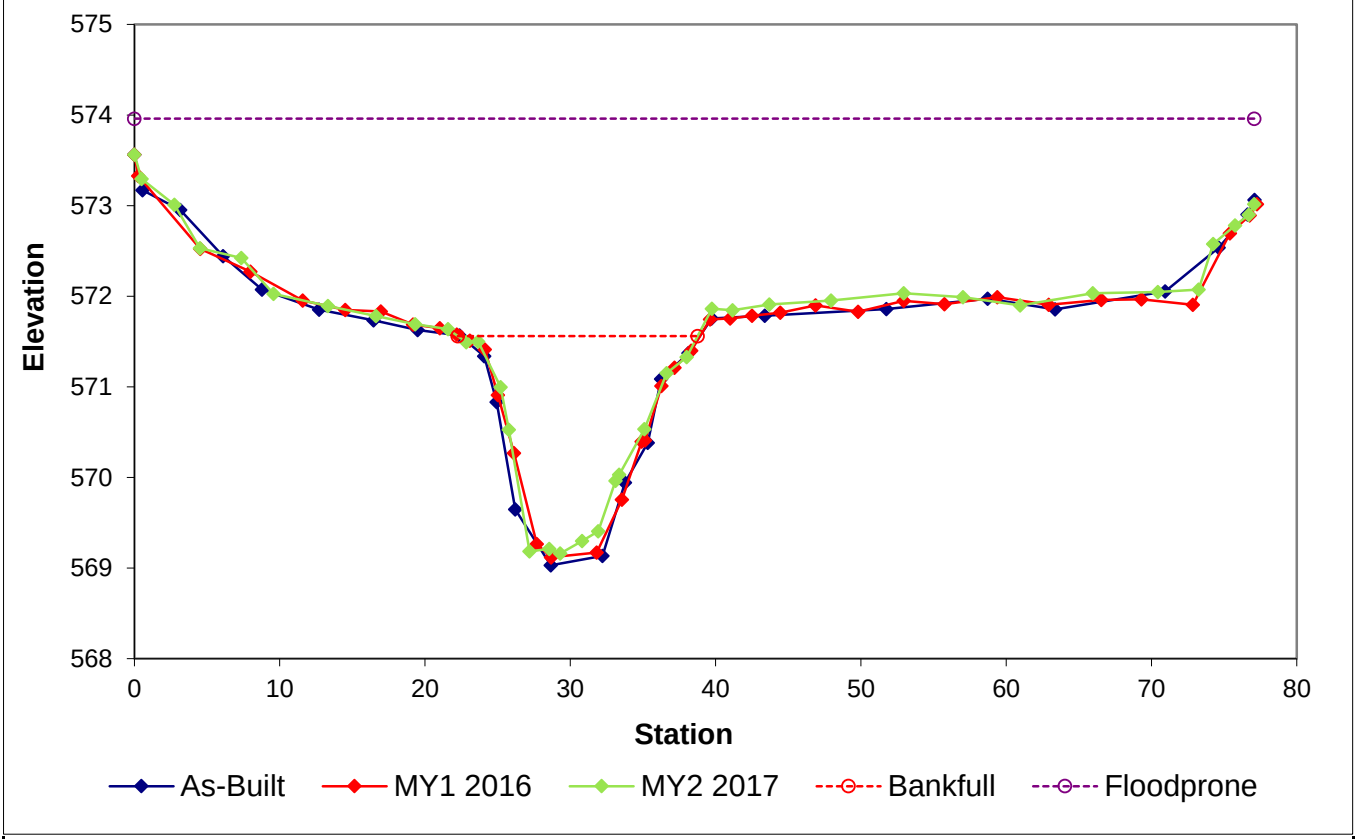
Permanent Cross-section
X3 - Reach 1 (Station 15+99)
Monitoring Year 2 - Collected October 2017





LEFT BANK **RIGHT BANK**

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev*	TOB Elev	WFPA
Pool		20.86	16.5	1.26	2.39	13.1	-	-	571.55	571.50	77.08



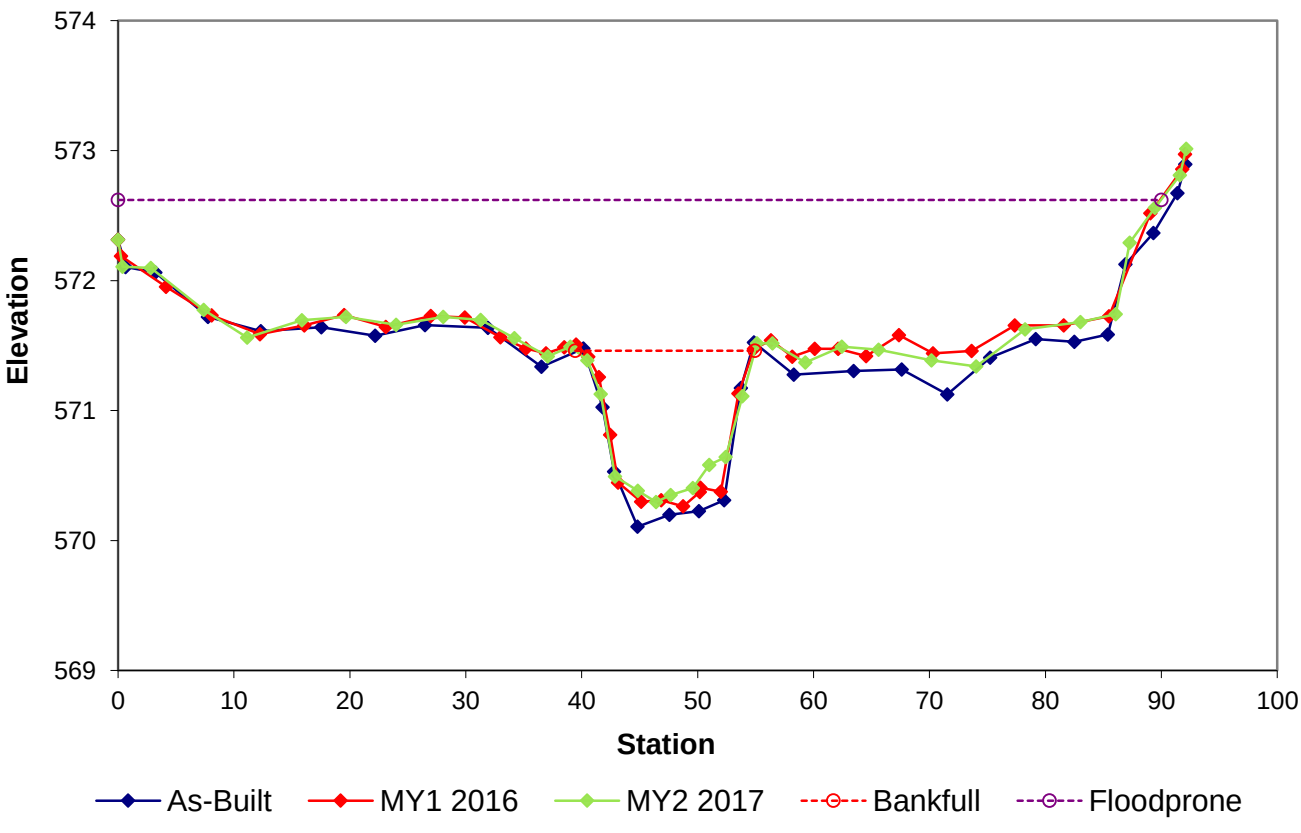
*Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X4 - Reach 1 (Station 16+18)
Monitoring Year 2 - Collected October 2017

LEFT BANK **RIGHT BANK**

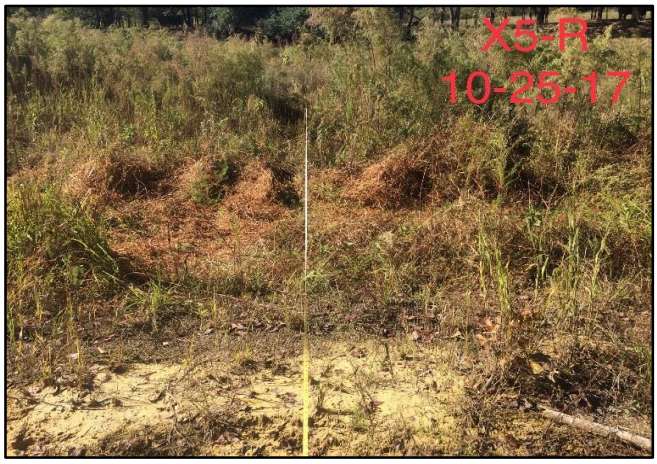
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	11.96	15.5	0.77	1.26	20.13	1.0	6.23	571.46	571.52	90.00



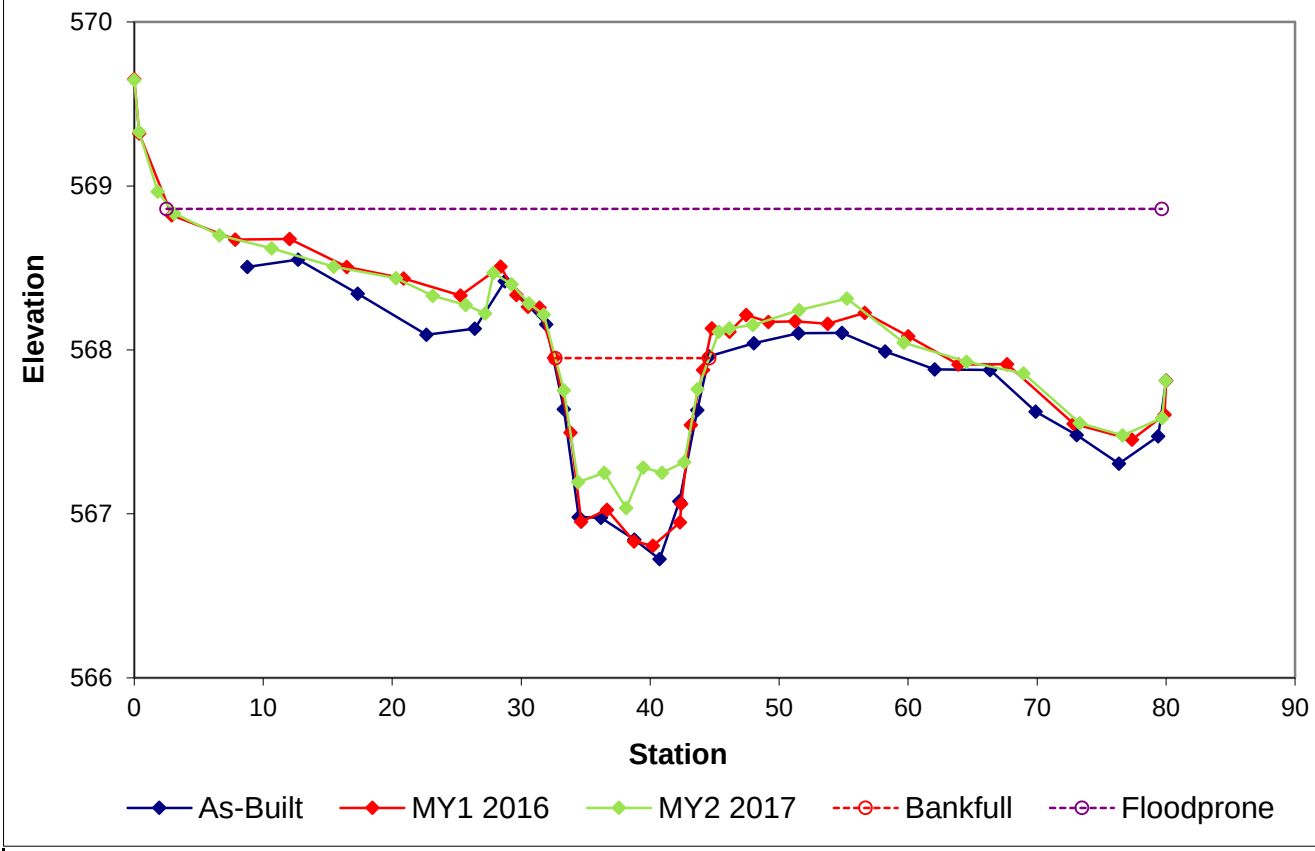
* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X5 - Reach 1 (Station 19+41)
Monitoring Year 2 - Collected October 2017



	LEFT BANK						RIGHT BANK				
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	7.14	11.92	0.6	1.11	19.87	1.0	6.41	567.95	568.11	77.18

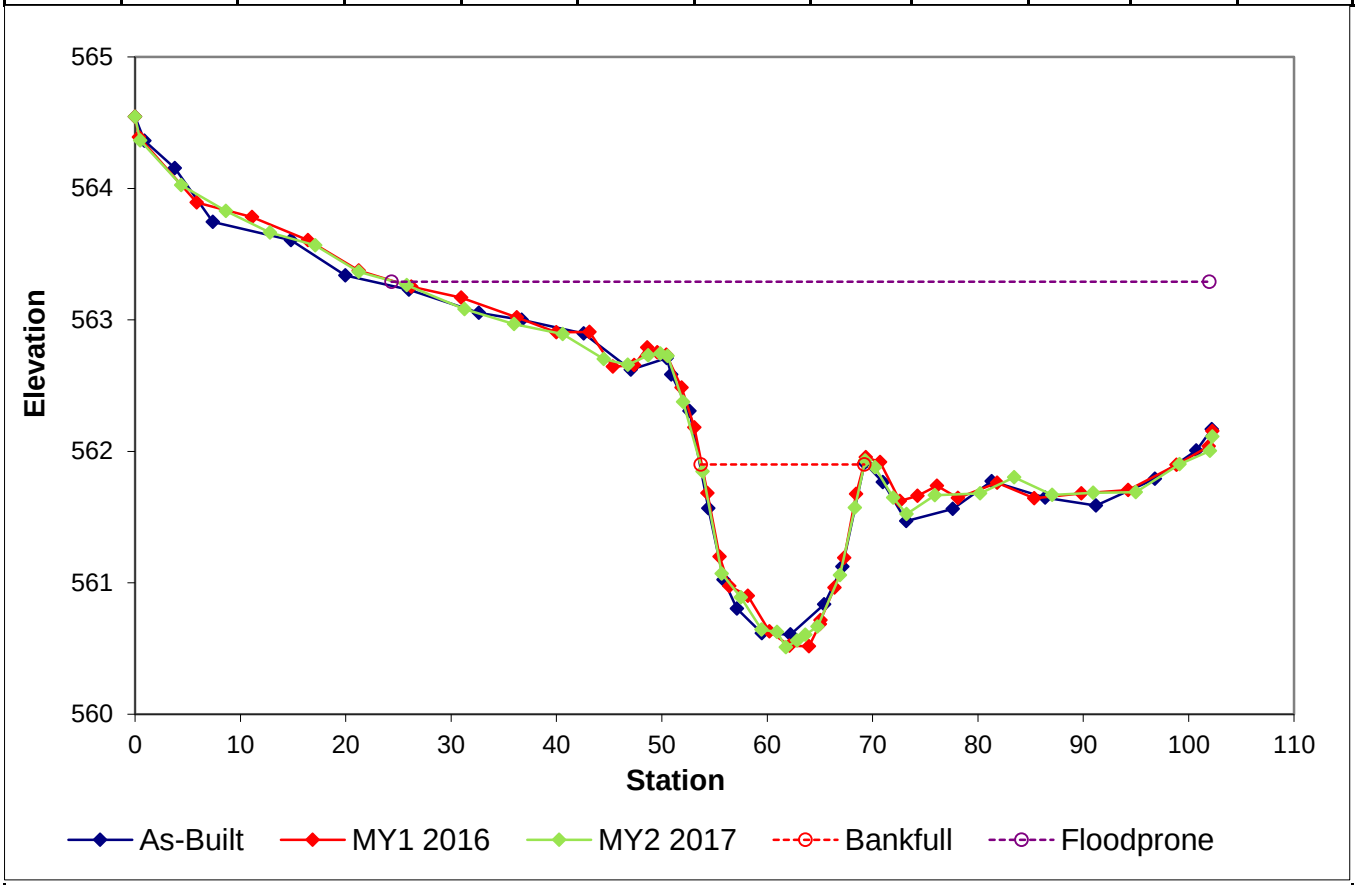


* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X6 - Reach 2 (Station 25+16)
Monitoring Year 2 - Collected October 2017

	LEFT BANK						RIGHT BANK				
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	14.82	15.53	0.95	1.29	16.35	1.1	4.97	561.90	561.93	77.62



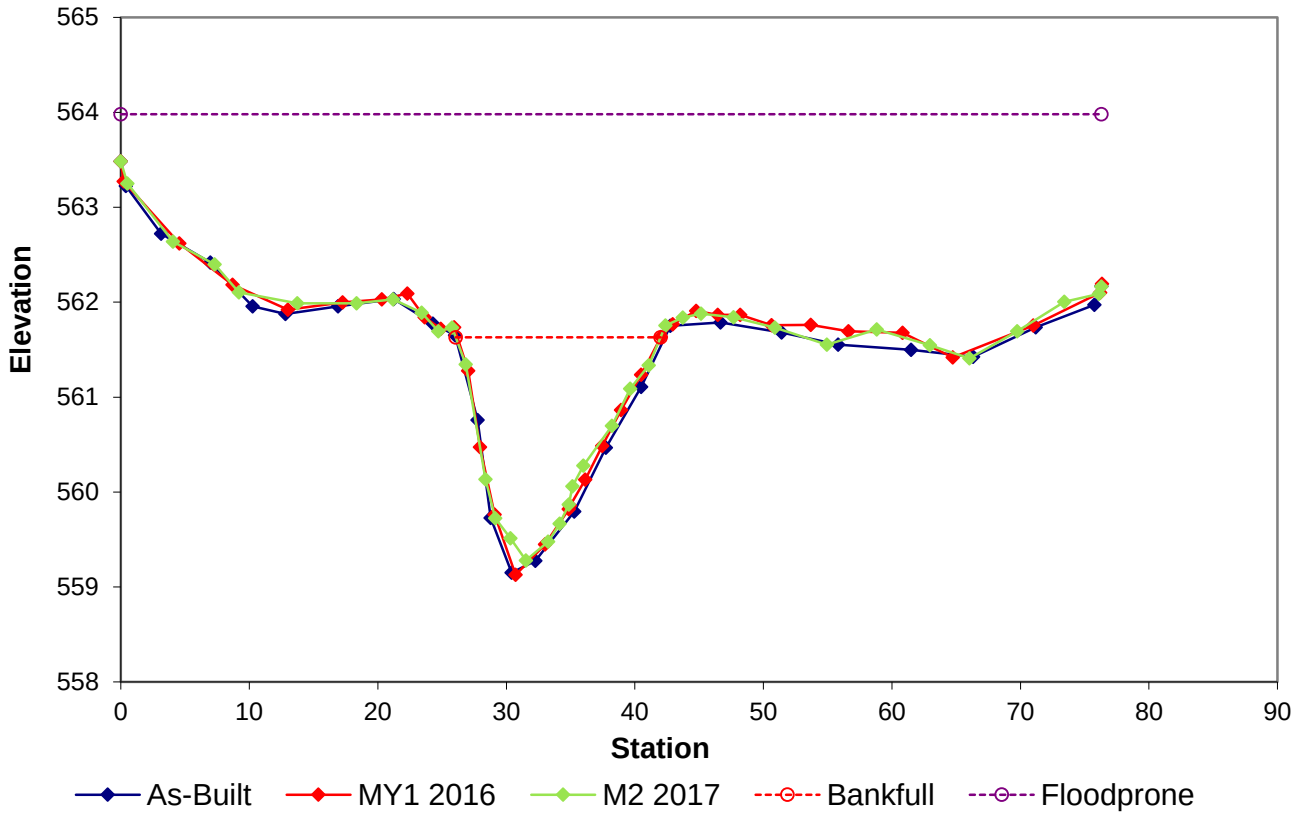
* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X7 - Reach 2 (Station 25+60)
Monitoring Year 2 - Collected October 2017

LEFT BANK **RIGHT BANK**

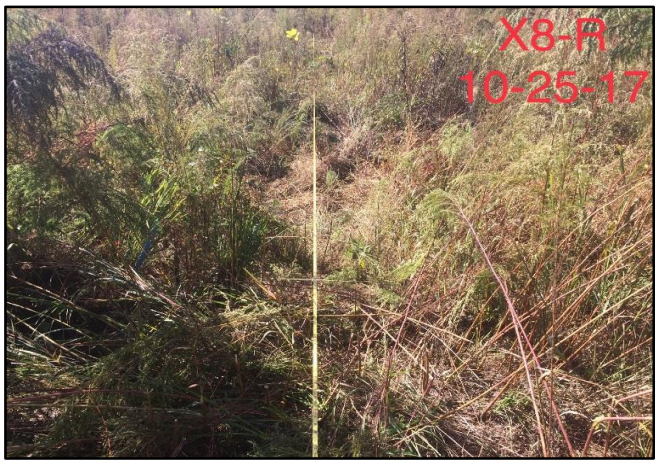
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev*	TOB Elev	WFPA
Pool		20.95	15.95	1.31	2.36	12.18	-	-	561.63	561.73	76.31



*Recorded BKF elevation reflects the as-built survey BKF elevation.

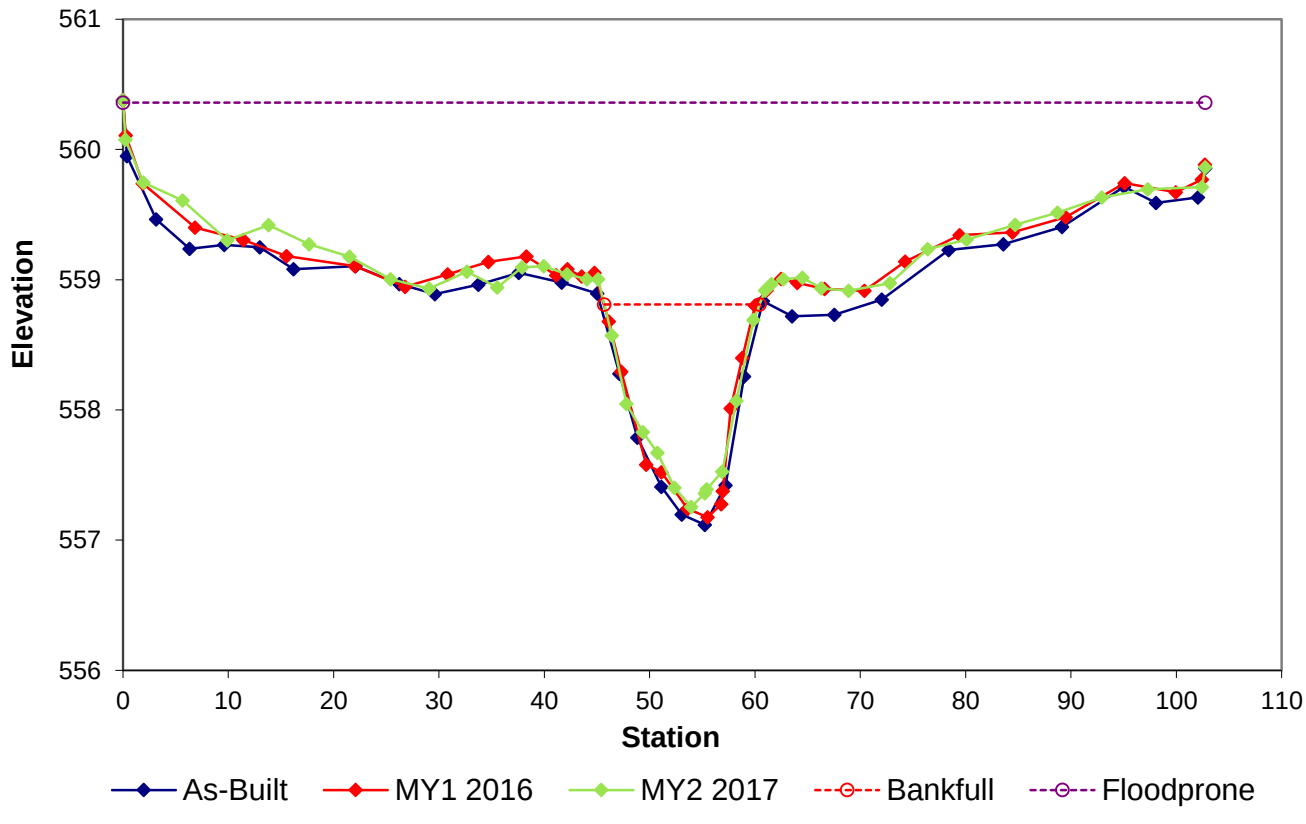
Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X8 - Reach 2 (Station 29+17)
Monitoring Year 2 - Collected October 2017



LEFT BANK **RIGHT BANK**

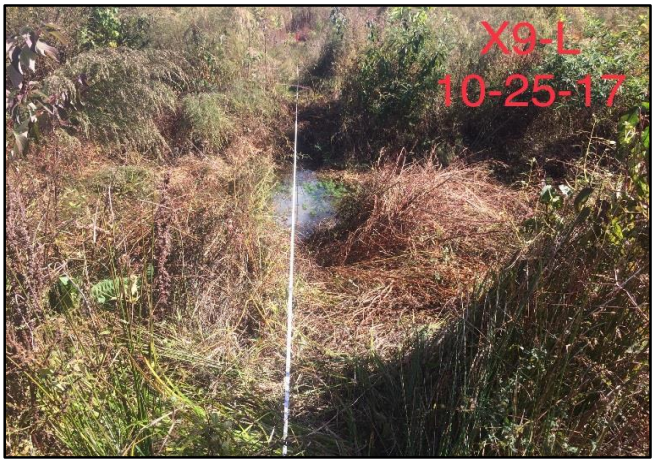
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	14.29	14.73	0.97	1.62	15.19	1.0	6.65	558.81	558.92	102.74



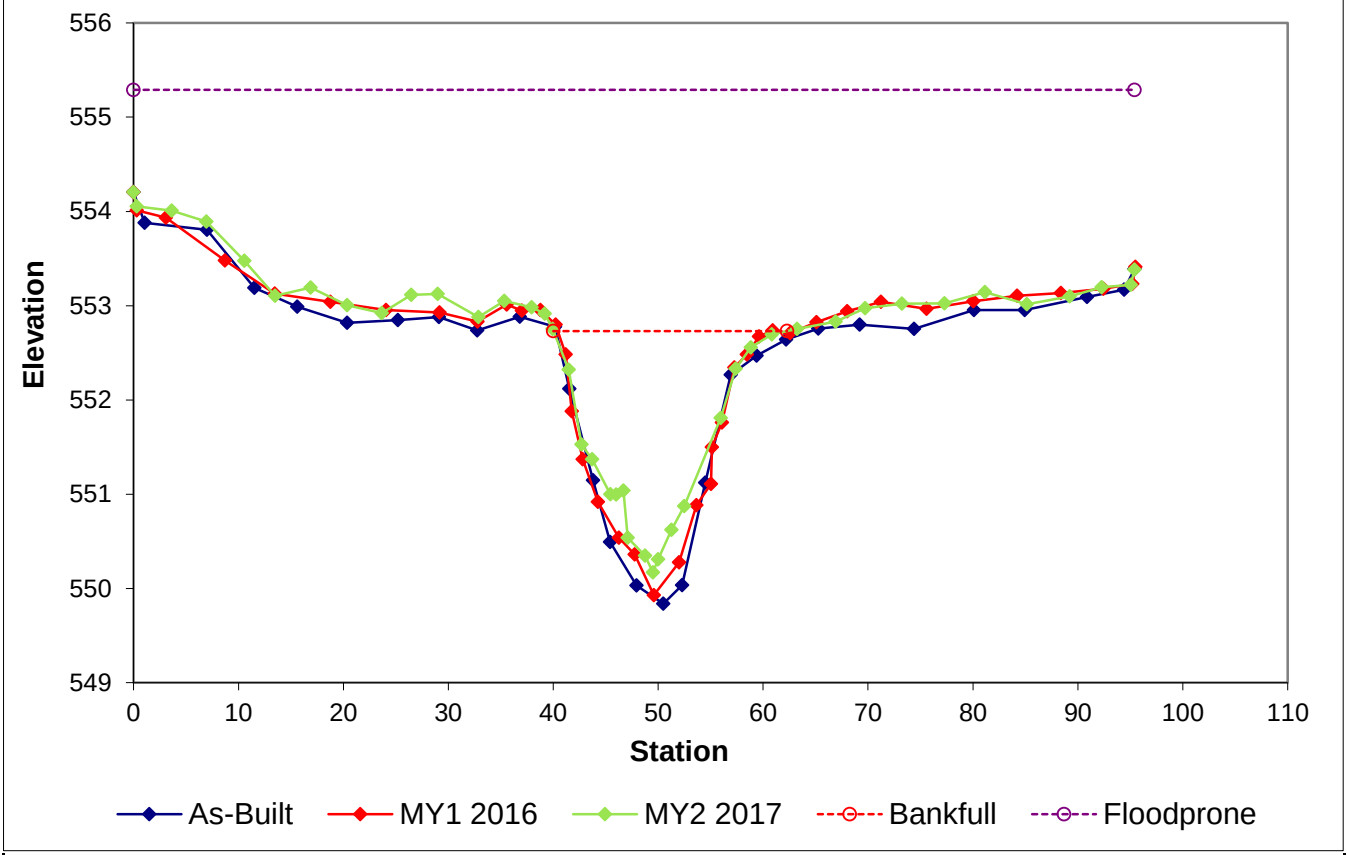
* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X9 - Reach 2 (Station 37+60)
Monitoring Year 2 - Collected October 2017



	LEFT BANK						RIGHT BANK				
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev*	TOB Elev	WFPA
Pool		26.77	22.28	1.2	2.56	18.57	-	-	552.73	552.70	95.39

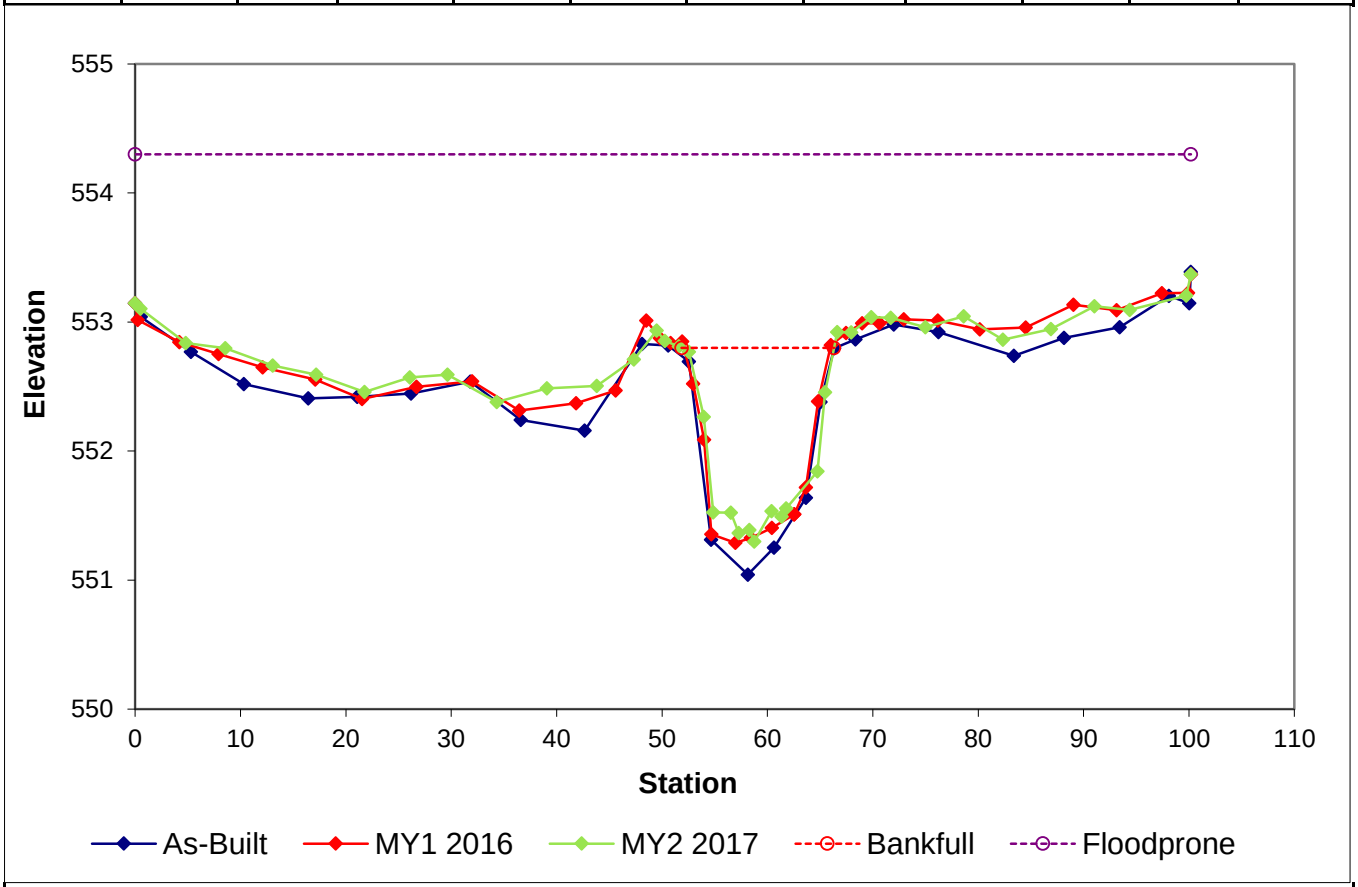


*Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X10 - Reach 2 (Station 37+91)
Monitoring Year 2 - Collected October 2017

LEFT BANK							RIGHT BANK				
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	14.42	14.47	1.00	1.76	14.47	0.84	6.45	552.80	552.77	100.19

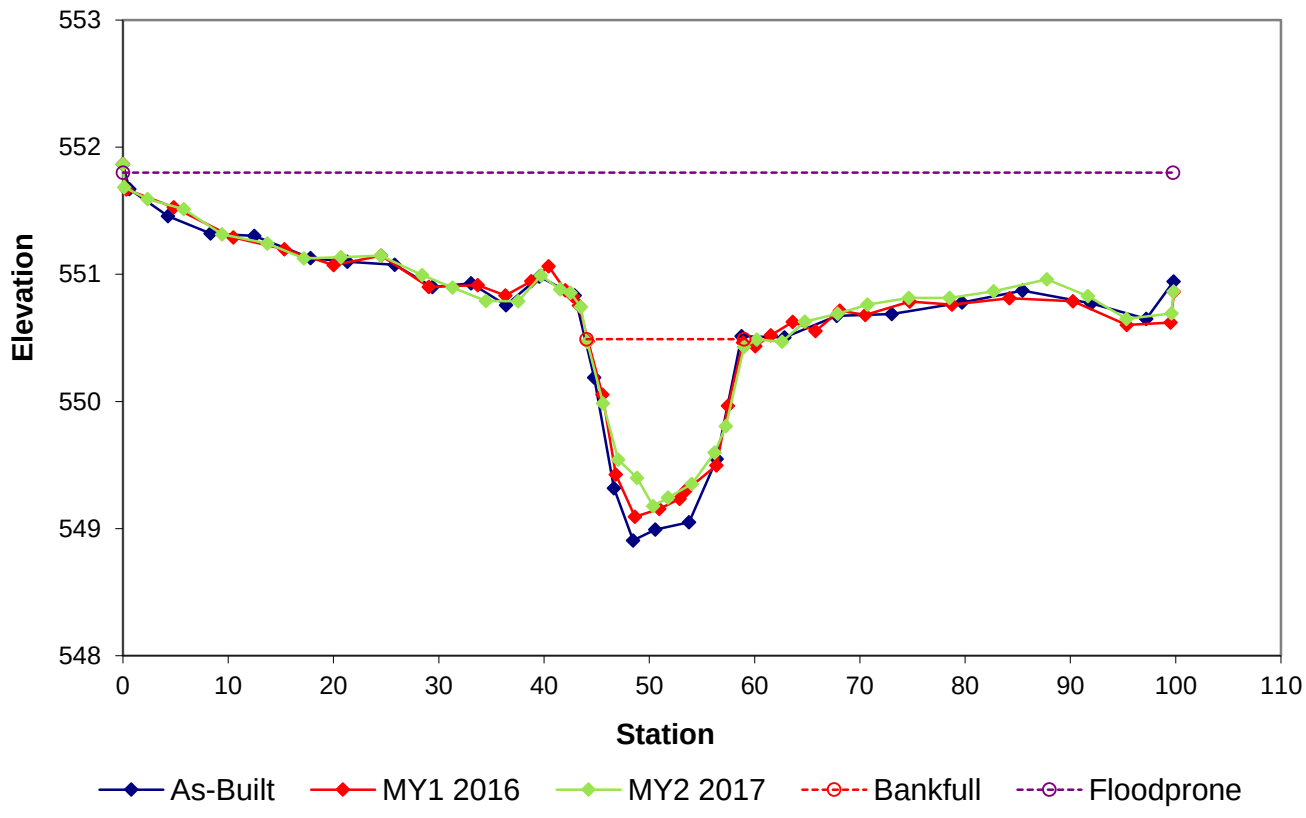


* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X11 - Reach 3 (Station 41+62)
Monitoring Year 2 Collected October 2017

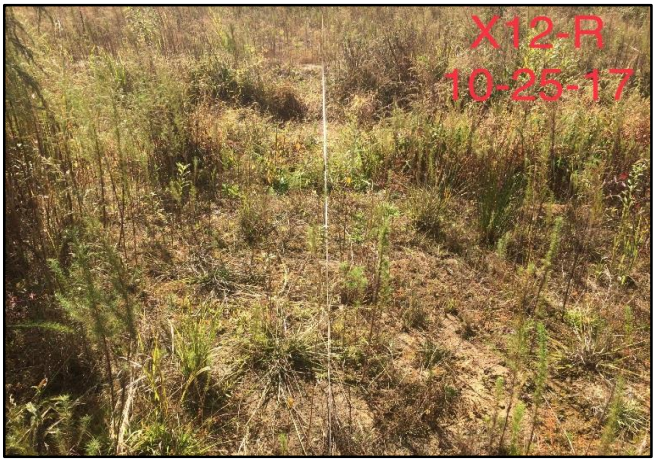
	LEFT BANK						RIGHT BANK				
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	13.31	14.96	0.89	1.51	16.81	0.67	6.72	550.49	550.43	99.76



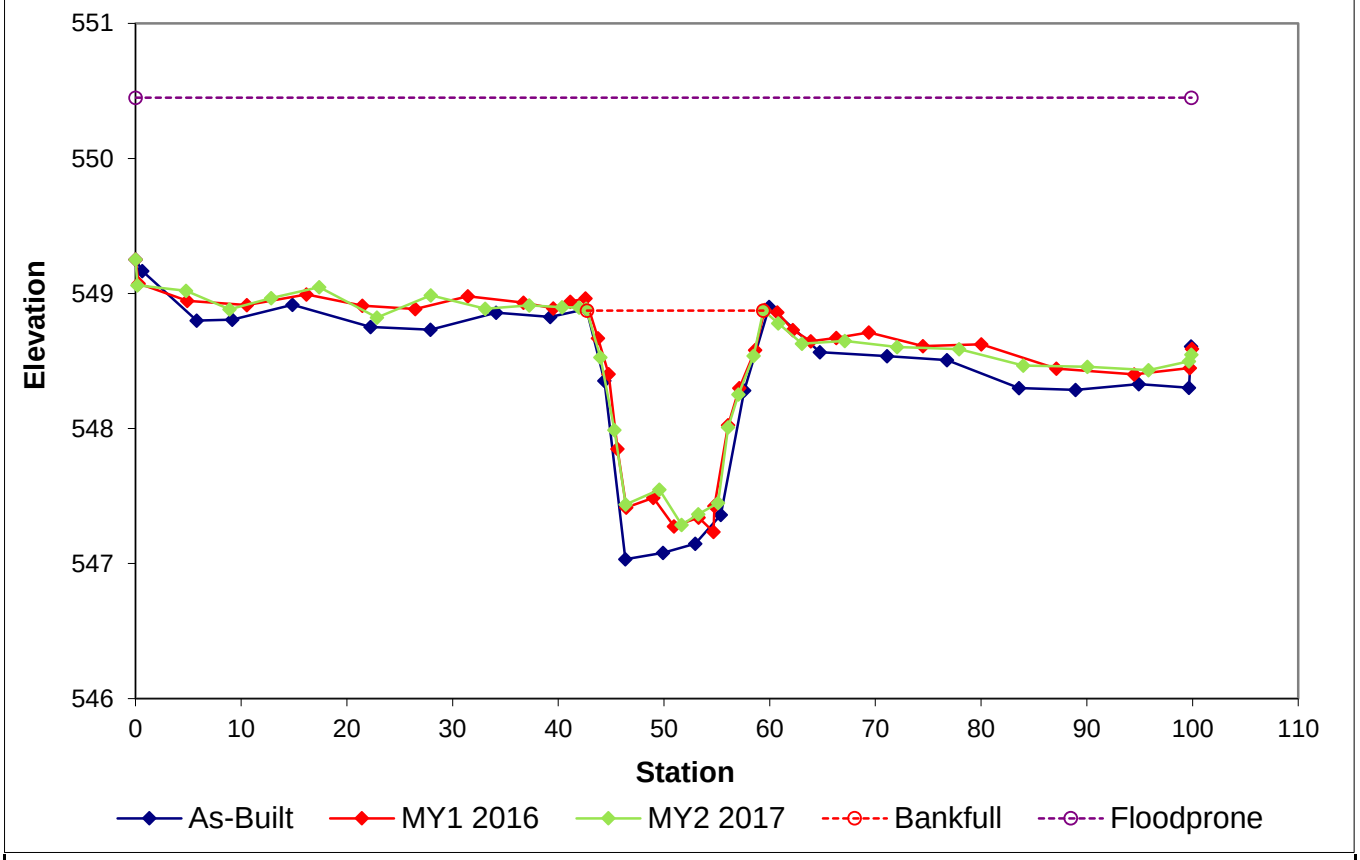
* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X12 - Reach 3 (Station 44+80)
Monitoring Year 2 - Collected October 2017



	LEFT BANK						RIGHT BANK				
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	17.51	16.69	1.05	1.79	15.9	0.9	5.84	548.87	548.87	99.91



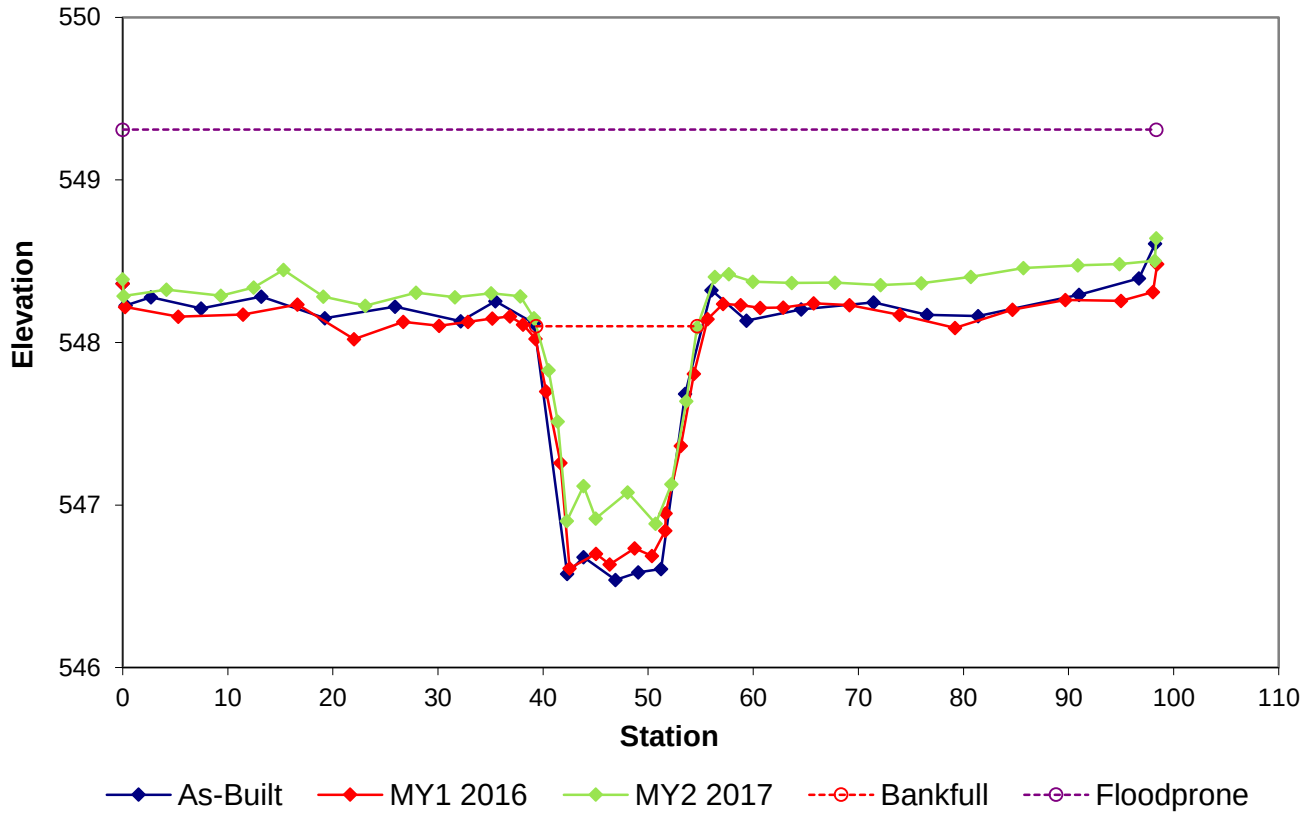
* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X13 - Reach 3 (Station 45+61)
Monitoring Year 2 - Collected October 2017

LEFT BANK **RIGHT BANK**

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	13.50	15.33	0.88	1.56	17.42	0.79	6.15	548.10	548.15	98.35



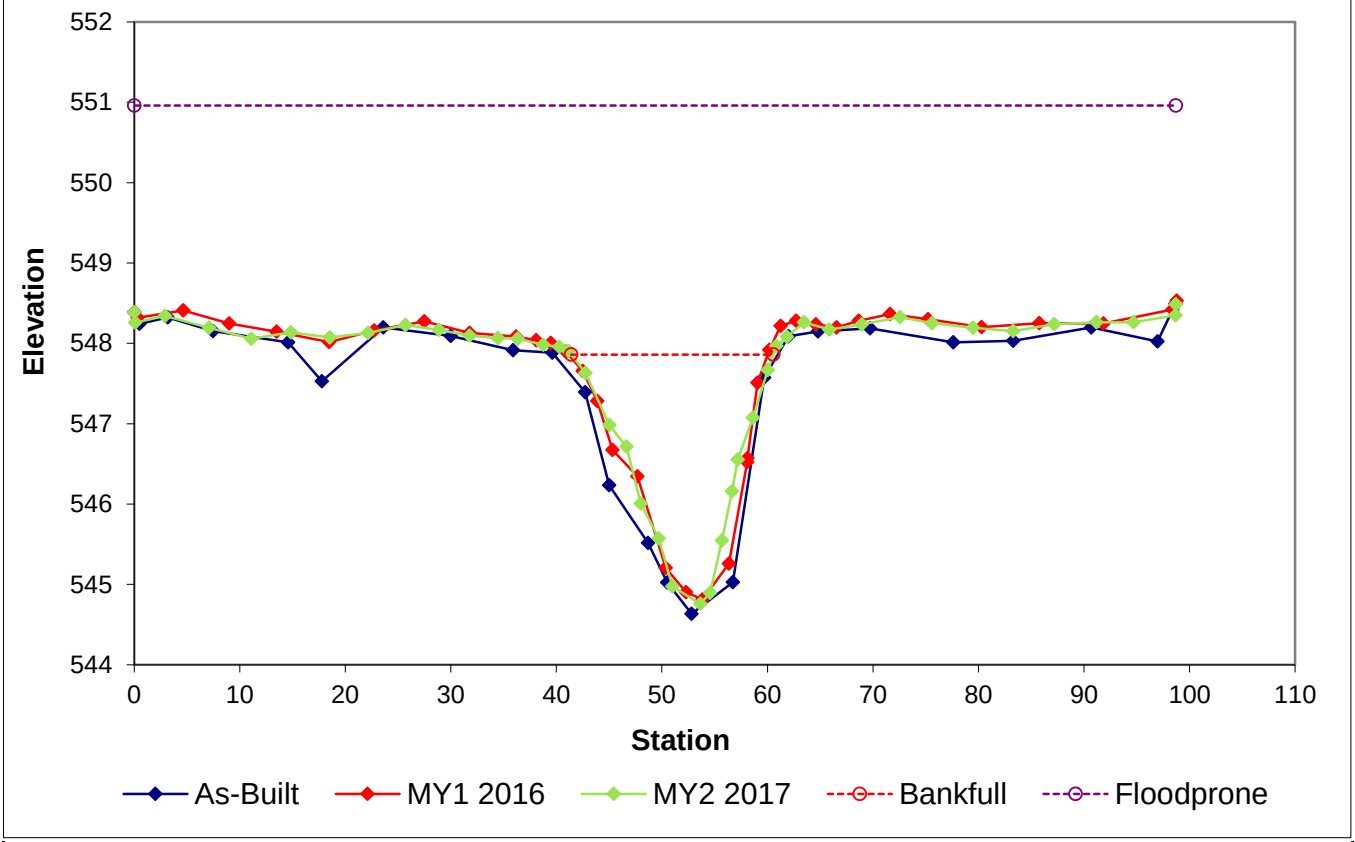
* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X14 - Reach 3 (Station 45+95)
Monitoring Year 2 - Collected October 2017

LEFT BANK **RIGHT BANK**

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev*	TOB Elev	WFPA
Pool		30.60	19.15	1.60	3.11	11.97	-	-	547.86	547.95	98.69

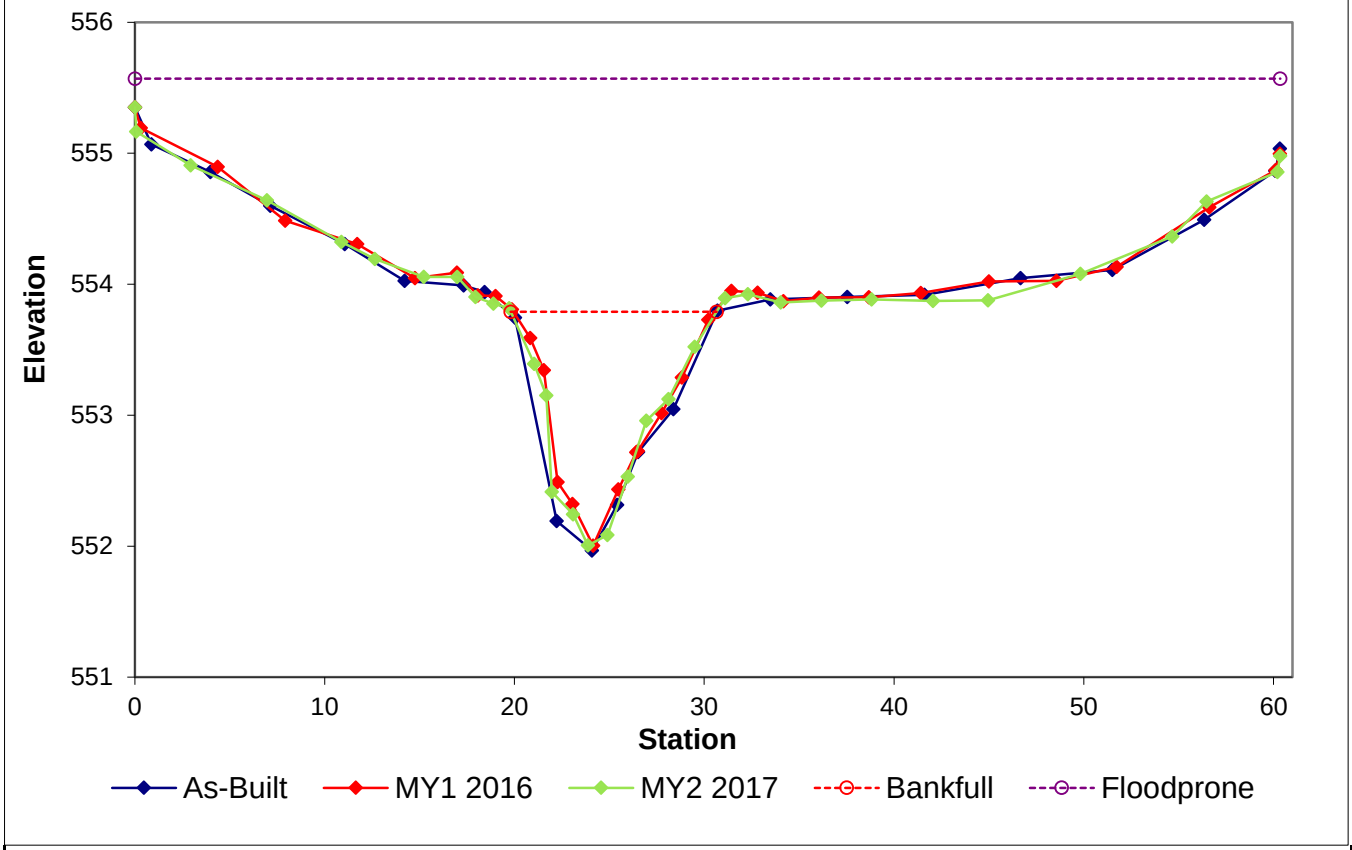


*Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X15 - Reach 6 (Station 26+17)
Monitoring Year 2 - Collected October 2017

	LEFT BANK							RIGHT BANK			
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev*	TOB Elev	WFPA
Pool		9.89	10.85	0.91	1.78	11.92	-	-	553.79	553.82	60.36

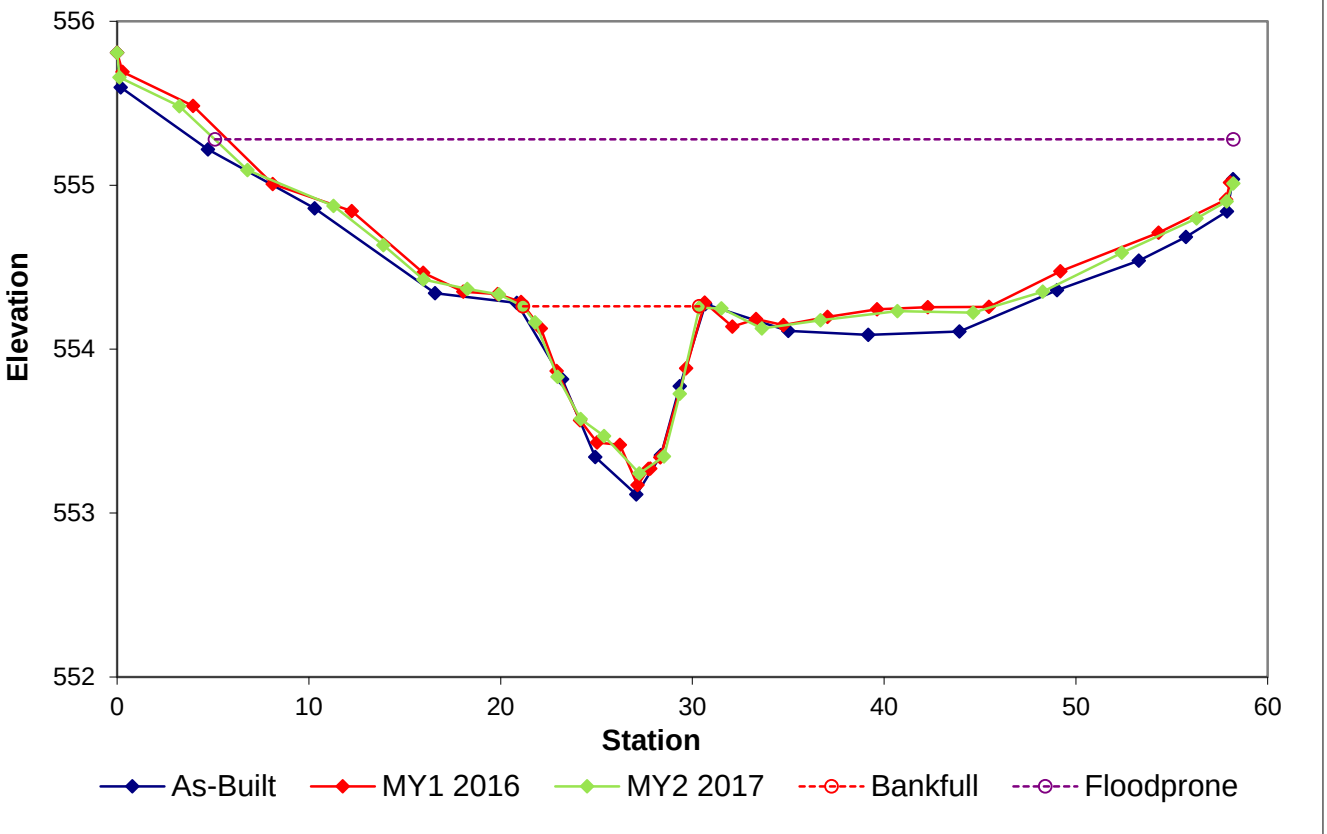


*Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X16 - Reach 6 (Station 26+02)
Monitoring Year 2 - Collected October 2017

	LEFT BANK						RIGHT BANK				
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	5.69	9.19	0.62	1.15	14.82	0.89	5.49	554.26	554.26	53.10

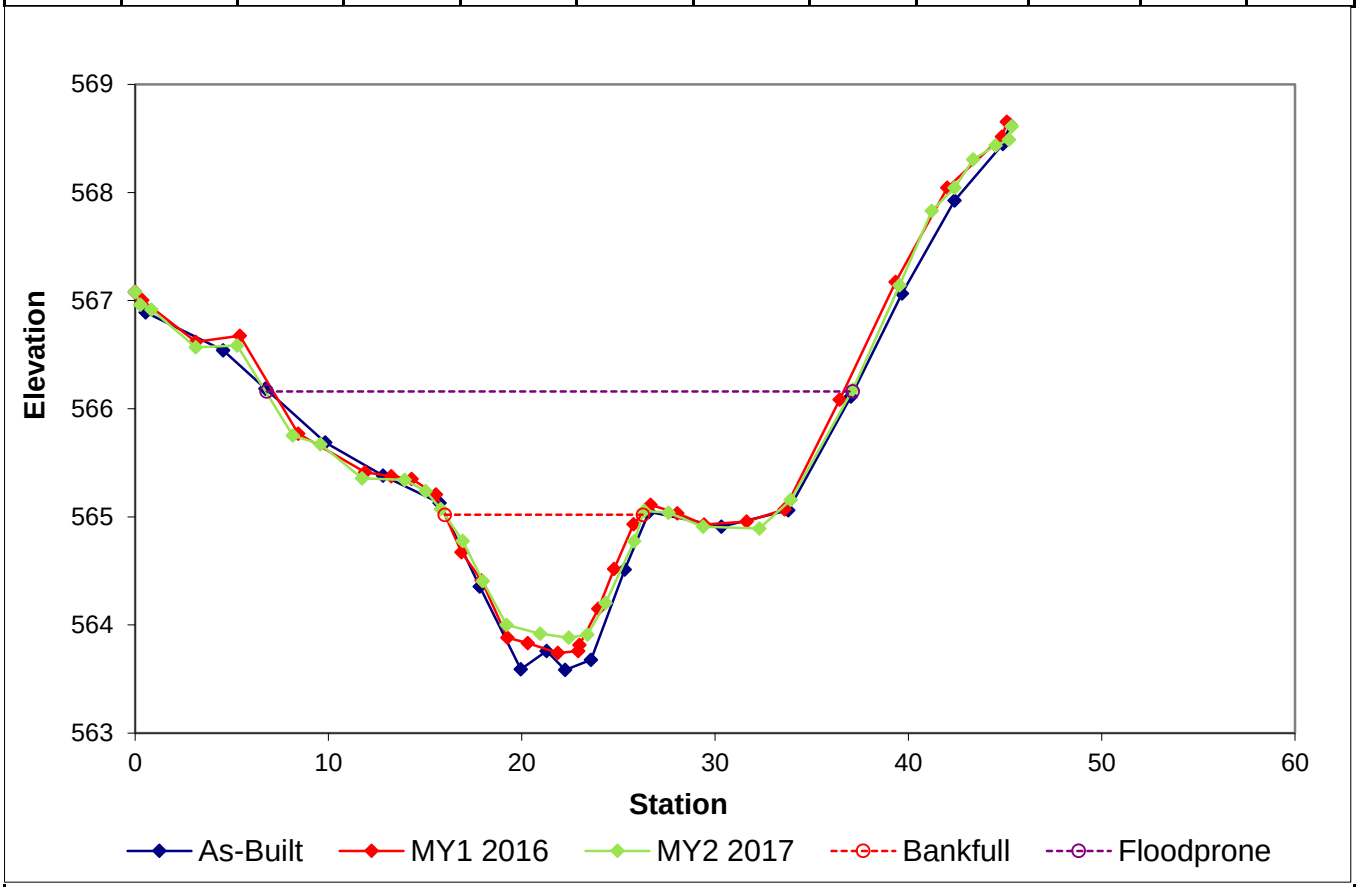


* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X17 - Reach 6 - (Station 21+06)
Monitoring Year 2 - Collected October 2017

	LEFT BANK						RIGHT BANK				
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	7.89	10.25	0.77	1.45	13.31	0.81	2.88	565.02	565.05	30.32

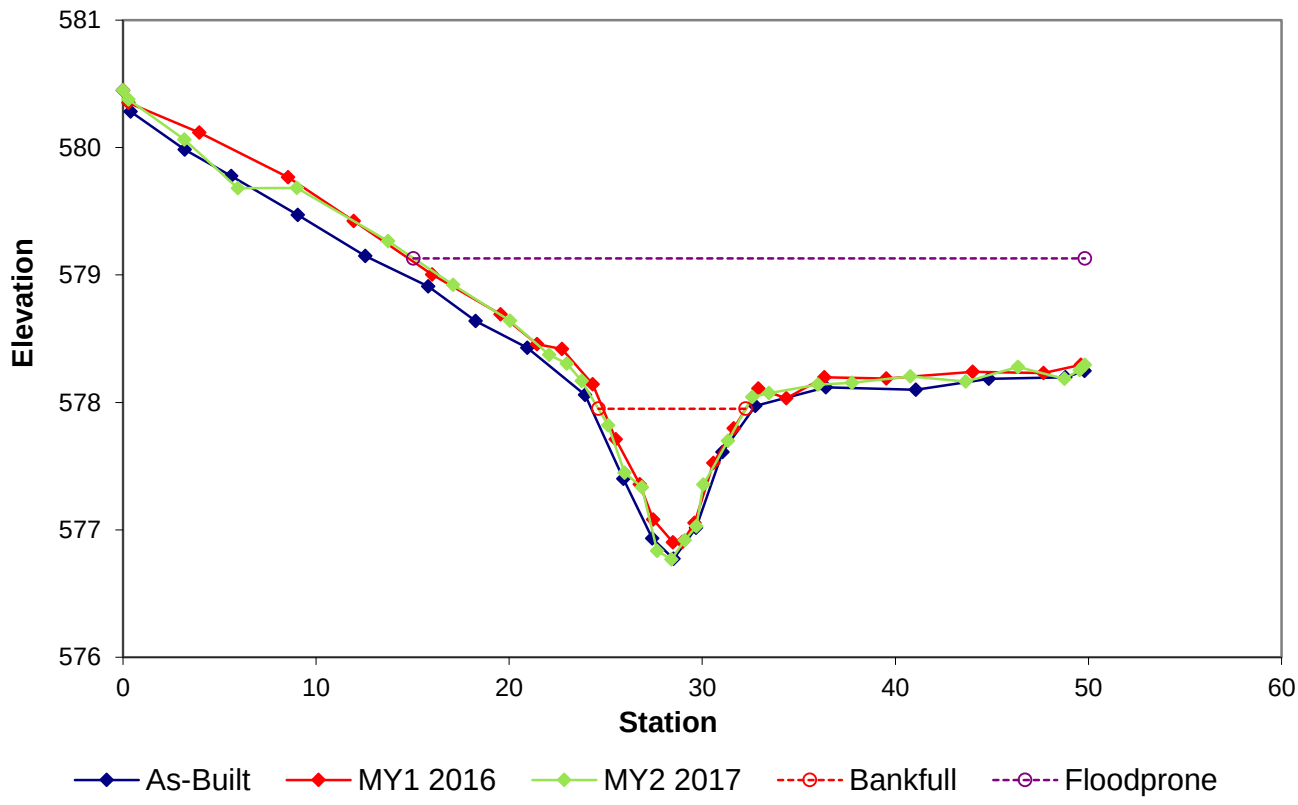


* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X18 - Reach 6 (Station 16+80)
Monitoring Year 2 - Collected October 2017

	LEFT BANK						RIGHT BANK				
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth*	W/D	BH Ratio*	ER*	BKF Elev**	TOB Elev	WFPA
Riffle	C	4.61	7.64	0.60	1.19	12.73	1.07	4.11	577.95	578.04	34.78



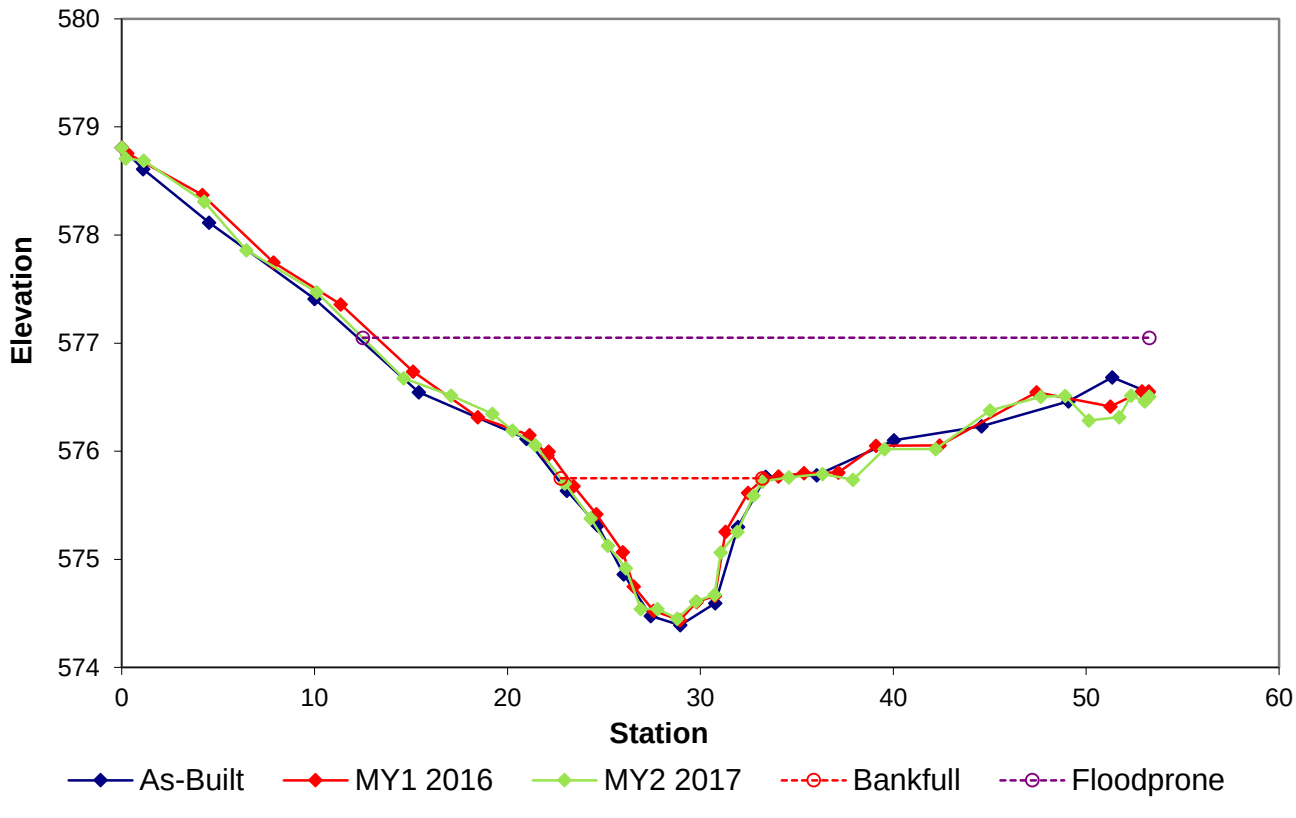
* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.
**Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X19 - Reach 6 (Station 17+69)
Monitoring Year 2 - Collected October 2017

LEFT BANK **RIGHT BANK**

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev*	TOB Elev	WFPA
Pool		7.89	10.45	0.76	1.30	13.75	-	-	575.75	575.72	40.77



*Recorded BKF elevation reflects the as-built survey BKF elevation.

Figure 4. Year 2 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

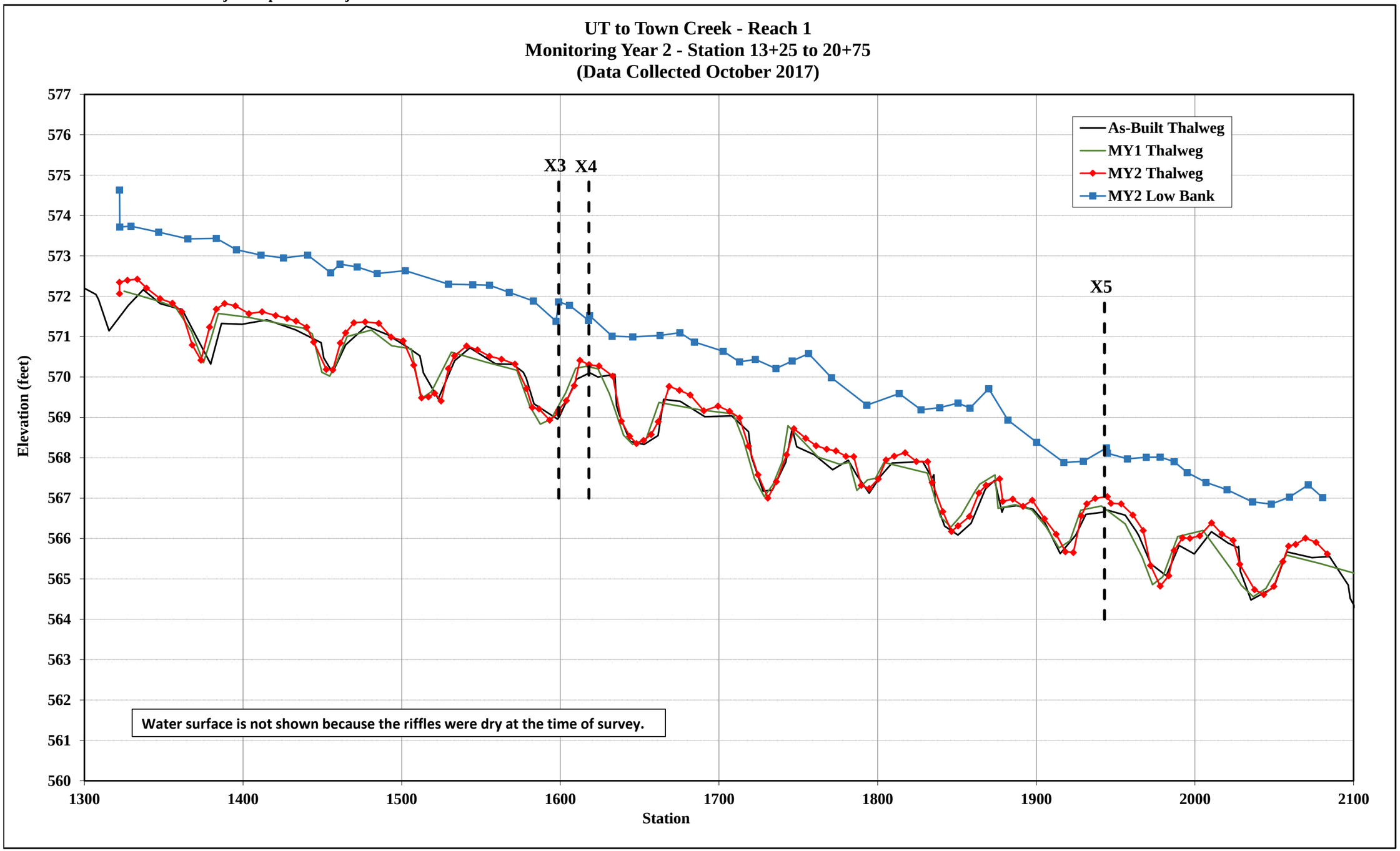


Figure 4 Cont. Year 2 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

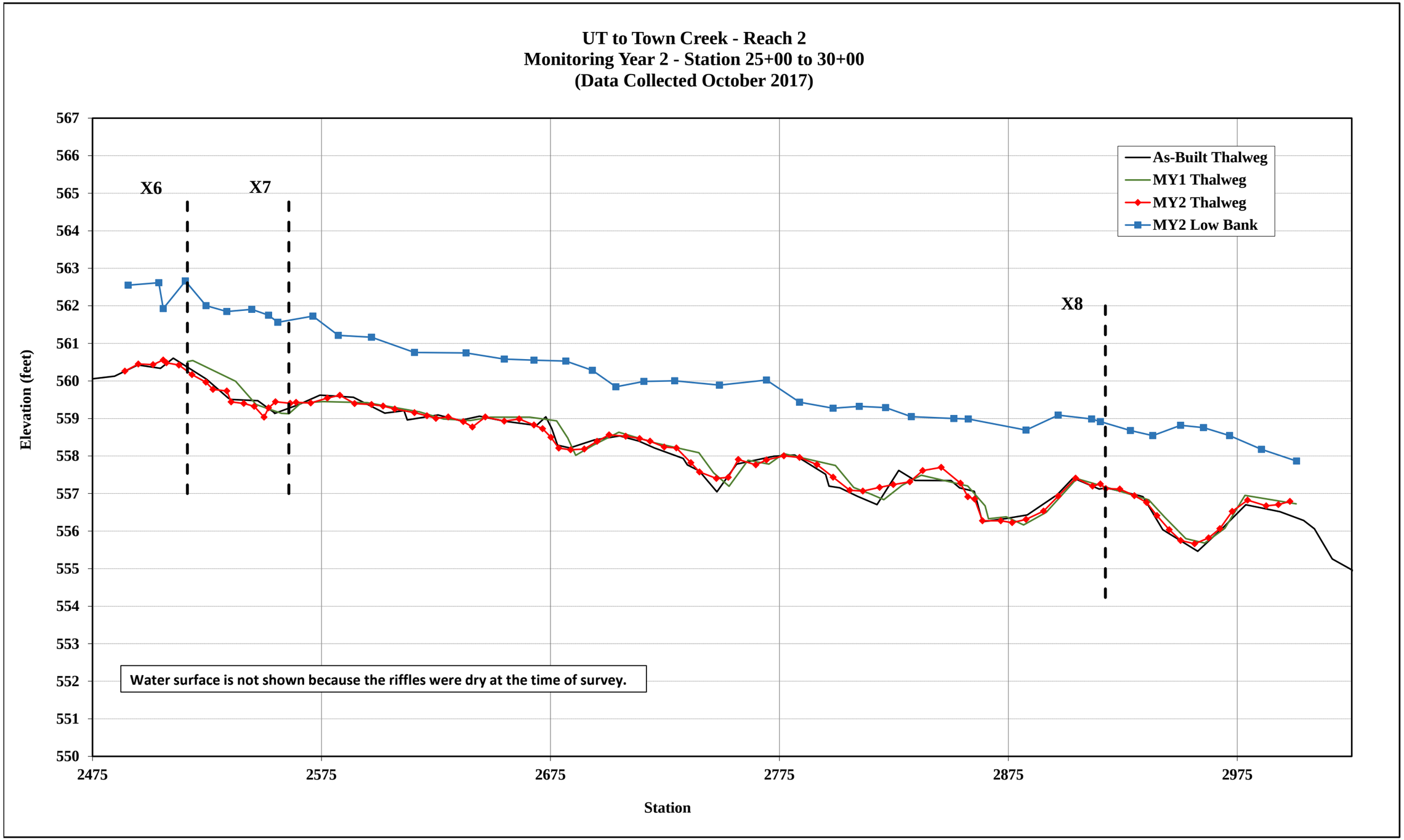


Figure 4 Cont. Year 2 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

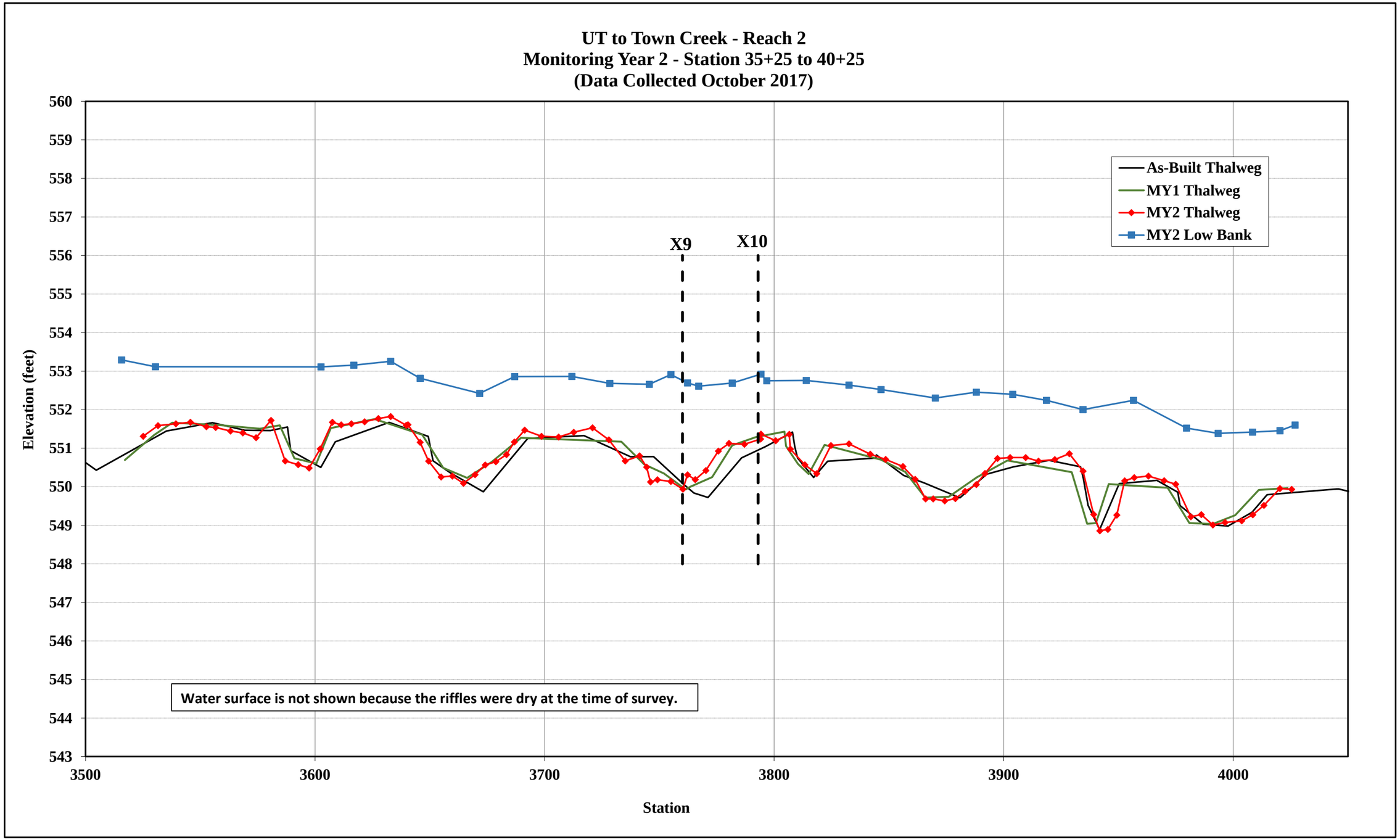


Figure 4 Cont. Year 2 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

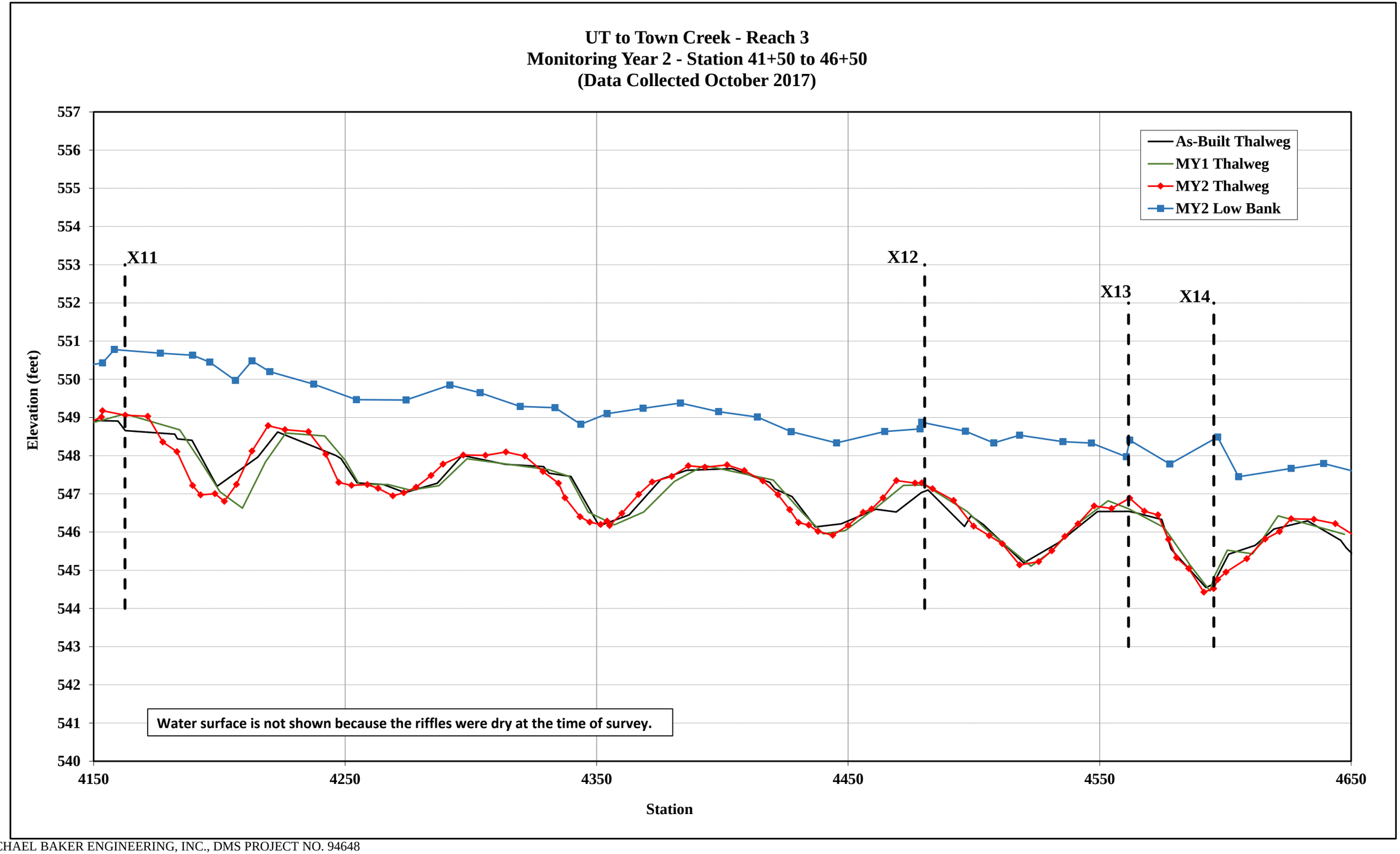


Figure 4 Cont. Year 2 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

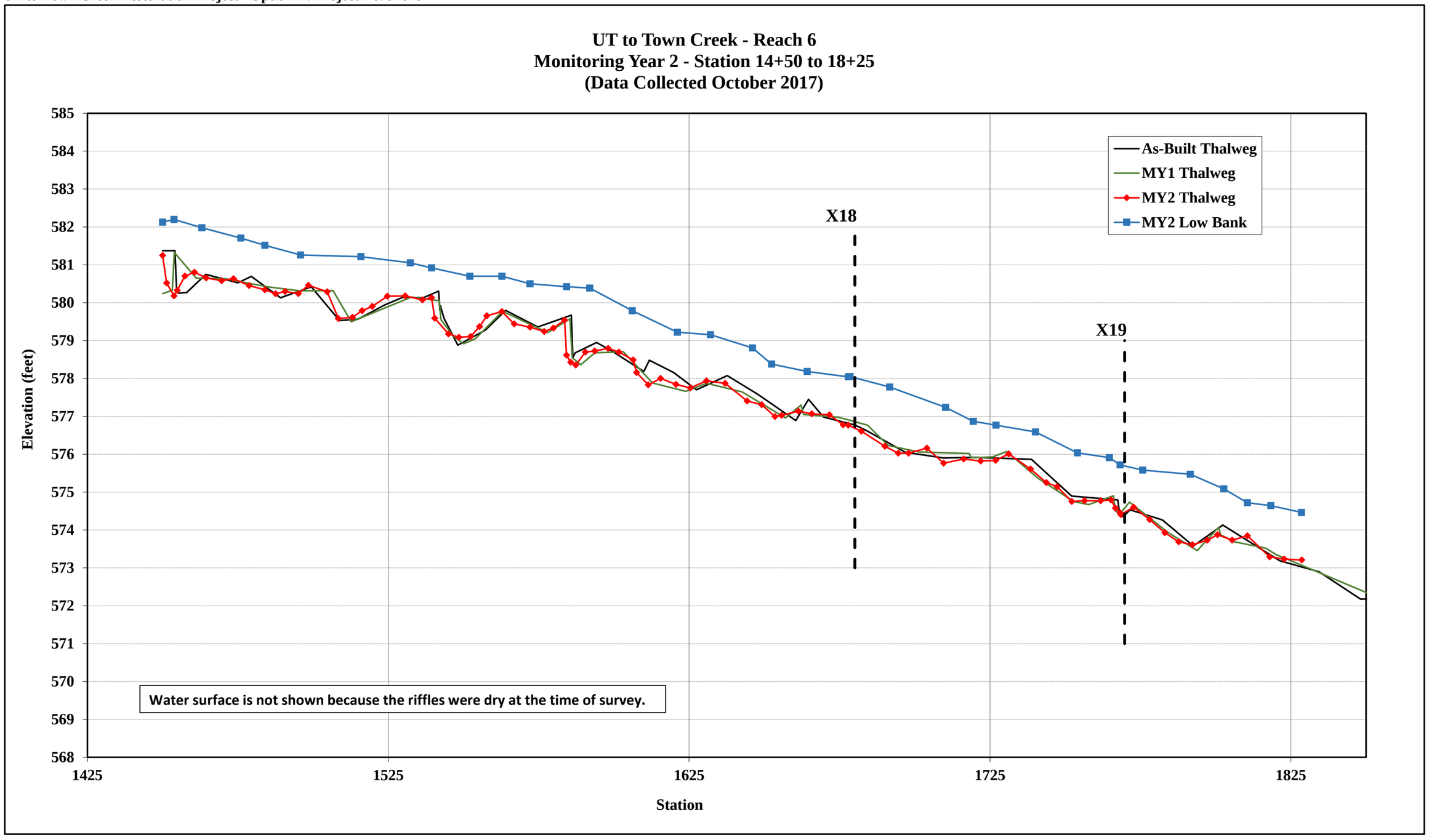


Figure 4 Cont. Year 2 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

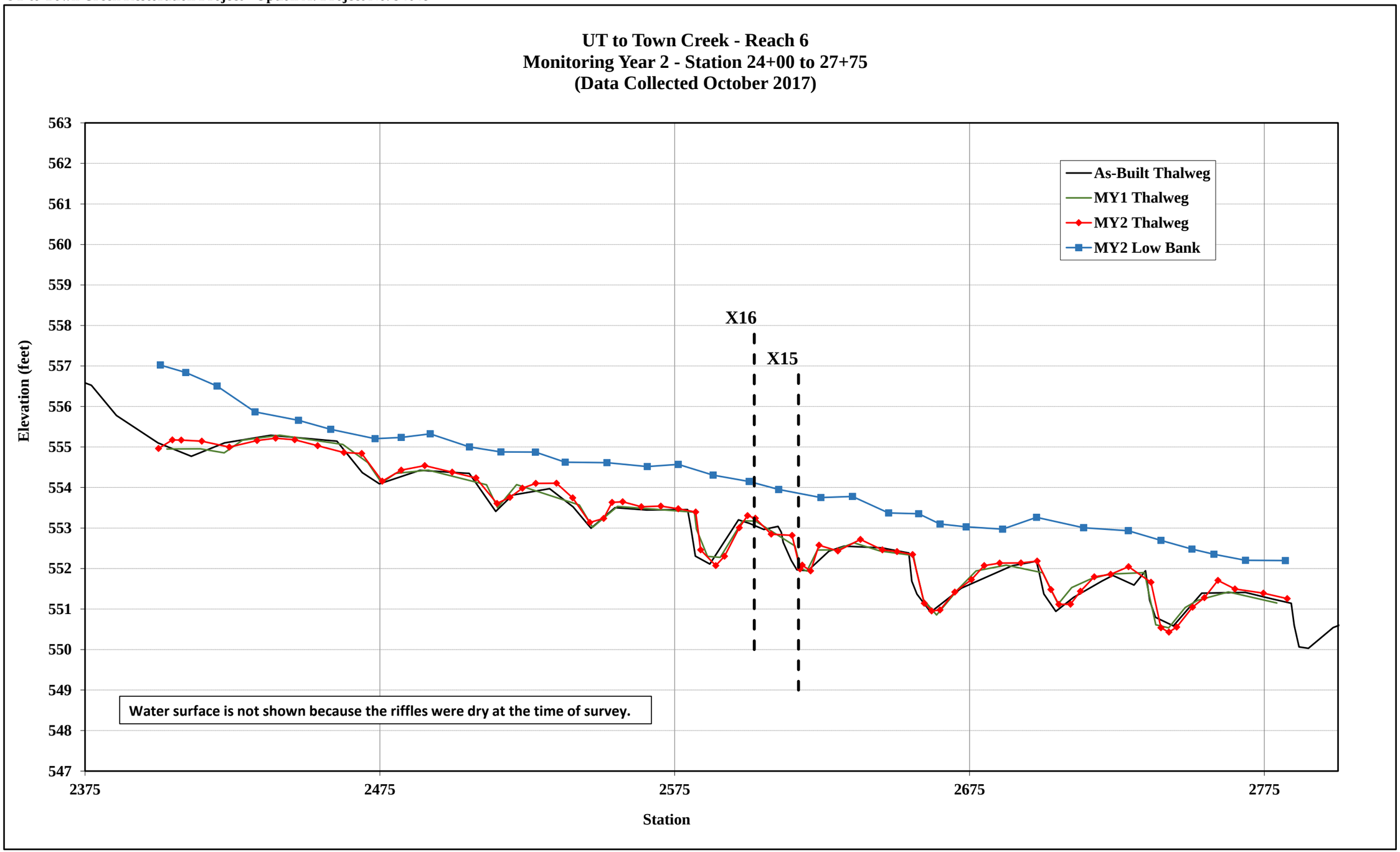


Figure 5a. Reachwide Pebble Count Distribution with Annual Overlays
UT to Town Creek Restoration Project: Project No. 94648

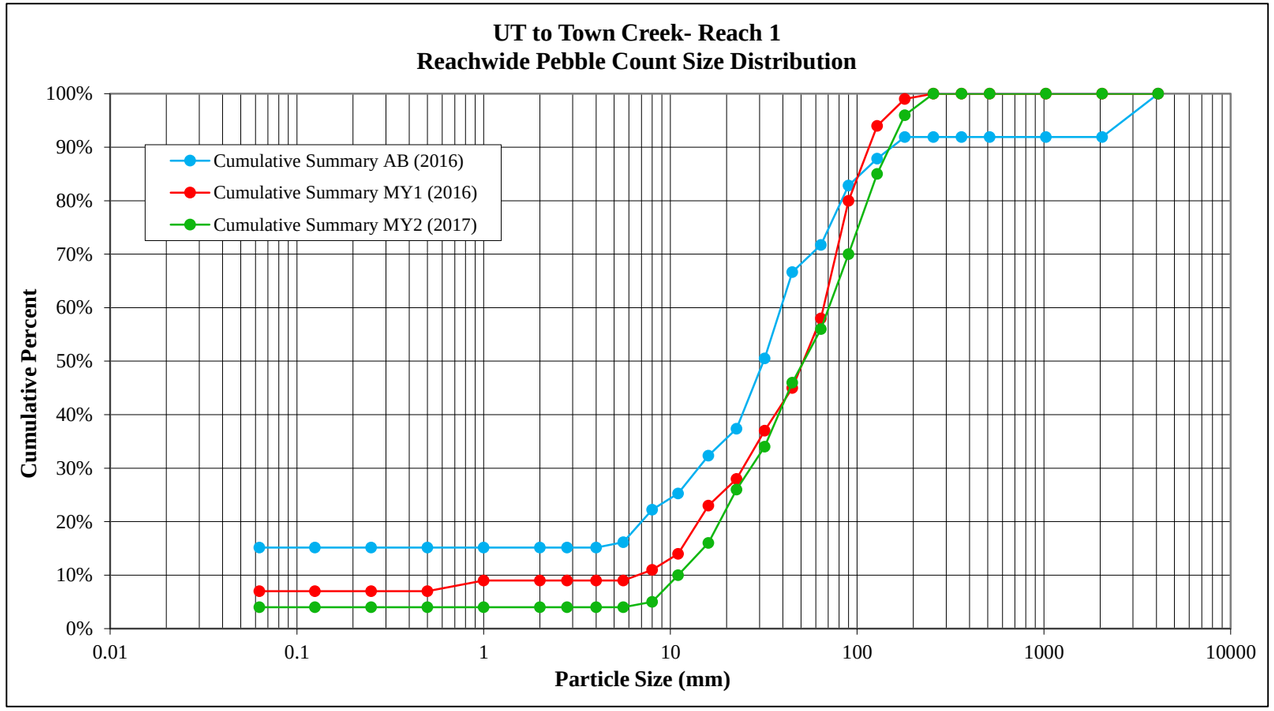
SITE OR PROJECT:	UT To Town Creek - Year 2
REACH/LOCATION:	Reach 1 (5 Riffles & 5 Pools)
DATE COLLECTED:	11/2/2017
FIELD COLLECTION BY:	KS and RM
DATA ENTERED BY:	KS

			PARTICLE CLASS			Reach Summary		Riffle Summary		Pool Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Pool	Total	Class %	% Cum	Class %	% Cum	Class %	% Cum
	Silt / Clay	< .063	3	1	4	4%	4%	6%	6%	2%	2%
Sand	Very Fine	.063 - .125	0	0			4%	0%	6%	0%	2%
Sand	Fine	.125 - .25	0	0			4%	0%	6%	0%	2%
Sand	Medium	.25 - .50	0	0			4%	0%	6%	0%	2%
Sand	Coarse	.50 - 1.0	0	0			4%	0%	6%	0%	2%
Sand	Very Coarse	1.0 - 2.0	0	0			4%	0%	6%	0%	2%
Gravel	Very Fine	2.0 - 2.8	0	0			4%	0%	6%	0%	2%
Gravel	Very Fine	2.8 - 4.0	0	0			4%	0%	6%	0%	2%
Gravel	Fine	4.0 - 5.6	0	0			4%	0%	6%	0%	2%
Gravel	Fine	5.6 - 8.0	0	1	1	1%	5%	0%	6%	2%	4%
Gravel	Medium	8.0 - 11.0	0	5	5	5%	10%	0%	6%	10%	14%
Gravel	Medium	11.0 - 16.0	3	3	6	6%	16%	6%	12%	6%	20%
Gravel	Coarse	16.0 - 22.6	2	8	10	10%	26%	4%	16%	16%	36%
Gravel	Coarse	22.6 - 32	2	6	8	8%	34%	4%	20%	12%	48%
Gravel	Very Coarse	32 - 45	3	9	12	12%	46%	6%	26%	18%	66%
Gravel	Very Coarse	45 - 64	6	4	10	10%	56%	12%	38%	8%	74%
Cobble	Small	64 - 90	11	3	14	14%	70%	22%	60%	6%	80%
Cobble	Small	90 - 128	9	6	15	15%	85%	18%	78%	12%	92%
Cobble	Large	128 - 180	8	3	11	11%	96%	16%	94%	6%	98%
Cobble	Large	180 - 256	3	1	4	4%	100%	6%	100%	2%	100%
Boulder	Small	256 - 362	0	0			100%	0%	100%	0%	100%
Boulder	Small	362 - 512	0	0			100%	0%	100%	0%	100%
Boulder	Medium	512 - 1024	0	0			100%	0%	100%	0%	100%
Boulder	Large-Very Large	1024 - 2048	0	0			100%	0%	100%	0%	100%
	Bedrock	> 2048	0	0			100%	0%	100%	0%	100%
		Total	**50**	**50**	**100**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Cummulative Channel materials	
D16 =	16.00
D35 =	32.92
D50 =	51.81
D84 =	125.03
D95 =	174.51
D100 =	180 - 256

Riffle Channel materials	
D16 =	22.60
D35 =	58.61
D50 =	77.08
D84 =	145.46
D95 =	190.88
D100 =	180 - 256

Pool Channel materials	
D16 =	12.46
D35 =	22.12
D50 =	33.24
D84 =	101.21
D95 =	151.79
D100 =	180 - 256



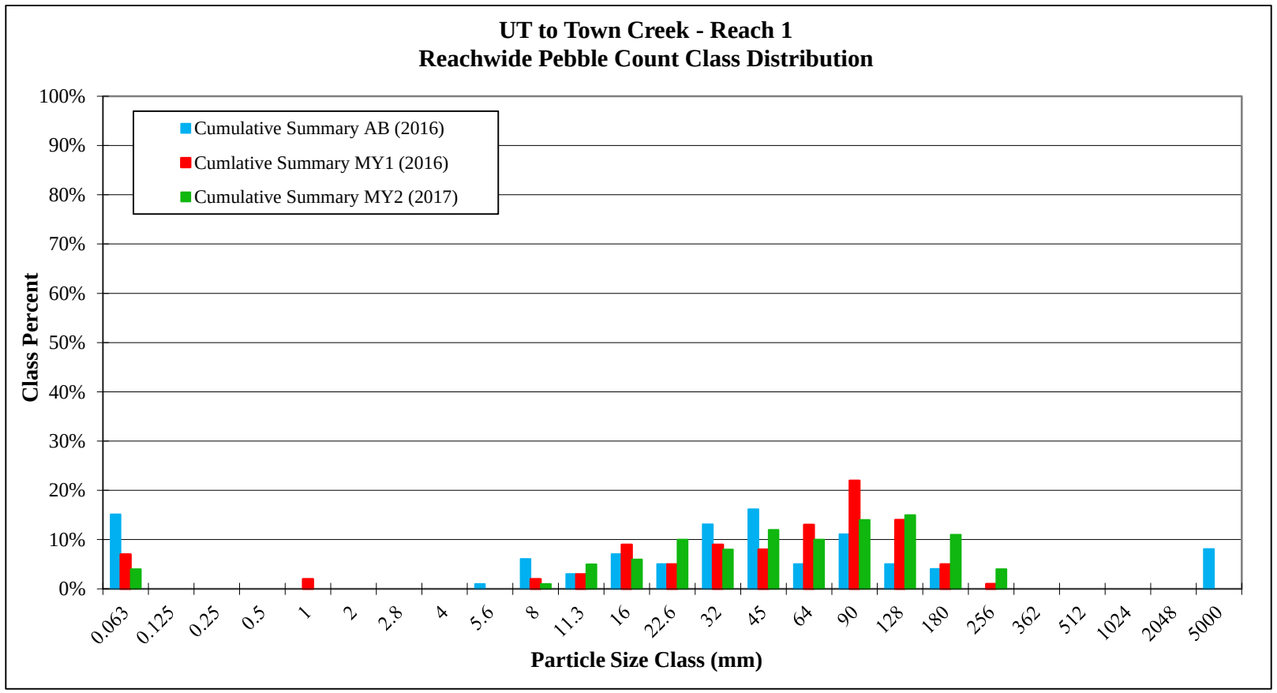


Figure 5b. Reachwide Pebble Count Distribution with Annual Overlays
UT to Town Creek Restoration Project: Project No. 94648

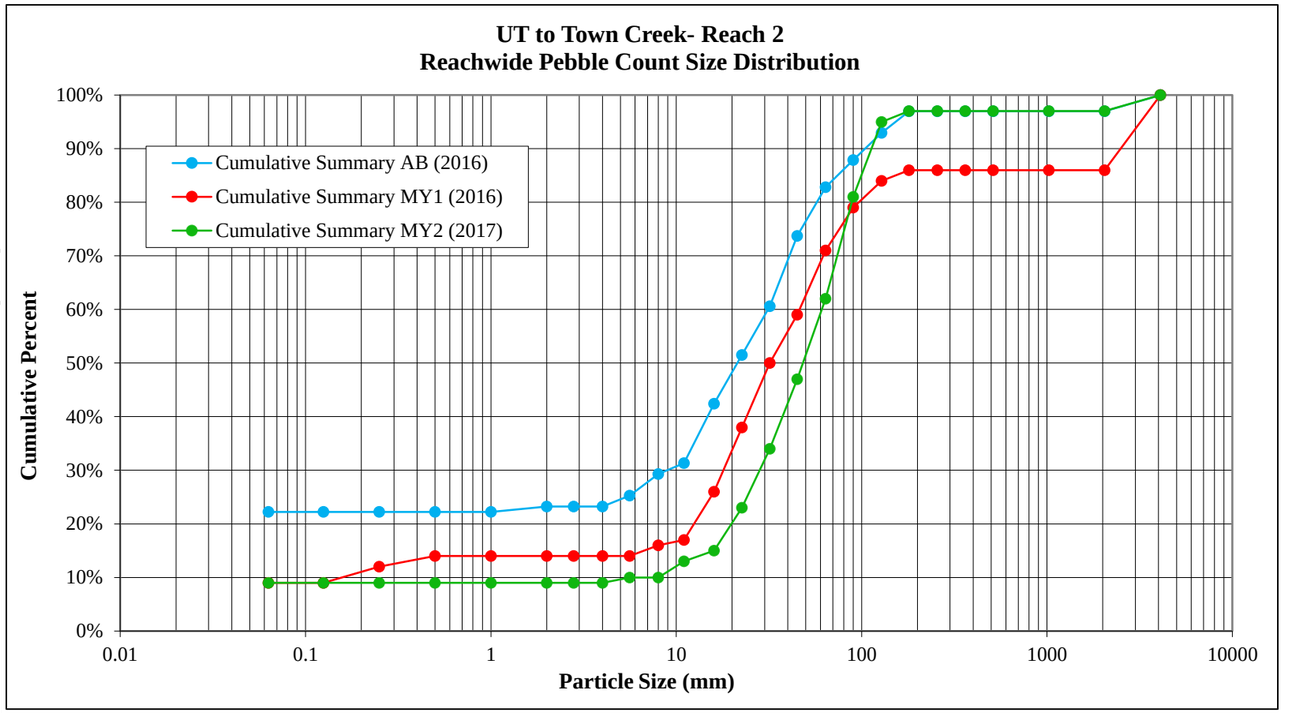
SITE OR PROJECT:	UT To Town Creek - Year 2
REACH/LOCATION:	Reach 2 (5 Riffles & 5 Pools)
DATE COLLECTED:	11/2/2017
FIELD COLLECTION BY:	KS and RM
DATA ENTERED BY:	KS

			PARTICLE CLASS			Reach Summary		Riffle Summary		Pool Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Pool	Total	Class %	% Cum	Class %	% Cum	Class %	% Cum
	Silt / Clay	< .063	2	7	9	9%	9%	4	4	14	14
Sand	Very Fine	.063 - .125	0	0			9%	0	4	0	14
	Fine	.125 - .25	0	0			9%	0	4	0	14
	Medium	.25 - .50	0	0			9%	0	4	0	14
	Coarse	.50 - 1.0	0	0			9%	0	4	0	14
	Very Coarse	1.0 - 2.0	0	0			9%	0	4	0	14
Gravel	Very Fine	2.0 - 2.8	0	0			9%	0	4	0	14
	Very Fine	2.8 - 4.0	0	0			9%	0	4	0	14
	Fine	4.0 - 5.6	0	1	1	1%	10%	0	4	2	16
	Fine	5.6 - 8.0	0	0			10%	0	4	0	16
	Medium	8.0 - 11.0	2	1	3	3%	13%	4	8	2	18
	Medium	11.0 - 16.0	0	2	2	2%	15%	0	8	4	22
	Coarse	16 - 22.6	4	4	8	8%	23%	8	16	8	30
	Coarse	22.6 - 32	6	5	11	11%	34%	12	28	10	40
	Very Coarse	32 - 45	6	7	13	13%	47%	12	40	14	54
	Very Coarse	45 - 64	9	6	15	15%	62%	18	58	12	66
Cobble	Small	64 - 90	12	7	19	19%	81%	24	82	14	80
	Small	90 - 128	8	6	14	14%	95%	16	98	12	92
	Large	128 - 180	1	1	2	2%	97%	2	100	2	94
	Large	180 - 256	0	0			97%	0	100	0	94
Boulder	Small	256 - 362	0	0			97%	0	100	0	94
	Small	362 - 512	0	0			97%	0	100	0	94
	Medium	512 - 1024	0	0			97%	0	100	0	94
	Large-Very Large	1024 - 2048	0	0			97%	0	100	0	94
	Bedrock	> 2048	0	3	3	3%	100%	0	100	6	100
		Total	**50**	**50**	**100**	**100%**	**100%**	**100**	**100**	**100**	**100**

Cummulative Channel materials	
D16 =	16.71
D35 =	32.85
D50 =	48.28
D84 =	97.06
D95 =	128.00
D100 =	> 2048

Riffle Channel materials	
D16 =	22.60
D35 =	39.04
D50 =	54.73
D84 =	94.05
D95 =	119.82
D100 =	128 - 180

Pool Channel materials	
D16 =	8.00
D35 =	26.89
D50 =	40.82
D84 =	101.21
D95 =	2298.80
D100 =	> 2048



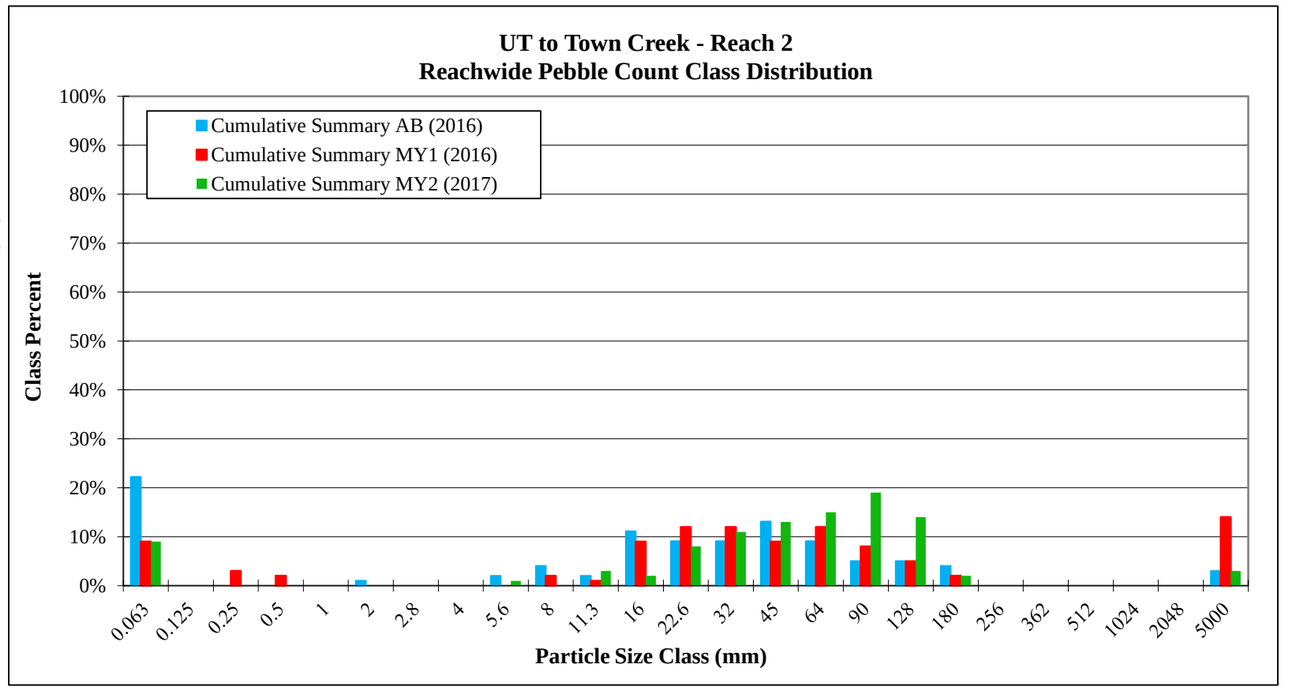


Figure 5c. Reachwide Pebble Count Distribution with Annual Overlays
UT to Town Creek Restoration Project: Project No. 94648

PEBBLE COUNT DATA SHEET

SITE OR PROJECT:	UT To Town Creek - Year 2
REACH/LOCATION:	Reach 3 (5 Riffles & 5 Pools)
DATE COLLECTED:	11/2/2017
FIELD COLLECTION BY:	KS and RM
DATA ENTERED BY:	KS

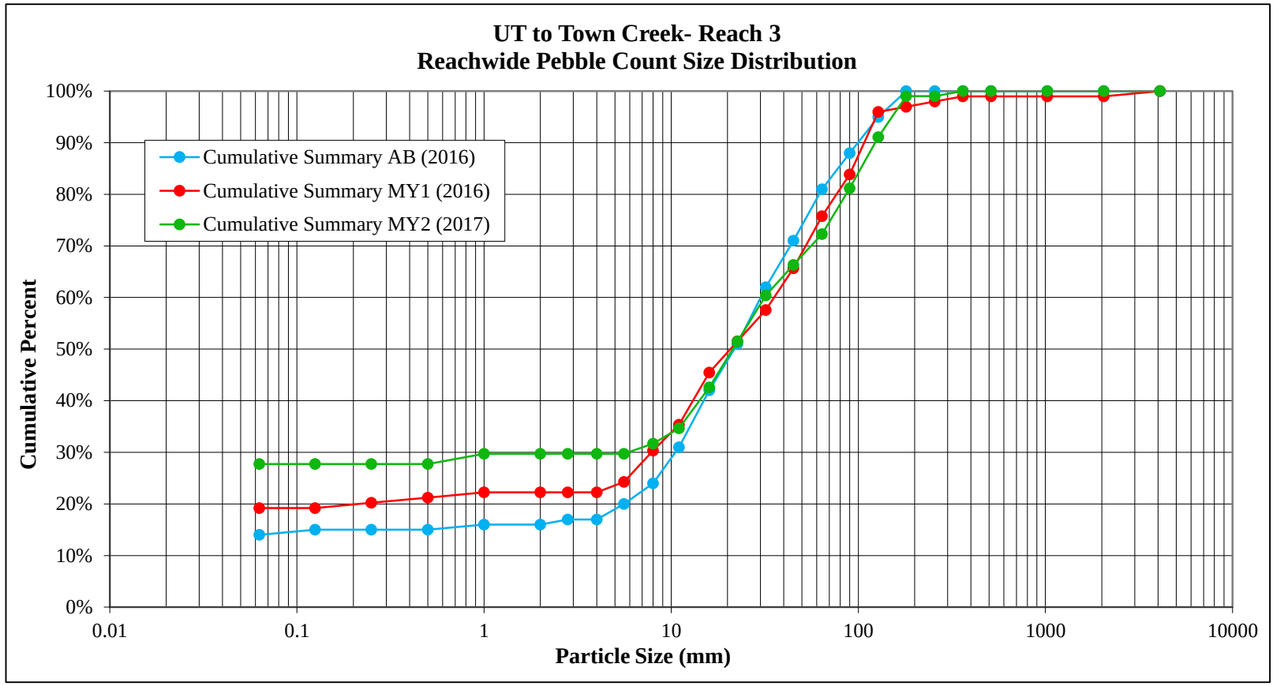
SEDIMENT ANALYSIS DATA SHEET

			PARTICLE CLASS			Reach Summary		Riffle Summary		Pool Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Pool	Total	Class %	% Cum	Class %	% Cum	Class %	% Cum
	Silt / Clay	< .063	20	8	28	28%	28%	40	40	16	16
Sand	Very Fine	.063 - .125	0	0			28%	0	40	0	16
	Fine	.125 - .25	0	0			28%	0	40	0	16
	Medium	.25 - .50	0	0			28%	0	40	0	16
	Coarse	.50 - 1.0	0	2	2	2%	30%	0	40	4	20
	Very Coarse	1.0 - 2.0	0	0			30%	0	40	0	20
Gravel	Very Fine	2.0 - 2.8	0	0			30%	0	40	0	20
	Very Fine	2.8 - 4.0	0	0			30%	0	40	0	20
	Fine	4.0 - 5.6	0	0			30%	0	40	0	20
	Fine	5.6 - 8.0	0	2	2	2%	32%	0	40	4	24
	Medium	8.0 - 11.0	1	2	3	3%	35%	2	42	4	27
	Medium	11.0 - 16.0	3	5	8	8%	43%	6	48	10	37
	Coarse	16 - 22.6	4	5	9	9%	51%	8	56	10	47
	Coarse	22.6 - 32	2	7	9	9%	60%	4	60	14	61
	Very Coarse	32 - 45	3	3	6	6%	66%	6	66	6	67
	Very Coarse	45 - 64	1	5	6	6%	72%	2	68	10	76
Cobble	Small	64 - 90	4	5	9	9%	81%	8	76	10	86
	Small	90 - 128	5	5	10	10%	91%	10	86	10	96
	Large	128 - 180	6	2	8	8%	99%	12	98	4	100
	Large	180 - 256	0	0			99%	0	98	0	100
Boulder	Small	256 - 362	1	0	1	1%	100%	2	100	0	100
	Small	362 - 512	0	0			100%	0	100	0	100
	Medium	512 - 1024	0	0			100%	0	100	0	100
	Large-Very Large	1024 - 2048	0	0			100%	0	100	0	100
	Bedrock	> 2048	0	0			100%	0	100	0	100
			50	51	101	100%	100%	100	100	100	100

Cummulative	
Channel materials	
D_{16} =	<0.063
D_{35} =	11.18
D_{50} =	21.34
D_{84} =	99.47
D_{95} =	151.47
D_{100} =	256 - 362

Riffle	
Channel materials	
D_{16} =	<0.063
D_{35} =	<0.063
D_{50} =	17.44
D_{84} =	119.29
D_{95} =	165.29
D_{100} =	256 - 362

Pool	
Channel materials	
D_{16} =	0.53
D_{35} =	14.68
D_{50} =	24.35
D_{84} =	83.16
D_{95} =	123.14
D_{100} =	128 - 180



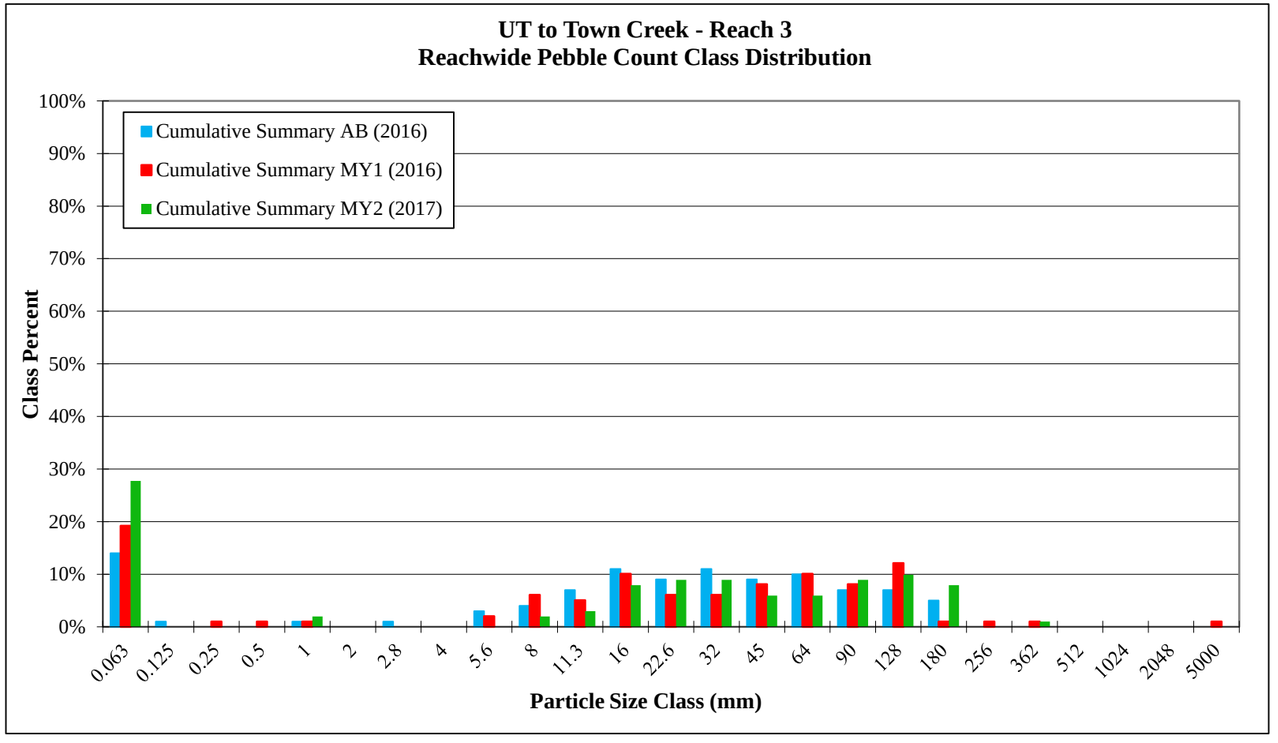


Figure 5d. Reachwide Pebble Count Distribution with Annual Overlays
UT to Town Creek Restoration Project: Project No. 94648

SITE OR PROJECT:	UT To Town Creek - Year 2
REACH/LOCATION:	Reach 6 (6 Riffles & 4 Pools)
DATE COLLECTED:	11/2/2017
FIELD COLLECTION BY:	KS and RM
DATA ENTERED BY:	KS

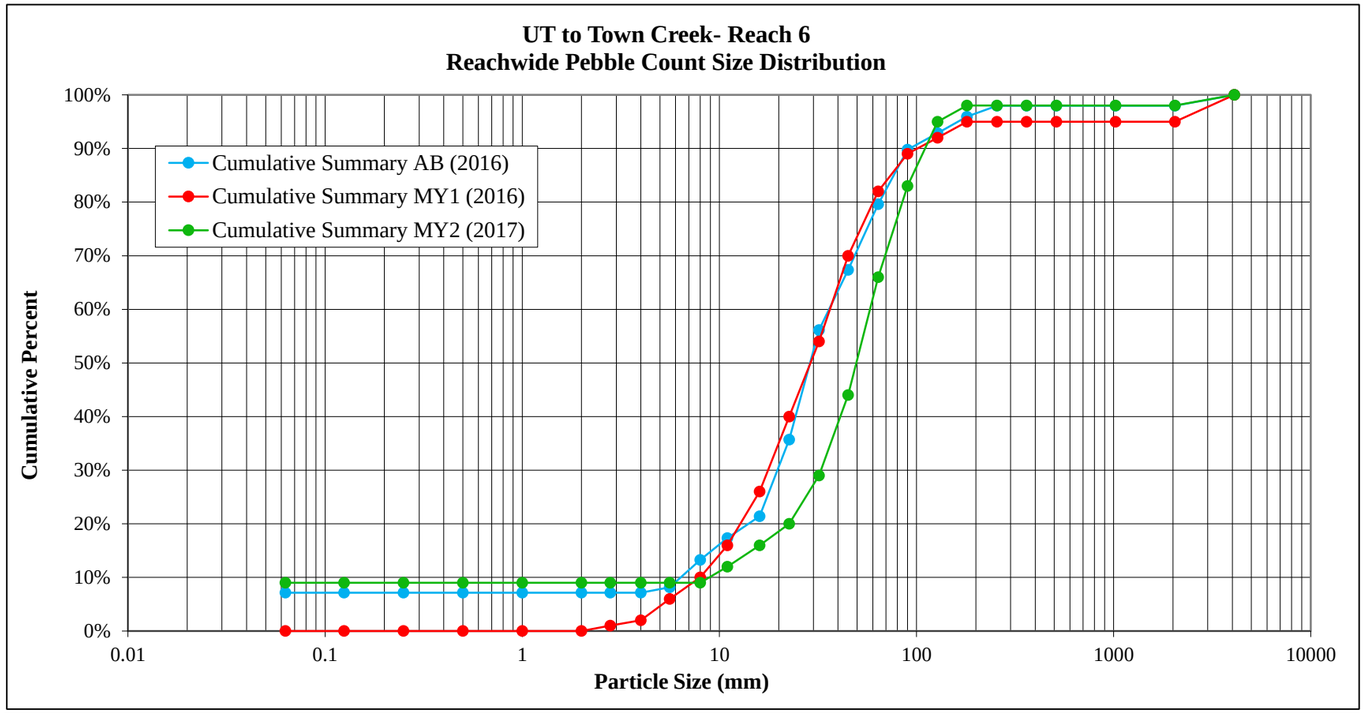
SEDIMENT ANALYSIS DATA SHEET

			PARTICLE CLASS			Reach Summary		Riffle Summary		Pool Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Pool	Total	Class %	% Cum	Class %	% Cum	Class %	% Cum
	Silt / Clay	< .063	3	6	9	9%	9%	5	5	15	15
Sand	Very Fine	.063 - .125	0	0			9%	0	5	0	15
	Fine	.125 - .25	0	0			9%	0	5	0	15
	Medium	.25 - .50	0	0			9%	0	5	0	15
	Coarse	.50 - 1.0	0	0			9%	0	5	0	15
	Very Coarse	1.0 - 2.0	0	0			9%	0	5	0	15
Gravel	Very Fine	2.0 - 2.8	0	0			9%	0	5	0	15
	Very Fine	2.8 - 4.0	0	0			9%	0	5	0	15
	Fine	4.0 - 5.6	0	0			9%	0	5	0	15
	Fine	5.6 - 8.0	0	0			9%	0	5	0	15
	Medium	8.0 - 11.0	2	1	3	3%	12%	3	8	3	18
	Medium	11.0 - 16.0	0	4	4	4%	16%	0	8	10	28
	Coarse	16 - 22.6	1	3	4	4%	20%	2	10	8	35
	Coarse	22.6 - 32	5	4	9	9%	29%	8	18	10	45
	Very Coarse	32 - 45	10	5	15	15%	44%	17	35	13	58
	Very Coarse	45 - 64	14	8	22	22%	66%	23	58	20	78
Cobble	Small	64 - 90	10	7	17	17%	83%	17	75	18	95
	Small	90 - 128	10	2	12	12%	95%	17	92	5	100
	Large	128 - 180	3	0	3	3%	98%	5	97	0	100
	Large	180 - 256	0	0			98%	0	97	0	100
Boulder	Small	256 - 362	0	0			98%	0	97	0	100
	Small	362 - 512	0	0			98%	0	97	0	100
	Medium	512 - 1024	0	0			98%	0	97	0	100
	Large-Very Large	1024 - 2048	0	0			98%	0	97	0	100
	Bedrock	> 2048	2	0	2	2%	100%	3	100	0	100
			60	40	100			100	100	100	100

Cummulative	
Channel materials	
D16 =	16.00
D35 =	36.68
D50 =	49.54
D84 =	92.68
D95 =	128.00
D100 =	> 2048

Riffle	
Channel materials	
D16 =	29.03
D35 =	45.00
D50 =	56.44
D84 =	108.85
D95 =	160.66
D100 =	> 2048

Pool	
Channel materials	
D16 =	9.09
D35 =	22.60
D50 =	36.68
D84 =	72.64
D95 =	90.00
D100 =	90 - 128



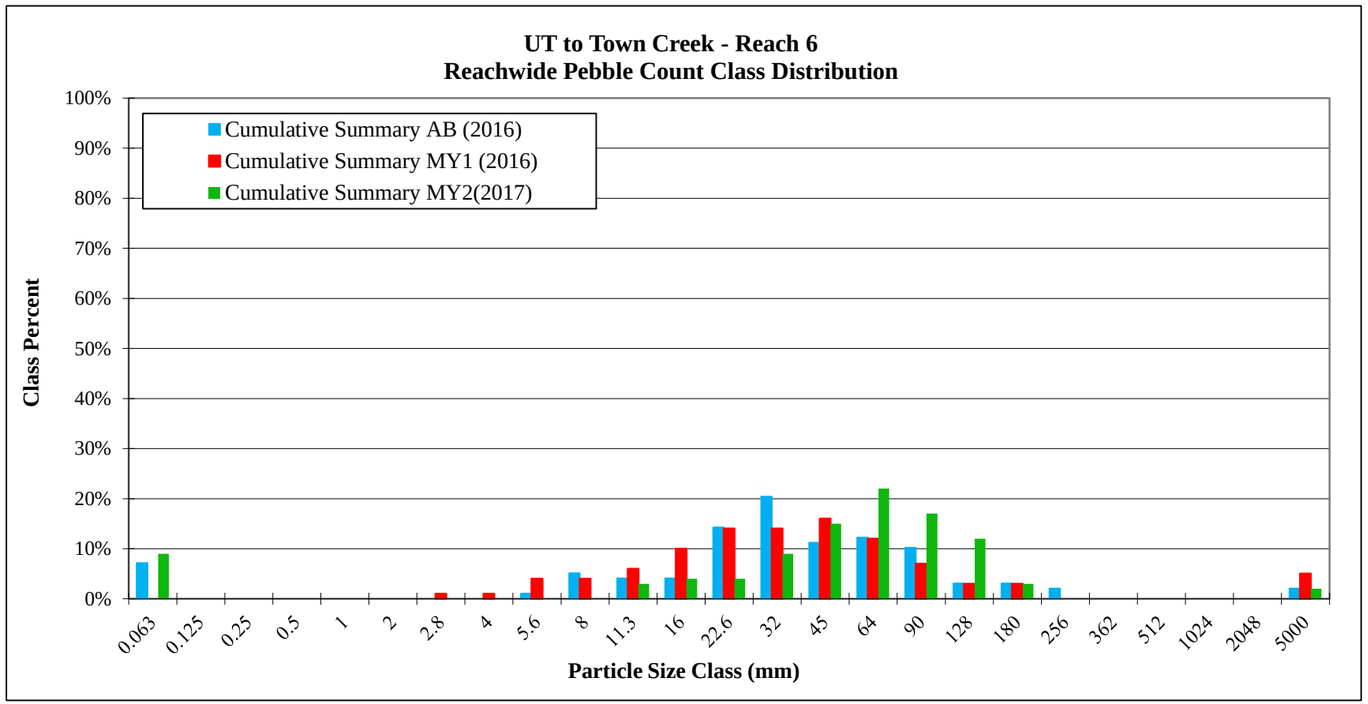


Table 10. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 1 (1,204 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition[1]						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	11.0	9.0	-----	-----	11.9	-----	2	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	77.0	-----	-----	-----	-----	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	1.4	1.2	-----	-----	1.5	-----	2	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	1.8	-----	-----	2.1	-----	2	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	18.9	-----	13.8	-----	-----	-----	-----	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	5.8	-----	-----	10.3	-----	2	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	6.5	-----	-----	8.6	-----	2	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	1.2	-----	-----	1.2	-----	2	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	50.0	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	31	-----	-----	101	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	17	-----	-----	77	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.4	-----	-----	8.6	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	63	-----	-----	144	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	2.6	-----	-----	11.2	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.011	-----	-----	0.056	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	65.6	-----	-----	206.5	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.8	-----	-----	-----	1	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----		11.3 / 33.0 / 50.0 / 128.0 / >2048						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180				
Reach Shear Stress (competency) lb/f²	-----	-----	-----	-----	0.61	-----	-----	0.71	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	32	-----	-----	37.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.830	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----			-----	:4 (incisec	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----		-----	-----	3.6	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	77.8	-----	-----	-----	50	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length (ft)[2]	-----	-----	-----	-----	-----	-----	-----	1181	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0080	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

[1] Reach 1 data based on two riffle cross-sections and one pool cross-section.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 1 (1,204 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	13.5	-----	-----	-----	-----	11.8	-----	-----	14.4	-----	3
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	45	-----	-----	63	-----	-----	33.1	-----	-----	91.8	-----	3
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	0.8	-----	-----	1.0	-----	3
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	1.4	-----	-----	-----	-----	1.2	-----	-----	1.4	-----	3
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	13.8	-----	-----	-----	-----	9.1	-----	-----	13.9	-----	3
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	13.2	-----	-----	-----	-----	14.4	-----	-----	15.2	-----	3
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	3.3	-----	-----	4.7	-----	-----	2.8	-----	-----	6.4	-----	3
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	3
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	50	-----	-----	-----	-----	-----	31.2	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	42.0	51.6	-----	72.9	-----	18
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.6	-----	-----	-----	15
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	15.5	35.0	35.4	62.8	12.7	18
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	0.01	-----	-----	0.017	-----	-----	0.008	0.017	0.017	0.031	0.006	18
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	20.3	-----	-----	67.5	-----	-----	38.0	64.0	64.0	81.7	11.0	17
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	2.1	-----	-----	3.6	-----	-----	2.50	-----	-----	2.52	0.0	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800					11.3 / 33.0 / 50.0 / 128.0 / >2048						4.0 / 18.4 / 31.2 / 96.6 / >2048 / >2048				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.41	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	26.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	-----	-----	0.830	-----	-----	-----	0.83	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	3.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	13.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,082	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,192	-----	-----	-----	-----	-----	1,206	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.11	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0094	-----	-----	-----	-----	-----	0.0096	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 2 (1,782 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	11.3	-----	12.6	-----	-----	-----	1	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	81.0	-----	-----	-----	-----	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	1.4	-----	1.2	-----	-----	-----	1	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	-----	1.6	-----	-----	-----	1	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	19.6	-----	14.5	-----	-----	-----	1	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	-----	11.0	-----	-----	-----	1	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	-----	6.4	-----	-----	-----	1	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	1.3	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	50.0	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	60	-----	185	-----	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	21	-----	80	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.7	-----	6.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	100	-----	340	-----	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	7.9	-----	27	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.01	-----	0.033	-----	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	49	-----	319	-----	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.1	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----		11.3 / 33.0 / 50.0 / 128.0 / >2048						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	0.77	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	42.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.9	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	:4 (incisec	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	3.8	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	81.2	-----	-----	-----	55	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	1,672	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.009	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 2 (1,782 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	14.0	-----	-----	-----	-----	15.4	-----	-----	15.6	-----	3
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	83	-----	-----	104.0	-----	-----	74.9	-----	-----	102.7	-----	3
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	1.1	-----	-----	-----	-----	1.0	-----	-----	1.1	-----	3
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	1.4	-----	-----	-----	-----	1.3	-----	-----	1.8	-----	3
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	14.7	-----	-----	-----	-----	14.8	-----	-----	17.0	-----	3
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	13.3	-----	-----	-----	-----	14.2	-----	-----	16.5	-----	3
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	5.9	-----	-----	7.4	-----	-----	4.8	-----	-----	6.7	-----	3
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	3
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	50	-----	-----	-----	-----	-----	20.9	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	48.6	54.7	-----	65.6	-----	7
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3.0	-----	-----	-----	8
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	16.4	48.9	39.1	101.3	37.2	21
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	-----	-----	-----	-----	-----	-----	0.003	0.018	0.018	0.035	0.0	21
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	21	-----	-----	70	-----	-----	46.0	75.4	70.0	130.2	23.5	19
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	2.1	-----	-----	3.7	-----	-----	2.5	-----	-----	2.9	0.3	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800					11.3 / 33.0 / 50.0 / 128.0 / >2048						<0.063 / 12.2 / 20.9 / 68.5 / 151.8 / >2048				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	35.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	0.96	-----	-----	-----	-----	-----	0.96	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	3.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	55	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,549	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,833	-----	-----	-----	-----	-----	1,842	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.07	-----	-----	-----	-----	-----	1.19	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0127	-----	-----	-----	-----	-----	0.0077	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 3 (829 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition[1]						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	12.9	9.8	-----	-----	12.7	-----	2	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	230.3	-----	-----	-----	-----	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	1.6	1.5	-----	-----	1.8	-----	2	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	2.9	-----	-----	3.2	-----	2	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	24.3	18.0	-----	-----	18.9	-----	2	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	5.4	-----	-----	8.6	-----	2	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	18.1	-----	-----	23.5	-----	2	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	15.0	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	40	-----	-----	65	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	34	-----	-----	61	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.7	-----	-----	4.9	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	63	-----	-----	199	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	5	-----	-----	20.3	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.014	-----	-----	0.03	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	38	-----	-----	132	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.6	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----		1.0 / 11.0 / 15.0 /64.0 / 150.0						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180				
Reach Shear Stress (competency) lb/f²	-----	-----	-----	-----	0.3	-----	-----	0.33	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	15.8	-----	-----	16.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	:4 (incisec	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	3.4	-----	-----	3.6	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	101.6	-----	-----	-----	65.0	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length (ft)[2]	-----	-----	-----	-----	-----	-----	-----	721	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.008	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 3 (829 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	15.5	-----	-----	-----	-----	14.9	-----	-----	17.1	-----	3
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	104	-----	-----	218.0	-----	-----	99.3	-----	-----	99.8	-----	3
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	1.1	-----	-----	1.3	-----	3
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	1.6	-----	-----	-----	-----	1.6	-----	-----	1.8	-----	3
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	18.2	-----	-----	-----	-----	16.3	-----	-----	21.5	-----	3
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	13.2	-----	-----	-----	-----	13.5	-----	-----	14.0	-----	3
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	6.7	-----	-----	14.1	-----	-----	5.8	-----	-----	6.7	-----	3
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	3
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	15	-----	-----	-----	-----	-----	21.8	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	31.0	-----	-----	47.0	-----	-----	54.5	63.2	-----	71.8	-----	9
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	3.5	-----	-----	8.0	-----	-----	-----	3.2	-----	-----	-----	7
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	25.2	46.1	43.3	67.0	15.4	11
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	0.005	-----	-----	0.006	-----	-----	0.005	0.020	0.016	0.055	0.0	11
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	62	-----	-----	109	-----	-----	63.7	77.7	77.2	90.9	8.3	9
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	2.4	-----	-----	4.11	-----	-----	3.2	-----	-----	3.2	-----	1
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800					1.0 / 11.0 / 15.0 / 64.0 / 150.0						2.0 / 12.6 / 21.8 / 74.1 / 128.0 / 128 - 180				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.23	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	12.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	-----	1.2	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	3.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	65.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	695	-----	-----	-----	-----
Channel length (ft^2)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	803	-----	-----	-----	-----	-----	829	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.16	-----	-----	-----	-----	-----	1.19	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0032	-----	-----	-----	-----	-----	0.0062	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----		-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 6 (1,340 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	5.7	-----	6.1	-----	-----	-----	1	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	9.7	-----	-----	-----	1	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	0.9	-----	0.8	-----	-----	-----	1	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	-----	1.3	-----	-----	-----	1	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft^2)	-----	80.0	300.0	6.7	-----	4.7	-----	-----	-----	1	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	-----	7.8	-----	-----	-----	1	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	-----	1.6	-----	-----	-----	1	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	1.9	-----	-----	-----	1	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	32.0	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	40	-----	-----	65	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	8	-----	-----	69	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.3	-----	-----	11.4	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	49	-----	-----	141	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	6.6	-----	-----	10.7	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	24.0	-----	-----	259.0	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	1.4	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	11.3 / 22.6 / 32.0 / 90 / 150						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180					
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	0.97	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	53.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.2	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	B4	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	25.8	-----	-----	-----	14	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	1,349	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.023	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 6 (1,340 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	10.0	-----	-----	-----	-----	8.5	-----	-----	10.5	-----	-----
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	19	-----	-----	87.0	-----	-----	33.1	-----	-----	55.4	-----	-----
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	0.6	-----	-----	-----	-----	0.6	-----	-----	0.9	-----	-----
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	0.9	-----	-----	-----	-----	1.2	-----	-----	1.5	-----	-----
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	6.3	-----	-----	-----	-----	5.3	-----	-----	9.8	-----	-----
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	15.9	-----	-----	-----	-----	11.4	-----	-----	15.1	-----	-----
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	1.9	-----	-----	8.7	-----	-----	3.1	-----	-----	5.7	-----	-----
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	-----
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	28.3	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.0	21.8	20.6	50.9	9.8	33
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	0.025	-----	-----	0.041	-----	-----	0.002	0.039	0.036	0.095	0.0	33
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	-----	50.0	-----	-----	-----	-----	17.5	39.2	38.8	82.7	14.2	34
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	1.3	-----	-----	2.2	-----	-----	1.4	-----	-----	1.8	-----	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800					11.3 / 22.6 / 32.0 / 90.0 / 150.0						8.7 / 21.5 / 28.3 / 73.4 / 160.7 / >2048				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.67	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	32.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	-----	-----	0.2	-----	-----	-----	-----	-----	0.2	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	C4b	-----	-----	-----	-----	-----	C4b	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	2.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	14	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1259	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,370	-----	-----	-----	-----	-----	1366	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.04	-----	-----	-----	-----	-----	1.09	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0226	-----	-----	-----	-----	-----	0.0226	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----		-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 7 (399 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	3.2	-----	5.0	-----	-----	-----	1	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	7.5	-----	-----	-----	1	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	0.6	-----	0.3	-----	-----	-----	1	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	-----	0.5	-----	-----	-----	1	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft^2)	-----	80.0	300.0	2.6	-----	1.6	-----	-----	-----	1	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	-----	15.7	-----	-----	-----	1	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	-----	1.5	-----	-----	-----	1	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	2.6	-----	-----	-----	1	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	17.5	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	30	-----	-----	48	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	7	-----	-----	41	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.4	-----	-----	8.2	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	26	-----	-----	101	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	6	-----	-----	9.6	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.0227	-----	-----	0.0578	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	19	-----	-----	259	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	1.1	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	8.5 / 12.4 / 17.5 / 50.6 / 81.6						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180					
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	0.65	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	38.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.046	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	B4	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	9.6	-----	-----	-----	4.7	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	386	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.045	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 7 (399 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	5.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	10	-----	-----	38.0	-----	-----	-----	-----	-----	-----	-----	-----
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	0.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	0.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	15.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	2	-----	-----	7.6	-----	-----	-----	-----	-----	-----	-----	-----
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8.2	15.3	12.4	32.5	8.0	14
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	0.045	-----	-----	0.073	-----	-----	0.015	0.062	0.046	0.171	0.049	14
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	8.0	-----	-----	25.0	-----	-----	15.0	27.8	28.0	42.5	10.2	12
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	0.6	-----	-----	1.1	-----	-----	-----	-----	-----	-----	-----	-----
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800						-----						-----			
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	-----	-----	0.0	-----	-----	-----	-----	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	B4a	-----	-----	-----	-----	-----	B4a	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	4.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	382	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	399	-----	-----	-----	-----	-----	413	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.04	-----	-----	-----	-----	-----	1.08	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0407	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 11a. Cross-section Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 1 (1,204 LF)

	Cross-section X-1 (Riffle)							Cross-section X-2 (Pool)							Cross-section X-3 (Pool)							Cross-section X-4 (Riffle)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	11.8	12.0	11.6					22.2	19.7	19.7					16.4	16.4	16.5					14.4	14.7	15.5				
BF Mean Depth (ft)	0.8	0.8	0.6					1.2	1.3	1.1					1.4	1.3	1.3					1.0	0.8	0.8				
Width/Depth Ratio	15.2	15.7	19.7					18.0	15.7	17.3					11.6	12.3	13.1					15.0	17.6	20.1				
BF Cross-sectional Area (ft²)	9.1	9.2	6.9					27.4	24.8	22.5					23.2	21.7	20.9					13.9	12.4	12.0				
*BF Max Depth (ft)	1.1	1.1	1.1					2.3	2.5	2.4					2.5	2.4	2.4					1.3	1.3	1.3				
Width of Floodprone Area (ft)	33.1	32.5	32.3					70.6	70.7	70.6					77.1	77.3	77.1					91.8	90.2	90.0				
*Entrenchment Ratio	2.8	2.8	2.7					-	-	-					-	-	-					6.4	6.3	6.2				
*Bank Height Ratio	1.0	1.0	1.0					-	-	-					-	-	-					1.0	0.9	1.0				
Wetted Perimeter (ft)	13.3	13.5	12.8					24.7	22.3	22.0					19.2	19.0	19.0					16.4	16.4	17.0				
Hydraulic Radius (ft)	0.7	0.7	0.5					1.1	1.1	1.0					1.2	1.1	1.1					0.8	0.8	0.7				
d50 (mm)	-	-						-	-						-	-						-	-					

* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

	Cross-section X-5 (Riffle)																											
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	12.1	12.1	11.9																									
BF Mean Depth (ft)	0.8	0.9	0.6																									
Width/Depth Ratio	14.4	14.1	19.9																									
BF Cross-sectional Area (ft²)	10.1	10.3	7.1																									
*BF Max Depth (ft)	1.1	1.1	1.1																									
Width of Floodprone Area (ft)	71.2	79.0	77.2																									
*Entrenchment Ratio	5.9	6.6	6.4																									
*Bank Height Ratio	1.0	1.2	1.0																									
Wetted Perimeter (ft)	13.7	13.8	13.1																									
Hydraulic Radius (ft)	0.7	0.7	0.5																									
d50 (mm)	-	-																										

* Max BKF depth was calculated from the As-built survey only for riffles. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

Reach 2 (1,782 LF)

	Cross-section X-6 (Riffle)							Cross-section X-7 (Pool)							Cross-section X-8 (Riffle)							Cross-section X-9 (Pool)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	15.6	15.4	15.5					16.3	15.9	16.0					15.4	14.6	14.7					24.3	20.3	22.3				
BF Mean Depth (ft)	1.0	1.0	1.0					1.4	1.4	1.3					1.1	1.0	1.0					1.4	1.5	1.2				
Width/Depth Ratio	16.5	16.2	16.4					11.5	11.6	12.2					14.5	14.1	15.2					17.9	13.4	18.6				
BF Cross-sectional Area (ft²)	14.8	14.6	14.8					23.2	21.8	21.0					16.5	15.1	14.3					33.1	30.9	26.8				
*BF Max Depth (ft)	1.3	1.3	1.3					2.5	2.5	2.4					1.6	1.6	1.6					2.9	2.8	2.6				
Width of Floodprone Area (ft)	74.9	77.3	77.6					75.8	76.4	76.3					102.7	102.7	102.7					95.4	95.5	95.4				
*Entrenchment Ratio	4.8	5.0	5.0					-	-	-					6.7	6.7	6.7					-	-	-				
*Bank Height Ratio	1.0	1.1	1.1					-	-	-					1.0	1.0	1.0					-	-	-				
Wetted Perimeter (ft)	17.5	17.3	17.4					19.2	18.7	18.6					17.6	16.7	16.7					27.1	23.4	24.7				
Hydraulic Radius (ft)	0.8	0.8	0.9					1.2	1.2	1.1					0.9	0.9	0.9					1.2	1.3	1.1				
d50 (mm)	-	-						-	-						-	-						-	-					

* Max BKF depth was calculated from the As-built survey only for riffles. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

	Cross-section X-10 (Riffle)																											
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	15.5	13.9	14.5																									
BF Mean Depth (ft)	1.1	1.1	1.0																									
Width/Depth Ratio	14.2	12.8	14.5																									
BF Cross-sectional Area (ft²)	17.0	15.1	14.4																									
*BF Max Depth (ft)	1.8	1.8	1.8																									
Width of Floodprone Area (ft)	100.0	100.2	100.2																									
*Entrenchment Ratio	6.4	6.5	6.5																									
*Bank Height Ratio	0.9	0.9	0.8																									
Wetted Perimeter (ft)	17.7	16.1	16.5																									
Hydraulic Radius (ft)	1.0	0.9	0.9																									
d50 (mm)	-	-																										

* Max BKF depth was calculated from the As-built survey only for riffles. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

Table 11a Cont. Cross-section Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 3 (829 LF)

	Cross-section X-11 (Riffle)							Cross-section X-12 (Riffle)							Cross-section X-13 (Riffle)							Cross-section X-14 (Pool)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	14.9	17.1	15.0					17.1	16.5	16.7					16.0	17.2	15.3					21.3	19.0	19.2				
BF Mean Depth (ft)	1.1	0.9	0.9					1.3	1.1	1.1					1.2	1.0	0.9					1.8	1.7	1.6				
Width/Depth Ratio	13.5	20.2	16.8					13.7	15.5	15.9					14.0	17.3	17.4					11.7	11.1	12.0				
BF Cross-sectional Area (ft²)	16.3	14.5	13.3					21.5	17.6	17.5					18.3	17.2	13.5					39.0	32.5	30.6				
*BF Max Depth (ft)	1.5	1.5	1.5					1.8	1.8	1.8					1.6	1.6	1.6					3.2	3.1	3.1				
Width of Floodprone Area (ft)	99.8	99.9	99.8					99.7	100.0	99.9					98.3	98.4	98.4					98.7	98.8	98.7				
*Entrenchment Ratio	6.7	6.7	6.7					5.8	5.8	5.8					6.1	6.2	6.2					-	-	-				
*Bank Height Ratio	1.0	0.9	0.7					1.0	0.9	0.9					1.0	0.9	0.8					-	-	-				
Wetted Perimeter (ft)	17.1	18.8	16.7					19.6	18.7	18.8					18.3	19.2	17.1					25.0	22.4	22.4				
Hydraulic Radius (ft)	1.0	0.8	0.8					1.1	0.9	0.9					1.0	0.9	0.8					1.6	1.5	1.4				
d50 (mm)	-	-						-	-																			

* Max BKF depth was calculated from the As-built survey only for riffles. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

Reach 6 (1,347 LF)

	Cross-section X-15 (Pool)							Cross-section X-16 (Riffle)							Cross-section X-17 (Riffle)							Cross-section X-18 (Riffle)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	11.0	10.6	10.9					9.7	9.3	9.2					10.5	10.3	10.3					8.5	7.5	7.6				
BF Mean Depth (ft)	1.0	0.9	0.9					0.6	0.6	0.6					0.9	0.8	0.8					0.6	0.6	0.6				
Width/Depth Ratio	10.9	12.0	11.9					15.1	15.2	14.8					11.4	12.6	13.3					13.5	13.0	12.7				
BF Cross-sectional Area (ft²)	11.1	9.4	9.9					6.2	5.7	5.7					9.8	8.4	7.9					5.3	4.3	4.6				
*BF Max Depth (ft)	1.8	1.8	1.8					1.2	1.2	1.2					1.5	1.5	1.5					1.2	1.2	1.2				
Width of Floodprone Area (ft)	60.3	60.3	60.4					55.4	52.9	53.1					33.1	30.5	30.3					37.3	34.0	34.8				
*Entrenchment Ratio	-	-	-					5.7	5.5	5.5					3.1	2.9	2.9					4.4	4.0	4.1				
*Bank Height Ratio	-	-	-					0.6	0.8	0.9					1.0	0.9	0.8					1.0	1.0	1.1				
Wetted Perimeter (ft)	13.0	12.4	12.7					11.0	10.6	10.4					12.4	11.9	11.8					9.7	8.6	8.8				
Hydraulic Radius (ft)	0.9	0.8	0.8					0.6	0.5	0.5					0.8	0.7	0.7					0.5	0.5	0.5				
d50 (mm)	-	-						-																				

* Max BKF depth was calculated from the As-built survey only for riffles. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

	Cross-section X-19 (Pool)																											
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	10.8	10.1	10.5																									
BF Mean Depth (ft)	0.8	0.7	0.8																									
Width/Depth Ratio	13.7	14.1	13.8																									
BF Cross-sectional Area (ft²)	8.4	7.3	7.9																									
*BF Max Depth (ft)	1.4	1.3	1.3																									
Width of Floodprone Area (ft)	41.4	40.1	40.8																									
*Entrenchment Ratio	-	-	-																									
*Bank Height Ratio	-	-	-																									
Wetted Perimeter (ft)	12.3	11.6	12.0																									
Hydraulic Radius (ft)	0.7	0.6	0.7																									
d50 (mm)	-	-																										

* Max BKF depth was calculated from the As-built survey only for riffles. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

Table 11b. Stream Reach Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 1 (1,204 LF)

Parameter	As-built						MY1						MY2					
Dimension and Substrate - Riffle	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	11.8	-----	-----	14.4	-----	3	12.0	12.9	12.1	14.7	1.6	3	11.6	13.0	11.9	15.5	2.2	3
Floodprone Width (ft)	33.1	-----	-----	91.8	-----	3	32.5	67.2	79.0	90.2	30.6	3	32.3	66.5	77.2	90.0	30.3	3
BF Mean Depth (ft)	0.8	-----	-----	1.0	-----	3	0.8	0.8	0.8	0.9	0.0	3	0.6	0.7	0.6	0.8	0.1	3
*BF Max Depth (ft)	1.1	-----	-----	1.3	-----	3	1.1	1.2	1.1	1.3	0.1	3	1.1	1.2	1.1	1.3	0.1	3
BF Cross-sectional Area (ft²)	9.1	-----	-----	13.9	-----	3	9.2	10.6	10.3	12.4	1.6	3	6.9	8.7	7.1	12.0	2.9	3
Width/Depth Ratio	14.4	-----	-----	15.2	-----	3	14.1	15.8	15.7	17.6	1.7	3	19.7	19.9	19.9	20.1	0.2	3
*Entrenchment Ratio	2.8	-----	-----	6.4	-----	3	2.8	5.2	6.3	6.6	2.1	3	2.7	5.1	6.2	6.4	2.1	3
*Bank Height Ratio	1.0	-----	-----	1.0	-----	3	0.9	1.0	1.0	1.2	0.1	3	1.0	1.0	1.0	1.0	0.0	3
d50 (mm)	-----	31.2	-----	-----	-----	-----	-----	64.0	-----	-----	-----	-----	-----	77.1	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	42.0	51.6	-----	72.9	-----	18	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	2.6	-----	-----	-----	15	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	15.5	35.0	35.4	62.8	12.7	18	13	28	22	60	16	12	20.0	28.0	26.3	45.0	7.5	12
Riffle Slope (ft/ft)	0.008	0.017	0.017	0.031	0.006	18	0.007	0.020	0.018	0.033	0.008	12	0.002	0.016	0.016	0.032	0.008	12
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	38.0	64.0	64.0	81.7	11.0	17	57.6	66.2	61.4	83	9.7	10	51.9	67.0	66.7	83.1	11.3	10
Pool Max Depth (ft)	2.5	-----	-----	2.5	0.0	2	2.43	-----	-----	2.48	0.0353553	2	2.3	-----	-----	2.4	0.0	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters							-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95		4.0 / 18.4 / 31.2 / 96.6 / >2048						19.02 / 46 / 64 / 101.2 / 125.5						22.6 / 58.61 / 77.08 / 145.46 / 190.88				
Reach Shear Stress (competency) lb/f²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Drainage Area (SM)	-----	0.83	-----	-----	-----	-----	-----	0.83	-----	-----	-----	-----	-----	0.83	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----	-----	C3	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	1,082	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length (ft)^2	-----	1,206	-----	-----	-----	-----	-----	750	-----	-----	-----	-----	-----	750	-----	-----	-----	-----
Sinuosity	-----	1.11	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	0.0096	-----	-----	-----	-----	-----	0.009	-----	-----	-----	-----	-----	0.008	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

Table 11b Cont. Stream Reach Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 2 (1,782 LF)

Parameter	As-built						MY1						MY2					
Dimension and Substrate - Riffle	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	15.4	-----	-----	15.6	-----	3	13.9	14.8	15.1	15.4	0.8	3	14.5	14.9	14.7	15.5	0.6	3
Floodprone Width (ft)	74.9	-----	-----	102.7	-----	3	77.3	93.4	100.2	102.7	14.0	3	77.6	93.5	100.2	102.7	13.8	3
BF Mean Depth (ft)	1.0	-----	-----	1.1	-----	3	1.0	1.0	1.0	1.1	0.1	3	1.0	1.0	1.0	1.0	0.0	3
*BF Max Depth (ft)	1.3	-----	-----	1.8	-----	3	1.3	1.6	1.6	1.8	0.2	3	1.3	1.6	1.6	1.8	0.2	3
BF Cross-sectional Area (ft²)	14.8	-----	-----	17.0	-----	3	14.6	14.9	15.1	15.1	0.2	3	14.3	14.5	14.4	14.8	0.3	3
Width/Depth Ratio	14.2	-----	-----	16.5	-----	3	12.8	14.4	14.1	16.2	1.7	3	14.5	15.3	15.2	16.4	0.9	3
*Entrenchment Ratio	4.8	-----	-----	6.7	-----	3	5.0	6.0	6.5	6.7	0.9	3	5.0	6.0	6.5	6.7	0.9	3
*Bank Height Ratio	0.9	-----	-----	1.0	-----	3	0.9	1.0	1.0	1.1	0.1	3	0.8	1.0	1.0	1.1	0.1	3
d50 (mm)	-----	20.9	-----	-----	-----	-----	-----	46.8	-----	-----	-----	-----	-----	54.7	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	48.6	54.7	-----	65.6	-----	7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	3.0	-----	-----	-----	8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	16.4	48.9	39.1	101.3	37.2	21	21	32	32	43	9	13	14.5	30.1	28.6	50.0	9.0	14
Riffle Slope (ft/ft)	0.003	0.018	0.018	0.035	0.0	21	0	0	0	0	0	13	0.004	0.016	0.014	0.033	0.009	14
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	46.0	75.4	70.0	130.2	23.5	19	46.1	65.9	66.3	95.2	14	12	42.9	66.7	66.2	95.4	15.7	12
Pool Max Depth (ft)	2.5	-----	-----	2.9	0.3	2	2.51	-----	-----	2.8	0.205061	2	2.5	-----	-----	2.6	0.1	2
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																		
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95		<0.063 / 12.2 / 20.9 / 68.5 / 151.8						16 / 28.83 / 46.80 / 2048 / >2048						22.6 / 39.04 / 54.73 / 94.05 / 119.82				
Reach Shear Stress (competency) lb/f²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Drainage Area (SM)	-----	0.96	-----	-----	-----	-----	-----	0.96	-----	-----	-----	-----	-----	0.96	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	1,549	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length (ft)²	-----	1,842	-----	-----	-----	-----	-----	1006	-----	-----	-----	-----	-----	1,006	-----	-----	-----	-----
Sinuosity	-----	1.19	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	0.0077	-----	-----	-----	-----	-----	0.0069	-----	-----	-----	-----	-----	0.007	-----	-----	-----	-----
BF slope (ft/ft)	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

Table 11b Cont. Stream Reach Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 3 (829 LF)

Parameter	As-built						MY1						MY2					
Dimension and Substrate - Riffle	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	14.9	-----	-----	17.1	-----	3	16.5	17.0	17.1	17.2	0.4	3	15.0	15.7	15.3	16.7	0.9	3
Floodprone Width (ft)	98.3	-----	-----	99.8	-----	3	98.4	99.4	99.9	100.0	0.8	3	98.4	99.3	99.8	99.9	0.9	3
BF Mean Depth (ft)	1.1	-----	-----	1.3	-----	3	0.9	1.0	1.0	1.1	0.1	3	0.9	0.9	0.9	1.1	0.1	3
*BF Max Depth (ft)	1.5	-----	-----	1.8	-----	3	1.5	1.6	1.6	1.8	0.1	3	1.5	1.6	1.6	1.8	0.1	3
BF Cross-sectional Area (ft^2)	16.3	-----	-----	21.5	-----	3	14.5	16.5	17.2	17.6	1.7	3	13.3	14.8	13.5	17.5	2.4	3
Width/Depth Ratio	13.7	-----	-----	14.9	-----	3	15.5	17.7	17.3	20.2	2.4	3	15.9	16.7	16.8	17.4	0.8	3
*Entrenchment Ratio	5.8	-----	-----	6.7	-----	3	5.8	6.2	6.2	6.7	0.4	3	5.8	6.2	6.2	6.7	0.4	3
*Bank Height Ratio	1.0	-----	-----	1.0	-----	3	0.9	0.9	0.9	0.9	0.0	3	0.7	0.8	0.8	0.9	0.1	3
d50 (mm)	-----	21.8	-----	-----	-----	-----	-----	53.7	-----	-----	-----	-----	-----	17.4	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	54.5	63.2	-----	71.8	-----	9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	3.2	-----	-----	-----	7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	25.2	46.1	43.3	67.0	15.4	11	17	25	24	33	6	7	22.9	28.6	29.6	37.8	5.0	7
Riffle Slope (ft/ft)	0.005	0.020	0.016	0.055	0.0	11	0	0	0	0	0	7	0.009	0.024	0.019	0.039	0.012	7
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	63.7	77.7	77.2	90.9	8.3	9	66.8	77	81.2	83	7.5	5	67.0	77.9	74.3	88.7	9.2	5
Pool Max Depth (ft)	3.2	-----	-----	3.2	-----	1	-----	3.06	-----	-----	-----	1	-----	3.2	-----	-----	-----	1
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																		
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95	2.0 / 12.6 / 21.8 / 74.1 / 128.0						16 / 36.88 / 53.7 / 112.6 / 214.7						<0.063 / <0.063 / 17.44 / 119.29 / 165.29					
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Drainage Area (SM)	-----	1.2	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	695	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	829	-----	-----	-----	-----	-----	496	-----	-----	-----	-----	-----	496	-----	-----	-----	-----
Sinuosity	-----	1.19	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	0.0062	-----	-----	-----	-----	-----	0.00637	-----	-----	-----	-----	-----	0.006	-----	-----	-----	-----
BF slope (ft/ft)	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

Table 11b Cont. Stream Reach Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 6 (1,347 LF)

Parameter	As-built						MY1						MY2					
Dimension and Substrate - Riffle	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	8.5	-----	-----	10.5	-----	3	7.5	9.0	9.3	10.3	1.4	3	7.6	9.0	9.2	10.3	1.3	3
Floodprone Width (ft)	33.1	-----	-----	55.4	-----	3	30.5	39.1	34.0	52.9	12.1	3	30.3	39.4	34.8	53.1	12.1	3
BF Mean Depth (ft)	0.6	-----	-----	0.9	-----	3	0.6	0.7	0.6	0.8	0.1	3	0.6	0.7	0.6	0.8	0.1	3
*BF Max Depth (ft)	1.2	-----	-----	1.5	-----	3	1.2	1.3	1.2	1.5	0.2	3	1.2	1.3	1.2	1.5	0.2	3
BF Cross-sectional Area (ft²)	5.3	-----	-----	9.8	-----	3	4.3	6.1	5.7	8.4	2.1	3	4.6	6.1	5.7	7.9	1.7	3
Width/Depth Ratio	11.4	-----	-----	15.1	-----	3	12.6	13.6	13.0	15.2	1.4	3	12.7	13.6	13.3	14.8	1.1	3
*Entrenchment Ratio	3.1	-----	-----	5.7	-----	3	2.9	4.1	4.0	5.5	1.3	3	2.9	4.2	4.1	5.5	1.3	3
*Bank Height Ratio	0.6	-----	-----	1.0	-----	3	0.8	0.9	0.9	1.0	0.1	3	0.8	0.9	0.9	1.1	0.1	3
d50 (mm)	-----	28.3	-----	-----	-----	-----	-----	34.3	-----	-----	-----	-----	-----	56.44	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	5.0	21.8	20.6	50.9	9.8	33	10	23	21	54	12	12	8.3	18.1	17.6	34.6	6.9	18
Riffle Slope (ft/ft)	0.002	0.039	0.036	0.095	0.0	33	0	0	0	0	0	12	0.003	0.025	0.023	0.064	0.016	18
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	17.5	39.2	38.8	82.7	14.2	34	30	41	39	62	9	16	28.1	40.4	40.1	56.1	7.7	15
Pool Max Depth (ft)	1.4	-----	-----	1.8	-----	2	1	-----	-----	2	-----	2	1.3	-----	-----	1.8	-----	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																		
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95		8.7 / 21.5 / 28.3 / 73.4 / 160.7						14.4 / 22.6 / 34.3 / 86.4 / >2048						29.03 / 45.00 / 56.44 / 108.85 / 160.66				
Reach Shear Stress (competency) lb/f²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Drainage Area (SM)	-----	0.2	-----	-----	-----	-----	-----	0.2	-----	-----	-----	-----	-----	0.2	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	C4b	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	1259	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length (ft)^2	-----	1366	-----	-----	-----	-----	-----	751	-----	-----	-----	-----	-----	751	-----	-----	-----	-----
Sinuosity	-----	1.09	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	0.0226	-----	-----	-----	-----	-----	0.02266	-----	-----	-----	-----	-----	0.023	-----	-----	-----	-----
BF slope (ft/ft)	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Max BKF depth was calculated from the As-built survey. BH ratio was calculated using current year's low bank depth divided by the as-built year's max BKF depth. ER was calculated using the current year's floodprone width divided by the as-built BKF width.

Appendix E

Hydrologic Data

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

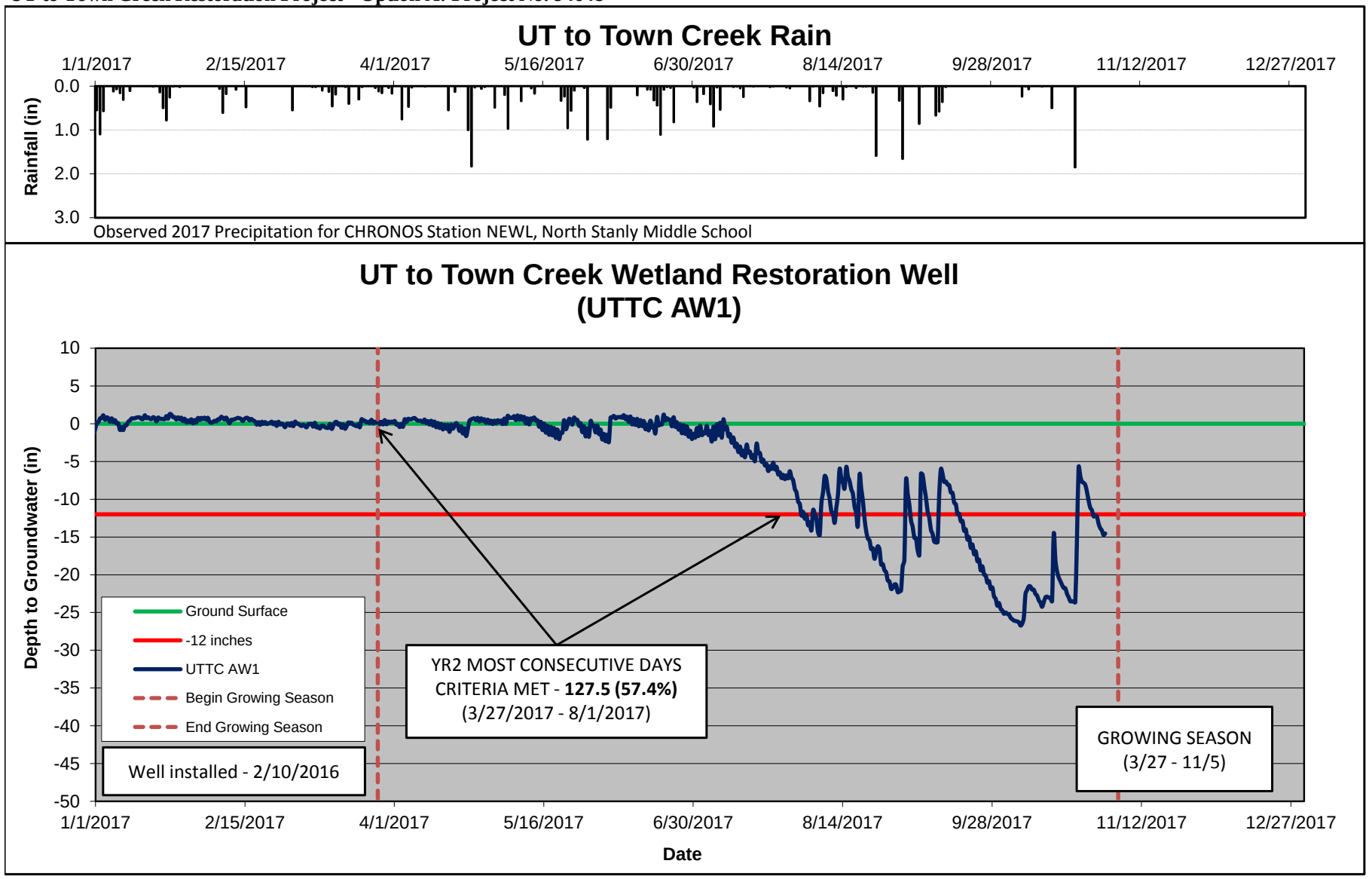


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

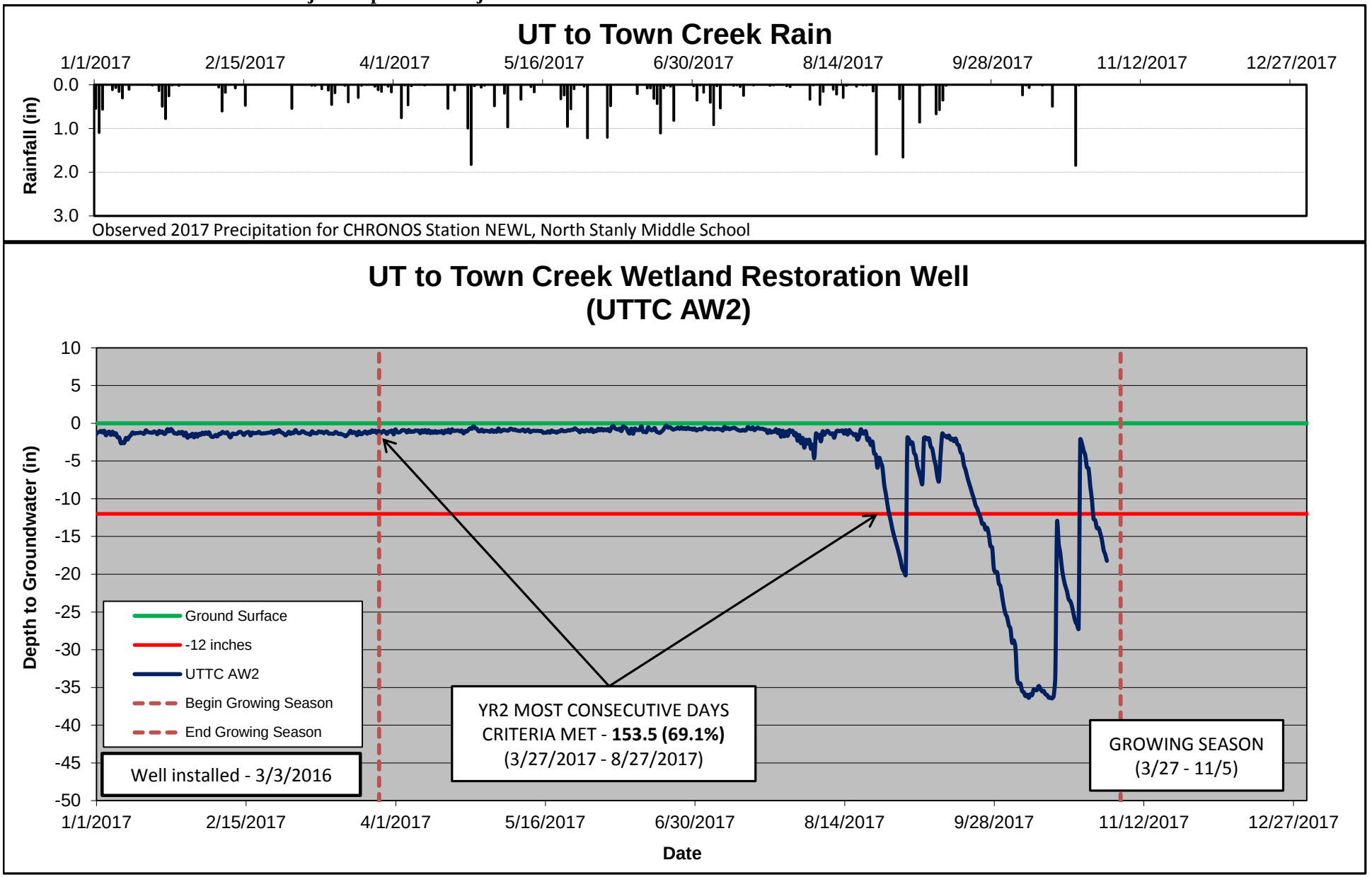


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

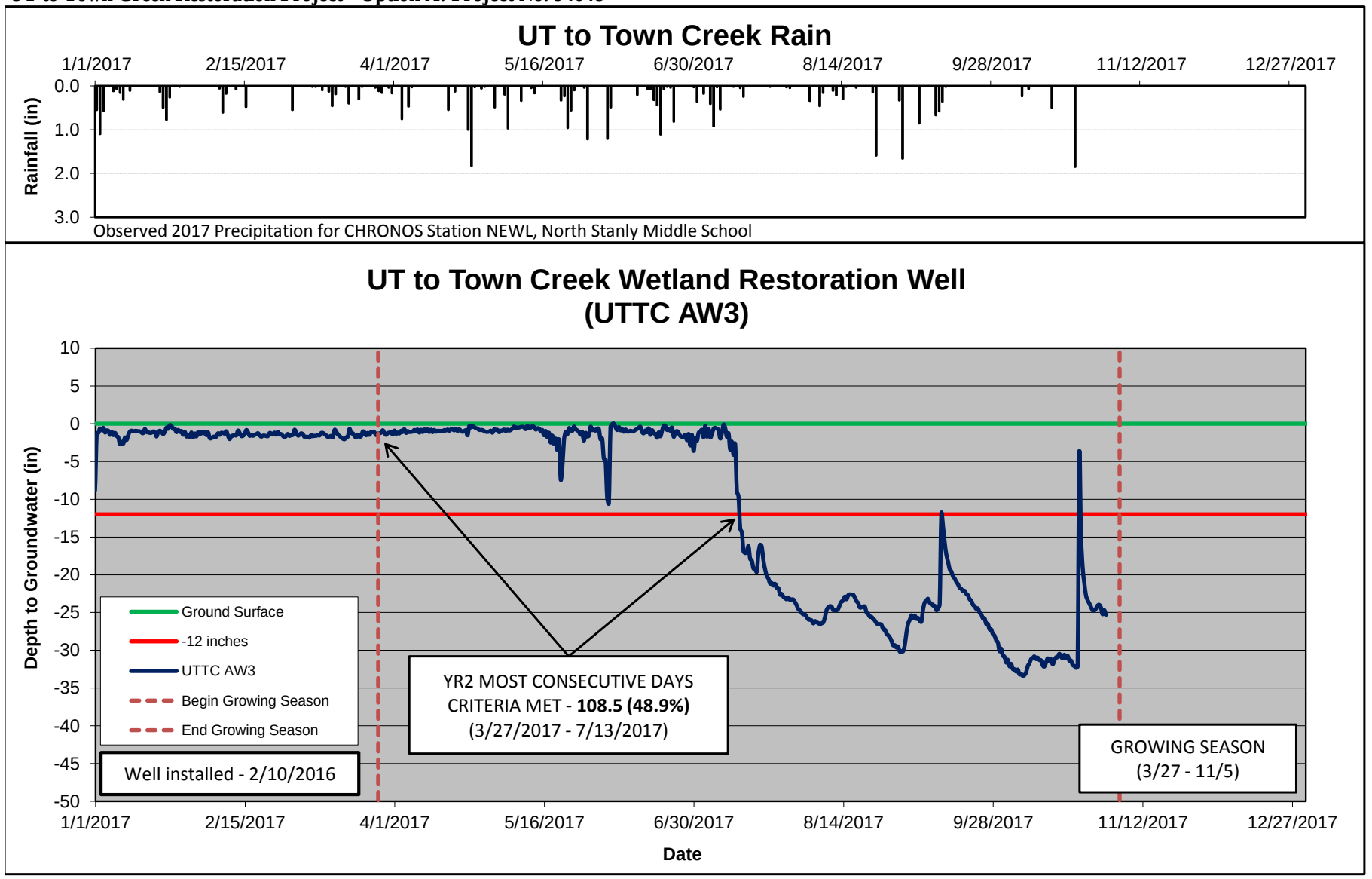


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

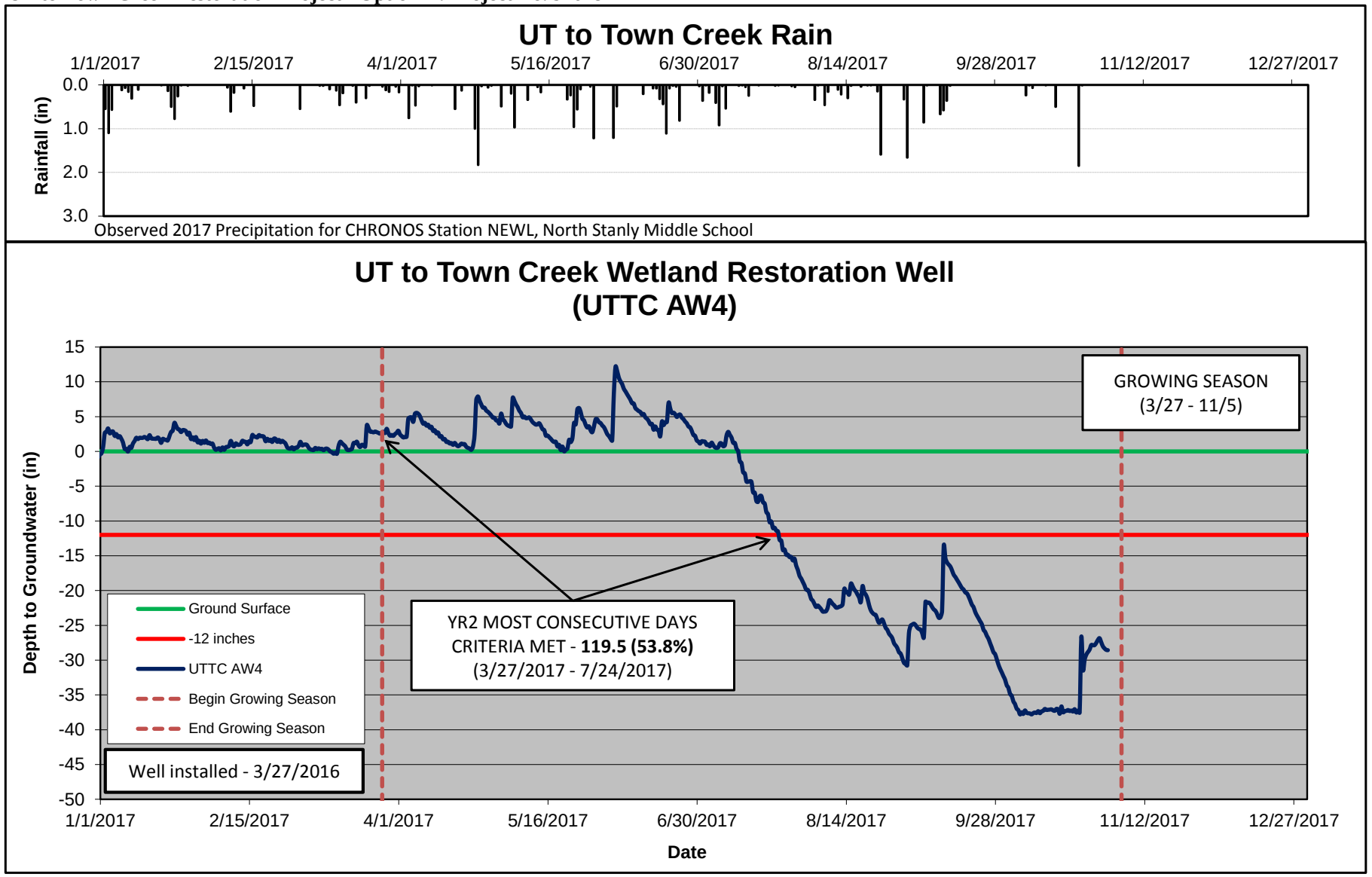


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

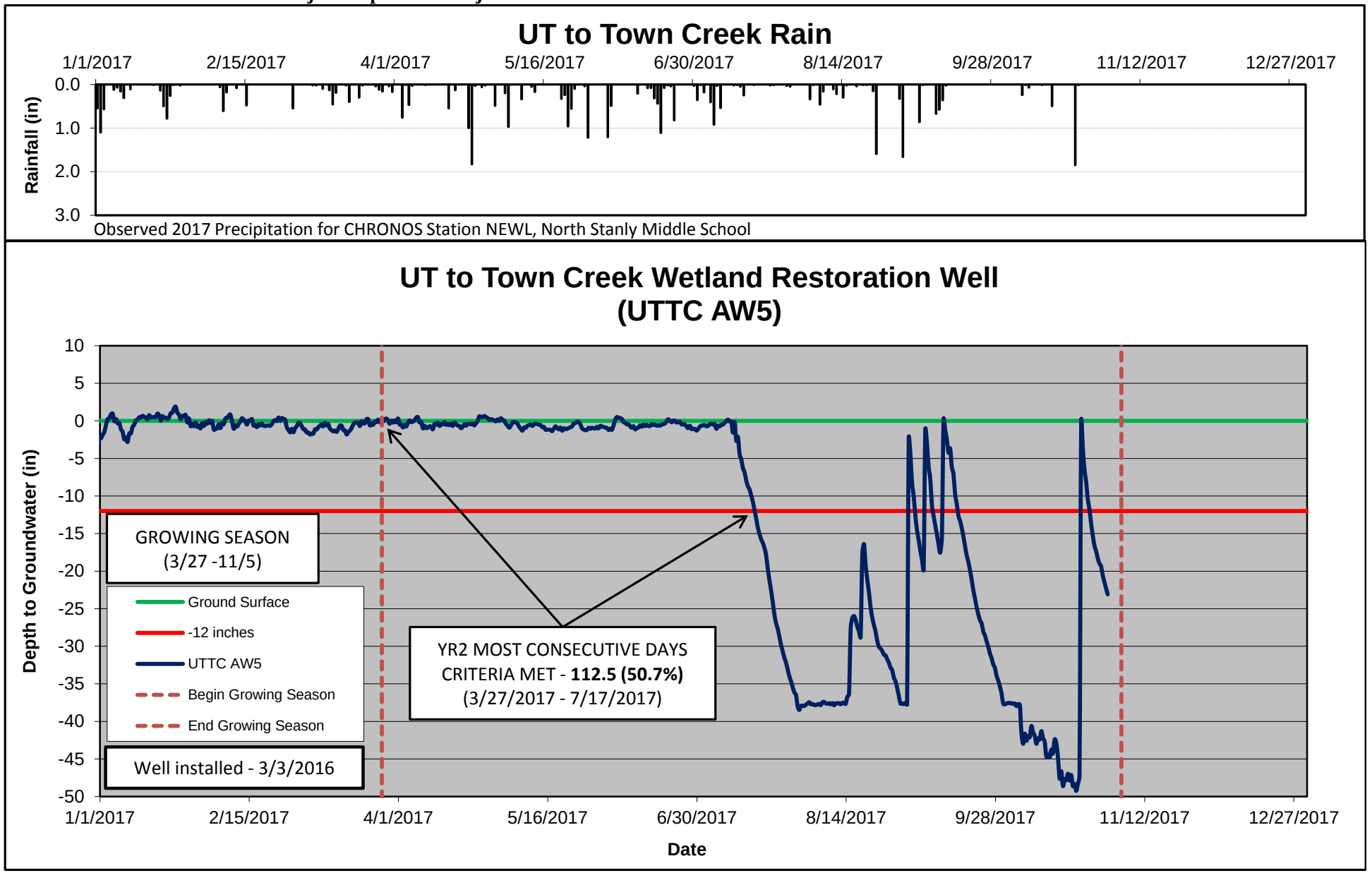


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

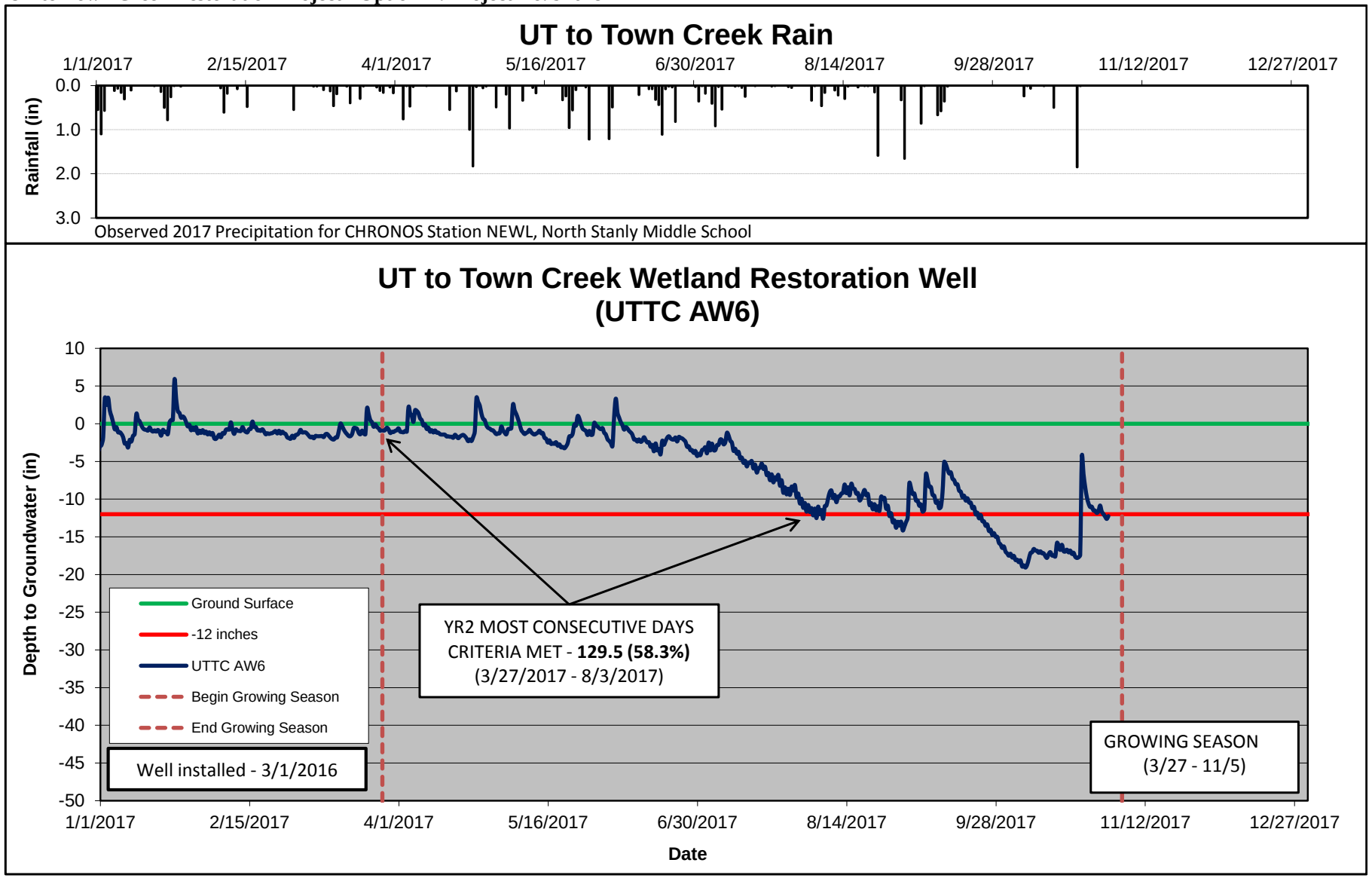


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

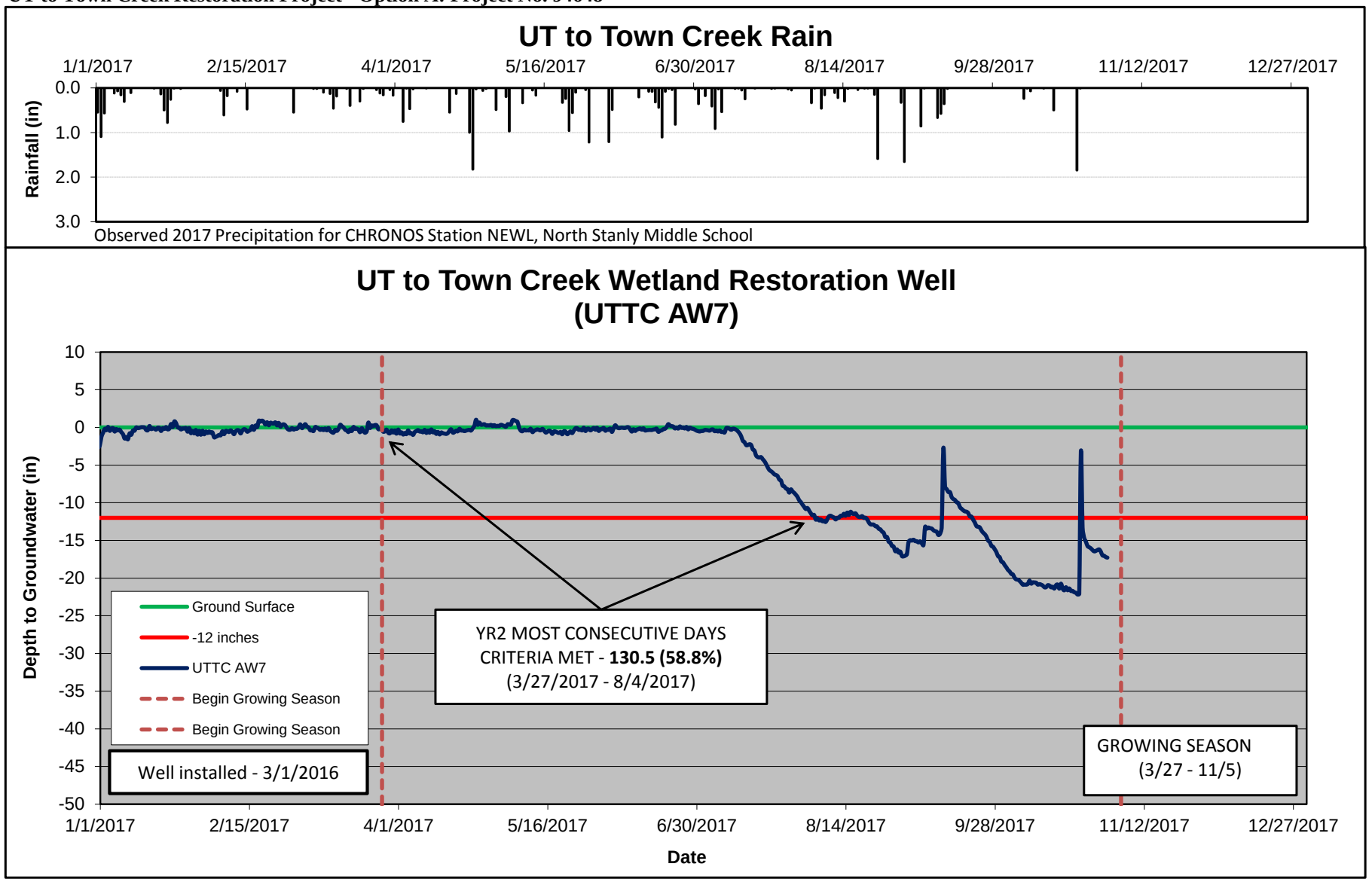


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

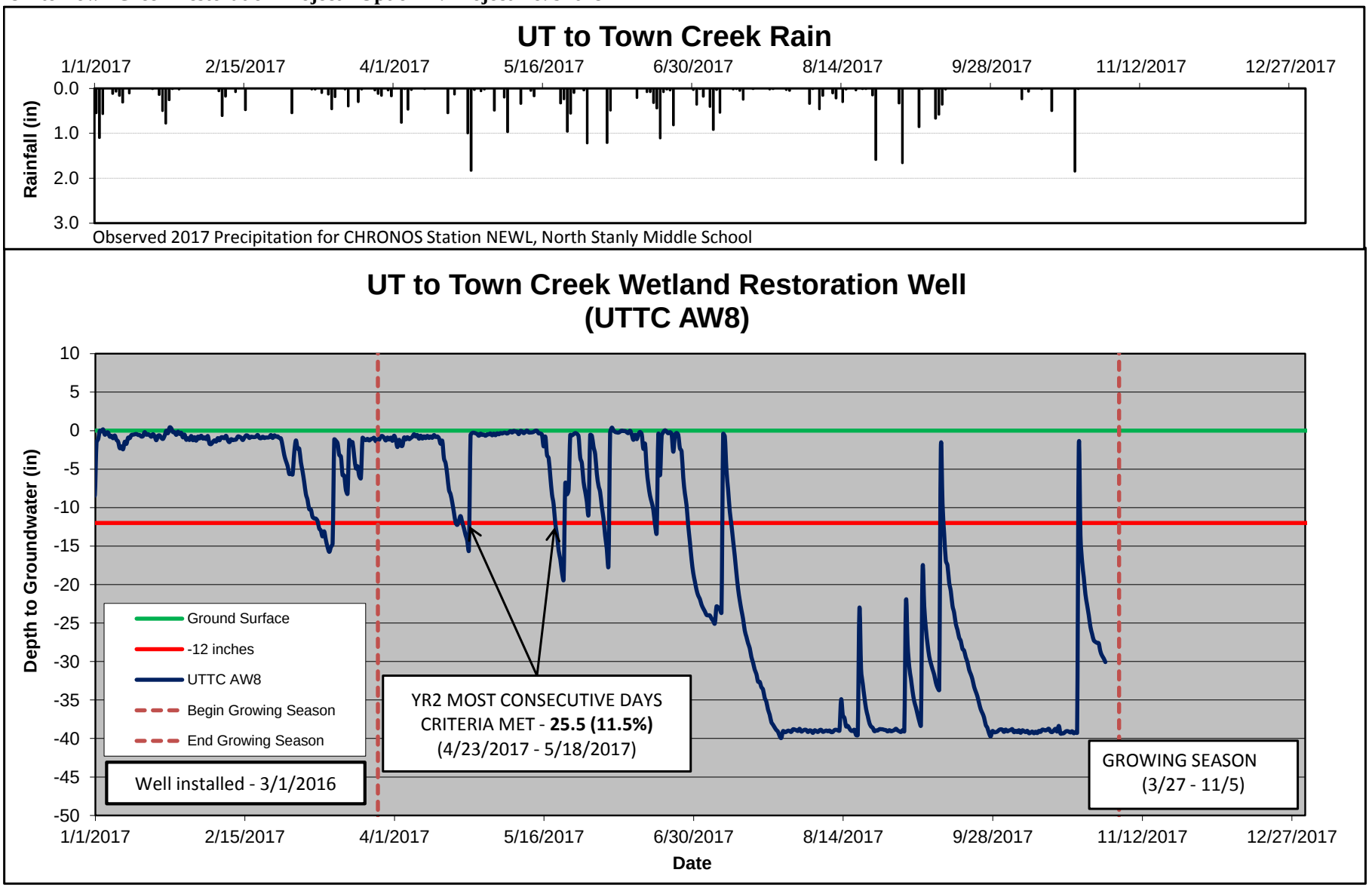


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

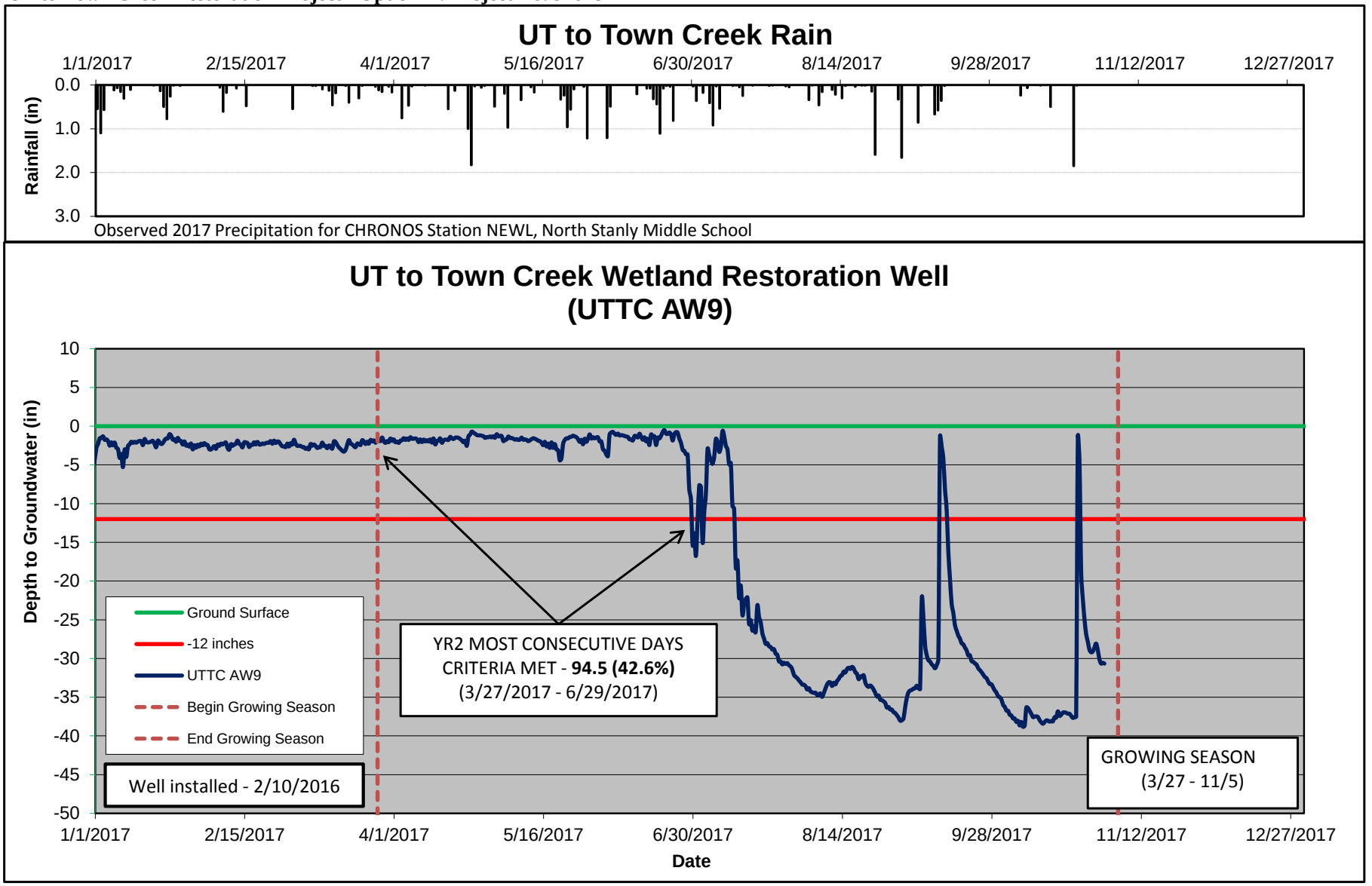


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648

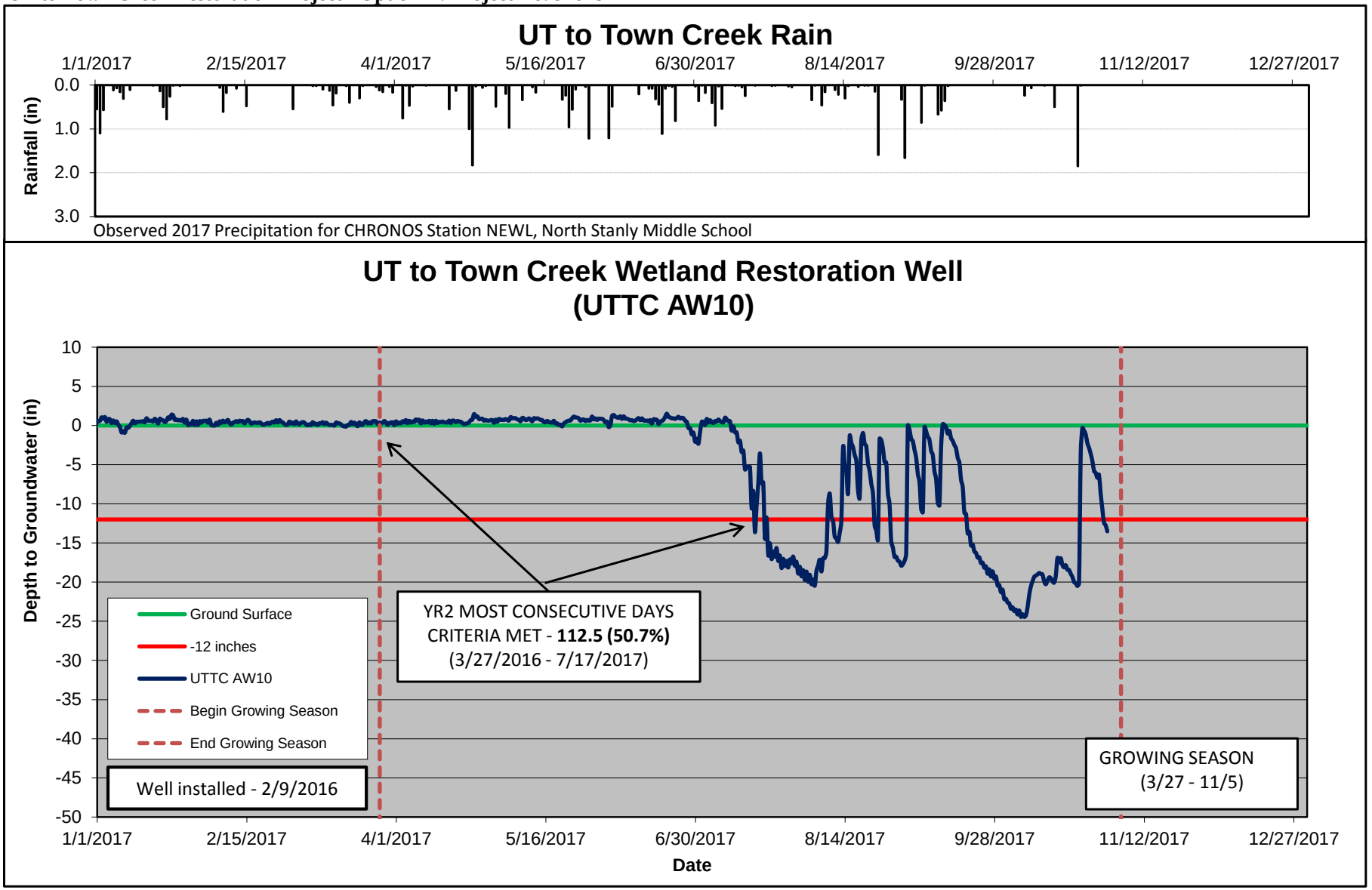
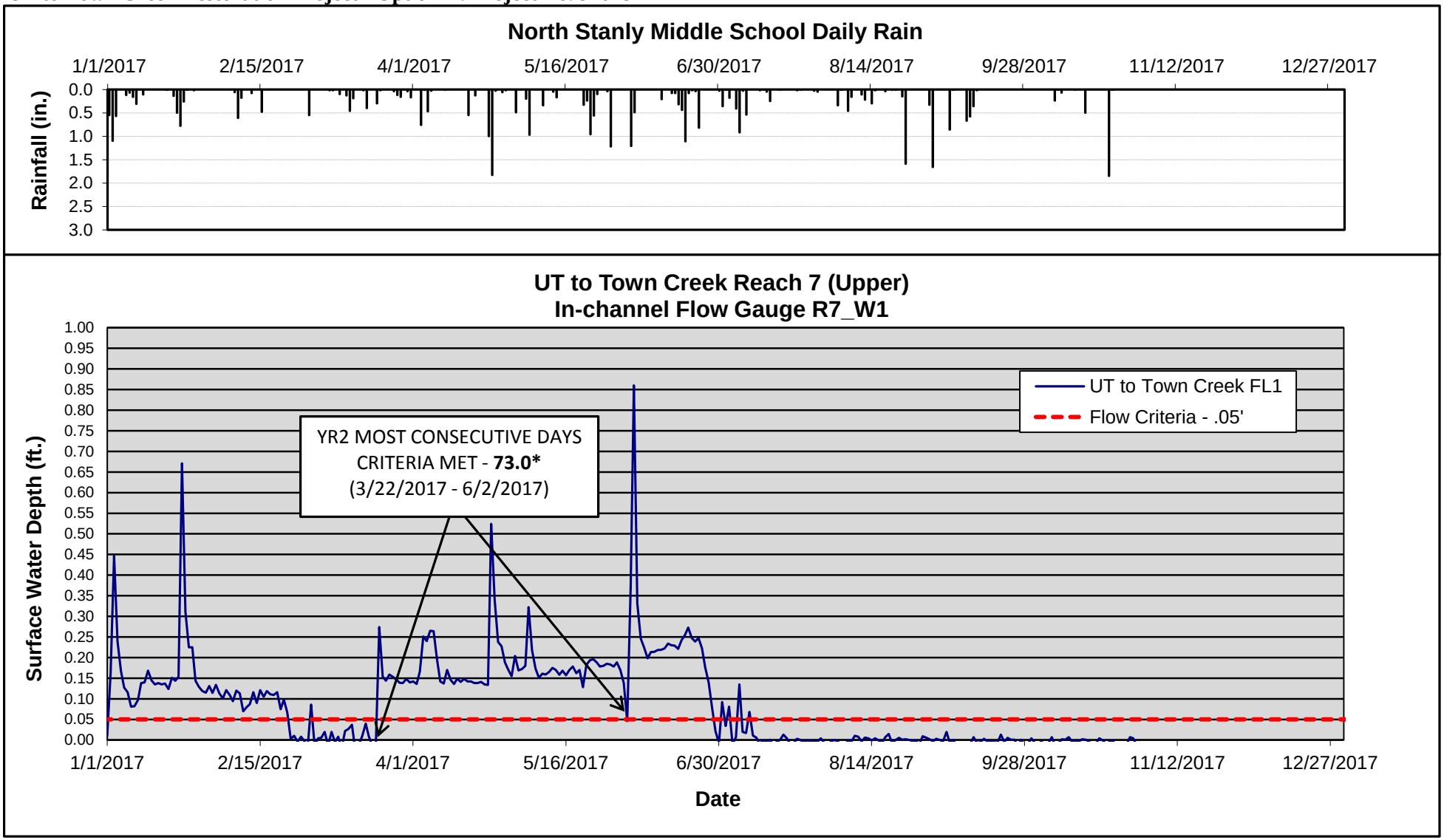


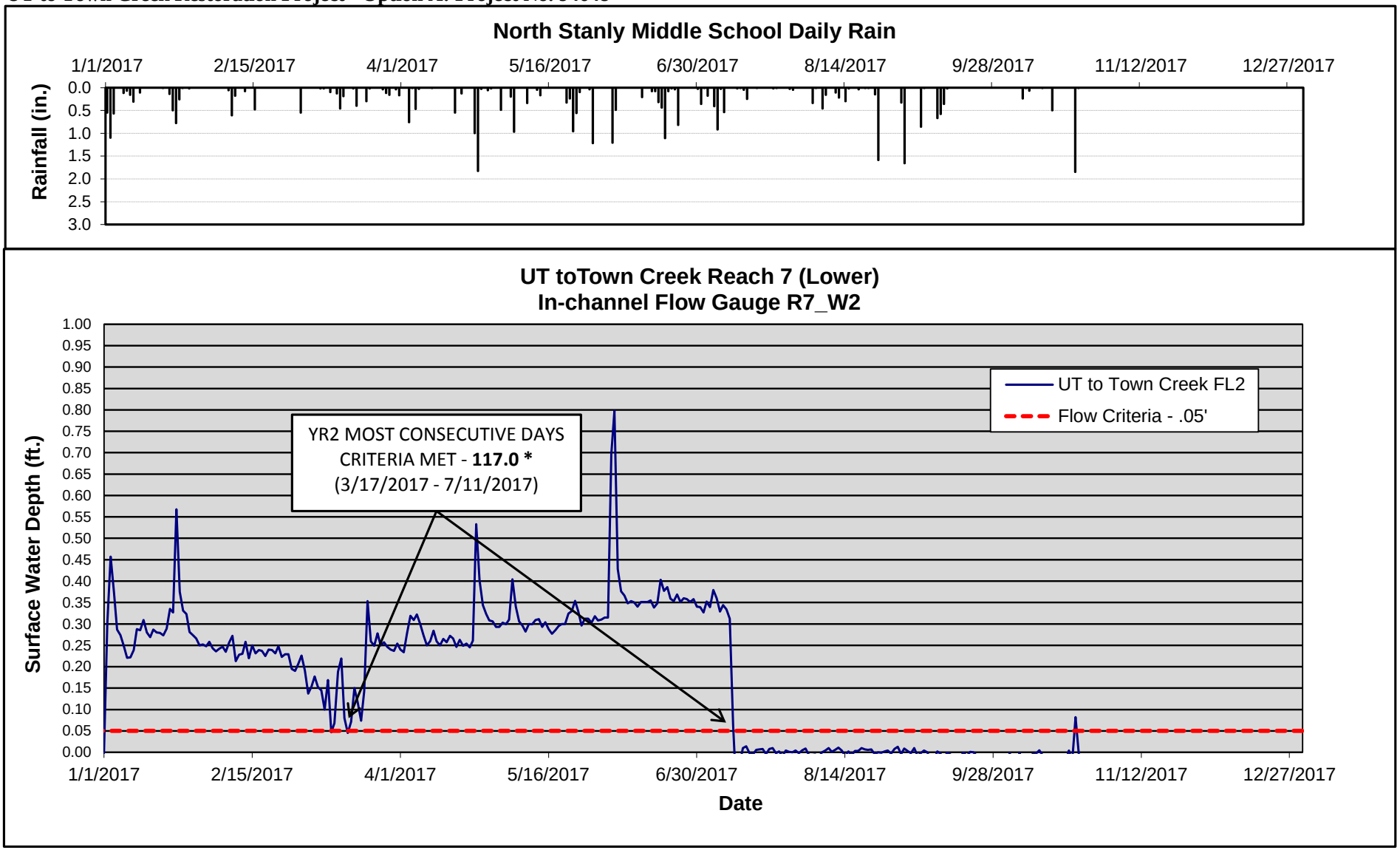
Figure 7. In-stream Flow Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648



* Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

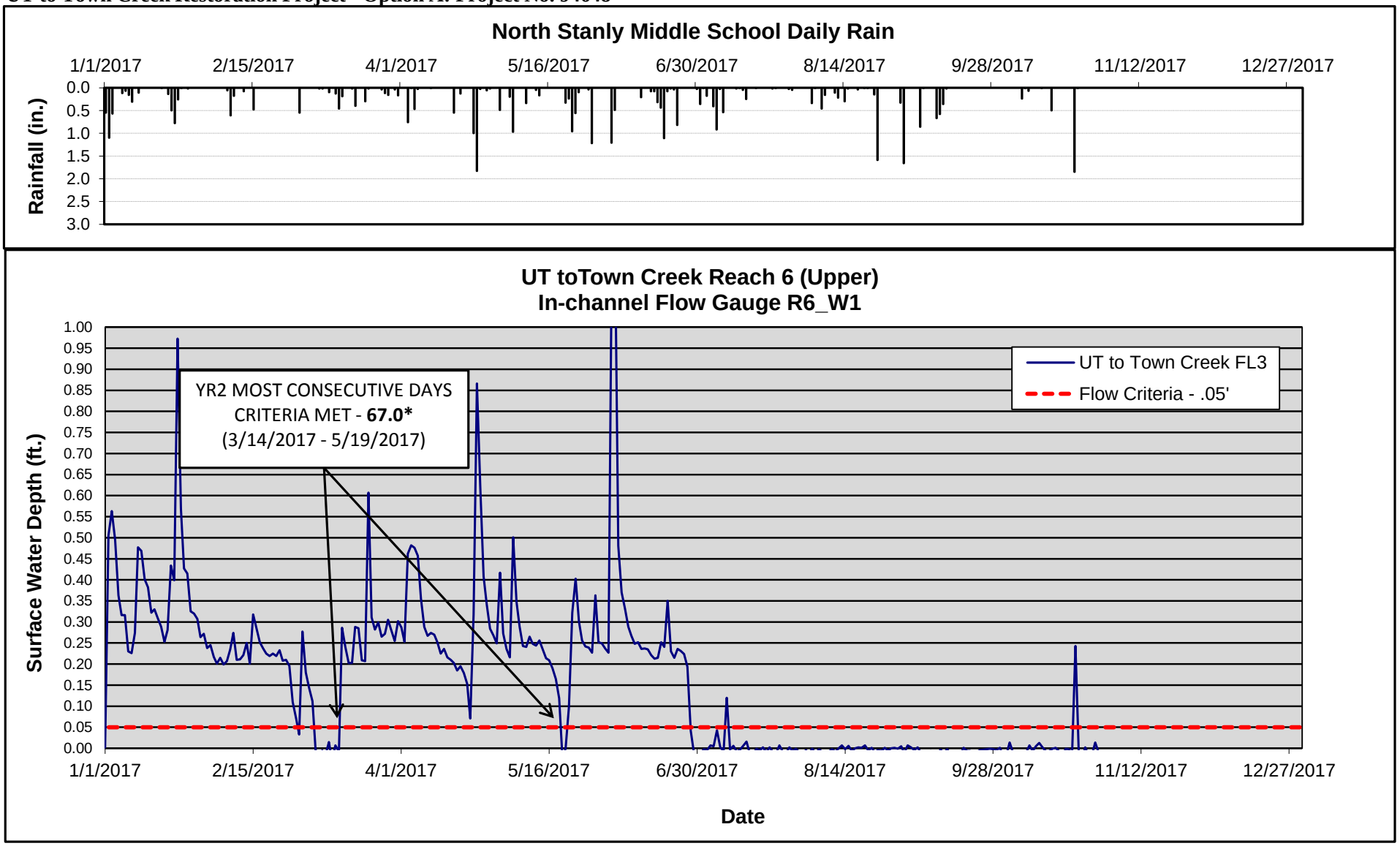
Figure 7 Cont. In-stream Flow Gauge Graphs

UT to Town Creek Restoration Project - Option A: Project No. 94648



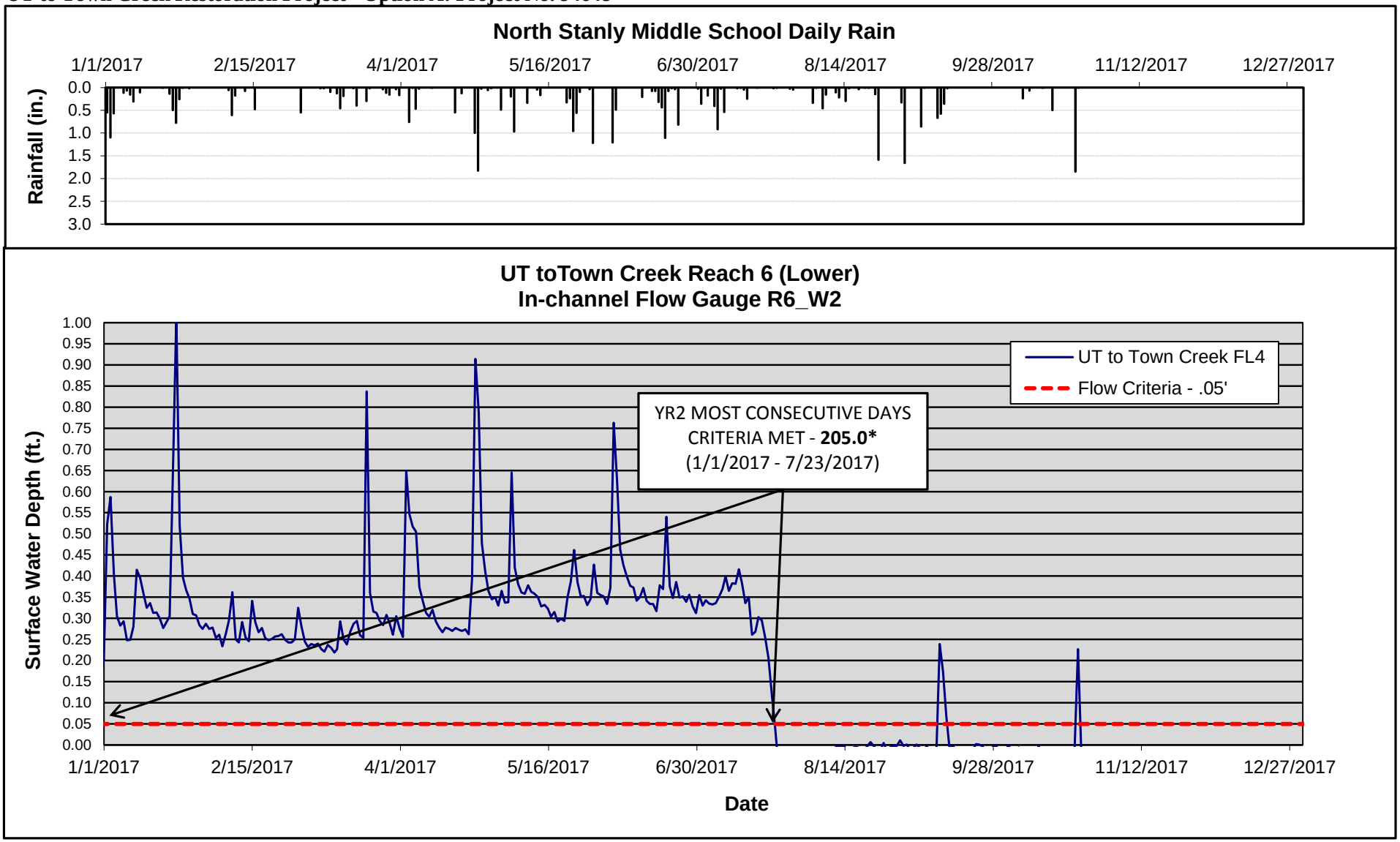
* Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Figure 7 Cont. In-stream Flow Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648



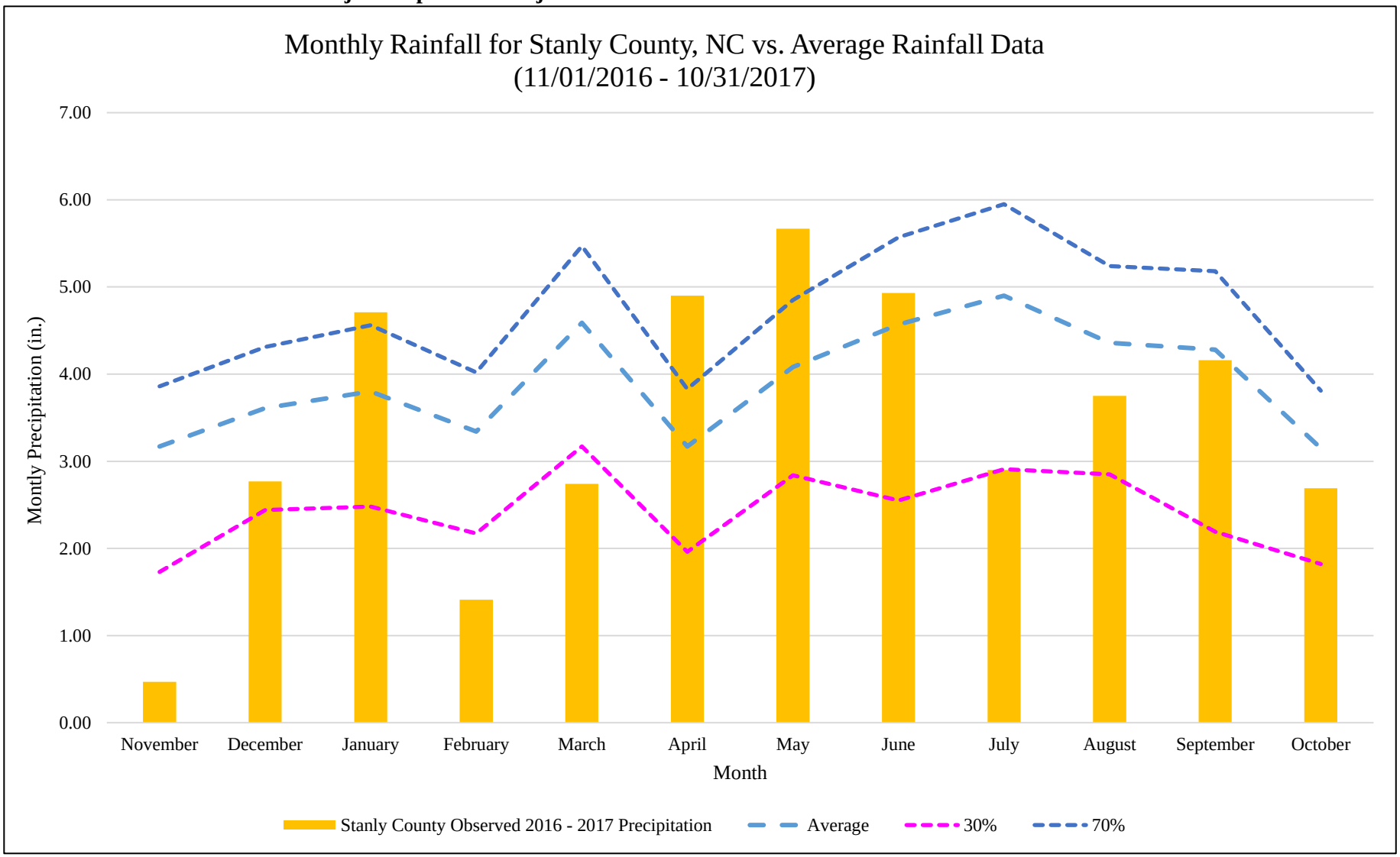
* Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Figure 7 Cont. In-stream Flow Gauge Graphs
UT to Town Creek Restoration Project - Option A: Project No. 94648



* Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

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 2016 - 2017 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	57.4	127.5	70.3	156.0	9
UTTC AW2	Groundwater	Restoration	69.1	153.5	80.9	179.5	3
UTTC AW3	Groundwater	Restoration	48.9	108.5	49.3	109.5	1
UTTC AW4	Groundwater	Restoration	53.8	119.5	53.8	119.5	1
UTTC AW5	Groundwater	Creation	50.7	112.5	56.1	124.5	5
UTTC AW6	Reference	Jurisdictional	58.3	129.5	80.6	179.0	5
UTTC AW7	Groundwater	Restoration	58.8	130.5	67.8	150.5	4
UTTC AW8	Groundwater	Restoration	11.5	25.5	40.1	89.0	8
UTTC AW9	Groundwater	Creation	42.6	94.5	48.9	108.5	5
UTTC AW10	Groundwater	Creation	50.7	112.5	69.8	155.0	7

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 13. Verification of In-stream Flow Conditions
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Flow Gauge ID	Consecutive Days of Flow[1]	Cumulative Days of Flow[2]
Reach 7 Flow Gauges		
R7_W1	73.0	156.0
R7_W2	117.0	190.0
Reach 6 Flow Gauges		
R6_W1	67.0	168.0
R6_W2	204.0	204.0

Notes:
[1]Indicates the number of consecutive days within the monitoring year where flow was measured.
[2]Indicates the number of cumulative days within the monitoring year where flow was measured.
Flow success criteria for the Site is stated as: A surface water flow event will be considered intermittent when the flow duration occurs for a minimum of 30 days.
Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.1 feet in depth.

Table 14. Verification of Bankfull Events
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Date of Data Collection	Date of Occurrence	Method	Gauge Height (FT)	Photo # (if available)
1/25/2017	Between 11/3/2016 and 1/25/2017	Crest Gauge	0.08	Crest Gauge PhotoMY2-1
5/3/2017	Between1/25/2017 and 5/3/2017	Crest Gauge	0.11	Crest Gauge PhotoMY2-2

UT to Town Creek – Bankfull Photos

Crest Gauge Photo MY2-1 (01/25/2017)

Crest Gauge Photo MY2-2 (05/03/2017)

Wrack Line on Reach 2 (05/03/2017)

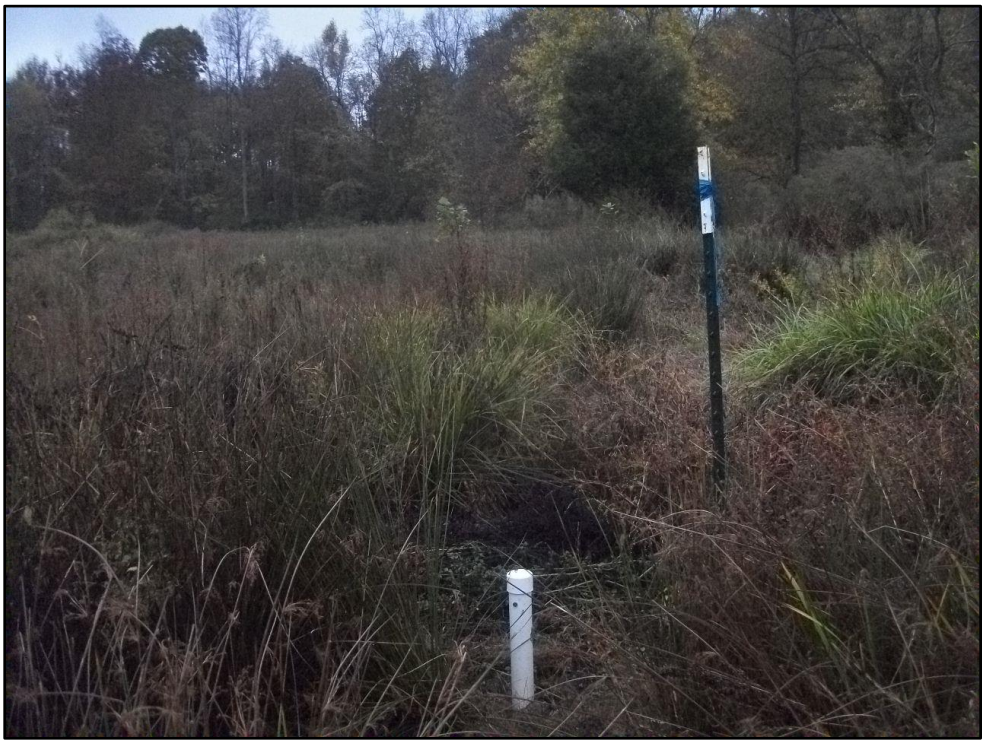
UT to Town Creek – Wetland Photos

UTTC AW1 – 11/08/17

UTTC AW2 – 11/08/17

UTTC AW3 – 11/08/17

UTTC AW4 – 11/08/17



UTTC AW5 – 11/08/17

UTTC AW6 – 11/08/17

UTTC AW7 – 11/08/17

UTTC AW8 – 11/08/17

UTTC AW9 – 11/08/17

UTTC AW10 – 11/09/17

UT to Town Creek Reach 6 – Flow Documentation Photos

Flow Documentation Photo – R6_W2 (01/04/2017)

Flow Documentation Photo – R6_W2 (02/04/2017)

Flow Documentation Photo – R6_W2 (03/04/2017)

UT to Town Creek Reach 7 – Flow Documentation Photos

Flow Documentation Photo – R7_W2 (02/18/2017)

Flow Documentation Photo – R7_W2 (03/18/2017)

Flow Documentation Photo – R7_W2 (04/24/2017)

Flow Documentation Photo – R7_W2 (05/05/2017)

Flow Documentation Photo – R7_W2 (06/05/2017)