# MY1 Monitoring Report

Owen Farms Mitigation Site
Transylvania County, NC

French Broad River Basin
Cataloging Unit 06010105

NCDMS Project No. 100064
NCDMS Contract No. 7532
NCDMS RFP No. 16-007334
(Issued 9/8/2017)

USACE ID: SAW-2018-01165

DWR ID: 20181033

Data Collected: 2021

**Prepared for:**

**NC Department of Environmental Quality**
**Division of Mitigation Services**
1652 Mail Service Center
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**Prepared by:**

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This Year 1 Monitoring Report has been written in conformance with the requirements of the following:

- Federal rule for compensatory mitigation project sites as described in the Federal Register, Title 33 Navigation and Navigable Waters, Volume 3, Chapter 2, Section § 332.8, paragraphs (c)(2) through (c)(14).
- NCDEQ Division of Mitigation Services IN-Lieu Fee instrument signed and dated July 28, 2010.

January 24, 2022

United States Army Corps of Engineers
151 Patton Ave #208
Asheville, NC 28801

Re: MY1 Monitoring Report Comments
Owen Farms Stream and Wetland Mitigation Site
French Broad River Basin; CU# 06010105 – Transylvania County
DMS Project ID No. 100064
Contract No. 7532
SAW-2018-01165

Mr. Wiesner,

As per your letter concerning the Owen Farms Stream and Wetland Mitigation Site MY1 Report, we have updated the reviewed and addressed your comments as follows:

General Comments

*1.* Please include a full copy of the final MY0 IRT comments and HDR/ LMG responses in the MY1 (2021) report as an Appendix for project documentation (attached). Please confirm that all IRT comments from MY0 have been addressed in the MY1 report. Table 4 should be updated as requested by the IRT in the MY0 comments. *RE: A copy of MY 0 IRT comments and responses have been added under Appendix G in MY 1 report. Table 4 has been replaced with the updated version.*

*2.* Based on the MY0 report and Table 1, 1.54 acres of wetlands have been enhanced on the site. Please review and update the text accordingly. *RE: According to Table 5 MY0 submittal on June 7, 2021, As-Built acreage for wetland enhancement areas is 1.396 AC. An older version of Table 1 was mistakenly included in MY1 report. Table 1 has been updated to reflect the most recent version.*

*3.* DMS recommends removing beaver and beaver dams as soon as possible to avoid potential irregular monitoring data, project/ plant damage and additional project maintenance. Beaver and beaver dams should be removed from the site through the entire project monitoring term. *RE: HDR/LMG noted evidence of relic beaver dams on-site in the Mitigation Plan and discussed it with the IRT during our walk through. It was agreed that inactive beaver dams would not be removed. If signs of active beaver are observed, a beaver removal plan may be implemented.*

*4.* Invasive/ exotic plant species should be treated within the conservation easement through the entire project monitoring term. *RE" Minor areas of individual stems of multiflora rose plants were observed within the easement boundary along UT1. Since there are only a few individual plants and it is not our expectation that it will rapidly spread, LMG does not recommend treatment at this time.*

*5.* If an additional groundwater gauge within the W5 re-establishment area is necessary to substantiate the wetland hydrology and proposed project wetland credit, it should be installed prior to the start of the MY2 (2022) growing season. HDR/ LMG should reach out to the NC IRT directly if there are questions about the proposed location/ placement of the additional groundwater

gauge/s. *RE: The MY1 Report narrative for Section 3.0 has been updated to state "W3 appears to be expanding beyond the current wetland boundary. W3 and W5 will be further investigated in February 2022 to determine if additional groundwater gauges may be warranted. If it is determined that groundwater gauges are warranted, HDR will coordinate with DMS and the IRT regarding gauge placement prior to installation."*

6. If the 2021 repair effort is completed before the issuance for the final MY1 report, please consider including the repair effort in the table. *RE: Repair efforts were not completed prior to resubmission. Table 5 will be updated to reflect completion of repairs in the MY2 report*.

7. Any groundwater wells that are not meeting the established success criteria should be shown as "red"/ "orange" on the CCPV maps. In addition, any vegetation plots not meeting the established interim success criteria should be shown as "red"/ "orange" on the CCPV maps. Please update the maps accordingly. *RE: CCPV maps have been revised accordingly*.

8. Please include the date that the project was visually assessed at the top of each table. This was an IRT request at the 2021 credit release meeting. *RE: Dates of Assessment has been added to Tables 7.1-7.6 and Table 8.*

9. Please provide dates for all project photos. If exact dates cannot be provided, please include the month and year for each photo. *RE: Dates have been added to all photos in Appendix C and Appendix D*

10. Please include the Vegetation Performance Standards Summary Table (DMS Template (10-1-20)) in the revised report. Please also include the average plot heights in the revised vegetation tables. *RE; Vegetation Performance Summary Table has been included as Table 10 in the MY 1 Report. Plot heights are now included in the table.*

*11.* In the MY0 DMS comments and HDR/ LMG responses, HDR and LMG committed to adding photo points at all crossings and monitoring the additional crossing photo points throughout the monitoring term. In does not appear that these crossing photos were included in the draft report. Please include the additional crossing photo points in the revised MY1 report. Please also review and confirm that all of the monitoring photo points depicted on the CCPV sheets are included and labeled in the appendices. *RE: Crossing photos have been added to Appendix C and photo points have been added to CCPV maps.*

*12.* Please provide separate figures for each individual groundwater gauge. Please identify the maximum consecutive day number for each gauge on the individual plots/ figures. Please also review the max. consecutive hydroperiods (%) reported in Table 13. Groundwater gauges 1-3 are all reporting 75 days above the 12" threshold and the growing season is reported as 206 days (75/206 = 36%). Table 13 is reporting 42% for groundwater gauges 1-3. In Table 13, please include MY1/ 2021; MY2/2022; etc. Please review, QA/QC, and update the figures, table and report text as necessary *RE: Separate figures have been added to the MY 1 Report. Table 13 has been updated.*

**Digital Support File Comments:**

13. Please submit the visual stream bank areas of concern as line features and ensure that reported lengths reflect feature lengths (Table 7). *RE: Line features for areas of concern were submitted as "Mass Wasting" and "Minor Erosion" polyline shapefiles, however, the attribute tables lacked a "length" field. A "length" field has been added to the attribute tables in the final support files.*

14. Please submit the vegetation areas of concern as polygons (e.g. Bare Areas, Low Stem Density Areas, and Areas of Poor Growth Rates) and include these in the CCPV – here too, ensure that feature areas reflect the reported areas (Table 8). Also, please update # Encroachments noted to 0. *RE: Encroachments changed to 0 on Table 8. Features have been added to CCPV. Table 8 has also been updated to reflect sparsely vegetated areas more accurately. Woody stem density was based off vegetation plot 12 not meeting performance standards.*

15. Please add the MY0 random plot data to the input veg table tool template – this will enable the tool to fully populate the Vegetation Performance Standards Summary Table. Please also include the Vegetation Performance Standards Summary Table in the report. Also, note that the input excel file was storing height values as text, which is why there are no average height values included in the output Table 6. The tool will now convert those text values to numeric so those rows will be populated. Please include the input and updated output files in the resubmittal. *RE: Data was included in Digital Support file package under the Tables Folder, see column "N" under "MY0 Veg Input Data" and "MY1 Veg Input Data"; rows marked as "R" in column N are the random plots. Vegetation Performance Standards Summary Table has been added to report (Table 10). Tables have been updated to include average height.*

16. Please submit the data used to create the cross-section figures and tables. *RE: Data was included in Digital Support file package under the Tables Folder. Look at tab labeled Raw XS Data*.

If you have any questions or need additional information, please do not hesitate to give me a call (843.830.1536).

Sincerely,

Davey Resource Group, Inc.

Alex DiGeronimo

# Contents

## Figures



## Tables



## Appendices

# 1.0 Project Summary

## 1.1 Location and Setting

The Owen Farms Mitigation Site (Site) is located approximately 3 miles north of Lake Toxaway in Transylvania County, NC.

Directions from Asheville, NC:

From Asheville, NC: Travel on I-26 east to exit 40 (NC-280 W/Airport Road) and merge on to NC-280 W, continue for 15.9 miles; continue straight onto US-64 W (NC-280 W becomes US-64 W), go 3.9 miles; turn right to stay on US-64 W; continue on US-64 W for 14.9 miles; turn right on Blue Ridge Road, continue for 5.4 miles and the Site entrance will be on the left.

The Site is located in the Blue Ridge Belt Physiographic Province of North Carolina.

## 1.2 Background

In October 2020 HDR|ICA restored approximately 3,180 linear feet of stream, enhanced approximately 5,172 linear feet of stream (125 linear feet of Enhancement I; 5,047 linear feet of Enhancement II), and preserved 423 linear feet of stream at the Owen Farms Mitigation Site. Additionally, 1.396 acres of wetlands have been enhanced, 0.35 acres of wetlands have been re-established, and 0.97 acres of wetlands have been rehabilitated at the Site. The Site provides many ecological functional uplifts within the French Broad River Basin. Project goals were established based on the French Broad RBRP (NCEEP 2009), and on Site data collected during the existing conditions survey. Site specific goals and objectives were developed to provide the highest practical potential for functional uplift based on NC SAM and NC WAM analyses of streams and wetlands on Site.

## 1.3 Preconstruction Conditions

Streams

The Site was cleared prior to 1951 and has been utilized for agricultural purposes including pasture and row crops. Prior to construction cattle had access to the majority of streams on Site. The streams on Site exhibited the following conditions prior to construction:

- Portions of WFFBR had been straightened to maximize agricultural practices on the property. The channel exhibited actively eroding banks due to cattle hoof shear and many of the channel's riffles and pools had experienced significant deposition of fine material from the eroded channel banks. The large majority of the channel displayed little to no deeply rooted bank or riparian vegetation. Where a woody buffer had been present, it was commonly only one tree wide, with vegetation typically sparse at best. Many of the trees within the one-tree buffer had been undercut because the channel had incised below the rooting depth.
- UT 5 was dammed and ponded immediately downstream of a culvert passing under Silverstein Road. Downstream of the pond, UT 5 had been straightened and channelized to its confluence with the West Fork French Broad River (WFFBR).
- With the exception of the upstream most 248 feet, UT 7 had an absent to minimal buffer. The downstream half of UT 7 appeared to have been modified for agricultural practices and ditched along the edge of the valley as evidenced by an incised channel and spoil piles adjacent to the banks.

- UT 8 was fairly stable except for the downstream most 40 feet of the reach which experienced down cutting to match the invert elevation of WFFBR at the confluence. In the downstream portion of the reach there was little to no deeply rooted vegetation along the banks. The banks had been lined with old bricks by the landowner in an attempt to prevent further mass wasting as the channel continues to incise and undercut the banks.
- UT 4a was significantly incised due to a headcut approximately 20 feet upstream of its confluence with UT 4.
- UT 1, UT 2, UT 2a, UT 3, UT 2b, UT 4, UT 4b, UT 6, UT 6a, UT 7a, and UT 7b are all first or second order, spring fed, perennial tributaries which exhibited mild to moderate instability due to cattle hoof shear and limited buffer presence in some areas before construction and planting activities.

Wetlands

Prior to construction cattle had access to all of the wetlands on Site. The wetlands on Site exhibited the following conditions prior to construction:

- Wetland W3 is the largest wetland within the Site (1.8 acres) and is divided into two distinct wetland types: Riverine Swamp Forest and Floodplain Pool. The Riverine Swamp Forest portion of W3 had a significantly altered vegetative community compared to reference condition. This portion of W3 consisted solely of herbaceous vegetation which was dominated by common rush and served as a cattle pasture. Fecal matter and cattle tracks were present throughout the wetland. The Floodplain Pool portion of W3 formed in a relic meander scroll of WFFBR. UT 5 flowed through the eastern portion of the Floodplain Pool prior to its confluence with WFFBR. Cattle had unrestricted access to the entirety of W3
- Wetland W5 was a relic Headwater Forest wetland area adjacent to UT 7. Prior to construction the channelization and placement of spoil along the floodplain made it so W5 no longer supported wetland hydrology. Cattle access also altered the vegetative structure and ground surface condition.
- Wetland W1 is a Riverine Swamp Forest that is heavily influenced by beaver. Prior to construction activities, cattle had full access to W1.
- Wetlands W2, W4, W6, W6A, W7, W8, and W9 are all headwater wetlands that had experienced alterations to the vegetative structure and significant fecal matter inputs due to cattle access.

# 2.0 Annual Monitoring

## 2.1 Monitoring

Table 3 in Appendix A outlines all the monitoring components, methods, quantity, and frequency of data to be collected for the Site. A visual representation of all monitoring devices can be found in the MY1 Current Conditions Plan View (CCPV) (Figures 2.1 – 2.9). Monitoring and data collection occurred between September 27 and September 29, 2021.

## 2.2 Results and Discussion

This section documents the conditions observed in Year 1 monitoring. It is important to note that the Site experienced a 200-year storm event between August 15-17. On-site rain data recorded 16.70 inches over a 72-hour period, with 6.07 inches falling within 3 hours on August 16. Due to the heavy rainfall and flooding events areas of floodplain scour have developed across the constructed floodplain and are as follows:

1. Floodplain scour around stump near STA 10+75
2. Floodplain scour on left floodplain near Station 11+10
3. Floodplain scour on right floodplain near STA 13+00
4. Floodplain scour along the right floodplain near STA 15+50
5. Floodplain scour on left bank between STA 16+25 and STA 18+50
6. Floodplain scour along right bank at STA 25+75
7. Floodplain scour along left bank near Station 28+50

Areas of floodplain scour and erosion are depicted in the MY1 CCPV in Appendix B. Photographs of select areas can be found in Figures 3.1 – 3.39 and Appendix F. Detailed repair plans for areas mentioned above are provided in Appendix F.

### 2.2.1 Stream Stability

Despite the 200-year storm event, WFFBR maintained stability except for areas noted above and in Appendix F. Areas of substantial erosion that require repair are as follows:

1. Erosion along the right bank from STA 10+65 to STA 10+95
2. Erosion along the left bank from STA 12+61 to STA 12+67
3. Bank failure along the left bank from STA 18+63 to STA 18+75
4. Bank failure along the right bank from STA 18+55 to STA 18+90

These areas in need of repair are depicted in the MY1 CCPV in Appendix B. Photographs of select areas can be found in Figures 3.1 – 3.39 and Appendix F. Detailed repair plans for areas mentioned above are provided in Appendix F.

The large majority of cross section geometry along WFFBR has remained consistent with the As-Built condition with the exception of Cross Section 3. During the storm event of August 2021, overbank flows eroded a large scour hole in the left floodplain bench of WFFBR starting at STA 16+25 and continued through left bank at STA 18+63. The failed bank at STA 18+63 allowed storm flow to bypass the upstream meander and direct perpendicular flow into the right bank of WFFBR through Cross Section 3. Approximately 35 feet of the right bank experienced bank failure due to the storm event (STA 18+55-18+90). Evidence of this can be seen in Figure 5.3 and Figure 4.3.

UT 8 has remained stable over the past monitoring year. Cross Section 7 depicts little change along the banks of UT 8 but does illustrate how the upper portion of UT 8 experienced heavy deposition of materials transported from upstream of the easement during the storm event in August. Photo representation in Figure 4.7 (Appendix D) shows that a significant amount of gravel and debris has been deposited through Cross Section 7. The concrete blocks visible in the photo will be removed by hand during the next monitoring year.

While the banks of UT 5 remain stable, Cross Section 9 and 12 indicate that UT 5 has also experienced increased deposition throughout the monitoring year. On Site observations revealed that the deposited material appears to be DOT stabilization stone transported from upstream of the project Site (Figure 3.39). It is expected that this material will mobilize and work its way through the system over time.

Cross sections along UT 7 remain largely unchanged from the As-Built condition. The restored reach appears stable and functioning as intended.

A small beaver dam was observed on UT 6A during Year 1 monitoring. This dam will be closely monitored during the course of the next monitoring year. If activity is observed within the constructed reaches of the Site, a comprehensive beaver removal program may be developed and implemented.

### 2.2.2 Vegetation

Year 1 vegetation plot data can be found in Table 9 of Appendix C. The average density of planted stems across the site is 544 stems per acre, which exceeds Year 3 success criteria of 320 planted stems per acre. Vegetation Plot 12 is currently not meeting Year 3 criteria due to a dense herbaceous vegetative layer outcompeting the planted bare roots. It is worth noting that Plot 12 is located in the Swamp Bog Complex planting area, and it is not uncommon for this community to be dominated by shrubby and herbaceous species. It was anticipated in the Mitigation Plan that this community may exhibit a lower stem density than the rest of the Site. Plot 12 will be re-assessed during Year 2 monitoring to determine if any of the missing stems can be accounted for after an additional year of growth.

Table 9 indicates Vegetation Plot 3 has 1052 stems per acre when including volunteers. It also indicates that a single species constitutes more than 50% of the dominant species composition. However, in accordance with the Mitigation Plan, volunteers must be present for a minimum of two growing seasons before they can be counted toward success criteria. Not including the volunteers, Vegetation Plot 3 still meets Year 3 success criteria at 486 stems per acre and no one species constitutes more than 50% of the plot.

Two areas of cattail were identified along the left and right banks of WFFBR. These areas are isolated and are not impeding channel flow therefore no action is recommended at this time. In addition to the cattail, multiflora rose plants were observed within the easement boundary along UT1. Since there are only a few individual plants, LMG does not recommend treatment at this time.

### 2.2.3 Stream Hydrology

All monitored streams have experienced continuous flow within tributaries and has been documented for at least 30 consecutive days. Stream flow gauge data indicates that each of the constructed stream channels has experienced at least 2 bankfull events during the monitoring period. Stream hydrologic data can be seen in Figures 7.1 - 7.4 (Appendix E).

### 2.2.4 Wetland Hydrology

Wetland W3 re-establishment and rehabilitation areas have experienced groundwater levels within 12 inches of the soil surface for 75 consecutive days over the Year 1 monitoring period as depicted in Figure 8.1. Based on the performance criteria outlined in the Mitigation Plan, all areas within W3 are exceeding success criteria. It is important to note that Gauge 1, located in W3, experienced software issues between November 2020 to April 2021 and data was unrecoverable. A new gauge was installed in April 2021. It should also be noted that areas extending beyond the boundaries of W3 exhibited hydrophytic vegetation, standing water, and saturated soils during site visits. Based on these observations it appears W3 may extend beyond the currently delineated wetland boundary.

The wetland enhancement area along W5 is exceeding the performance criteria outlined in the Mitigation Plan. Wetland gauge data indicate water levels within 12 inches for 87 consecutive days over the Year 1 monitoring period: this data is depicted in Figure 8.2 in Appendix E. The re-establishment area of W5 is

be a result of a drainage effect created by the gauges proximity to UT 7. This area will be further examined to determine if additional groundwater gauges are warranted.

# 3.0 Maintenance and Adaptive Management Plans

The Repair Plan in Appendix F provides a detailed strategy for mending the damage the Site received during the 200-year storm event in August 2021. Repairs began on January 21, 2022 and be completed by January 31, 2022. Scoured areas in the floodplain will be filled with on-site material excavated from adjacent terrace slopes. Excess material deposited during the August storm event will be removed and placed along the channel toe of repaired stream banks. Eroded stream banks will be graded to approximate design dimensions and matted with coir fiber matting. Soil lifts will be installed between stations 18+60 and 19+10. Overall, approximately 100 linear feet of stream bank grading and 100 linear feet of substrate removal is anticipated as a result of repair activities. Disturbed areas will be seeded with a permanent, native seed mix and replanted with native species as approved in the Mitigation Plan.

The re-establishment area of W5 is not currently meeting performance criteria for wetland hydrology. However, W3 appears to be expanding beyond the current wetland boundary. W3 and W5 will be further investigated in February 2022 to determine if additional groundwater gauges may be warranted. If it is determined that groundwater gauges are warranted, HDR will coordinate with DMS and the IRT regarding gauge placement prior to installation.

# 4.0 References

HDR Engineering, Inc. of the Carolinas 2020. Mitigation Plan Owen Farms Mitigation Site. Transylvania County, North Carolina. January 31, 2020.

NCDENR. Division of Mitigation Services (DMS). 2013. *Survey Requirements for Full Delivery Projects*. https://ncdenr.s3.amazonaws.com/s3fspublic/Mitigation_Services/Document_Management_Library/Guidance_and_Template_Documents/2013_08_13_FD_SurveySpecs.pdf

NCDEQ. Division of Mitigation Services (DMS). 2020. *Annual Monitoring Report Format, Data, and Content Requirements October 2020*. https://files.nc.gov/ncdeq/Mitigation%20Services/Document%20Management%20Library/Guidance%20and%20Template%20Documents/DMSMonitoringReportTemplateOct2020.pdf

North Carolina Geological Survey (NCGS), 1985. Geologic Map of North Carolina.

North Carolina Wetland Functional Assessment Team (WFAT). 2016. N.C. Wetland Assessment Method (NC WAM) User Manual, Version 5.0 (February 2016). 290 pp

North Carolina Stream Functional Assessment Team (SFAT). 2015. N. C. Stream Assessment Method (NC SAM) User Manual, Version 2.1 (August 2015). 350 pp

Rosgen, David. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs Colorado.

Schafale, Michael P., Weakley, Alan S. Classification of the Natural Communities of North Carolina. Third Approximation. 1990. North Carolina Natural Heritage Program, Raleigh, NC.

The Applied Climate Information System (ACIS). 2021. *WETS Station: Brevard, NC*. http://agacis.rcc-acis.org/?fips=37175

US Army Corps of Engineers (USACE), North Carolina Interagency Review Team (NCIRT). 2016. *Wilmington District Stream and Wetland Compensatory Mitigation Update*.

United States Geological Survey (USGS), 1984. Lake Toxaway Quadrangle, North Carolina, 7.5 Minute Series (Topographic). Washington, D. C.

# Appendix A – General Project Information

*Table 1. Owen Farms Mitigation Site (DMS Project No. 100064) Project Mitigation Quantities and Credits*

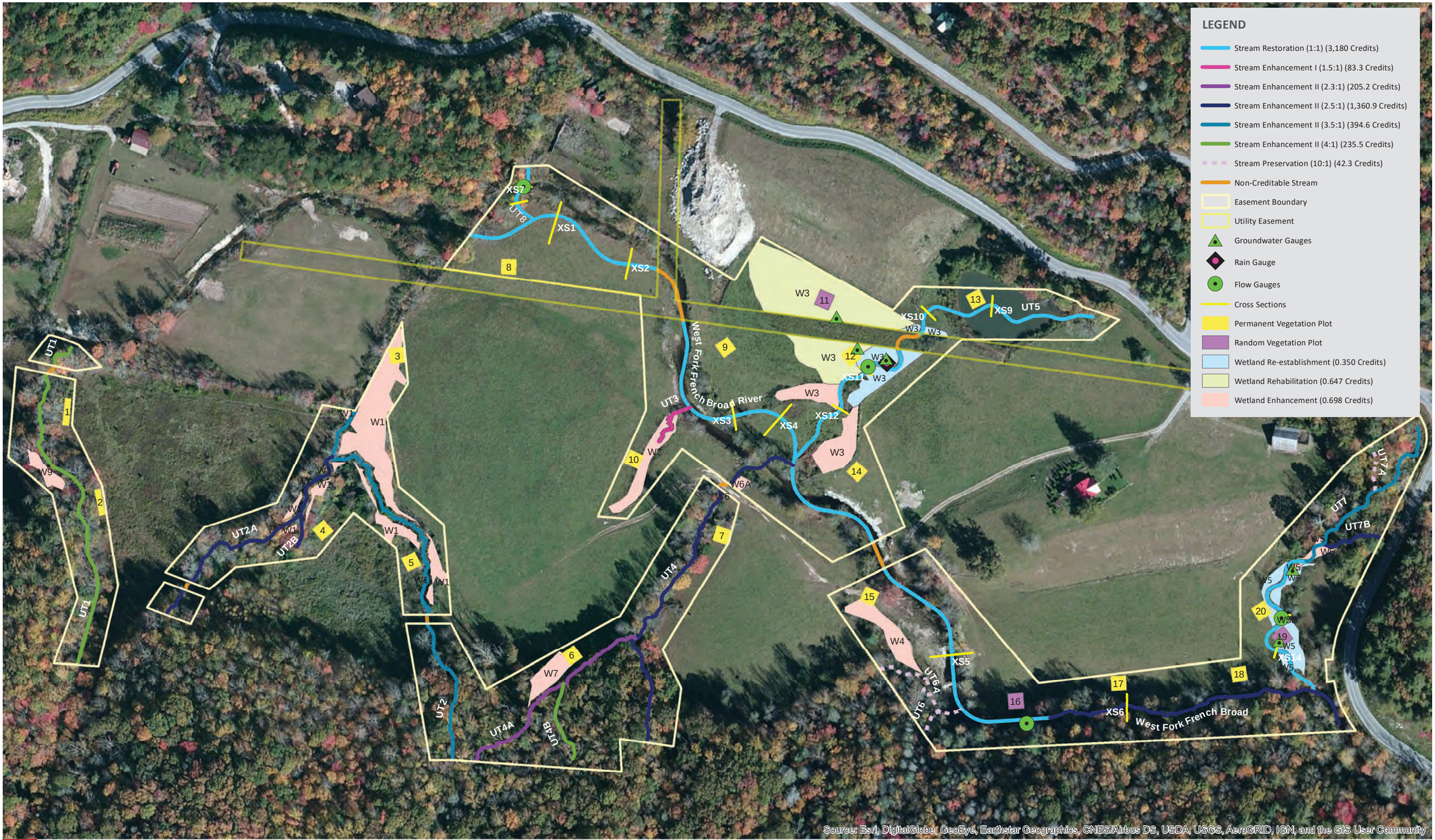
| Project Segment | Original Mitigation Plan Ft/Ac | As-Built Ft/Ac | Original Mitigation Category | Original Restoration Level | Original Mitigation Ratio (X:1) | Credits | Comments |
|---|---|---|---|---|---|---|---|
| Stream | | | | | | | |
| West Fork French Broad River (WFFBR)* | 1799.000 | 1799.000 | Cold | R | 1.00000 | 1,799.000 | Full channel Restoration, buffer planting, livestock exclusion, permanent easement |
| West Fork French Broad River (WFFBR) | 705.000 | 705.000 | Cold | EII | 2.50000 | 282.000 | Bank stabilization along the left bank, buffer planting, livestock exclusion, and permanent easement |
| UT 1* | 764.000 | 764.000 | Cold | EII | 4.00000 | 191.000 | Buffer planting, livestock exclusion, and permanent easement |
| UT 2 | 923.000 | 923.000 | Cold | EII | 3.50000 | 263.714 | Buffer planting, livestock exclusion, and permanent easement |
| UT 2A* | 546.000 | 546.000 | Cold | EII | 2.50000 | 218.400 | Buffer planting, livestock exclusion, and permanent easement |
| UT 2B | 75.000 | 75.000 | Cold | EII | 2.50000 | 30.000 | Buffer planting, livestock exclusion, and permanent easement |
| UT 3 | 125.000 | 125.000 | Cold | EI | 1.50000 | 83.333 | Stabilization of channel dimension and profile, buffer planting, livestock exclusion, and permanent easement |
| UT 4* | 809.000 | 809.000 | Cold | EII | 2.50000 | 323.600 | Buffer planting, livestock exclusion, and permanent easement |
| UT 4A | 472.000 | 472.000 | Cold | EII | 2.30000 | 205.217 | Stabilization of channel dimension and profile near confluence with UT 4, buffer planting, livestock exclusion, and permanent easement |
| UT 4B | 178.000 | 178.000 | Cold | EII | 4.00000 | 44.500 | Buffer planting, livestock exclusion, and permanent easement |
| UT 5* | 827.000 | 827.000 | Cold | R | 1.00000 | 827.000 | Full channel Restoration, buffer planting, livestock exclusion, permanent easement |
| UT 6 | 114.000 | 114.000 | Cold | P | 10.00000 | 11.400 | Preservation |
| UT 6A | 206.000 | 206.000 | Cold | P | 10.00000 | 20.600 | Preservation |
| UT 7 | 417.000 | 417.000 | Cold | R | 1.00000 | 417.000 | Full channel Restoration, buffer planting, livestock exclusion, permanent easement |
| UT 7 | 439.000 | 439.000 | Cold | EII | 3.50000 | 125.429 | Buffer planting, livestock exclusion, and permanent easement |
| UT 7A | 103.000 | 103.000 | Cold | P | 10.00000 | 10.300 | Preservation |
| UT 7B | 136.000 | 136.000 | Cold | EII | 2.50000 | 54.400 | Buffer planting, livestock exclusion, and permanent easement |
| UT 8 | 137.000 | 137.000 | Cold | R | 1.00000 | 137.000 | Full channel Restoration near confluence with WFFBR, buffer planting, livestock exclusion, permanent easement |
| | | | | | **Total:** | **5,043.893** | |
| Wetland | | | | | | | |
| Wetland Group 1 (W1-W9) | 1.540 | 1.396 | R | E | 2.00000 | 0.770 | Planting, livestock exclusion, permanent easement |
| Wetland Group 2 (W3 and W5) | 0.350 | 0.350 | R | REE | 1.00000 | 0.350 | Raising invert of adjacent tributaries and filling abandoned channels; livestock exclusion, planting, and removal of spoil |
| Wetland Group 3 (W3) | 0.970 | 0.970 | R | RH | 1.50000 | 0.647 | Planting, livestock exclusion, permanent easement; restoring adjacent tributaries to increase frequency of floodwaters accessing wetland |
| | | | | | **Total:** | **1.767** | |

*Length of streams flowing through utility easements or agricultural crossings has been deducted from As-Built and Original Mitigation Plan footage and credits

**Project Credits**

| | Stream | | | Riparian | Non-Rip | Coastal |
|---|---|---|---|---|---|---|
| Restoration Level | Warm | Cool | Cold | Wetland | Wetland | Marsh |
| Restoration | N/A | N/A | 3,180.000 | N/A | N/A | N/A |
| Re-establishment | | | | 0.350 | N/A | N/A |
| Rehabilitation | | | | 0.647 | N/A | N/A |
| Enhancement | | | | 0.770 | N/A | N/A |
| Enhancement I | N/A | N/A | 83.333 | | | |
| Enhancement II | N/A | N/A | 1,738.260 | | | |
| Creation | | | | N/A | N/A | N/A |
| Preservation | N/A | N/A | 42.300 | N/A | N/A | |
| **Totals** | **N/A** | **N/A** | **5,043.893** | **1.767** | **N/A** | **N/A** |

**Total Stream Credit** **5,043.893**
**Total Wetland Credit** **1.767**




0 Feet 1,400

# PROJECT ASSET MAP

## OWEN FARMS MITIGATION SITE

FIGURE 1.0

OWEN FARMS AS-BUILT REPORT

*Table 2. Project Goals, Performance Criteria, and Functional Improvements*

| Goal | Treatment | Functional Uplift | Performance Criteria | Measurements | Monitoring Results |
|---|---|---|---|---|---|
| Restore/enhance streams within the Site so that they are neither aggrading nor degrading | Restore a stable dimension, pattern, and profile. Install fencing to exclude cattle. | Reduction of nutrients and sediment to downstream locations, reduction of shear stress, and improved hydraulic function. | Entrenchment Ratios should be ≥ 2.2. BHR should not exceed 1.2. BHR should not change more than 10% in any given monitoring interval. Riffle section W/D ratios should remain within the range of the appropriate stream type. | Cross-section monitoring and visual inspections. | Cross sectional profiles indicate aggradation of deposited material from 200 year storm event. All cross sections BHR≤1. |
| Provide/ enhance flood attenuation. | Restore several existing streams as primarily a Priority I restoration where bankfull and larger flows can access the floodplain. Construct floodplain bench on WFFBR. | Increase attenuation of floodwaters, increase biogeochemical cycling and recharge riparian wetlands. | Four bankfull events in separate monitoring years. | Flow gauges (Pressure transducers), and visual inspection. | All monitored reaches have experienced 2 bankfull events. |
| Restore/enhance aquatic, semi-aquatic, and riparian habitat. | Restore native vegetation to the stream channel banks, wetlands, and the adjacent riparian corridor. | Treatment of nutrient enriched surface runoff from adjacent pastureland, increased bank stability and increased habitat. | Minimum of 320 stems/ac present at MY-3. Minimum of 260 stems/ac present at MY-5. Minimum of 210 stems/ac present at MY-7. Trees should average 6 feet in height at MY-5 and 8 feet in height at MY-7. Bog Complex communities may exhibit lower stem density and height. | Vegetation plots will be monitored annually between July 1st and leaf fall using the CVS protocol. | 19/20 plots meeting performance criteria. Plot 12 is currently not meeting MY3 standards. |
| Restore/Enhance Wetlands within the Site to remove hydrologic impairments | Reconstruct above bankfull stream channel flows to riparian wetlands and re-grade topography to remove spoil and overburden material. | Restoration of riparian habitat, treatment of nutrient enriched runoff from adjacent pastureland, increased flood attenuation. | Groundwater elevation within 12 inches of the ground surface for at least 12% of the growing season (April 7 - October 30). | Groundwater monitoring gauges. | All but one wetland is meeting performance criteria |
| Restore and connect riparian habitat with adjacent natural communities. | Conservation easement establishment. | Protect Site from encroachment in conservation easement. | Prevent Easement Encroachment. | Visual inspection. | No encroachment into the conservation easement. |

*Table 3. Monitoring Plan Components*

| Parameter | Monitoring Method | Quantity | Frequency | Notes |
|---|---|---|---|---|
| Dimension | Riffle Cross Sections | UT5 (2)<br>UT7 (1)<br>UT8 (1)<br>WFFBR (4) | Years 1, 2, 3, 5 & 7 | |
| | Pool Cross Sections | UT5 (2)<br>UT7 (1)<br>UT 8 (1)<br>WFFBR (2) | Years 1, 2, 3, 5 & 7 | Bank pins may be installed in areas of concern. |
| Pattern | Visual | None | twice per year | Bank pins may be installed in areas of concern |
| Profile | Visual | None | twice per year | Additional profile measurements may be required if problems are identified during the monitoring period |
| Substrate | Visual | None | Annual | There should be an absence of any significant trend in the aggradational or depositional potential of the channel |
| Surface Water Hydrology | Flow Gage (Pressure Transducer) | UT5 (1)<br>UT7 (1)<br>UT8 (1)<br>WFFBR (1) | twice per year | Measuring devices will be inspected/downloaded at each site visit to document occurrence of bankfull events and ensure device function |
| Groundwater Hydrology | Groundwater Gages | 5 Site gauges,<br>2 Reference Gauges | Annual | Data will be downloaded at each site visit. |
| Vegetation | CVS Level 2 | Vegetation plots will be placed on ~2% of the planted area (17 permanent, 10x10 meter plots; 3 random plots of equal size) | Years 1, 2, 3, 5 & 7 | Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols. GPS coordinates and orientation of random plots will be provided in the annual monitoring reports and plot locations will be depicted on the Current Condition Plan View maps. |
| Invasive and nuisance vegetation | Visual | | twice per year | Locations of exotic and nuisance vegetation and the occurrence of beaver dams and approximate inundation limits will be mapped |
| Project Boundary | Visual | | twice per year | Fence damage, vegetation damage, boundary encroachments, etc. will be mapped |
| Culverts and Crossings | Visual | | Twice per year | Blockages and/or erosion around culverts and crossings will be mapped and noted in monitoring reports. |

*Table 4. Project Attributes*

| Project Attribute Table | | | | |
|---|---|---|---|---|
| Project Name | | Owen Farms Mitigation Site | | |
| County | | Transylvania | | |
| Project Area (acres) | | 25 | | |
| Project Coordinates (latitude and longitude decimal degrees) | | 35.183902, -82.937970 | | |
| **Project Watershed Summary Information** | | | | |
| Physiographic Province | | Blue Ridge Mountains | | |
| River Basin | | French Broad | | |
| USGS Hydrologic Unit 8-digit | 06010105 | USGS Hydrologic Unit 14-digit | 06010105010020 | |
| DWR Sub-basin | | 0601010501 | | |
| Project Drainage Area (acres) | | 3,795 | | |
| Project Drainage Area Percentage of Impervious Area | | 2 | | |
| Land Use Classification | | Agricultural/Pasture | | |
| **Reach Summary Information** | | | | |
| **Parameters** | **WFFB** | **UT 4** | **UT 5** | **UT 6** |
| Pre-project length (feet) | 1,975 | 731 | 652 | 114 |
| Post-project (feet) | 1,799 | 809 | 827 | 114 |
| Valley confinement (Confined, moderately confined, unconfined) | Unconfined | Confined | Confined | Confined |
| Drainage area (acres) | 3,795 | 30.6 | 45.2 | 21.7 |
| Perennial, Intermittent, Ephemeral | Perennial | Perennial | Perennial | Perennial |
| NCDWR Water Quality Classification | B; Tr | B | B | B |
| Dominant Stream Classification (existing) | B4 | B4 | B4 | B4 |
| Dominant Stream Classification (proposed) | C4 | C4 | C4 | C4 |
| Dominant Evolutionary class (Simon) if applicable | | | | |
| **Reach Summary Information Continued** | | | | |
| **Parameters** | **UT 7** | **UT 8** | **UT 1** | **UT 2** |
| Pre-project length (feet) | 372 | 49 | 764 | 923 |
| Post-project (feet) | 417 | 137 | 764 | 923 |
| Valley confinement (Confined, moderately confined, unconfined) | Confined | Confined | Confined | Confined |
| Drainage area (acres) | 32.1 | 41 | 19.5 | 18.6 |
| Perennial, Intermittent, Ephemeral | Perennial | Perennial | Perennial | Perennial |
| NCDWR Water Quality Classification | B | B | B | B |
| Dominant Stream Classification (existing) | B4 | B4 | B4 | B4 |
| Dominant Stream Classification (proposed) | C4 | C4 | B4 | B4 |
| Dominant Evolutionary class (Simon) if applicable | | | | |
| **Reach Summary Information Continued** | | | | |
| **Parameters** | **UT 3** | | | |
| Pre-project length (feet) | 125 | | | |
| Post-project (feet) | 125 | | | |
| Valley confinement (Confined, moderately confined, unconfined) | Confined | | | |
| Drainage area (acres) | <1 | | | |
| Perennial, Intermittent, Ephemeral | Intermittent | | | |
| NCDWR Water Quality Classification | B | | | |
| Dominant Stream Classification (existing) | E4 | | | |
| Dominant Stream Classification (proposed) | E4 | | | |
| Dominant Evolutionary class (Simon) if applicable | | | | |
| **Wetland Summary Information** | | | | |
| **Parameters** | **Wetland Group 1 (W1-W9)** | **Wetland Group 2 (W3 & W5)** | **Wetland Group 3 (W3)** | |
| Pre-project (acres) | 1.54 | 0.35 | 0.97 | |
| Post-project (acres) | 1.54 | 0.35 | 0.97 | |
| Wetland Type (non-riparian, riparian) | Riparian Riverine | Riparian Riverine | Riparian Riverine | |
| Mapped Soil Series | Ela | Ela | Ela | |
| Soil Hydric Status | A7, F3, F6 | F3, F6 | F3, F6 | |
| **Regulatory Considerations** | | | | |
| **Parameters** | **Applicable?** | **Resolved?** | **Supporting Docs?** | |
| Water of the United States - Section 404 | Yes | Yes | PCN | |
| Water of the United States - Section 401 | Yes | Yes | PCN | |
| Endangered Species Act | Yes | Yes | CE | |
| Historic Preservation Act | Yes | Yes | CE | |
| Coastal Zone Management Act (CZMA or CAMA) | No | N/A | N/A | |
| Essential Fisheries Habitat | No | N/A | N/A | |

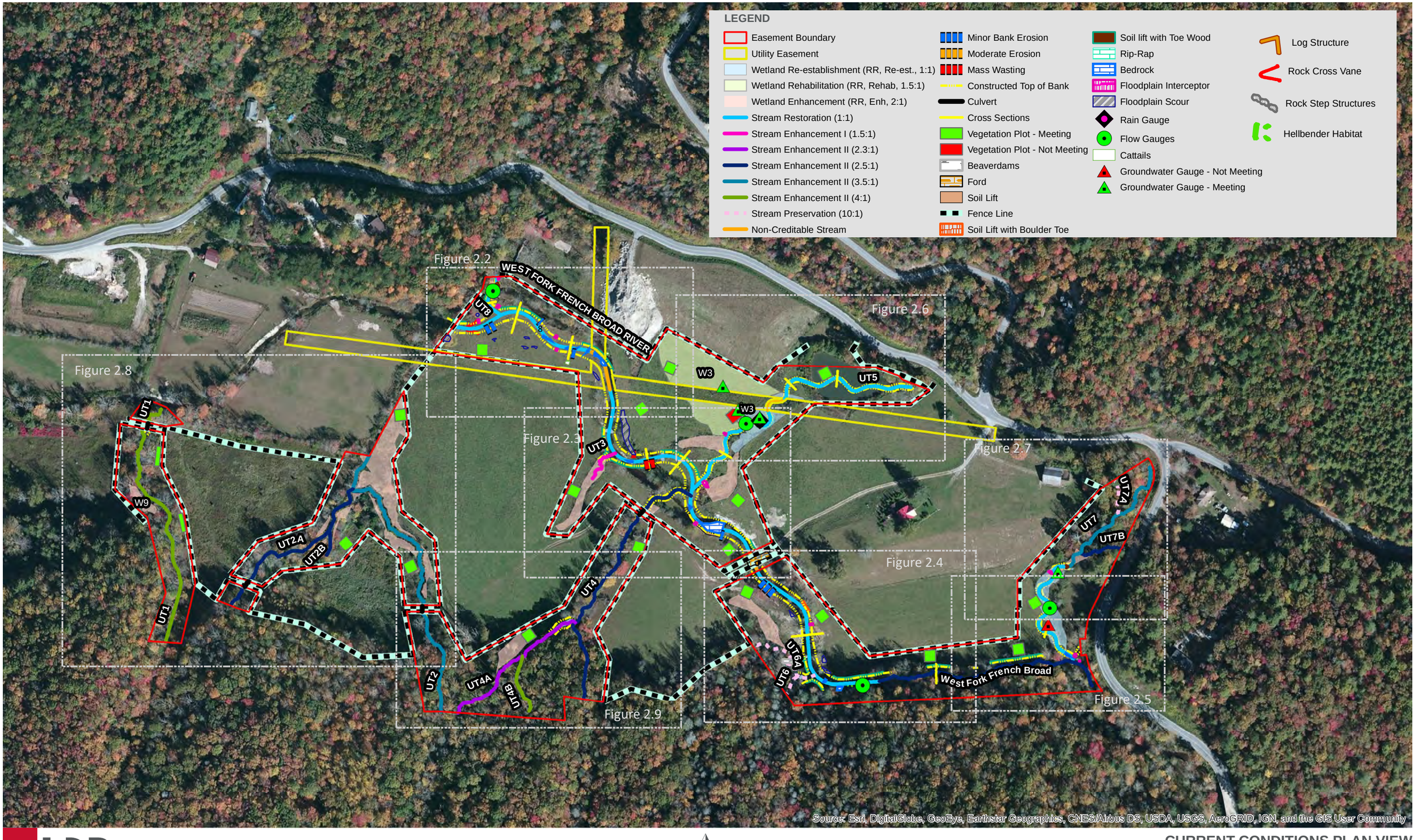
*Table 5. Project Activity and Reporting History*

| Activity or Report | Data Collection Complete | Completion or Delivery |
|---|---|---|
| Mitigation Plan | January 2020 | January 2020 |
| Final Design – Planting and Construction Plans | January 2020 | February 2020 |
| Construction | --- | October 7, 2020 |
| Repair Activities Complete | --- | January 15, 2021 |
| Bare Root and Livestake Plantings for Entire Project Area | --- | January 22, 2021 |
| Mitigation Plan/As-built (Year 0 Monitoring-Baseline) | February 25, 2021 | March 31, 2021 |
| Year 1 Monitoring | September 29, 2021 | January 24, 2022 |
| Year 2 Monitoring | | |
| Year 3 Monitoring | | |
| Year 4 Monitoring | | |
| Year 5 Monitoring | | |

*Table 6. Project Contacts Table*

| | |
|---|---|
| **Designer**<br><br><br>Primary project design POC | HDR Engineering<br>555 Fayetteville Street, Suite 900<br>Raleigh, North Carolina 27601-3034<br>Vickie Miller (919) 232-6600 |
| **Construction Contractor**<br><br><br>Construction Contractor POC | Land Mechanics Design, Inc.<br>126 Circle G Lane<br>Willow Spring, NC 27592<br>Lloyd Glover (919) 639-6132 |
| **Planting Contractor**<br><br><br>Planting Contractor POC | Land Mechanics Design, Inc.<br>126 Circle G Lane<br>Willow Spring, NC 27592<br>Lloyd Glover (919) 639-6132 |
| **Monitoring Performers** | Land Management Group, Inc<br>3101 Poplarwood Court<br>Raleigh, North Carolina 27604 |
| Stream Monitoring POC | Land Management Group, Inc<br>3101 Poplarwood Court<br>Raleigh, North Carolina 27604<br>Alex DiGeronimo (843) 830-1536 |
| Vegetation Monitoring POC | Land Management Group, Inc<br>3101 Poplarwood Court<br>Raleigh, North Carolina 27604<br>Alex DiGeronimo (843) 830-1536 |

# Appendix B – Visual Assessment Data

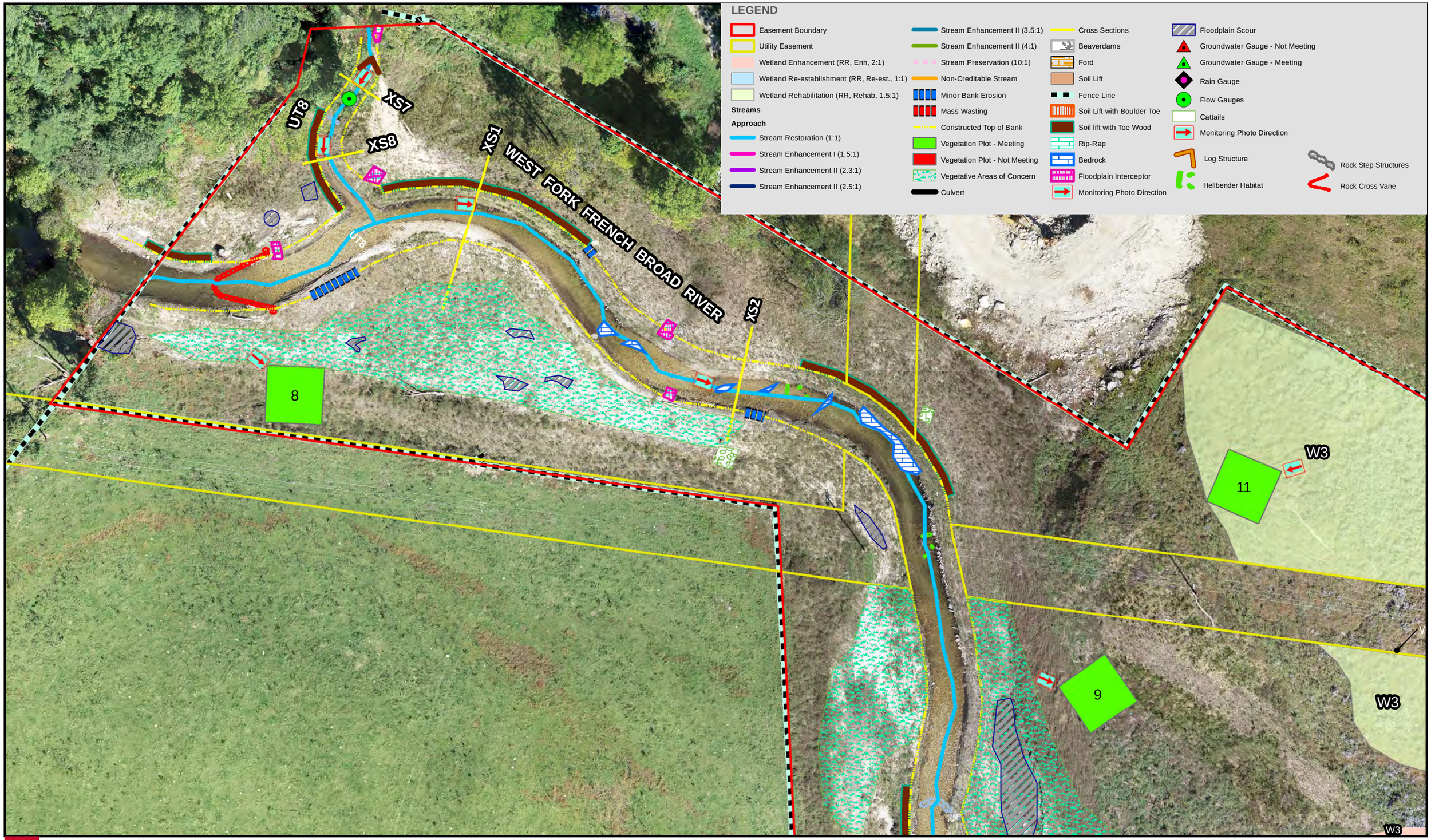



0 Feet 1,800

# CURRENT CONDITIONS PLAN VIEW

## OWEN FARMS MITIGATION SITE

FIGURE 2.1




## LEGEND

- Easement Boundary
- Utility Easement
- Wetland Enhancement (RR, Enh, 2:1)
- Wetland Re-establishment (RR, Re-est., 1:1)
- Wetland Rehabilitation (RR, Rehab, 1.5:1)

**Streams**

**Approach**

- Stream Restoration (1:1)
- Stream Enhancement I (1.5:1)
- Stream Enhancement II (2.3:1)
- Stream Enhancement II (2.5:1)
- Stream Enhancement II (3.5:1)
- Stream Enhancement II (4:1)
- Stream Preservation (10:1)
- Non-Creditable Stream
- Minor Bank Erosion
- Mass Wasting
- Constructed Top of Bank
- Vegetation Plot - Meeting
- Vegetation Plot - Not Meeting
- Vegetative Areas of Concern
- Culvert
- Cross Sections
- Beaverdams
- Ford
- Soil Lift
- Fence Line
- Soil Lift with Boulder Toe
- Soil lift with Toe Wood
- Rip-Rap
- Bedrock
- Floodplain Interceptor
- Monitoring Photo Direction
- Floodplain Scour
- Groundwater Gauge - Not Meeting
- Groundwater Gauge - Meeting
- Rain Gauge
- Flow Gauges
- Cattails
- Monitoring Photo Direction
- Log Structure
- Hellbender Habitat
- Rock Step Structures
- Rock Cross Vane

0 Feet 375

# CURRENT CONDITIONS PLAN VIEW

## OWEN FARMS MITIGATION SITE

FIGURE 2.2

WEST FORK FRENCH BROAD RIVER

UT3

UT4

UT5

XS3

XS4

XS11

XS12

W2

W3

W6

W6A

9

10

12

14

16

7

## LEGEND

- Easement Boundary
- Utility Easement
- Wetland Enhancement (RR, Enh, 2:1)
- Wetland Re-establishment (RR, Re-est., 1:1)
- Wetland Rehabilitation (RR, Rehab, 1.5:1)

### Streams

**Approach**

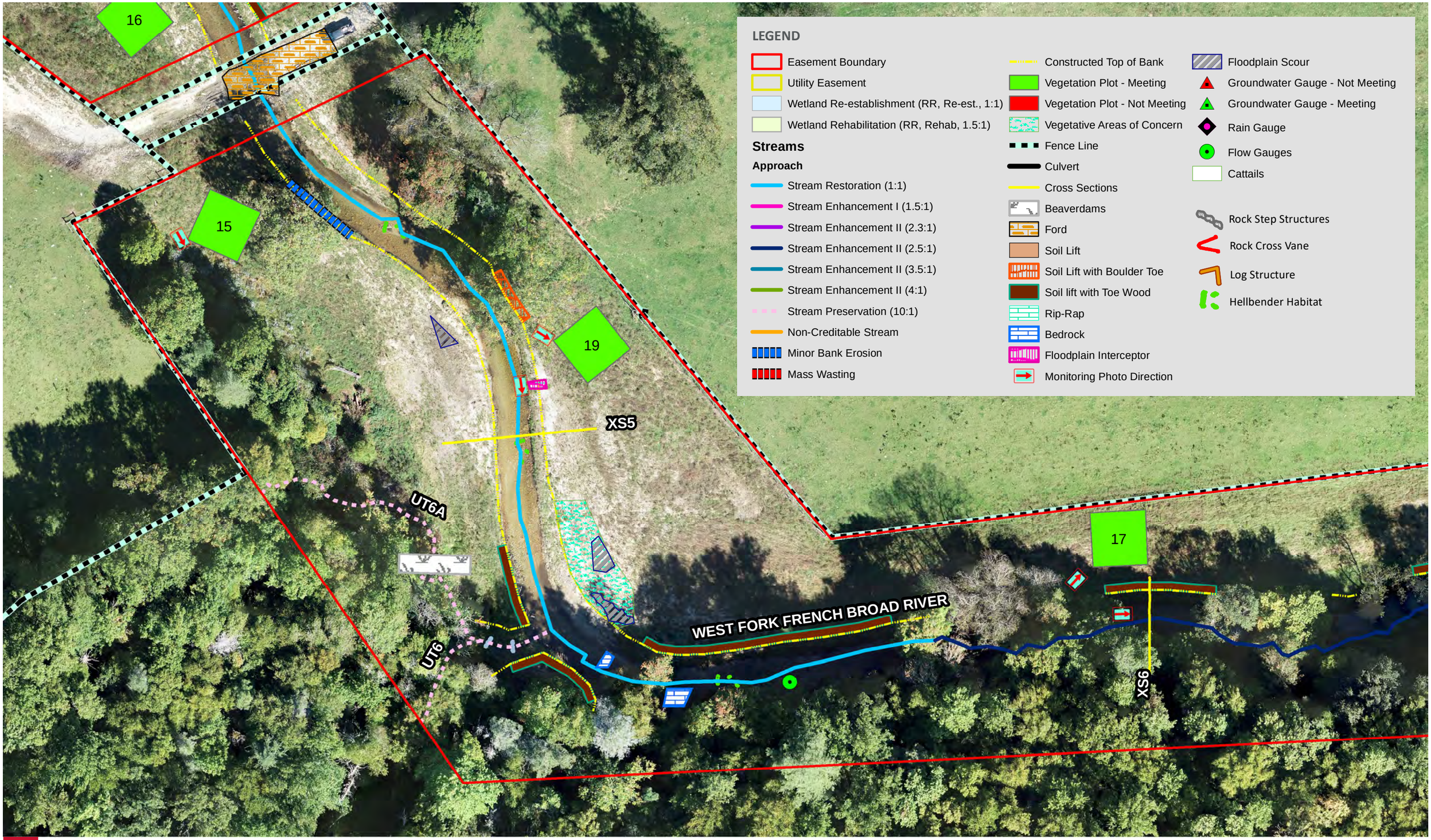
- Stream Restoration (1:1)
- Stream Enhancement I (1.5:1)
- Stream Enhancement II (2.3:1)
- Stream Enhancement II (2.5:1)
- Stream Enhancement II (3.5:1)
- Stream Enhancement II (4:1)
- Stream Preservation (10:1)
- Non-Creditable Stream
- Minor Bank Erosion
- Groundwater Gauge - Not Meeting
- Groundwater Gauge - Meeting
- Mass Wasting
- Constructed Top of Bank
- Culvert
- Vegetation Plot - Meeting
- Vegetation Plot - Not Meeting
- Vegetative_Areas_of_Concern
- Cross Sections
- Fence Line
- Beaverdams
- Ford
- Soil Lift
- Soil Lift with Boulder Toe
- Soil lift with Toe Wood
- Rip-Rap
- Bedrock
- Floodplain Interceptor
- Monitoring Photo Direction
- Floodplain Scour
- Rain Gauge
- Flow Gauges
- Cattails
- Log Structure
- Hellbender Habitat
- Rock Step Structures
- Rock Cross Vane

0 Feet 370

# CURRENT CONDITIONS PLAN VIEW

## OWEN FARMS MITIGATION SITE

FIGURE 2.3




## LEGEND

- Easement Boundary
- Utility Easement
- Wetland Re-establishment (RR, Re-est., 1:1)
- Wetland Rehabilitation (RR, Rehab, 1.5:1)

**Streams**

**Approach**

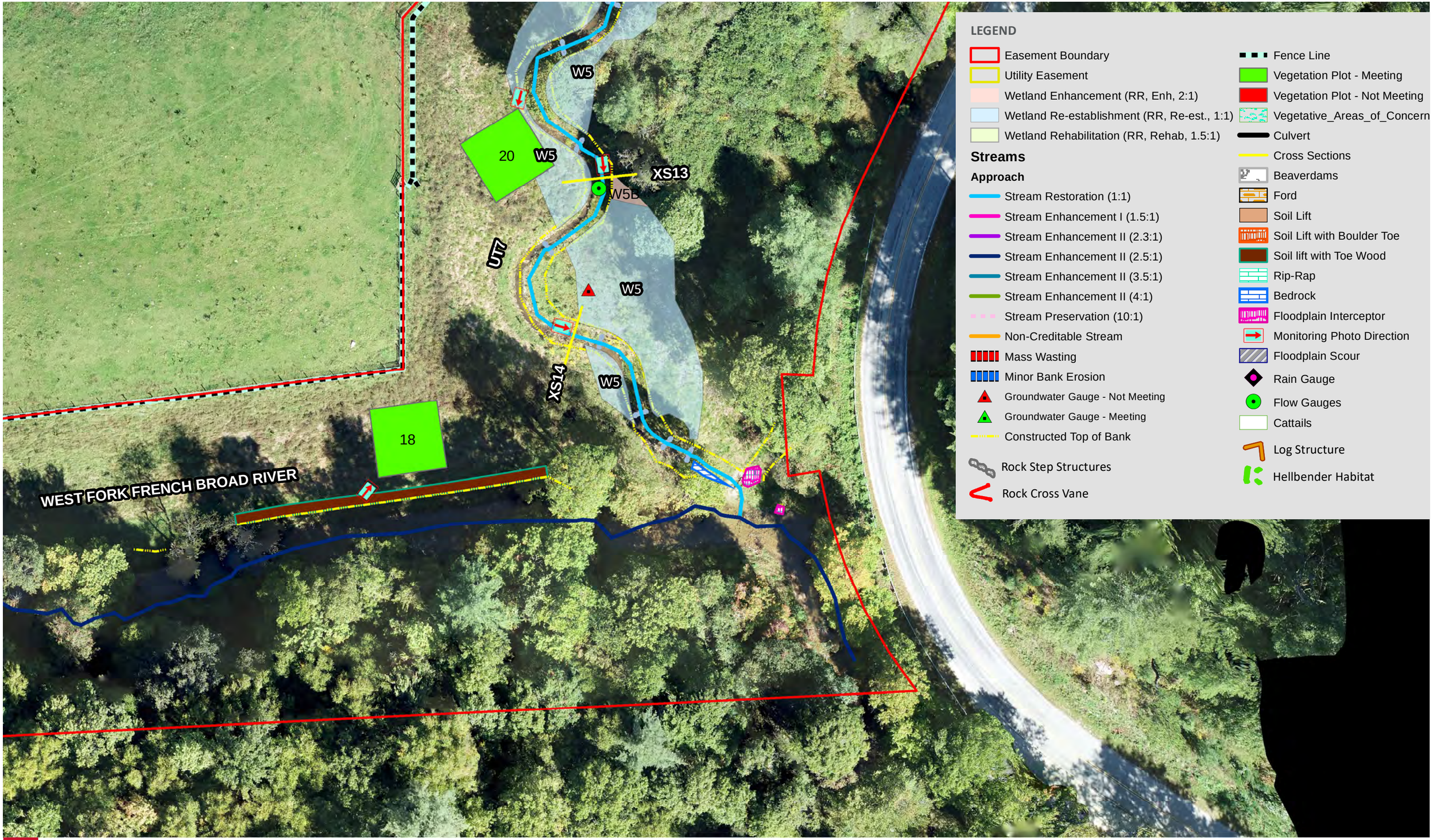
- Stream Restoration (1:1)
- Stream Enhancement I (1.5:1)
- Stream Enhancement II (2.3:1)
- Stream Enhancement II (2.5:1)
- Stream Enhancement II (3.5:1)
- Stream Enhancement II (4:1)
- Stream Preservation (10:1)
- Non-Creditable Stream
- Minor Bank Erosion
- Mass Wasting
- Constructed Top of Bank
- Vegetation Plot - Meeting
- Vegetation Plot - Not Meeting
- Vegetative Areas of Concern
- Fence Line
- Culvert
- Cross Sections
- Beaverdams
- Ford
- Soil Lift
- Soil Lift with Boulder Toe
- Soil lift with Toe Wood
- Rip-Rap
- Bedrock
- Floodplain Interceptor
- Monitoring Photo Direction
- Floodplain Scour
- Groundwater Gauge - Not Meeting
- Groundwater Gauge - Meeting
- Rain Gauge
- Flow Gauges
- Cattails
- Rock Step Structures
- Rock Cross Vane
- Log Structure
- Hellbender Habitat

0 Feet 390

# CURRENT CONDITIONS PLAN VIEW

## OWEN FARMS MITIGATION SITE

FIGURE 2.4




LEGEND

- Easement Boundary
- Utility Easement
- Wetland Enhancement (RR, Enh, 2:1)
- Wetland Re-establishment (RR, Re-est., 1:1)
- Wetland Rehabilitation (RR, Rehab, 1.5:1)

**Streams**

**Approach**

- Stream Restoration (1:1)
- Stream Enhancement I (1.5:1)
- Stream Enhancement II (2.3:1)
- Stream Enhancement II (2.5:1)
- Stream Enhancement II (3.5:1)
- Stream Enhancement II (4:1)
- Stream Preservation (10:1)
- Non-Creditable Stream
- Mass Wasting
- Minor Bank Erosion
- Groundwater Gauge - Not Meeting
- Groundwater Gauge - Meeting
- Constructed Top of Bank
- Rock Step Structures
- Rock Cross Vane
- Fence Line
- Vegetation Plot - Meeting
- Vegetation Plot - Not Meeting
- Vegetative_Areas_of_Concern
- Culvert
- Cross Sections
- Beaverdams
- Ford
- Soil Lift
- Soil Lift with Boulder Toe
- Soil lift with Toe Wood
- Rip-Rap
- Bedrock
- Floodplain Interceptor
- Monitoring Photo Direction
- Floodplain Scour
- Rain Gauge
- Flow Gauges
- Cattails
- Log Structure
- Hellbender Habitat

0 Feet 310

# CURRENT CONDITIONS PLAN VIEW

## OWEN FARMS MITIGATION SITE

FIGURE 2.5

## LEGEND

- Easement Boundary
- Utility Easement
- Wetland Enhancement (RR, Enh, 2:1)
- Wetland Re-establishment (RR, Re-est., 1:1)
- Wetland Rehabilitation (RR, Rehab, 1.5:1)

**Streams**

**Approach**

- Stream Restoration (1:1)
- Stream Enhancement I (1.5:1)
- Stream Enhancement II (2.3:1)
- Stream Enhancement II (2.5:1)
- Stream Enhancement II (3.5:1)
- Stream Enhancement II (4:1)
- Stream Preservation (10:1)
- Non-Creditable Stream
- Minor Bank Erosion
- Mass Wasting
- Constructed Top of Bank
- Culvert
- Vegetation Plot - Meeting
- Vegetation Plot - Not Meeting
- Vegetative Areas of Concern
- Cross Sections
- Beaverdams
- Fence Line
- Ford
- Soil Lift
- Soil Lift with Boulder Toe
- Soil lift with Toe Wood
- Rip-Rap
- Bedrock
- Floodplain Interceptor
- Monitoring Photo Direction
- Floodplain Scour
- Groundwater Gauge - Not Meeting
- Groundwater Gauge - Meeting
- Rain Gauge
- Flow Gauges
- Cattails
- Rock Step Structures
- Rock Cross Vane
- Log Structure
- Hellbender Habitat

W3

13

XS10

UT5

XS9

W3

W3

12

W3

XS11

W3

W3

XS4

XS12

W3

0 Feet 375

# CURRENT CONDITIONS PLAN VIEW

## OWEN FARMS MITIGATION SITE

FIGURE 2.6

LEGEND

- Easement Boundary
- Utility Easement
- Wetland Enhancement (RR, Enh, 2:1)
- Wetland Re-establishment (RR, Re-est., 1:1)
- Wetland Rehabilitation (RR, Rehab, 1.5:1)

**Streams**

**Approach**

- Stream Restoration (1:1)
- Stream Enhancement I (1.5:1)
- Stream Enhancement II (2.3:1)
- Stream Enhancement II (2.5:1)
- Stream Enhancement II (3.5:1)
- Stream Enhancement II (4:1)
- Stream Preservation (10:1)
- Non-Creditable Stream

**Groundwater Gauges**

- Groundwater Gauge - Not Meeting
- Groundwater Gauge - Meeting
- Minor Bank Erosion
- Moderate Erosion
- Mass Wasting
- Vegetation Plot - Meeting
- Vegetation Plot - Not Meeting
- Constructed Top of Bank
- Fence Line
- Culvert
- Cross Sections
- Beaverdams
- Ford
- Soil Lift
- Soil Lift with Boulder Toe
- Soil lift with Toe Wood
- Rip-Rap
- Bedrock
- Floodplain Interceptor
- Monitoring Photo Direction
- Floodplain Scour
- Rain Gauge
- Flow Gauges
- Cattails
- Rock Step Structures
- Rock Cross Vane
- Log Structure
- Hellbender Habitat


0 Feet 410

# CURRENT CONDITION PLAN VIEW

## OWEN FARMS MITIGATION SITE

FIGURE 2.7

LEGEND

- Easement Boundary
- Utility Easement
- Wetland Enhancement (RR, Enh, 2:1)
- Wetland Re-establishment (RR, Re-est., 1:1)
- Wetland Rehabilitation (RR, Rehab, 1.5:1)

**Streams**

**Approach**

- Stream Restoration (1:1)
- Stream Enhancement I (1.5:1)
- Stream Enhancement II (2.3:1)
- Stream Enhancement II (2.5:1)
- Stream Enhancement II (3.5:1)
- Stream Enhancement II (4:1)
- Stream Preservation (10:1)
- Non-Creditable Stream
- Groundwater Gauge - Not Meeting
- Groundwater Gauge - Meeting
- Minor Bank Erosion
- Vegetation Plot - Meeting
- Vegetation Plot - Not Meeting
- Vegetative Areas of Concern
- Mass Wasting
- Constructed Top of Bank
- Fence Line
- Culvert
- Cross Sections
- Beaverdams
- Ford
- Soil Lift
- Soil Lift with Boulder Toe
- Soil lift with Toe Wood
- Rip-Rap
- Bedrock
- Floodplain Interceptor
- Floodplain Scour
- Monitoring Photo Direction
- Rain Gauge
- Flow Gauges
- Cattails
- Rock Step Structures
- Rock Cross Vane
- Log Structure
- Hellbender Habitat

UT1 UT1 1 W9 2 UT1 UT2 W1 3 W1 W1 W1 W1 UT2A W1 UT2B 4 W1 5 W1 W1 UT2 UT2A

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 Feet 630

# CURRENT CONDITIONS PLAN VIEW

## OWEN FARMS MITIGATION SITE

FIGURE 2.8


LEGEND

- Easement Boundary
- Utility Easement
- Wetland Enhancement (RR, Enh, 2:1)
- Wetland Re-establishment (RR, Re-est., 1:1)
- Wetland Rehabilitation (RR, Rehab, 1.5:1)

**Streams**

**Approach**

- Stream Restoration (1:1)
- Stream Enhancement I (1.5:1)
- Stream Enhancement II (2.3:1)
- Stream Enhancement II (2.5:1)
- Stream Enhancement II (3.5:1)
- Stream Enhancement II (4:1)
- Stream Preservation (10:1)
- Non-Creditable Stream
- Minor Bank Erosion
- Groundwater Gauge - Not Meeting
- Groundwater Gauge - Meeting
- Mass Wasting
- Constructed Top of Bank
- Fence Line
- Culvert
- Vegetation Plot - Meeting
- Vegetation Plot - Not Meeting
- Vegetative Areas of Concern
- Cross Sections
- Beaverdams
- Ford
- Soil Lift
- Soil Lift with Boulder Toe
- Soil lift with Toe Wood
- Rip-Rap
- Bedrock
- Floodplain Interceptor
- Monitoring Photo Direction
- Floodplain Scour
- Rain Gauge
- Flow Gauges
- Cattails
- Rock Step Structures
- Rock Cross Vane
- Log Structure
- Hellbender Habitat

0 Feet 500

# CURRENT CONDITIONS PLAN VIEW

## OWEN FARMS MITIGATION SITE

FIGURE 2.9

*Table 7.1 Visual Stream Stability Assessment*

| | |
|---|---|
| Reach | WFFB |
| Assessed Stream Length | 1799 |
| Assessed Bank Length | 3598 |
| Date of Assessment | 9/27/2021 |

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Bank** | **Surface Scour/Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour | | | 106 | 97% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse | | | 48 | 99% |
| **Totals** | | | | | 154 | 96% |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 16 | 16 | | 100% |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document) | 15 | 16 | | 94% |

*Table 7.2 Visual Stream Stability Assessment*

| | |
|---|---|
| Reach | UT4 |
| Assessed Stream Length | 809 |
| Assessed Bank Length | 1618 |
| Date of Assessment | 9/27/2021 |

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Bank** | **Surface Scour/Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse | | | 0 | 100% |
| **Totals** | | | | | 0 | 100% |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 14 | 14 | | 100% |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document) | 14 | 14 | | 100% |

*Table 7.3 Visual Stream Stability Assessment*

| | |
|---|---|
| Reach | UT6 |
| Assessed Stream Length | 114 |
| Assessed Bank Length | 228 |
| Date of Assessment | 9/27/2021 |

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Bank** | **Surface Scour/Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse | | | 0 | 100% |
| **Totals** | | | | | 0 | 100% |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 2 | 2 | | 100% |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document) | 2 | 2 | | 100% |

*Table 7.4 Visual Stream Stability Assessment*

| | |
|---|---|
| Reach | UT5 |
| Assessed Stream Length | 827 |
| Assessed Bank Length | 1654 |
| Date of Assessment | 9/27/2021 |

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Bank** | **Surface Scour/Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse | | | 0 | 100% |
| **Totals** | | | | | 0 | 100% |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 23 | 23 | | 100% |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document) | 23 | 23 | | 100% |

*Table 7.5 Visual Stream Stability Assessment*

| | |
|---|---|
| Reach | UT7 |
| Assessed Stream Length | 417 |
| Assessed Bank Length | 834 |
| Date of Assessment | 9/27/2021 |

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Bank** | **Surface Scour/Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse | | | 0 | 100% |
| **Totals** | | | | | 0 | 100% |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 10 | 10 | | 100% |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document) | 10 | 10 | | 100% |

*Table 7.6. Visual Stream Stability Assessment*

| | |
|---|---|
| Reach | UT8 |
| Assessed Stream Length | 137 |
| Assessed Bank Length | 274 |
| Date of Assessment | 9/27/2021 |

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Bank** | **Surface Scour/Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse | | | 0 | 100% |
| **Totals** | | | | | 0 | 100% |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 3 | 3 | | 100% |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document) | 3 | 3 | | 100% |

*Table 8. Visual Vegetation Condition Assessment*

Planted acreage 14.26

Date of Assessment 9/27/2021

| Vegetation Category | Definitions | Mapping Threshold | Combined Acreage | % of Planted Acreage |
|---|---|---|---|---|
| Bare Areas | Very limited cover of both woody and herbaceous material. | 0.10 acres | 0.34 | 2.4% |
| Low Stem Density Areas | Woody stem densities clearly below target levels based on current MY stem count criteria. | 0.10 acres | 0.02 | 0.1% |
| | | **Total** | 0.36 | 2.5% |
| Areas of Poor Growth Rates | Planted areas where average height is not meeting current MY Performance Standard. | 0.10 acres | 0.40 | 2.8% |
| | | **Cumulative Total** | 0.76 | 5.3% |

**Easement Acreage** **25.0**

| Vegetation Category | Definitions | Mapping Threshold | Combined Acreage | % of Easement Acreage |
|---|---|---|---|---|
| Invasive Areas of Concern | Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary. | 0.10 acres | 0.00 | 0.0% |
| | | | | |
| Easement Encroachment Areas | Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area. | 0.10 acres | 0 Encroachments noted | |

# Appendix C – Vegetation Plot Data

## *Table 9. Vegetation Plot Data*

| | |
|---|---|
| Planted Acreage | 14.26 |
| Date of Initial Plant | 2021-01-22 |
| Date(s) of Supplemental Plant | #N/A |
| (s) Date(s) Mowing | #N/A |
| Date of Current Survey | 2021-09-27 |
| Plot size (ACRES) | 0.0247 |

| | Scientific Name | Common Name | Tree/Shrub | Indicator Status | Veg Plot 1 F | | Veg Plot 2 F | | Veg Plot 3 F | | Veg Plot 4 F | | Veg Plot 5 F | | Veg Plot 6 F | | Veg Plot 7 F | | Veg Plot 8 F | | Veg Plot 9 F | | Veg Plot 10 F | | Veg Plot 12 F | | Veg Plot 13 F | | Veg Plot 14 F | | Veg Plot 15 F | | Veg Plot 17 F | | Veg Plot 18 F | | Veg Plot 20 F | | Veg Plot 11 R | Veg Plot 16 R | Veg Plot 19 R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Total | Total | Total |
| Species Included in Approved Mitigation Plan | *Alnus serrulata* | hazel alder | Tree | OBL | | | | | | 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | | |
| | *Aronia arbutifolia* | red chokeberry | Shrub | FACW | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | | | | | | | | 1 | | |
| | *Betula alleghaniensis* | yellow birch | Tree | FAC | 1 | 1 | | | 1 | 1 | 1 | 1 | | | | | 1 | 1 | | | | | 1 | 1 | | | 4 | 4 | 1 | 1 | | | | | | | | | | |
| | *Betula nigra* | river birch | Tree | FACW | 4 | 4 | 2 | 2 | 1 | 1 | | | | | | | 1 | 1 | 6 | 6 | 3 | 3 | | | | | 6 | 6 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | | | 1 | | |
| | *Carya cordiformis* | bitternut hickory | Tree | FACU | | | | | | | | | | | | | | | 2 | 2 | 4 | 4 | | | | | | | 4 | 4 | | | 2 | 2 | | | | | 4 | 9 |
| | *Carya ovata* | shagbark hickory | Tree | FACU | | 1 | | | | | 1 | 1 | | | | | | | 1 | 1 | 2 | 2 | | | | | | | 1 | 1 | 5 | 5 | | | 1 | 1 | | | | |
| | *Cephalanthus occidentalis* | common buttonbush | Shrub | OBL | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | | | | | | | | 1 | | |
| | *Cornus amomum* | silky dogwood | Shrub | FACW | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | | | | 3 | | |
| | *Cornus florida* | flowering dogwood | Tree | FACU | | | | | | | | | | | | | | | 2 | 2 | 1 | 1 | | | | | | | | | | | 4 | 4 | 1 | 1 | | | | | |
| | *Hamamelis virginiana* | American witchhaze | Tree | FACU | 1 | 1 | 3 | 3 | | | 3 | 3 | 1 | 1 | 4 | 4 | 1 | 1 | | | | | 3 | 3 | | | | 1 | | | | | | | | | | | | | |
| | *Lindera benzoin* | northern spicebush | Tree | FAC | | | | | | | | | | | | | | | | | | | | | 3 | 3 | | | | | | | | | | | | | | | |
| | *Liriodendron tulipifera* | tuliptree | Tree | FACU | 2 | 2 | 3 | 4 | 2 | 2 | 4 | 4 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | | | 1 | 1 | 4 | 4 | 1 | 1 | 2 | 2 | 5 | 5 | | | 1 | 3 | |
| | *Platanus occidentalis* | American sycamore | Tree | FACW | 3 | 3 | 1 | 1 | 3 | 3 | | | 6 | 6 | 5 | 5 | 4 | 4 | 5 | 5 | 3 | 3 | 2 | 2 | | | | | 1 | 1 | 6 | 6 | 2 | 2 | 5 | 5 | 5 | 5 | 1 | 7 | 3 |
| | *Quercus alba* | white oak | Tree | FACU | 1 | 1 | 1 | 1 | 4 | 4 | 2 | 2 | 5 | 5 | 6 | 6 | 3 | 3 | | | | | 7 | 7 | | | 5 | 5 | | | | | | | | | 5 | 5 | | | |
| | *Sambucus canadensis* | American black elderberry | Tree | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | | | | | | | | 1 | | |
| | *Ulmus americana* | American elm | Tree | FACW | | | 3 | 3 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | 2 | 2 | | | | | 1 | 1 | | | |
| Sum | Performance Standard | | | | 12 | 13 | 13 | 14 | 12 | 26 | 11 | 11 | 15 | 15 | 16 | 16 | 11 | 11 | 17 | 17 | 15 | 15 | 15 | 15 | 6 | 6 | 16 | 17 | 14 | 14 | 17 | 17 | 13 | 13 | 14 | 14 | 11 | 11 | 11 | 13 | 15 |
| Post Mitigation Plan Species | *Acer rubrum* | red maple | Tree | FAC | | *1* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | *Ilex opaca* | American holly | Tree | FACU | | *1* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sum | Proposed Standard | | | | 12 | 13 | 13 | 14 | 12 | 26 | 11 | 11 | 15 | 15 | 16 | 16 | 11 | 11 | 17 | 17 | 15 | 15 | 15 | 15 | 6 | 6 | 16 | 17 | 14 | 14 | 17 | 17 | 13 | 13 | 14 | 14 | 11 | 11 | 11 | 13 | 15 |
| Invasives | *Rosa multiflora* | multiflora rose | Shrub | FACU | | | | *1* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mitigation Plan Performance Standard | Current Year Stem Count | | | | | 13 | | 14 | | 26 | | 11 | | 15 | | 16 | | 11 | | 17 | | 15 | | 15 | | 6 | | 17 | | 14 | | 17 | | 13 | | 14 | | 11 | 11 | 13 | 15 |
| | Stems/Acre | | | | | 526 | | 567 | | 1052 | | 445 | | 607 | | 648 | | 445 | | 688 | | 607 | | 607 | | 243 | | 688 | | 567 | | 688 | | 526 | | 567 | | 445 | 445 | 526 | 607 |
| | Species Count | | | | | 7 | | 6 | | 7 | | 5 | | 4 | | 4 | | 6 | | 6 | | 6 | | 5 | | 4 | | 5 | | 7 | | 5 | | 5 | | 5 | | 3 | 6 | 4 | 3 |
| | Dominant Species Composition (%) | | | | | 27 | | 27 | | 54 | | 36 | | 40 | | 38 | | 36 | | 35 | | 27 | | 47 | | 50 | | 35 | | 29 | | 35 | | 31 | | 36 | | 45 | 36 | 54 | 60 |
| | Average Plot Height (ft.) | | | | | 2 | | 1 | | 2 | | 3 | | 3 | | 2 | | 3 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 1 | | 1 | | 2 | 3 | 2 | 3 |
| | % Invasives | | | | | 0 | | 7 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | 0 | 0 | 0 |
| Post Mitigation Plan Performance Standard | Current Year Stem Count | | | | | 13 | | 14 | | 26 | | 11 | | 15 | | 16 | | 11 | | 17 | | 15 | | 15 | | 6 | | 17 | | 14 | | 17 | | 13 | | 14 | | 11 | 11 | 13 | 15 |
| | Stems/Acre | | | | | 526 | | 567 | | 1052 | | 445 | | 607 | | 648 | | 445 | | 688 | | 607 | | 607 | | 243 | | 688 | | 567 | | 688 | | 526 | | 567 | | 445 | 445 | 526 | 607 |
| | Species Count | | | | | 7 | | 6 | | 7 | | 5 | | 4 | | 4 | | 6 | | 6 | | 6 | | 5 | | 4 | | 5 | | 7 | | 5 | | 5 | | 5 | | 3 | 6 | 4 | 3 |
| | Dominant Species Composition (%) | | | | | 27 | | 27 | | 54 | | 36 | | 40 | | 38 | | 36 | | 35 | | 27 | | 47 | | 50 | | 35 | | 29 | | 35 | | 31 | | 36 | | 45 | 36 | 54 | 60 |
| | Average Plot Height (ft.) | | | | | 2 | | 1 | | 2 | | 3 | | 3 | | 2 | | 3 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 1 | | 1 | | 2 | 3 | 2 | 3 |
| | % Invasives | | | | | 0 | | 7 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | 0 | 0 | 0 |

Meeting Success Criteria
Not Meeting Success Criteria

## *Table 10 Vegetation Performance Standards Summary Table*

| Vegetation Performance Standards Summary Table | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Veg Plot 1 F | | | | Veg Plot 2 F | | | | Veg Plot 3 F | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | | | | | | | | | | | | |
| Monitoring Year 1 | 526 | 2 | 7 | 0 | 567 | 1 | 6 | 7 | 1052 | 2 | 7 | 0 |
| Monitoring Year 0 | 486 | 2 | 6 | 0 | 526 | 2 | 6 | 0 | 445 | 2 | 5 | 0 |
| | Veg Plot 4 F | | | | Veg Plot 5 F | | | | Veg Plot 6 F | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | | | | | | | | | | | | |
| Monitoring Year 1 | 445 | 3 | 5 | 0 | 607 | 3 | 4 | 0 | 648 | 2 | 4 | 0 |
| Monitoring Year 0 | 445 | 2 | 5 | 0 | 607 | 2 | 4 | 0 | 648 | 2 | 4 | 0 |
| | Veg Plot 7 F | | | | Veg Plot 8 F | | | | Veg Plot 9 F | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | | | | | | | | | | | | |
| Monitoring Year 1 | 445 | 3 | 6 | 0 | 688 | 2 | 6 | 0 | 607 | 2 | 6 | 0 |
| Monitoring Year 0 | 445 | 2 | 6 | 0 | 648 | 2 | 6 | 0 | 607 | 2 | 6 | 0 |
| | Veg Plot 10 F | | | | Veg Plot 12 F | | | | Veg Plot 13 F | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | | | | | | | | | | | | |
| Monitoring Year 1 | 607 | 2 | 5 | 0 | 243 | 2 | 4 | 0 | 688 | 2 | 5 | 0 |
| Monitoring Year 0 | 607 | 2 | 5 | 0 | 243 | 2 | 4 | 0 | 648 | 2 | 4 | 0 |
| | Veg Plot 14 F | | | | Veg Plot 15 F | | | | Veg Plot 17 F | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | | | | | | | | | | | | |
| Monitoring Year 1 | 567 | 2 | 7 | 0 | 688 | 2 | 5 | 0 | 526 | 1 | 5 | 0 |
| Monitoring Year 0 | 567 | 2 | 7 | 0 | 688 | 2 | 5 | 0 | 526 | 2 | 5 | 0 |
| | Veg Plot 18 F | | | | Veg Plot 20 F | | | | Veg Plot Group 1 R | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | | | | | | | | | | | | |
| Monitoring Year 1 | 567 | 1 | 5 | 0 | 445 | 2 | 3 | 0 | 445 | 3 | 6 | 0 |
| Monitoring Year 0 | 567 | 2 | 5 | 0 | 445 | 2 | 3 | 0 | 526 | 1.84 | 5 | 0 |
| | Veg Plot Group 2 R | | | | Veg Plot Group 3 R | | | | | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | | | | |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | | | | | | | | | | | | |
| Monitoring Year 1 | 526 | 2 | 4 | 0 | 607 | 3 | 3 | 0 | | | | |
| Monitoring Year 0 | 729 | 2.05 | 5 | 0 | 648 | 1.99 | 4 | 0 | | | | |

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

Meeting Success Criteria
Not Meeting Success Criteria

*Figures 3.1 – 3.43: Vegetation Plot Photographs and Site Aerial Photographs*

**3.1 Vegetation Plot 1, 9/27/2021**

**3.2 Vegetation Plot 2, 9/27/2021**

**3.3 Vegetation Plot 3, 9/27/2021**

**3.4 Vegetation Plot 4, 9/27/2021**

**3.5 Vegetation Plot 5, 9/27/2021**

**3.6 Vegetation Plot 6, 9/27/2021**

*Figures 3.1 – 3.43: Vegetation Plot Photographs and Site Aerial Photographs*

**3.7 Vegetation Plot 7, 9/29/2021**

**3.8 Vegetation Plot 8, 9/28/2021**

**3.9 Vegetation Plot 9, 9/28/2021**

**3.10 Vegetation Plot 10, 9/28/2021**

**3.11 Vegetation Plot 11, 9/28/2021**

**3.12 Vegetation Plot 12, 9/28/2021**

*Figures 3.1 – 3.43: Vegetation Plot Photographs and Site Aerial Photographs*

**3.13 Vegetation Plot 13, 9/28/2021**

**3.14 Vegetation Plot 14, 9/28/2021**

**3.15 Vegetation Plot 15, 9/27/2021**

**3.16 Vegetation Plot 16, 9/28/2021**

**3.17 Vegetation Plot 17, 9/29/2021**

**3.18 Vegetation Plot 18, 9/29/2021**

*Figures 3.1 – 3.43: Vegetation Plot Photographs and Site Aerial Photographs*

**3.19 Vegetation Plot 19, 9/29/2021**

**3.20 Vegetation Plot 20, 9/29/2021**

**3.21 Aerial overview looking downstream West Fork French Broad River, 9/28/2021**

**3.22 Aerial overview of UT 8 and West Fork French Broad River confluence, 9/28/2021**

**3.23 Aerial overview of UT3, UT4 and UT3 West Fork French Broad confluence, 9/28/2021**

**3.24 Aerial overview of UT3, looking from left bank, 9/28/2021**

*Figures 3.1 – 3.43: Vegetation Plot Photographs and Site Aerial Photographs*

**3.25 Aerial overview of UT3, looking downstream, 9/28/2021**

**3.26 Aerial overview of UT3, looking upstream, 9/28/2021**

**3.27 Aerial overview of damage along left bank of West Fork French Broad River, 9/28/2021**

**3.28 Aerial overview of UT7, looking downstream, 9/28/2021**

**3.29 Storm damage to right bank of West Fork French Broad River above XS 4, 9/27/2021**

**3.30 Storm damage to right bank of West Fork French Broad River at above XS3, 9/27/2021**

*Figures 3.1 – 3.43: Vegetation Plot Photographs and Site Aerial Photographs*

**3.31 Scour hole at Station 10+00, 9/27/2021**

**3.32 Low bank erosion at station 14+00, 9/27/2021**

**3.33 Right floodplain erosion at Station 15+20, 9/27/2021**

**3.34 Severe floodplain erosion between Station 16+25 and 18+10, 9/27/201**

**3.35 Severe erosion at Station 18+80 9/27/2021**

**3.36 Toe scour at station 24+30, 9/21/2021**

*Figures 3.1 – 3.43: Vegetation Plot Photographs and Site Aerial Photographs*

**3.31 Scour hole at Station 10+00, 9/27/2021**

**3.32 Low bank erosion at station 14+00, 9/27/2021**

**3.33 Right floodplain erosion at Station 15+20, 9/27/2021**

**3.34 Severe floodplain erosion between Station 16+25 and 18+10, 9/27/201**

**3.35 Severe erosion at Station 18+80 9/27/2021**

**3.36 Toe scour at station 24+30, 9/21/2021**

*Figures 3.1 – 3.43: Vegetation Plot Photographs and Site Aerial Photographs*

**3.37 Aerial photo of floodplain scour at Station 25+00, 9/27/2021**

**3.38 Floodplain scour along left bank at Station 27+00, 9/27/2021**

**3.39 Stabilization material from Blue Ridge Rd. 9/27/2021**

**3.40 Crossing at UT 1 9/27/2021**

**3.41 Crossing at UT 2 9/27/2021**

**3.42 Crossing at UT 4 9/27/2021**

*Figures 3.1 – 3.43: Vegetation Plot Photographs and Site Aerial Photographs*

**3.43 Ford Crossing at West Fork French Broad River, 9/27/2021**

# Appendix D – Stream Geomorphology Data

*Figures 4.1 – 4.14 Cross Section Photos*

**4.1 West Fork French Broad Cross Section 1, 9/27/2021**

**4.2 West Fork French Broad Cross Section 2, 9/27/2021**

**4.3 West Fork French Broad Cross Section 3, 9/27/2021**

**4.4 West Fork French Broad Cross Section 4, 9/27/2021**

**4.5 West Fork French Broad Cross Section 5, 9/27/2021**

**4.6 West Fork French Broad Cross Section 6, 9/27/2021**

*Figures 4.1 – 4.14 Cross Section Photos*

**4.7 UT 8 Cross Section 7, 9/27/2021**

**4.8 UT 8 Cross Section 8, 9/27/2021**

**4.9 UT 5 Cross Section 9, 9/27/2021**

**4.10 UT 5 Cross Section 10, 9/28/2021**

**4.11 UT 5 Cross Section 11, 9/28/2021**

**4.12 UT 5 Cross Section 12, 9/28/2021**

*Figures 4.1 – 4.14 Cross Section Photos*

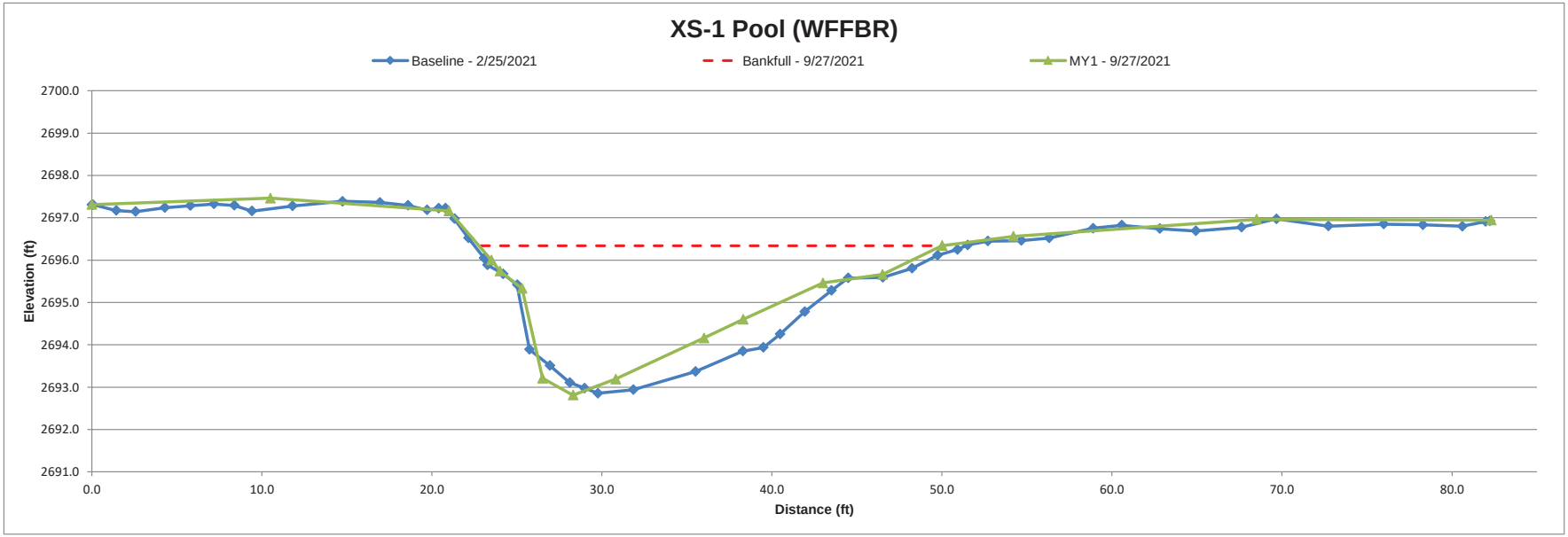
**4.13 UT 7 Cross Section 13, 9/28/2021**

**4.14 UT 7 Cross Section 14, 9/28/2021**

*Figures 4.1 – 4.14 Monitoring Cross Section Plots*

## *Figure 4.1 Cross Section 1*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 1 (WFFBR) |
| Drainage Area (Acres) | 3,795 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |




Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 1 (Pool) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | -- | -- | | | | |
| Bank Height Ratio | -- | -- | | | | |
| Thalweg Elevation | 2692.85 | 2692.81 | | | | |
| Low Top Of Bank Elevation | 2696.45 | 2696.34 | | | | |
| Low Top of Bank Max Depth (ft) | 3.60 | 3.53 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 58.72 | 46.68 | | | | |

*Figure 4.2 Cross Section 2*

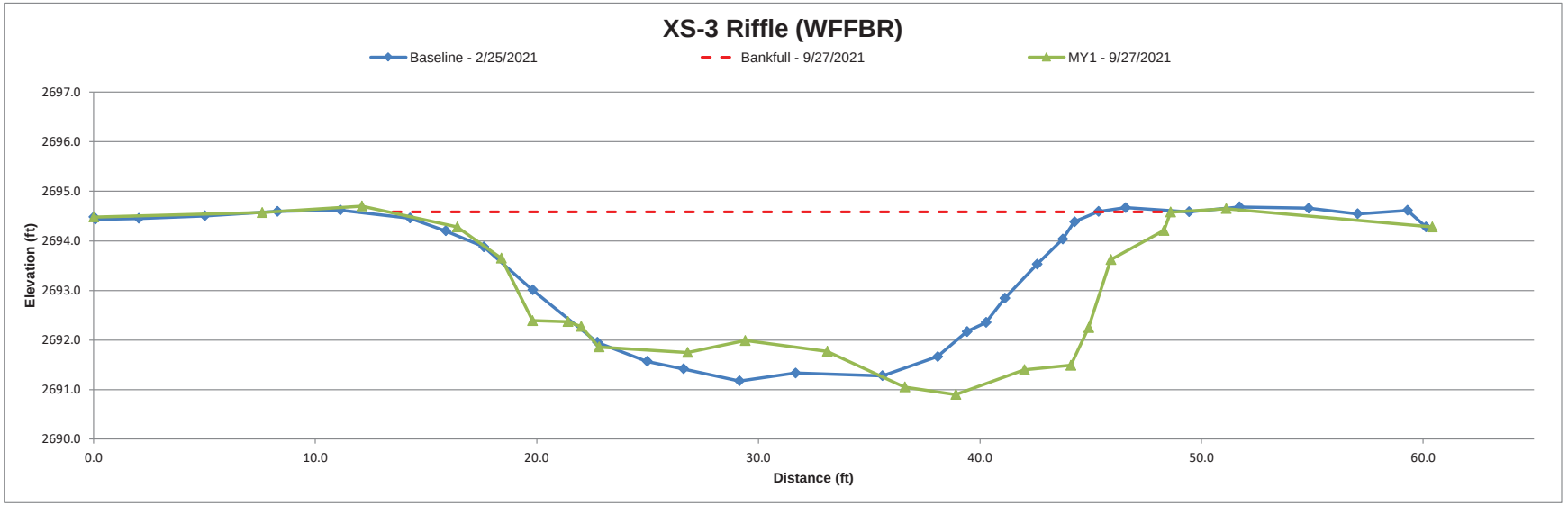
| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 2 (WFFBR) |
| Drainage Area (Acres) | 3,795 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |


Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 2 (Riffle) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | 2696.15 | 2695.96 | | | | |
| Bank Height Ratio | 1.00 | 1.07 | | | | |
| Thalweg Elevation | 2692.68 | 2692.53 | | | | |
| Low Top Of Bank Elevation | 2696.15 | 2696.21 | | | | |
| Low Top of Bank Max Depth (ft) | 3.47 | 3.68 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 61.32 | 69.39 | | | | |

*Figure 4.3 Cross Section 3*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 3 (WFFBR) |
| Drainage Area (Acres) | 3,795 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

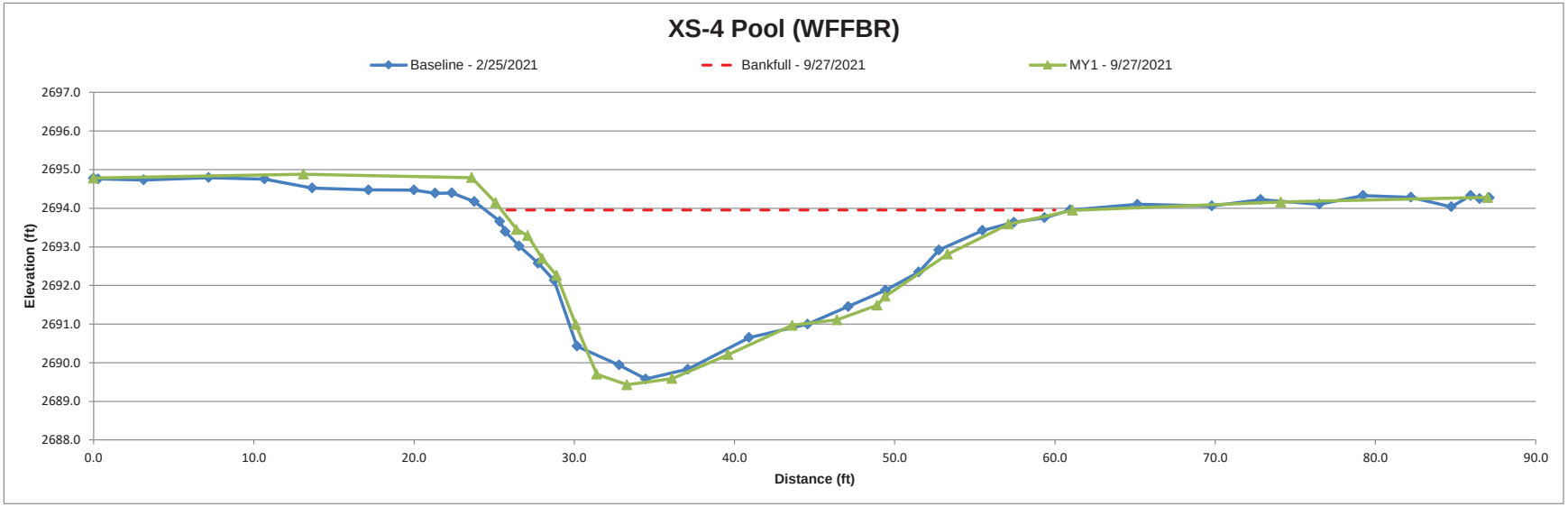



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 3 (Riffle) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | 2694.46 | 2694.11 | | | | |
| Bank Height Ratio | 1.00 | 1.15 | | | | |
| Thalweg Elevation | 2691.17 | 2690.90 | | | | |
| Low Top Of Bank Elevation | 2694.46 | 2694.58 | | | | |
| Low Top of Bank Max Depth (ft) | 3.29 | 3.68 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 65.45 | 80.97 | | | | |

*Figure 4.4 Cross Section 4*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 4 (WFFBR) |
| Drainage Area (Acres) | 3,795 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

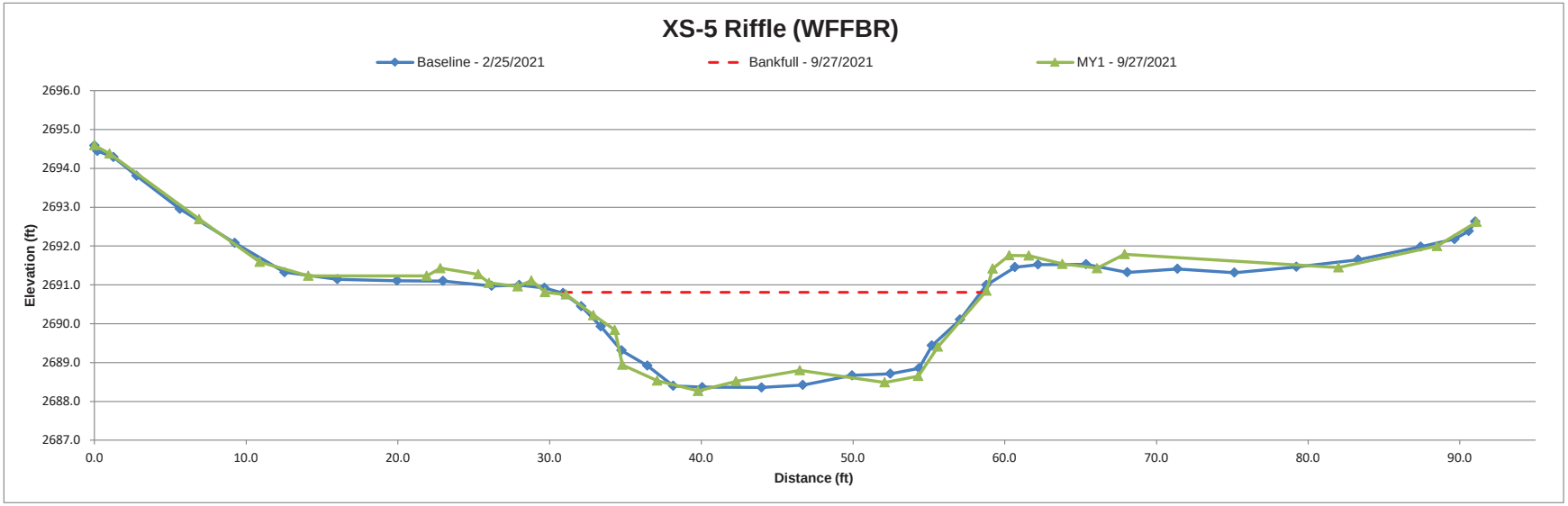



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 4 (Pool) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | -- | -- | | | | |
| Bank Height Ratio | -- | -- | | | | |
| Thalweg Elevation | 2689.58 | 2689.43 | | | | |
| Low Top Of Bank Elevation | 2693.64 | 2693.95 | | | | |
| Low Top of Bank Max Depth (ft) | 4.06 | 4.52 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 71.83 | 84.77 | | | | |

*Figure 4.5 Cross Section 5*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 5 (WFFBR) |
| Drainage Area (Acres) | 3,795 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

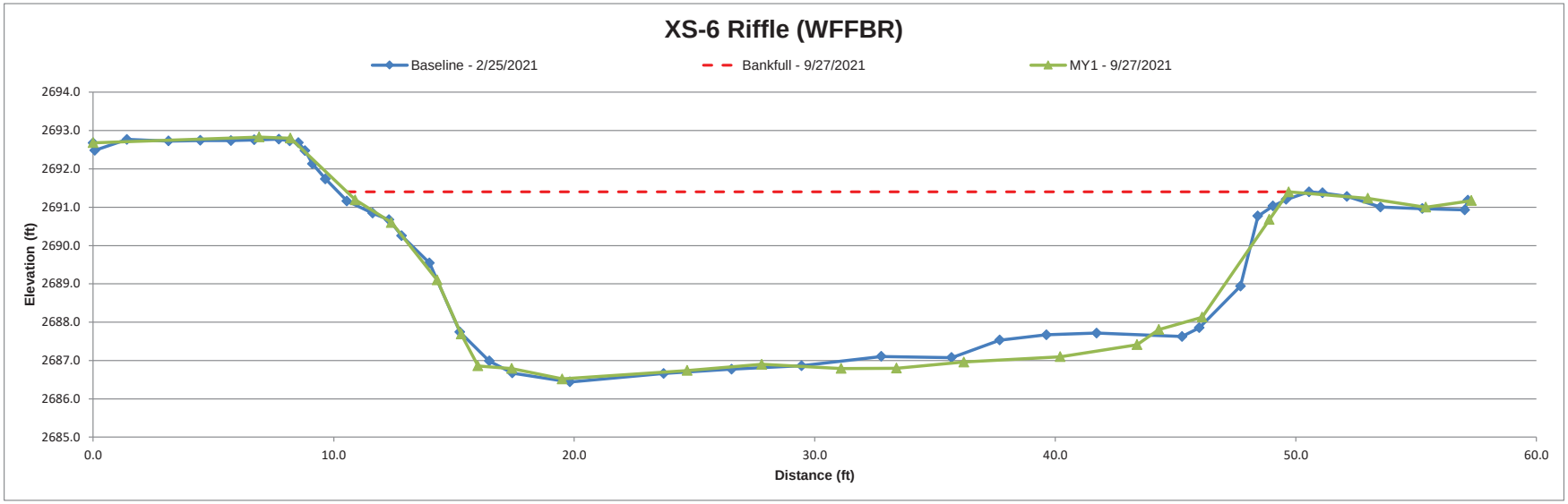



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 5 (Riffle) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | 2690.79 | 2690.79 | | | | |
| Bank Height Ratio | 1.00 | 1.01 | | | | |
| Thalweg Elevation | 2688.36 | 2688.27 | | | | |
| Low Top Of Bank Elevation | 2690.79 | 2690.81 | | | | |
| Low Top of Bank Max Depth (ft) | 2.43 | 2.54 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 49.82 | 50.32 | | | | |

*Figure 4.6 Cross Section 6*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 6 (WFFBR) |
| Drainage Area (Acres) | 3,795 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

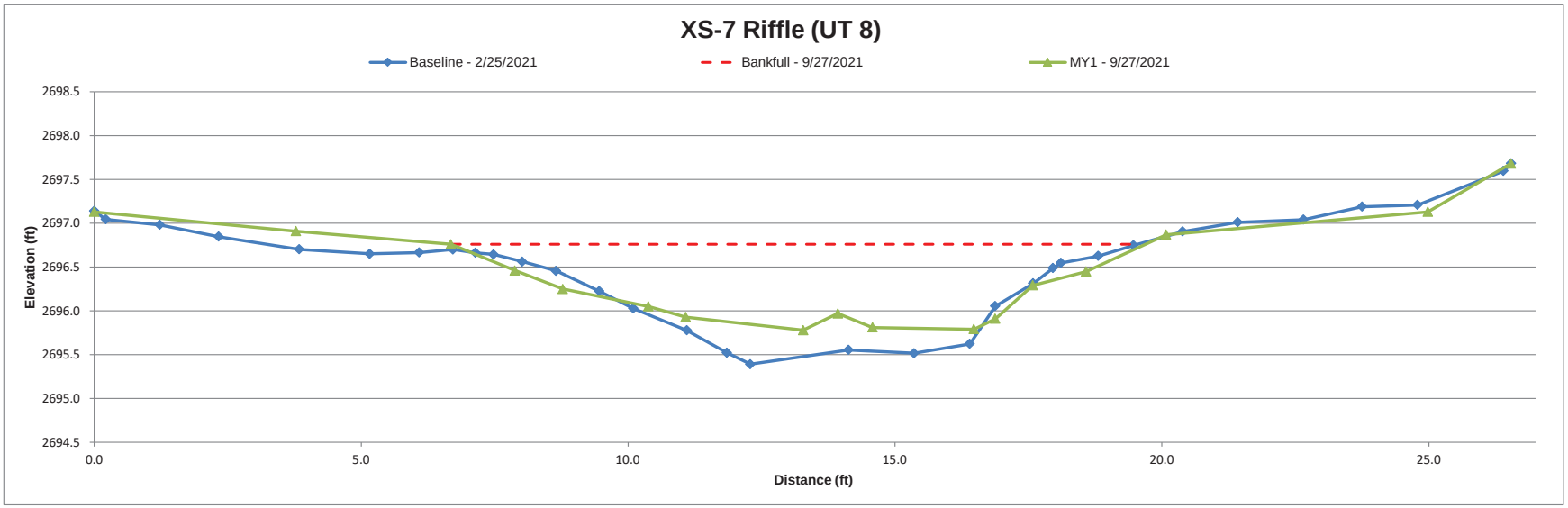



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 6 (Riffle) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | 2691.20 | 2691.11 | | | | |
| Bank Height Ratio | 1.00 | 1.06 | | | | |
| Thalweg Elevation | 2686.44 | 2686.52 | | | | |
| Low Top Of Bank Elevation | 2691.20 | 2691.40 | | | | |
| Low Top of Bank Max Depth (ft) | 4.76 | 4.88 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 138.26 | 149.49 | | | | |

*Figure 4.7 Cross Section 7*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 7 (UT 8) |
| Drainage Area (Acres) | 41 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

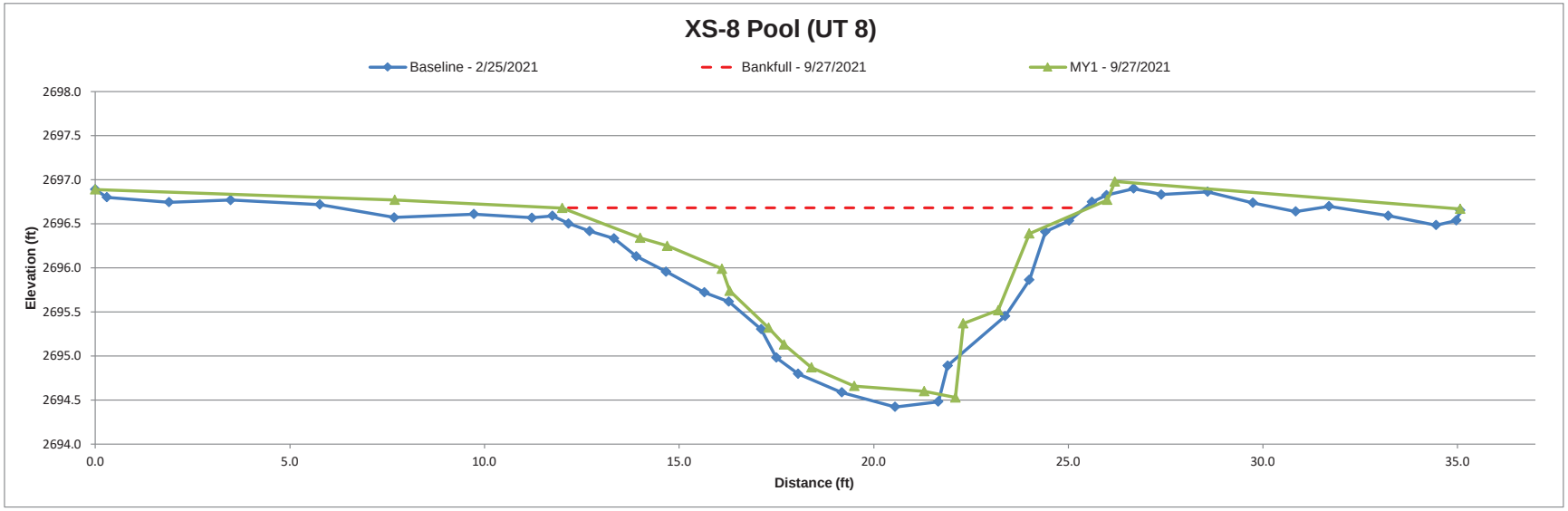



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 7 (Riffle) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | 2696.64 | 2696.74 | | | | |
| Bank Height Ratio | 1.00 | 1.02 | | | | |
| Thalweg Elevation | 2695.39 | 2695.78 | | | | |
| Low Top Of Bank Elevation | 2696.64 | 2696.76 | | | | |
| Low Top of Bank Max Depth (ft) | 1.25 | 0.98 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 8.14 | 8.40 | | | | |

*Figure 4.8Cross Section 8*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 8 (UT 8) |
| Drainage Area (Acres) | 41 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

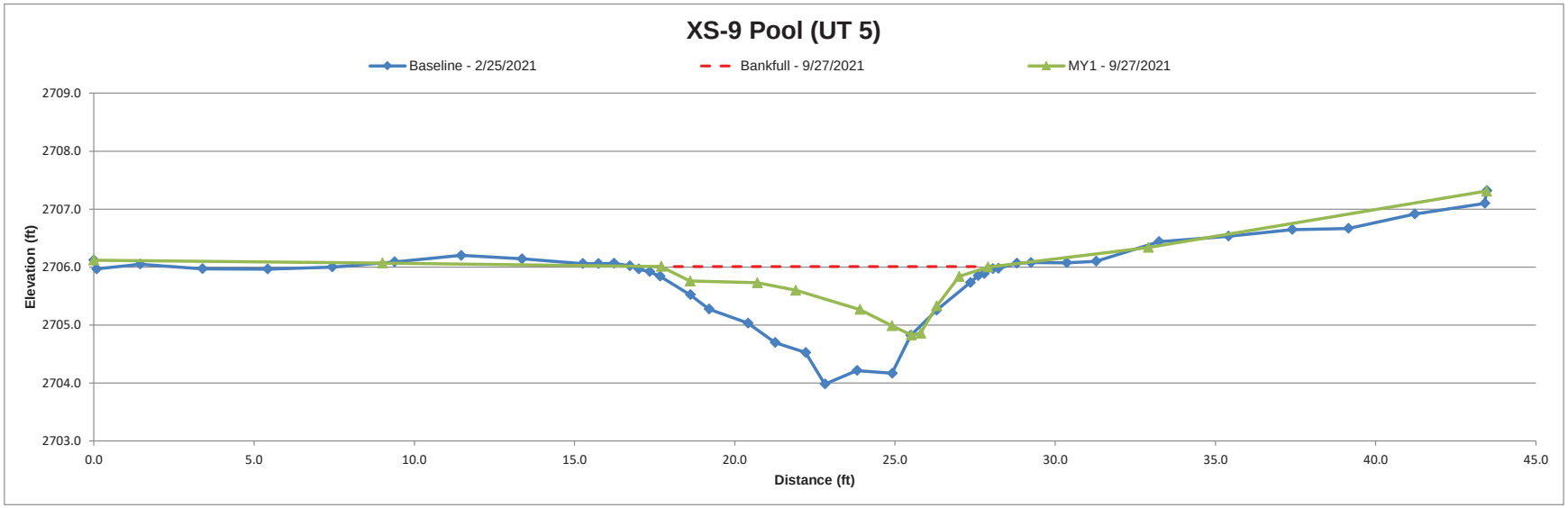



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 8 (Pool) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | -- | -- | | | | |
| Bank Height Ratio | -- | -- | | | | |
| Thalweg Elevation | 2694.42 | 2694.53 | | | | |
| Low Top Of Bank Elevation | 2696.50 | 2696.68 | | | | |
| Low Top of Bank Max Depth (ft) | 2.08 | 1.97 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 14.19 | 11.96 | | | | |

*Figure 4.9 Cross Section 9*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 9 (UT 5) |
| Drainage Area (Acres) | 45.2 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

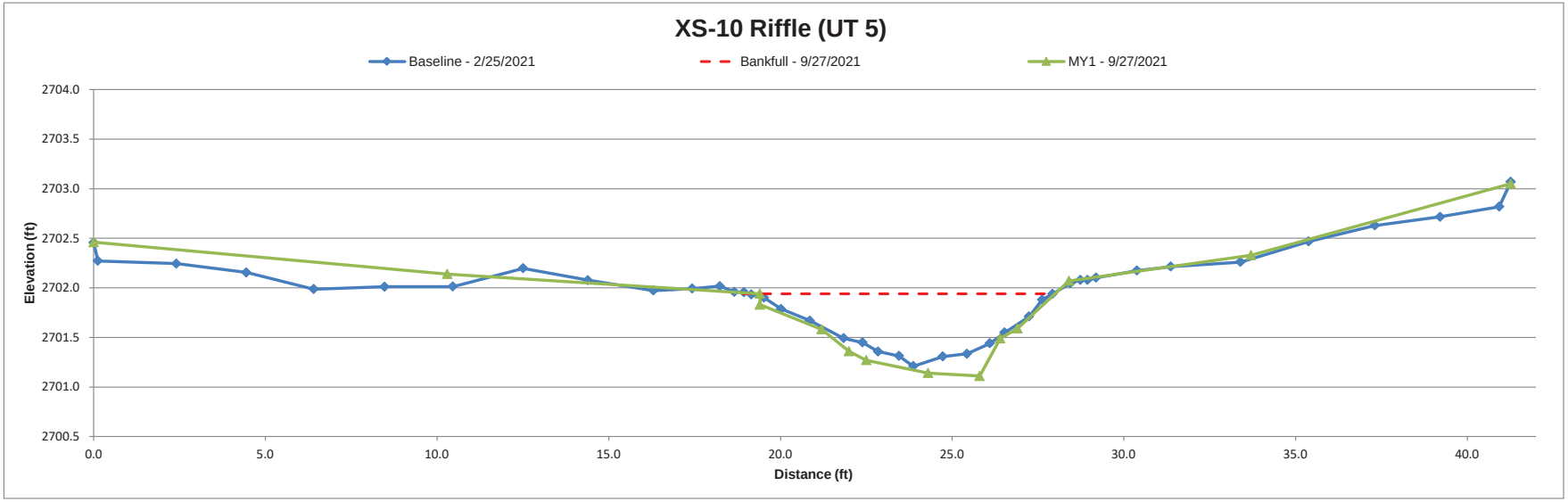



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 9 (Pool) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | -- | -- | | | | |
| Bank Height Ratio | -- | -- | | | | |
| Thalweg Elevation | 2703.98 | 2704.83 | | | | |
| Low Top Of Bank Elevation | 2705.97 | 2706.01 | | | | |
| Low Top of Bank Max Depth (ft) | 1.99 | 1.18 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 10.89 | 4.96 | | | | |

*Figure 4.10 Cross Section 10*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 10 (UT 5) |
| Drainage Area (Acres) | 45.2 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

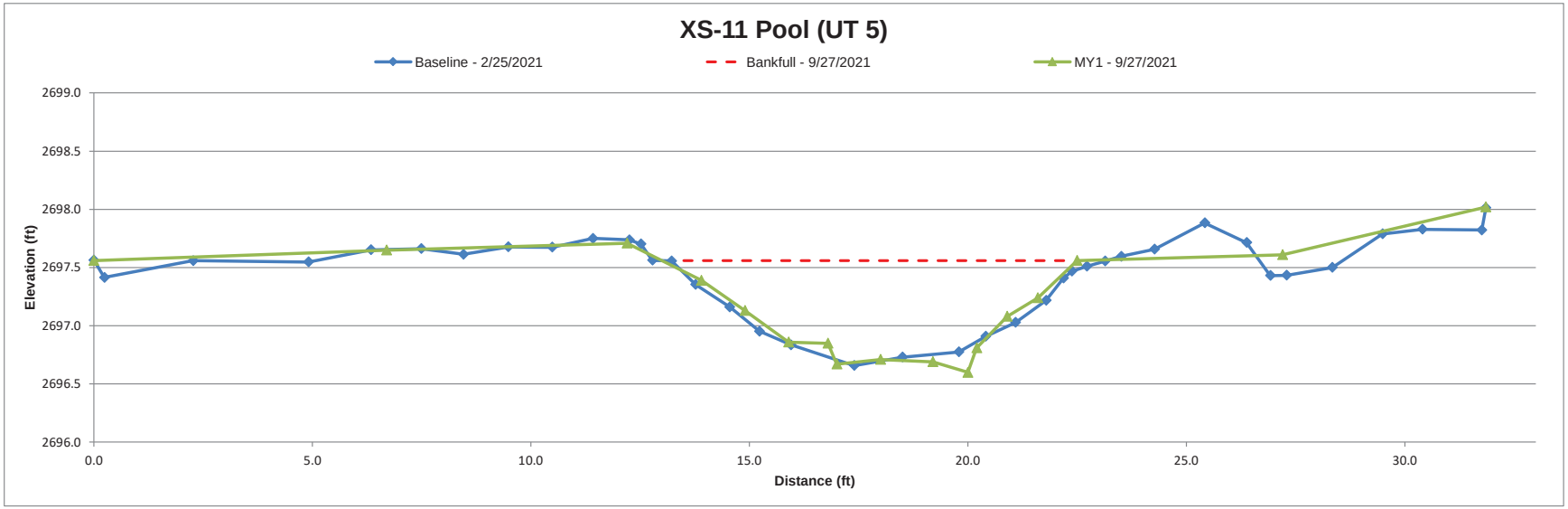



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 10 (Riffle) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | 2702.02 | 2701.93 | | | | |
| Bank Height Ratio | 1.00 | 1.01 | | | | |
| Thalweg Elevation | 2701.21 | 2701.11 | | | | |
| Low Top Of Bank Elevation | 2702.02 | 2701.94 | | | | |
| Low Top of Bank Max Depth (ft) | 0.81 | 0.83 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 4.37 | 4.43 | | | | |

*Figure 4.11 Cross Section 11*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 11 (UT 5) |
| Drainage Area (Acres) | 45.2 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

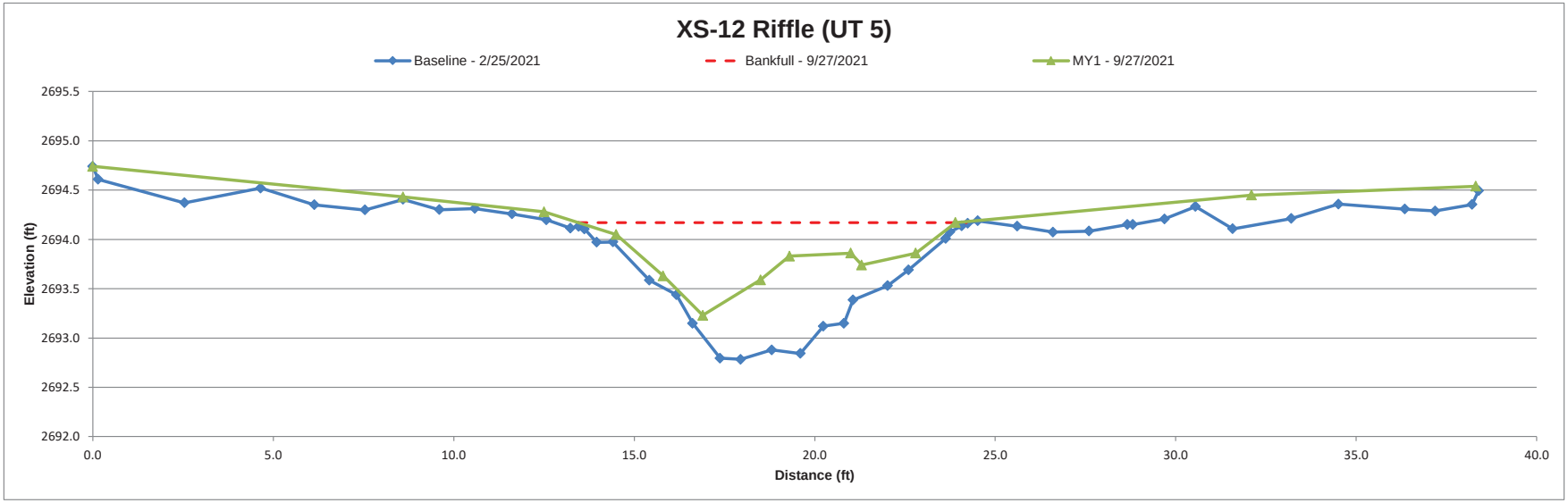



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 11 (Pool) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | -- | -- | | | | |
| Bank Height Ratio | -- | -- | | | | |
| Thalweg Elevation | 2696.66 | 2996.60 | | | | |
| Low Top Of Bank Elevation | 2697.47 | 2697.56 | | | | |
| Low Top of Bank Max Depth (ft) | 0.81 | 0.96 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 4.75 | 5.40 | | | | |

*Figure 4.12 Cross Section 12*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 12 (UT 5) |
| Drainage Area (Acres) | 45.2 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

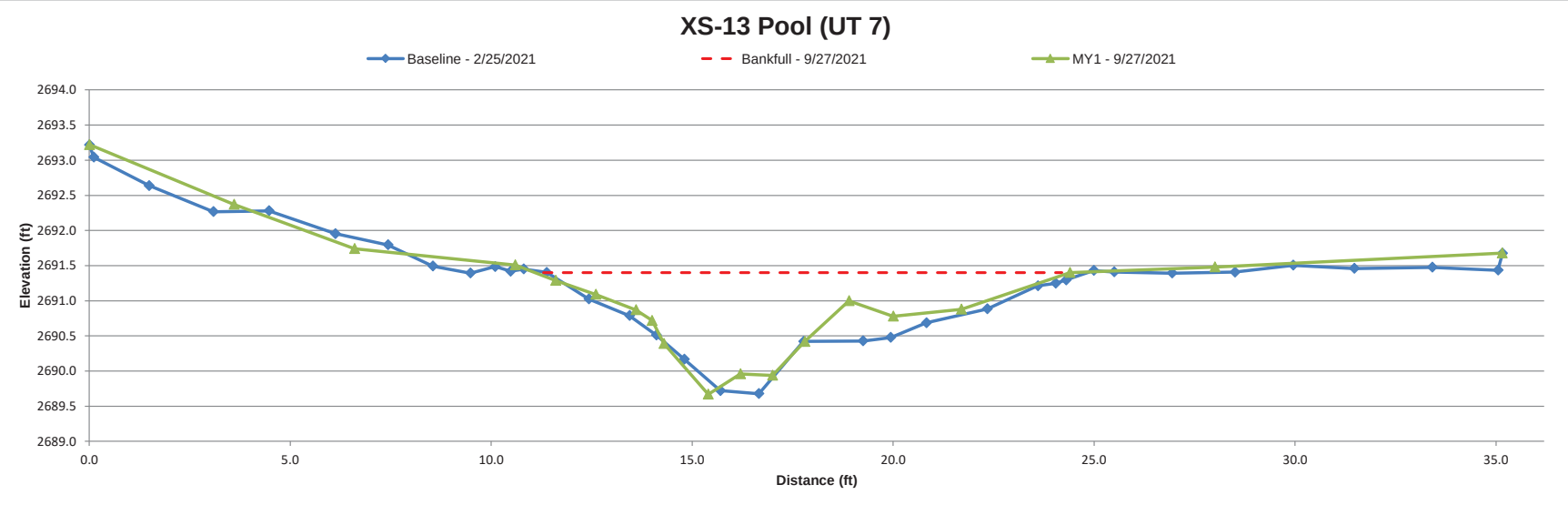



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 12 (Riffle) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | 2694.13 | 2694.49 | | | | |
| Bank Height Ratio | 1.00 | 0.75 | | | | |
| Thalweg Elevation | 2692.78 | 2693.23 | | | | |
| Low Top Of Bank Elevation | 2694.13 | 2694.17 | | | | |
| Low Top of Bank Max Depth (ft) | 1.35 | 0.95 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 7.83 | 4.38 | | | | |

*Figure 4.13 Cross Section 13*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 13 (UT 7) |
| Drainage Area (Acres) | 32.1 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |

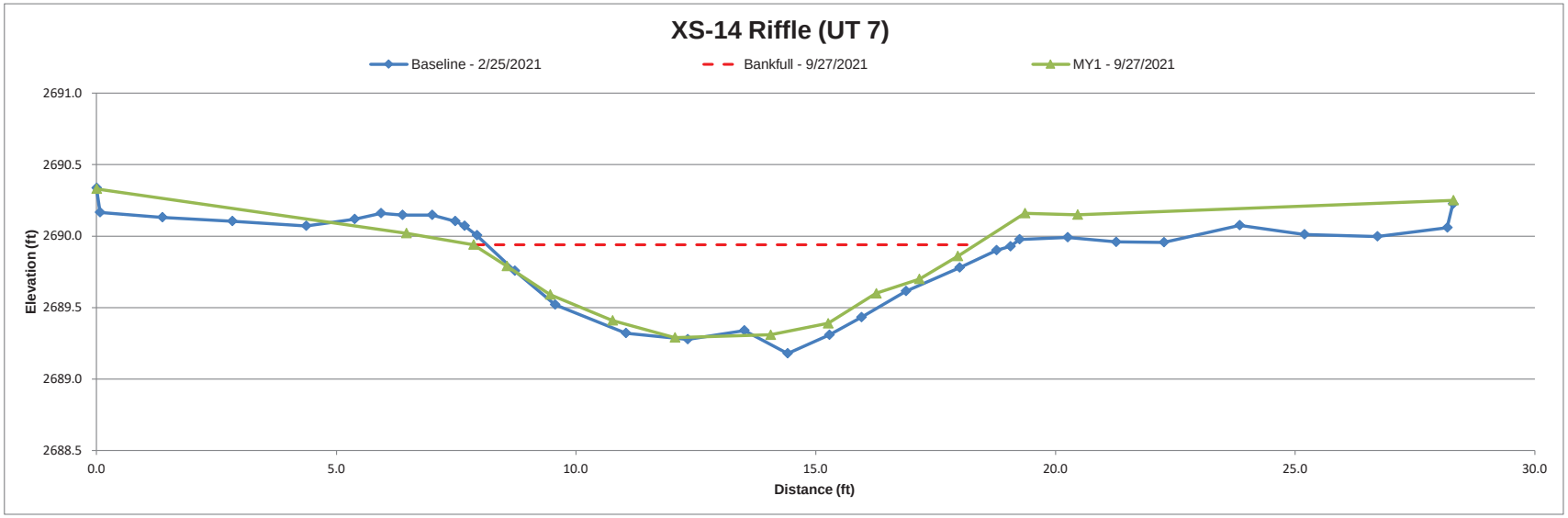



Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 13 (Pool) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | -- | -- | | | | |
| Bank Height Ratio | -- | -- | | | | |
| Thalweg Elevation | 2689.68 | 2689.67 | | | | |
| Low Top Of Bank Elevation | 2691.25 | 2691.40 | | | | |
| Low Top of Bank Max Depth (ft) | 1.57 | 1.73 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 8.77 | 9.06 | | | | |

*Figure 4.14 Cross Section 14*

| | |
|---|---|
| River Basin | French Broad |
| Watershed | 06010105010020 |
| XS ID | XS 14 (UT 7) |
| Drainage Area (Acres) | 32.1 |
| Date | 9/27/2021 |
| Field Crew | CLS, RVS |




Bankfull elevation adjusted to current monitoring year's low top of bank elevation

| | Cross Section 14 (Riffle) | | | | | |
|---|---|---|---|---|---|---|
| **Dimensions** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| | | | | | | |
| Bankfull Elevation (ft) - Based on As Built-Bankfull Area | 2689.90 | 2689.95 | | | | |
| Bank Height Ratio | 1.00 | 0.98 | | | | |
| Thalweg Elevation | 2689.18 | 2689.29 | | | | |
| Low Top Of Bank Elevation | 2689.90 | 2689.94 | | | | |
| Low Top of Bank Max Depth (ft) | 0.72 | 0.65 | | | | |
| Low Top Of Bank Cross Sectional Area ($ft^2$) | 4.56 | 4.45 | | | | |

## *Table 11. Baseline Stream Data Summary*

| | West Fork French Broad River | | | | | | | | | | UT 5 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Pre-Existing Condition (applicaple)** | | | | | **Design** | | **Monitoring Baseline (MY0)** | | | **Pre-Existing Condition (applicaple)** | | | | | **Design** | | **Monitoring Baseline (MY0)** | | |
| **Riffle Only** | Min | Mean | Med | Max | n | Min | Max | Min | Max | n | Min | Mean | Med | Max | n | Min | Max | Min | Max | n |
| Bankfull Width (ft) | 28.78 | 38.38 | 38.47 | 47.90 | 3 | 30.00 | 30.00 | 27.52 | 39.11 | 4 | 4.38 | 4.38 | 4.38 | 4.38 | 1 | 8.50 | 8.50 | 8.94 | 10.08 | 2 |
| Floodprone Width (ft) | 47.89 | 56.15 | 51.56 | 69.00 | 3 | 93.00 | 93.00 | 96.35 | 430.60 | 4 | 8.00 | 8.00 | 8.00 | 8.00 | 1 | 100.00 | 100.00 | 60.41 | 491.41 | 2 |
| Bankfull Mean Depth (ft) | 1.89 | 2.12 | 2.07 | 2.41 | 3 | 2.14 | 2.14 | 1.81 | 3.54 | 4 | 0.66 | 0.66 | 0.66 | 0.66 | 1 | 0.63 | 0.63 | 0.43 | 0.53 | 2 |
| Bankfull Max Depth (ft) | 2.93 | 3.14 | 3.20 | 3.28 | 3 | 2.63 | 2.63 | 2.43 | 4.76 | 4 | 0.95 | 0.95 | 0.95 | 0.95 | 1 | 0.76 | 0.76 | 0.81 | 0.81 | 2 |
| Bankfull Cross Sectional Area ($ft^2$) | 69.31 | 79.83 | 79.56 | 90.63 | 3 | 69.60 | 69.60 | 49.82 | 138.26 | 4 | 2.90 | 2.90 | 2.90 | 2.90 | 1 | 5.00 | 5.00 | 4.37 | 4.75 | 2 |
| Width/Depth Ratio | 11.94 | 18.62 | 18.58 | 25.34 | 3 | 14.00 | 14.00 | 11.05 | 15.20 | 4 | 6.64 | 6.64 | 6.64 | 6.64 | 1 | 13.50 | 13.50 | 16.87 | 23.44 | 2 |
| Entrenchment Ratio | 1.25 | 1.49 | 1.44 | 1.79 | 3 | 3.10 | 3.10 | 3.50 | 14.23 | 4 | 1.83 | 1.83 | 1.83 | 1.83 | 1 | 11.80 | 11.80 | 5.99 | 54.94 | 2 |
| Bank Height Ratio | 1.70 | 1.90 | 1.80 | 2.19 | 3 | 1.00 | 1.00 | 1.00 | 1.00 | 4 | 1.20 | 1.20 | 1.20 | 1.20 | 1 | 1.00 | 1.00 | 1.00 | 1.00 | 2 |
| Max part size (mm) mobilized at bankfull | 83 | | | | | 83 | | 83 | | | 40 | | | | | 40 | | 40 | | |
| Rosgen Classification | B4 / F4 | | | | | C4 | | C4 | | | B4 | | | | | C4 | | C4 | | |
| Bankfull Discharge (cfs) | 300 | | | | | 300 | | 300 | | | 10 | | | | | 10 | | 10 | | |
| Sinuosity (ft) | 1.06 | | | | | 1.12 | | 1.14 | | | 1.08 | | | | | 1.14 | | 1.14 | | |
| Water Surface Slope (Channel) (ft/ft) | 0.0034 | | | | | 0.0034 | | 0.0036 | | | 0.012 | | | | | 0.006 | | 0.007 | | |

| | UT 7 | | | | | | | | | | UT 8 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Pre-Existing Condition (applicaple)** | | | | | **Design** | | **Monitoring Baseline (MY0)** | | | **Pre-Existing Condition (applicaple)** | | | | | **Design** | | **Monitoring Baseline (MY0)** | | |
| **Riffle Only** | Min | Mean | Med | Max | n | Min | Max | Min | Max | n | Min | Mean | Med | Max | n | Min | Max | Min | Max | n |
| Bankfull Width (ft) | 4.71 | 4.71 | 4.71 | 4.71 | 1 | 9.00 | 9.00 | 0.00 | 0.00 | 1 | 11.60 | 11.60 | 11.60 | 11.60 | 1 | 12.00 | 12.00 | 0.00 | 0.00 | 1 |
| Floodprone Width (ft) | 12.80 | 12.80 | 12.80 | 12.80 | 1 | 130.00 | 130.00 | 0.00 | 0.00 | 1 | 17.00 | 17.00 | 17.00 | 17.00 | 1 | 30.00 | 30.00 | 0.00 | 0.00 | 1 |
| Bankfull Mean Depth (ft) | 0.57 | 0.57 | 0.57 | 0.57 | 1 | 0.67 | 0.67 | 0.00 | 0.00 | 1 | 0.70 | 0.70 | 0.70 | 0.70 | 1 | 0.92 | 0.92 | 0.00 | 0.00 | 1 |
| Bankfull Max Depth (ft) | 0.74 | 0.74 | 0.74 | 0.74 | 1 | 0.80 | 0.80 | 0.00 | 0.00 | 1 | 0.97 | 0.97 | 0.97 | 0.97 | 1 | 1.11 | 1.11 | 0.00 | 0.00 | 1 |
| Bankfull Cross Sectional Area ($ft^2$) | 2.69 | 2.69 | 2.69 | 2.69 | 1 | 5.60 | 5.60 | 0.00 | 0.00 | 1 | 8.19 | 8.19 | 8.19 | 8.19 | 1 | 10.30 | 10.30 | 0.00 | 0.00 | 1 |
| Width/Depth Ratio | 8.26 | 8.26 | 8.26 | 8.26 | 1 | 13.50 | 13.50 | 0.00 | 0.00 | 1 | 16.30 | 16.30 | 16.30 | 16.30 | 1 | 13.00 | 13.00 | 0.00 | 0.00 | 1 |
| Entrenchment Ratio | 2.71 | 2.71 | 2.71 | 2.71 | 1 | 14.40 | 14.40 | 0.00 | 0.00 | 1 | 1.47 | 1.47 | 1.47 | 1.47 | 1 | 2.50 | 2.50 | 0.00 | 0.00 | 1 |
| Bank Height Ratio | 3.40 | 3.40 | 3.40 | 3.40 | 1 | 1.00 | 1.00 | 0.00 | 0.00 | 1 | 2.79 | 2.79 | 2.79 | 2.79 | 1 | 1.00 | 1.00 | 0.00 | 0.00 | 1 |
| Max part size (mm) mobilized at bankfull | 61.7 | | | | | 61.7 | | 61.7 | | | 76.8 | | | | | 76.8 | | 76.8 | | |
| Rosgen Classification | B4 | | | | | C4 | | C4 | | | B4 | | | | | C4 | | C4 | | |
| Bankfull Discharge (cfs) | 13 | | | | | 13 | | 13 | | | 45 | | | | | 45 | | 45 | | |
| Sinuosity (ft) | 1 | | | | | 1.24 | | 1.26 | | | 1.03 | | | | | 1.09 | | 1.10 | | |
| Water Surface Slope (Channel) (ft/ft) | 0.0246 | | | | | 0.0054 | | 0.0057 | | | 0.0379 | | | | | 0.0110 | | 0.0112 | | |

*Table 12. Cross Section Morphology Monitoring Summary*

| Owen Farms Mitigation Site / DMS: 100064 - West Fork French Broad River (WFFBR), UT 5, UT 7, UT 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cross Section 1 (Pool - WFFBR) | | | | | | | Cross Section 2 (Riffle - WFFBR) | | | | | | | Cross Section 3 (Riffle - WFFBR) | | | | | | | Cross Section 4 (Pool - WFFBR) | | | | | | | Cross Section 5 (Riffle - WFFBR) | | | | | | |
| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ |
| Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area | -- | -- | | | | | | 2696.15 | 2695.96 | | | | | | 2694.46 | 2694.11 | | | | | | -- | -- | | | | | | 2690.79 | 2690.79 | | | | | |
| Bank Height Ratio_Based on AB Bankfull[1] Area | -- | -- | | | | | | 1.00 | 1.07 | | | | | | 1.00 | 1.15 | | | | | | -- | -- | | | | | | 1.00 | 1.01 | | | | | |
| Thalweg Elevation | 2692.85 | 2692.81 | | | | | | 2692.68 | 2692.53 | | | | | | 2691.17 | 2690.90 | | | | | | 2689.58 | 2689.43 | | | | | | 2688.36 | 2688.27 | | | | | |
| LTOB[2] Elevation | 2696.45 | 2696.34 | | | | | | 2696.15 | 2696.21 | | | | | | 2694.46 | 2694.58 | | | | | | 2693.64 | 2693.95 | | | | | | 2690.79 | 2690.81 | | | | | |
| LTOB[2] Max Depth (ft) | 3.60 | 3.53 | | | | | | 3.47 | 3.68 | | | | | | 3.29 | 3.68 | | | | | | 4.06 | 4.52 | | | | | | 2.43 | 2.54 | | | | | |
| LTOB[2] Cross Sectional Area ($ft^2$) | 58.72 | 46.68 | | | | | | 61.32 | 69.39 | | | | | | 65.45 | 80.97 | | | | | | 71.83 | 84.77 | | | | | | 49.82 | 50.32 | | | | | |
| | Cross Section 6 (Riffle - WFFBR) | | | | | | | Cross Section 7 (Riffle - UT 8) | | | | | | | Cross Section 8 (Pool - UT 8) | | | | | | | Cross Section 9 (Pool - UT 5) | | | | | | | Cross Section 10 (Riffle - UT 5) | | | | | | |
| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ |
| Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area | 2691.20 | 2691.11 | | | | | | 2696.64 | 2696.74 | | | | | | -- | -- | | | | | | -- | -- | | | | | | 2702.02 | 2701.93 | | | | | |
| Bank Height Ratio_Based on AB Bankfull[1] Area | 1.00 | 1.06 | | | | | | 1.00 | 1.02 | | | | | | -- | -- | | | | | | -- | -- | | | | | | 1.00 | 1.01 | | | | | |
| Thalweg Elevation | 2686.44 | 2686.52 | | | | | | 2695.39 | 2695.78 | | | | | | 2694.42 | 2694.53 | | | | | | 2703.98 | 2704.83 | | | | | | 2701.21 | 2701.11 | | | | | |
| LTOB[2] Elevation | 2691.20 | 2691.40 | | | | | | 2696.64 | 2696.76 | | | | | | 2696.50 | 2696.68 | | | | | | 2705.97 | 2706.01 | | | | | | 2702.02 | 2701.94 | | | | | |
| LTOB[2] Max Depth (ft) | 4.76 | 4.88 | | | | | | 1.25 | 0.98 | | | | | | 2.08 | 1.97 | | | | | | 1.99 | 1.18 | | | | | | 0.81 | 0.83 | | | | | |
| LTOB[2] Cross Sectional Area ($ft^2$) | 138.26 | 149.49 | | | | | | 8.14 | 8.40 | | | | | | 14.19 | 11.96 | | | | | | 10.89 | 4.96 | | | | | | 4.37 | 4.43 | | | | | |
| | Cross Section 11 (Pool - UT 5) | | | | | | | Cross Section 12 (Riffle - UT 5) | | | | | | | Cross Section 13 (Pool - UT 7) | | | | | | | Cross Section 14 (Riffle - UT 7) | | | | | | | | | | | | | |
| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY+ | | | | | | | |
| Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area | -- | -- | | | | | | 2694.13 | 2694.49 | | | | | | -- | -- | | | | | | 2689.90 | 2689.95 | | | | | | | | | | | | |
| Bank Height Ratio_Based on AB Bankfull[1] Area | -- | -- | | | | | | 1.00 | 0.75 | | | | | | -- | -- | | | | | | 1.00 | 0.98 | | | | | | | | | | | | |
| Thalweg Elevation | 2696.66 | 2996.60 | | | | | | 2692.78 | 2693.23 | | | | | | 2689.68 | 2689.67 | | | | | | 2689.18 | 2689.29 | | | | | | | | | | | | |
| LTOB[2] Elevation | 2697.47 | 2697.56 | | | | | | 2694.13 | 2694.17 | | | | | | 2691.25 | 2691.40 | | | | | | 2689.90 | 2689.94 | | | | | | | | | | | | |
| LTOB[2] Max Depth (ft) | 0.81 | 0.96 | | | | | | 1.35 | 0.95 | | | | | | 1.57 | 1.73 | | | | | | 0.72 | 0.65 | | | | | | | | | | | | |
| LTOB[2] Cross Sectional Area ($ft^2$) | 4.75 | 5.40 | | | | | | 7.83 | 4.38 | | | | | | 8.77 | 9.06 | | | | | | 4.56 | 4.45 | | | | | | | | | | | | |

The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners.

1 **- Bank Height Ratio (BHR)** takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation.
2 - **LTOB Area and Max depth -** These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

# Appendix E – Hydrologic Data

*Figure 6. Monthly Precipitation Data*

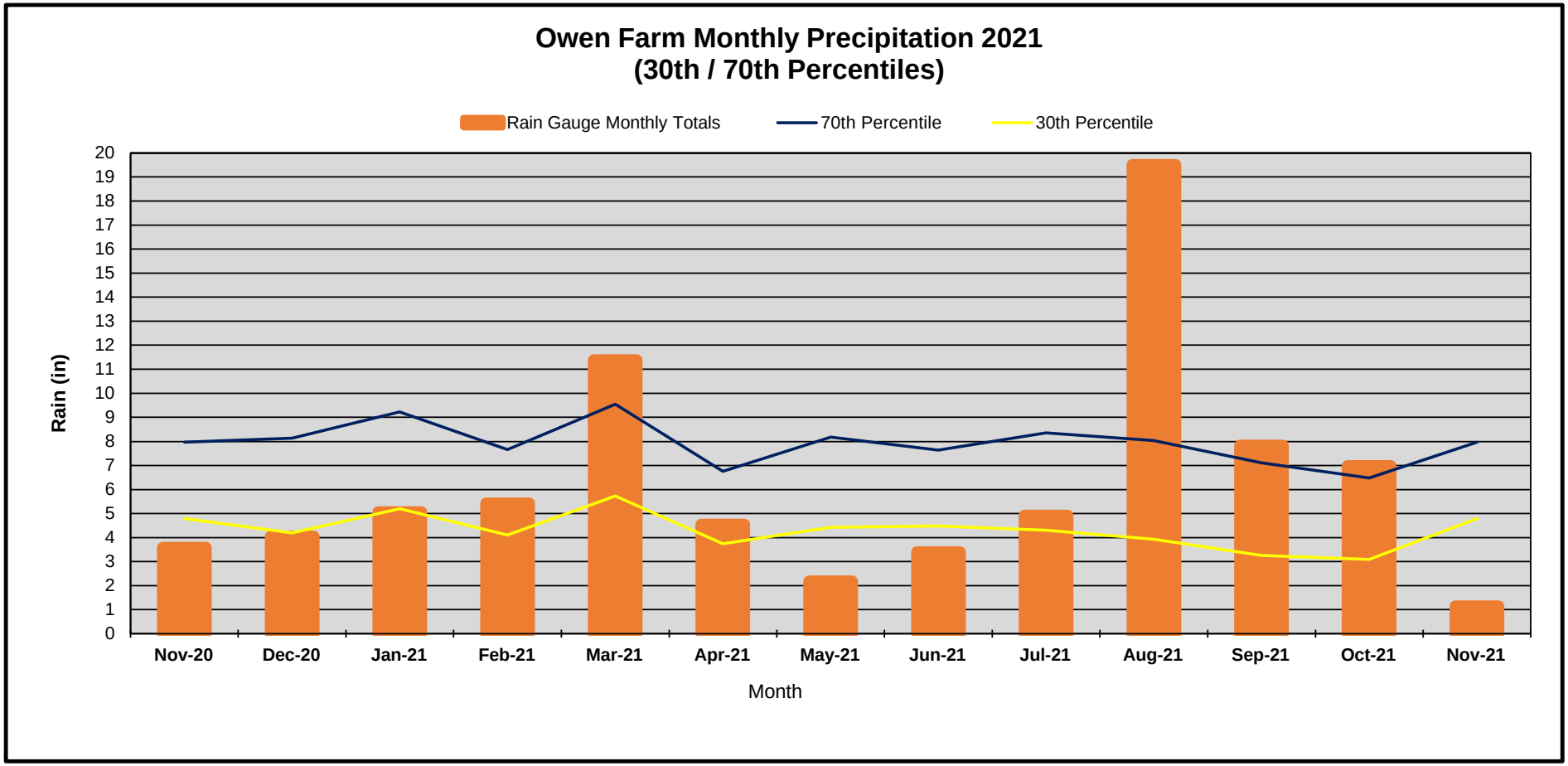


*Figure 7.1 - 7.4 Channel Flow Hydrographs*

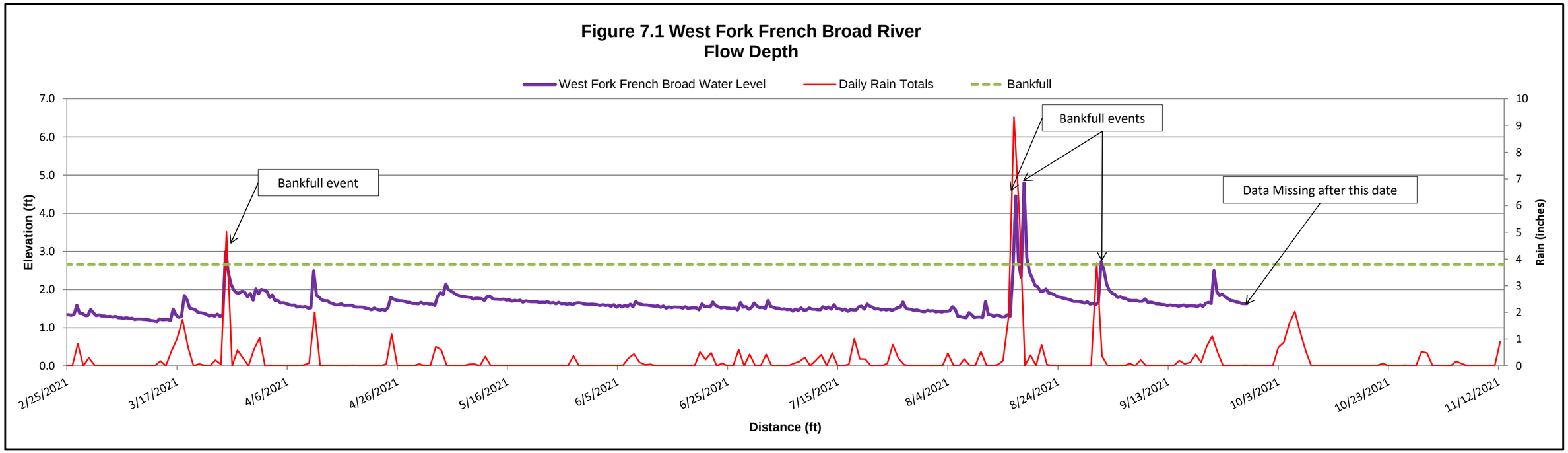


**Figure 7.2 UT 5 Flow Depth**

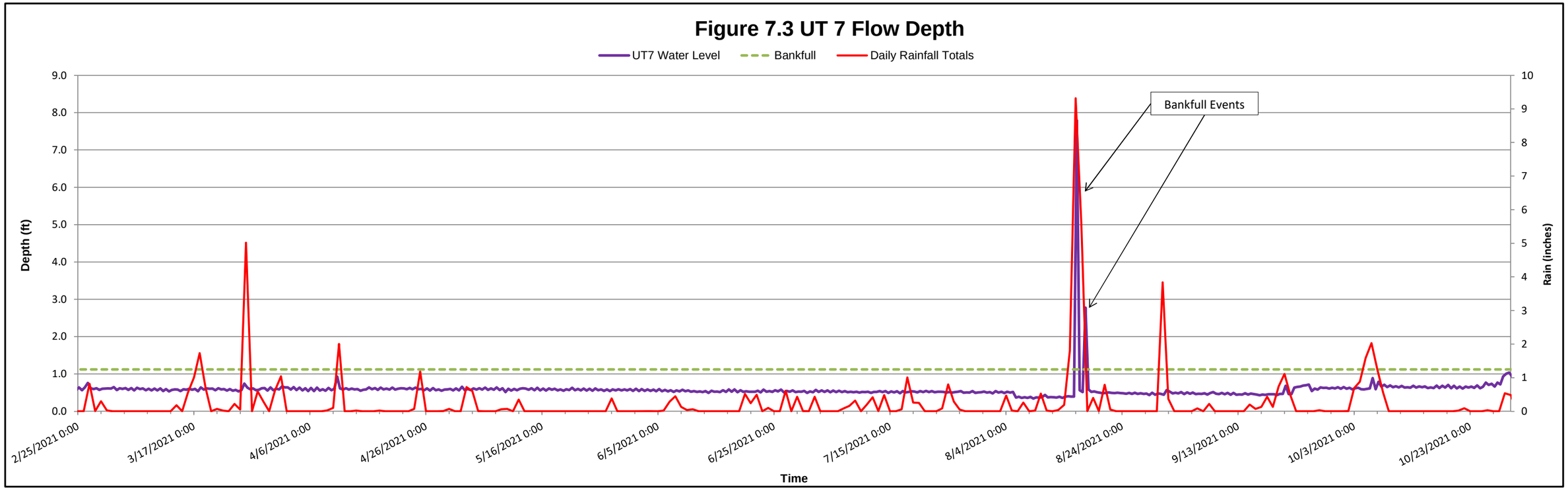
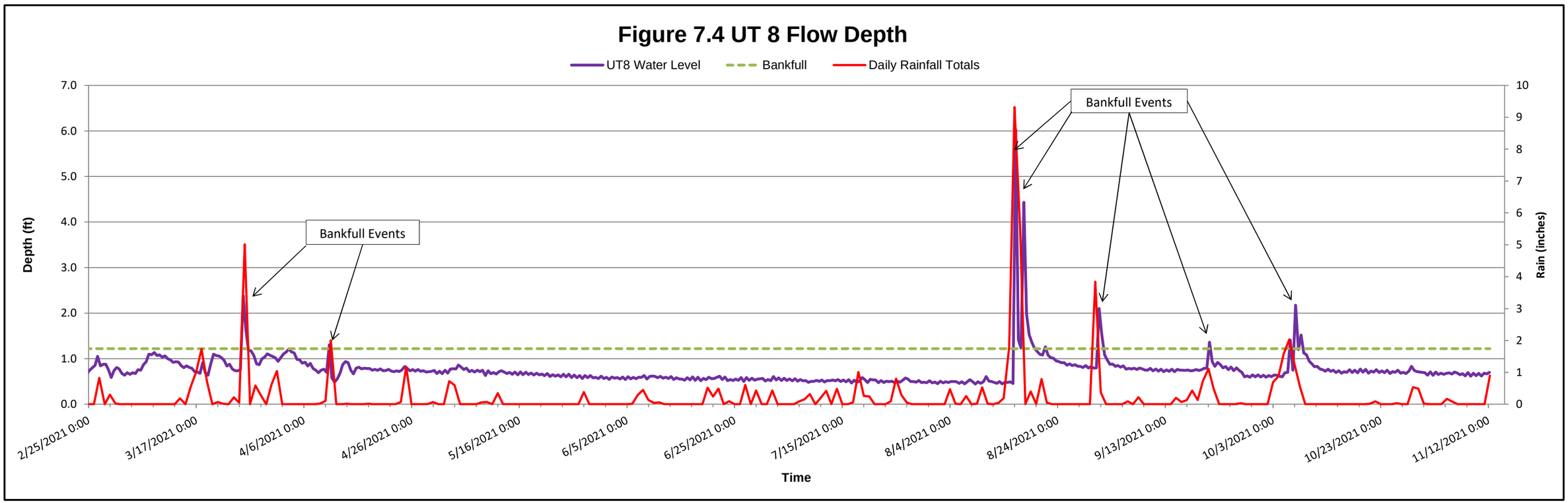


Figure 7.3 UT 7 Flow Depth
UT7 Water Level
Bankfull
Daily Rainfall Totals
Bankfull Events
Depth (ft)
Rain (inches)
Time
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
10
9
8
7
6
5
4
3
2
1
0
2/25/2021 0:00
3/17/2021 0:00
4/6/2021 0:00
4/26/2021 0:00
5/16/2021 0:00
6/5/2021 0:00
6/25/2021 0:00
7/15/2021 0:00
8/4/2021 0:00
8/24/2021 0:00
9/13/2021 0:00
10/3/2021 0:00
10/23/2021 0:00

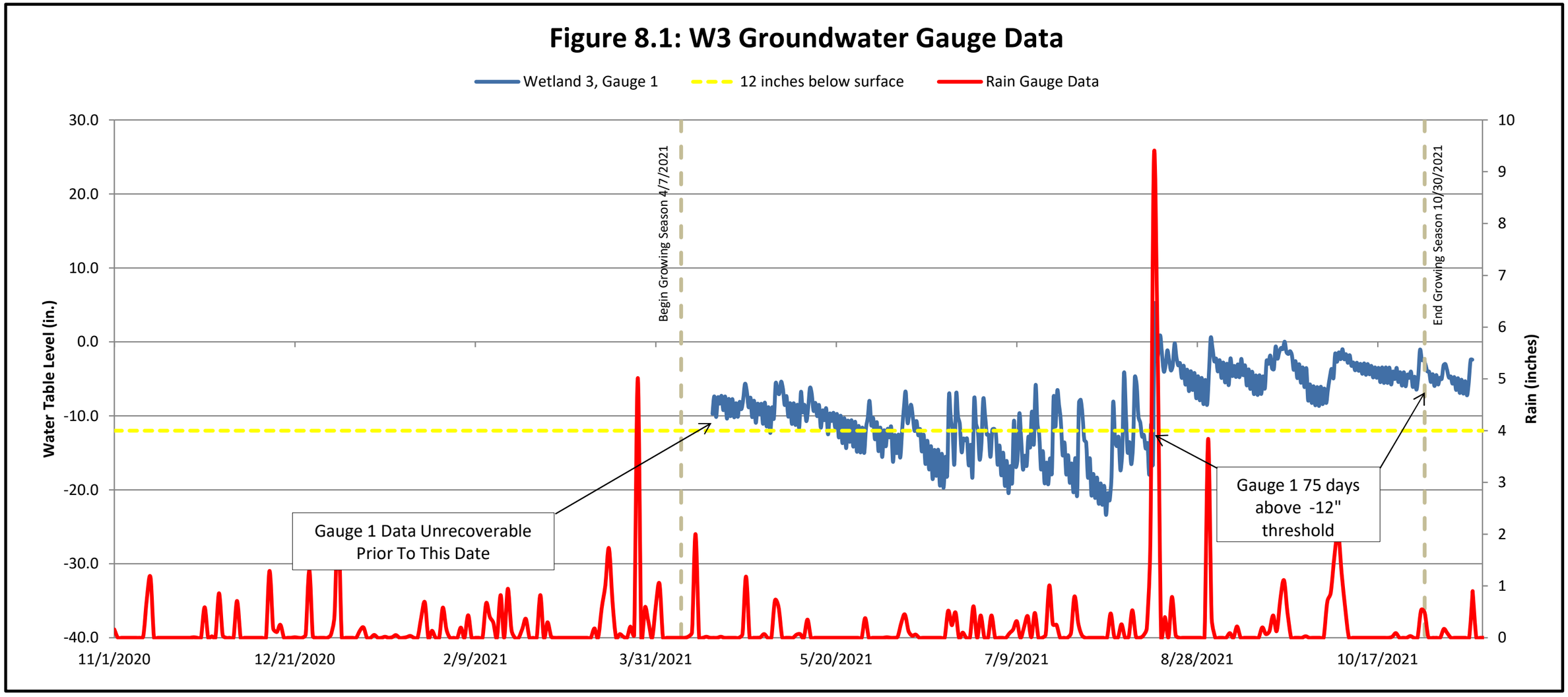
## Figure 7.4 UT 8 Flow Depth



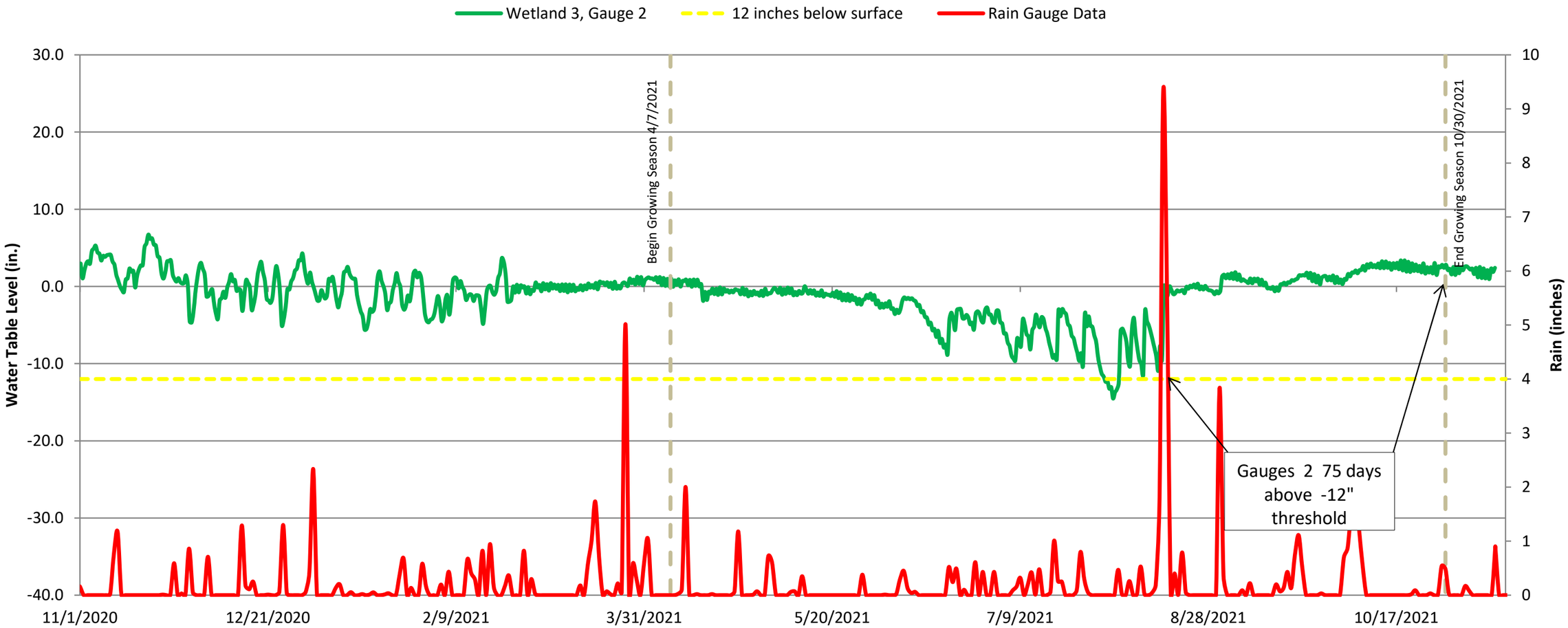
### *Table 13. Bankfull Events Summary*

| Bankfull Events | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Gauge ID** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** |
| **West Fork French Broad** | 8/16/2021, 8/18/2021, 9/1/2021 | | | | | | |
| **UT 5** | 8/16/2021, 8/18/2021, 10/30/2021 | | | | | | |
| **UT 7** | 8/16/2021, 8/18/2021 | | | | | | |
| **UT 8** | 8/16/2021, 8/18/2021, 8/31/2021, 10/7/2021 | | | | | | |

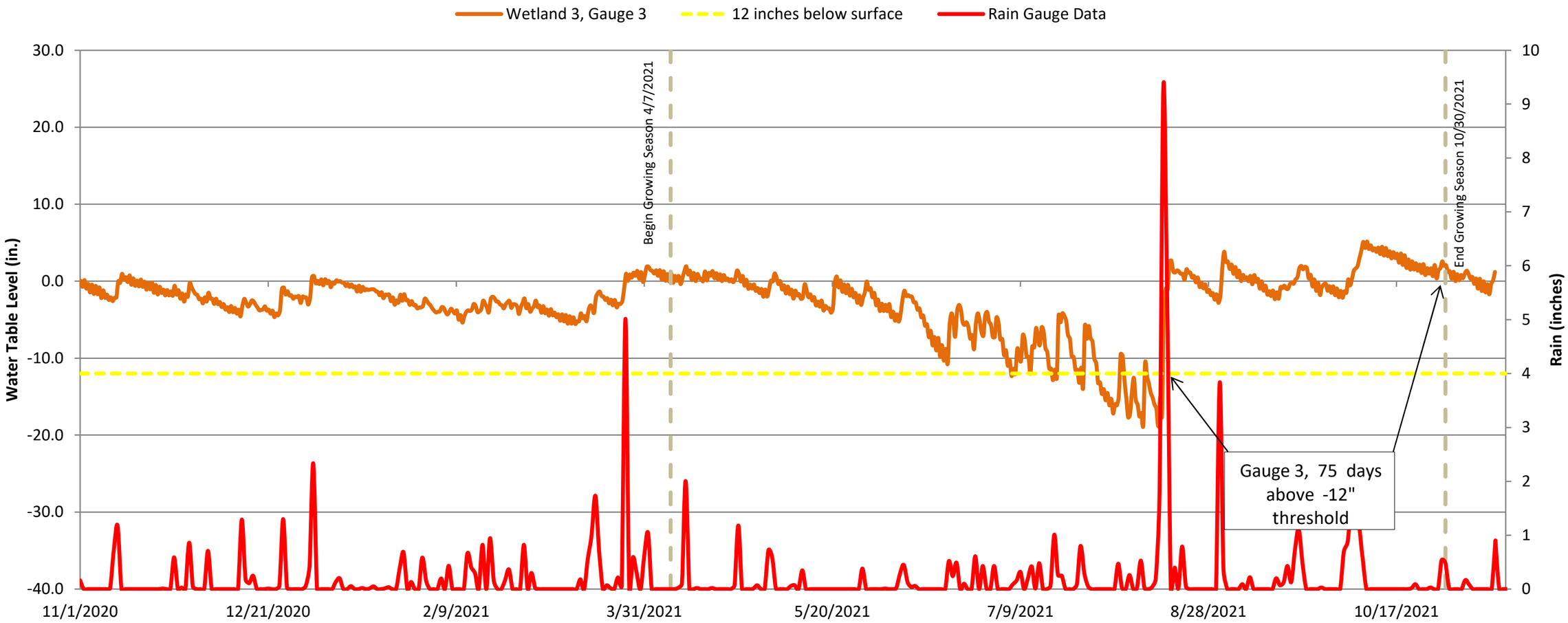
*Figures 8.1 - 8.5 Wetland Groundwater Gauge Data*



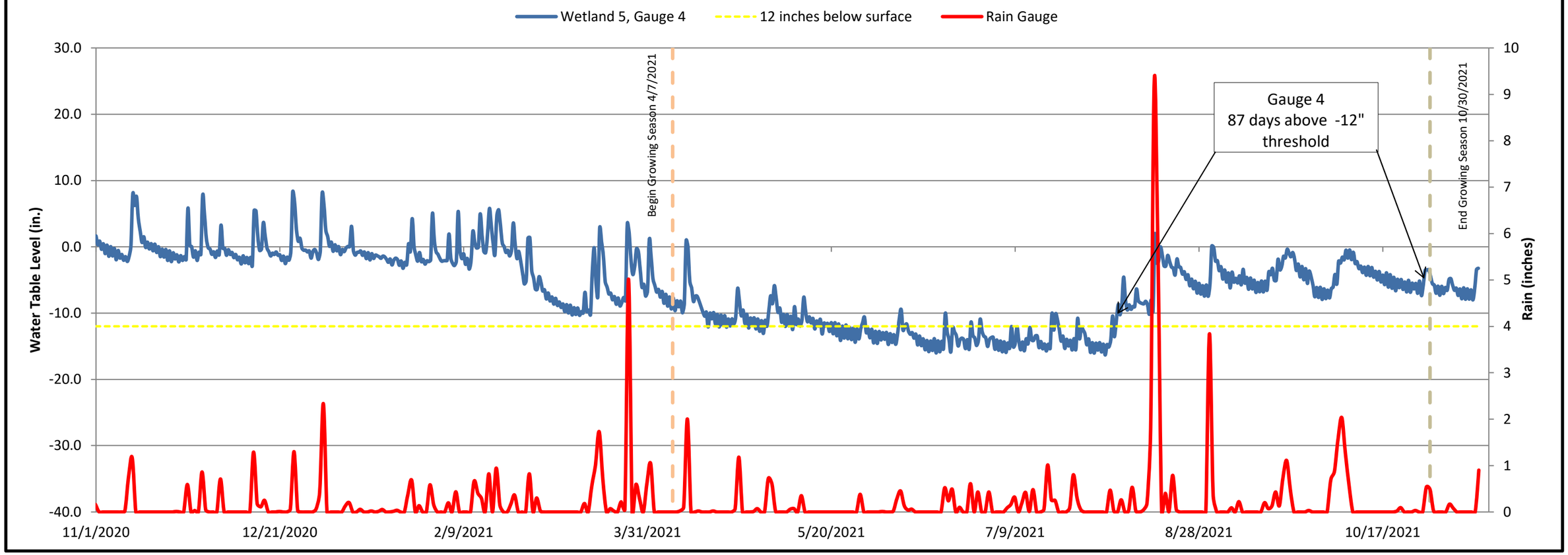
## Figure 8.2: W3 Groundwater Gauge Data



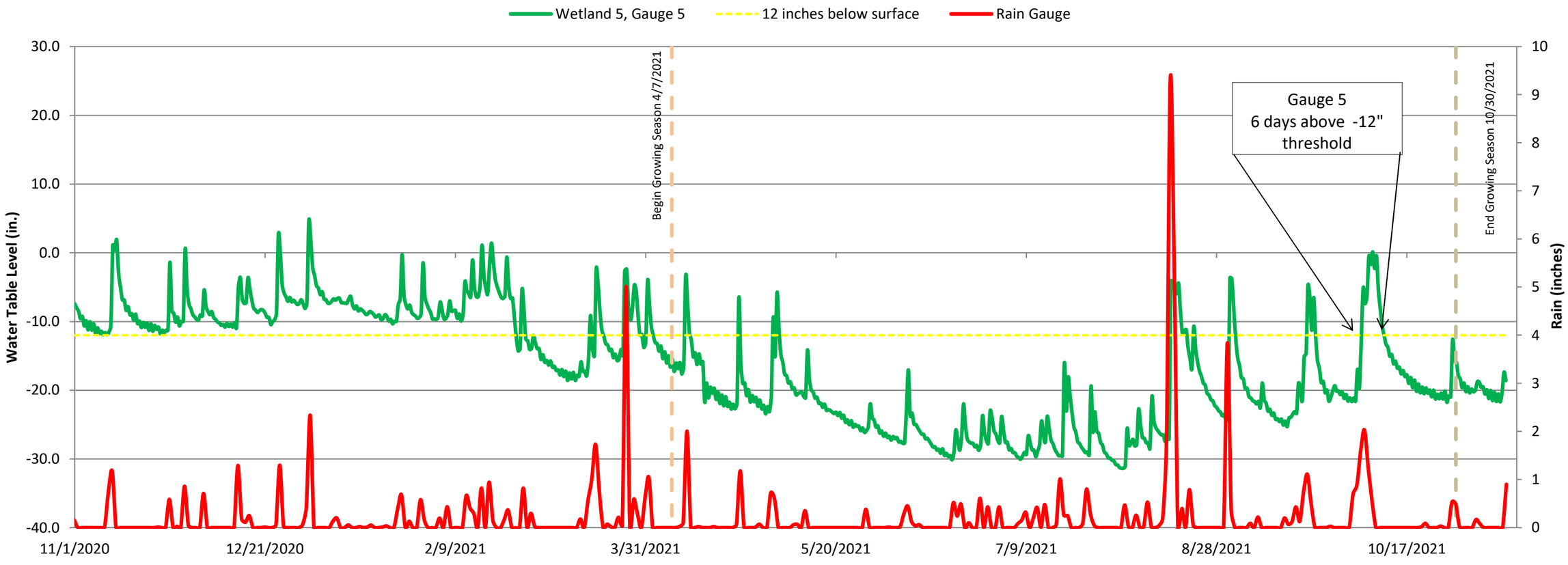
## Figure 8.3: W3 Groundwater Gauge Data



## Figure 8.4: W5 Groundwater Gauge Data



## Figure 8.5: W5 Groundwater Gauge Data



### *Table 14. Wetland Hydrology Summary*

| Monitoring Gauge | Performance Standard: **25 Consecutive Days**<br>WETS Station: **Brevard, NC**<br>Growing Season: **04/07 to 10/31 (207 days)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Max. Consecutive Hydroperiod (%)** | | | | | | |
| | **MY1 2021** | **MY2 2022** | **MY3 2023** | **MY4 2024** | **MY5 2025** | **MY6 2026** | **MY7 2027** |
| **W3-1** | 36 | | | | | | |
| **W3-2** | 36 | | | | | | |
| **W3-3** | 36 | | | | | | |
| **W5-4** | 42 | | | | | | |
| **W5-5** | 3 | | | | | | |

# Appendix F – Adaptive Maintenance and Repair Plan Submittal to IRT

LMG
LAND MANAGEMENT GROUP
a DAVEY company

November 5, 2021

Ms. Kim Browning
United States Army Corps of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587

Subject: Owen Farms (SAW-2018-01165) Repair Plans

Ms. Browning,

The purpose of this letter is to inform you of recent damage observed at the Owen Farms Mitigation Site (Site) and describe our plan for corrective action. The Site experienced a 200-year storm event between August 15-17. On-site rain data recorded 16.70 inches over a 72-hour period, with 6.07 inches falling within 3 hours on August 16. Monthly precipitation totals recorded at the site are attached. This storm event resulted in floodplain scour, eroded banks, and excess channel deposition. LMG used a drone to capture aerial imagery of the Site on September 29, 2021. Figure 1 (attached) depicts areas of disturbance discussed above overlain on aerial imagery from September 29, 2021. The attached photo log provides representative photos of disturbed areas.

LMG has developed a repair plan for the Site. Standard construction equipment will be used to repair degraded areas (i.e. excavator and off-road hauler). Scoured areas in the floodplain will be filled with on-site material excavated from adjacent terrace slopes. Excess cobble and gravel material deposited between stations 10+50 and 11+50, creating a transverse bar. This excess material will be removed and placed along the channel toe of repaired stream banks. Eroded Stream banks will be graded to approximate design dimensions and matted with coir fiber matting. Approximately 50 linear feet of soil lifts will be installed between stations 18+60 and 19+10. Overall, approximately 100 linear feet of stream bank grading and 100 linear feet of substrate removal is anticipated as a result of repair activities. Disturbed areas will be seeded with a permanent, native seed mix and replanted with native species as approved in the Mitigation Plan. A temporary seed mix consisting of rye (grass and/or grain) will also be applied to disturbed areas.

Repair work will be conducted under the existing Nationwide Permit 27 and Erosion Control Permit for the Site. The Nationwide Permit 27 (and associated 401 Certification, DWR #18-1033) was issued on March 30, 2020 and expires March 18, 2022. The Erosion Control Permit was issued June 5, 2020 and expires June 5,

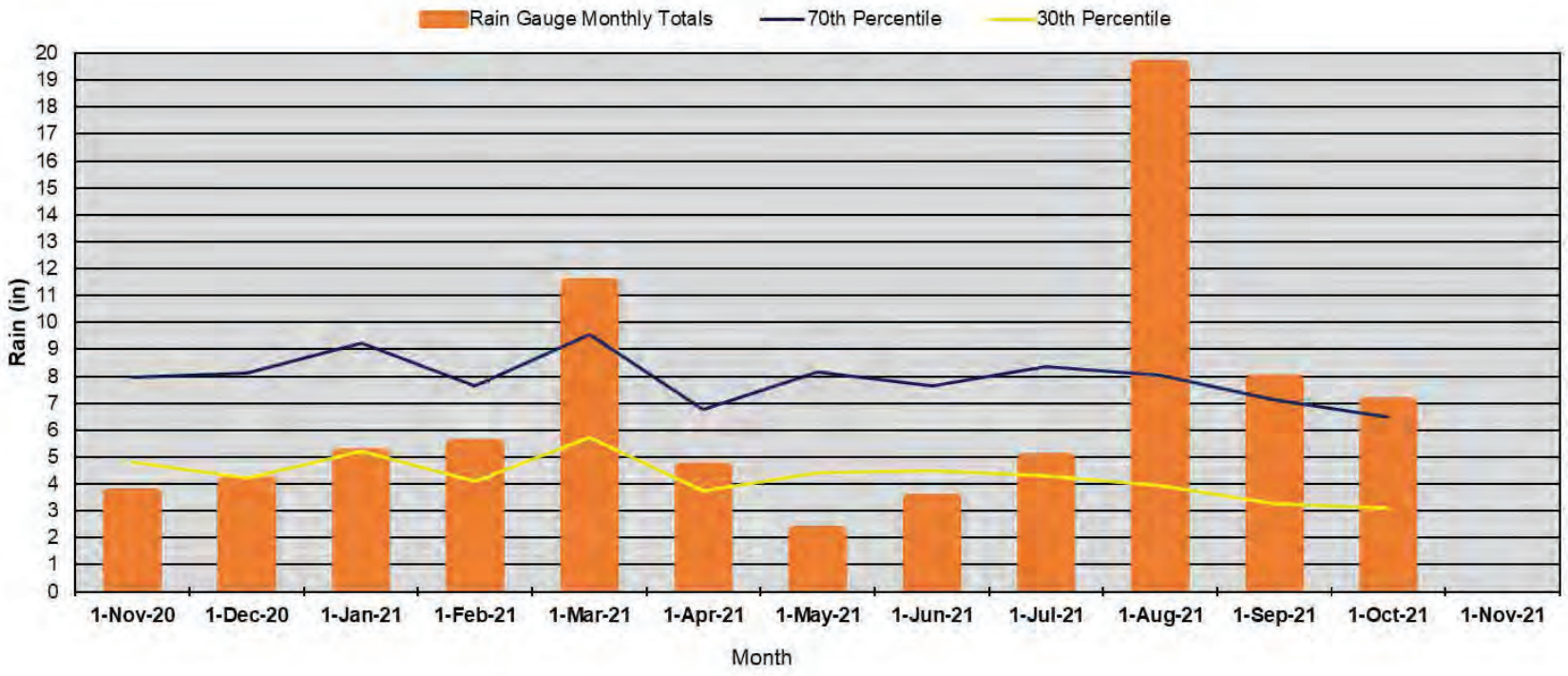
2023. Repair work is anticipated to begin by December 10 and be completed by December 31, 2021. Planting will be completed by March 31, 2022. LMG has spoken with the North Carolina Wildlife Resources Commission (WRC, Andrea Leslie) regarding the trout moratorium that is currently in effect at the Site. LMG will submit a written request for a waiver of the trout moratorium for purposes of completing repair work at the Site. A copy of this letter will be provided to WRC and will be included in the Year 1 Monitoring Report.

Should you have any questions or concerns, please call me at 919.588.9663 or you can reach me via email at bfurr@lmgroup.net.

Thank you,

Ben Furr, PWS
Land Management Group

## Figure 6 Owen Farm Monthly Precipitation 2021 (30th / 70th Percentiles)




0 Feet 880

# REPAIR PLAN MAP

## OWEN FARMS MITIGATION SITE

FIGURE 1

MAP DATE: 11-04-2021

Looking downstream at stump to be removed on left bank near Station 10+75.

Looking downstream at eroded right bank near station 11+00.

Looking upstream at excess material deposited in channel, creating transverse bar near Station 11+25.

Looking upstream at scour in the right floodplain near Station 13+00.

Looking downstream at scour hole in right floodplain near Station 15+50.

Looking downstream at scour in left floodplain near station 17+50.

Looking at eroded right bank near station 18+75.

Looking upstream at scour in the right floodplain near station 25+75.

Looking downstream at scour in the left floodplain near station 28+50

| STATE | | SHEET NO. |
|---|---|---|
| N.C. | WEST FORK FRENCH BROAD RIVER | 1 |

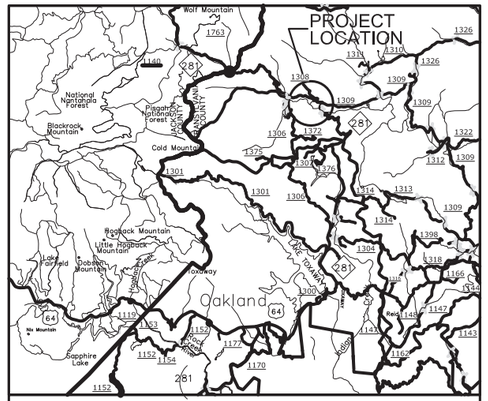
# RECORD DRAWING
# OWEN FARMS
# MITIGATION SITE

LOCATION: TRANSYLVANIA COUNTY, NORTH CAROLINA

LAT: 35.183611 LONG: −82.9413889

35 11' 04.89" −82 56' 34.97"

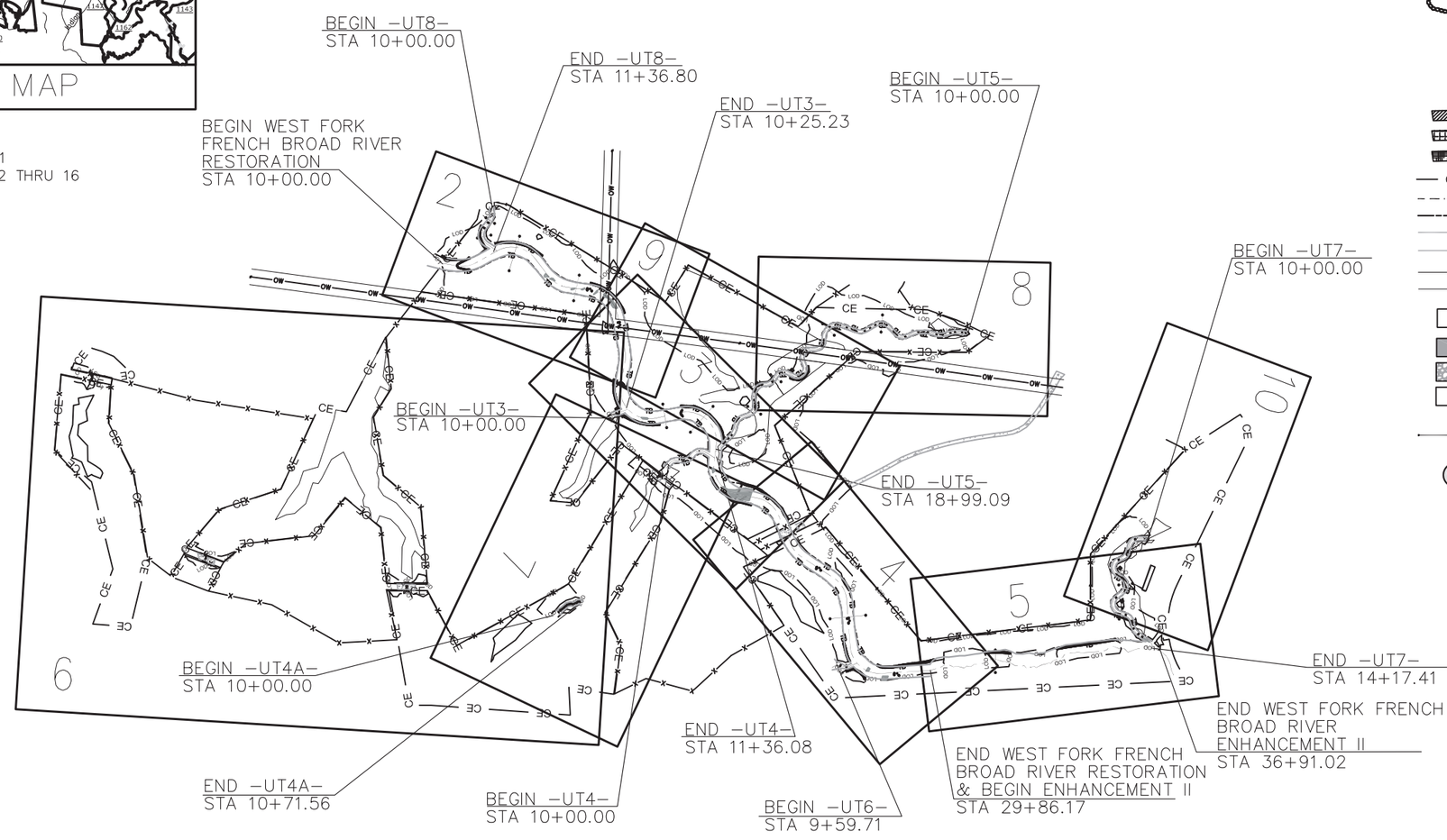
TYPE OF WORK: RECORD DRAWINGS




VICINITY MAP

INDEX OF SHEETS






## LEGEND

- 1/2" RBC (CROSS−SECTION REBAR)
- GAUGE (AS NOTED)
- ROCK STEP STRUCTURE W/ RIP RAP
- LOG SILL
- ROCK STEP STRUCTURE W/ BOULDERS AND HELLBENDER HABITAT
- ROCK CROSS VANE W/ HELLBENDER HABITAT
- HELLBENDER HABITAT
- UTILITY POLE
- GUY ANCHOR
- SOIL LIFT
- SOIL LIFT W/ BOULDER TOE
- SOIL LIFT W/ TOE WOOD
- CE — CONSERVATION EASEMENT
- AS−BUILT CENTERLINE
- TB — AS−BUILT TOP OF BANK
- DESIGN CENTERLINE
- DESIGN TOP OF BANK
- OW — OVERHEAD WIRE
- X — FENCE
- GRAVEL
- BEDROCK
- RIP RAP
- EXISTING WETLANDS
- KISSING GATE
- WP — CONSERVATION EASEMENT WITNESS POST

DWR # 18−1033
DMS ID # 100064
DMS CONTRACT 7532
USACE−SAW−2018−01165

NORTH CAROLINA PROFESSIONAL SEAL 050744 ENGINEER CHRISTOPHER L. SMITH

5/26/2021

DRG Services, P.C.
3101 Poplarwood Ct.
Raleigh N.C. 27604
License No. C−4174

CONTRACT: OWEN FARMS MITIGATION SITE

RECORD DRAWINGS

This record drawing has been prepared in part, based upon information furnished by others. While this information is believed to be reliable, the Engineer cannot assure its accuracy, and thus is not responsible for the accuracy of this record drawing or for any errors or omissions which may have been incorporated into it as a result. Those relying on this record document are advised to obtain independent verification of its accuracy before applying for any purpose.

SURVEY PREPARED BY:

KEE MAPPING & SURVEYING
P.O. BOX 2566
ASHEVILLE, NC 28802
(828) 575−9021

GRAPHIC SCALES

50 25 0 50 100
PLANS

10 5 0 10 20
PROFILE (HORIZONTAL)

20 10 0 20 40
PROFILE (VERTICAL)

## DESIGN DATA

| WEST FORK FRENCH BROAD RIVER | | UT 5 | | UT 7 | | UT 8 | |
|---|---|---|---|---|---|---|---|
| DESIGN STREAM TYPE | = C4 | DESIGN STREAM TYPE | = C4 | DESIGN STREAM TYPE | = C4 | DESIGN STREAM TYPE | = C4 |
| BANKFULL AREA ($FT^2$) CROSS−SECTIONED | = 64.29 | BANKFULL AREA ($FT^2$) CROSS−SECTIONED | = 5.35 | BANKFULL AREA ($FT^2$) CROSS−SECTIONED | = 6.0 | BANKFULL AREA ($FT^2$) CROSS−SECTIONED | = 11.08 |
| BANKFULL WIDTH (FT) | = 30.0 | BANKFULL WIDTH (FT) | = 8.5 | BANKFULL WIDTH (FT) | = 9.0 | BANKFULL WIDTH (FT) | = 12.0 |
| MAX DEPTH (FT) | = 2.68 | MAX DEPTH (FT) | = 0.76 | MAX DEPTH (FT) | = 0.80 | MAX DEPTH (FT) | = 1.11 |
| WIDTH / DEPTH RATIO | = 14.0 | WIDTH / DEPTH RATIO | = 13.5 | WIDTH / DEPTH RATIO | = 13.5 | WIDTH / DEPTH RATIO | = 13.0 |
| DRAINAGE AREA ($MI^2$) | = 5.50 | DRAINAGE AREA ($MI^2$) | = 0.07 | DRAINAGE AREA ($MI^2$) | = 0.06 | DRAINAGE AREA ($MI^2$) | = 0.31 |
| BANKFULL SLOPE(FT/FT) | = 0.00353 | BANKFULL SLOPE(FT/FT) | = 0.00569 | BANKFULL SLOPE(FT/FT) | = 0.00539 | BANKFULL SLOPE(FT/FT) | = 0.01096 |

CHRISTOPHER L. SMITH
PROJECT DESIGNER / ENGINEER

## PROJECT LENGTH

| | | EXISTING STREAM LENGTH | PROPOSED DESIGN STREAM LENGTH |
|---|---|---|---|
| WEST FORK FRENCH BROAD RIVER | = | 2,859.55 FT | 2,691.02 FT |
| −UT4− | = | 1,133.30 FT | 136.08 FT |
| −UT4A− | = | 471.56 FT | 71.56 FT |
| −UT5− | = | 652.00 FT | 899.09 FT |
| −UT7− | = | 811.00 FT | 417.41 FT |
| −UT8− | = | 49.00 FT | 136.80 FT |

Prepared in the Office of:

LMG LAND MANAGEMENT GROUP
a DAVEY company
for

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F−0116

Z:\HDR Projects\Owen_Farms\6.0_CAD\6.5_Proj\6.5.6_Asbuilt Plans (AutoCad)\OwenFarms_psh_01.dwg, 5/27/2021 8:57:24 AM

# Repair Plans 10/25/2021

PLACE ANY EXCESS CUT MATERIAL IN EXISTING STOCKPILE AREA.

REMOVE FENCE FOR SITE ACCESS. REPLACE FENCE ONCE COMPLETE.

BEGIN UT8
STA: 10+00.00

CROSS-SECTION #13

CROSS-SECTION #14

CROSS-SECTION #1

CROSS-SECTION #2

FILL BANK SCOUR WITH IN CHANNEL MATERIAL.

FILL SCOUR HOLE.

REMOVE STUMP.

INTERSECTION
END UT8
STA: 11+36.80
WEST FORK FRENCH BROAD RIVER
STA: 11+46.97

WEST FORK FRENCH BROAD RIVER
FLOW

BEGIN WEST FORK FRENCH BROAD RIVER
STA: 10+00.00

EXCAVATE SCOUR POOL OF SEDIMENT.

FILL TOE SCOUR WITH IN CHANNEL MATERIAL

FILL FLOODPLAIN BENCH SCOUR

REPAIR AND FILL SCOUR AROUND POWER POLE.

FILL FLOODPLAIN SCOUR WITH OVERBANK MATERIAL.

OVERHEAD UTILITY LINES AND EASEMENT

MATCHLINE STA 16+50 SEE SHEET 3

PREPARED IN THE OFFICE OF
LMG
LAND MANAGEMENT GROUP
a DAVEY company
FOR

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

OWEN FARMS MITIGATION SITE
STREAM & WETLAND RESTORATION PROJECT
TRANSYLVANIA COUNTY, NORTH CAROLINA
WEST FORK FRENCH BROAD RIVER STA 10+00 – STA 16+50
_UT8– STA 10+00 – 11+47

GRAPHIC SCALE
50 25 0 25
PLANS

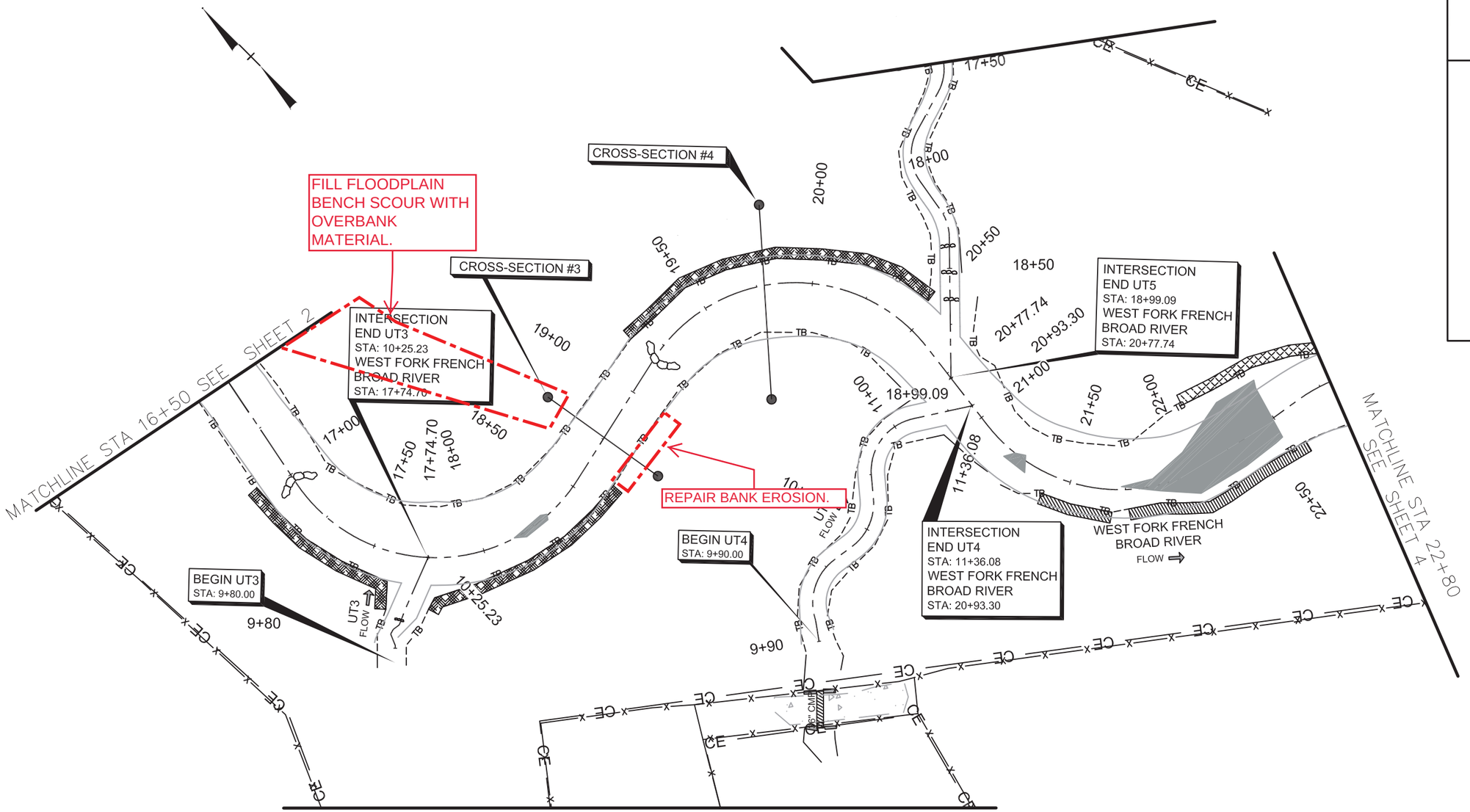
DATE:
03-11-2021

REPAIR PLANS

SHEET
2

DMS ID #
100064

**Repair Plans 10/25/2021**

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FOR


HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116


OWEN FARMS MITIGATION SITE
STREAM & WETLAND RESTORATION PROJECT
TRANSYLVANIA COUNTY, NORTH CAROLINA

WEST FORK FRENCH BROAD STA 16+50 – STA 22+80
–UT3– STA 9+80 – 10+25.24
–UT4– STA 9+90 – 11+36.08
–UT5– 17+50 – 18+99.09

GRAPHIC SCALE
50 25 0 25
PLANS

DATE:
03–11–2021

REPAIR PLANS

SHEET
3

DMS ID #
100064

**Repair Plans 10/25/2021**

WEST FORK FRENCH BROAD RIVER
END RESTORATION
BEGIN ENHANCEMENT II
STA: 29+86.17

MATCHLINE STA 30+25

CROSS-SECTION #5

INTERSECTION
END UT6
STA: 10+27.56
WEST FORK FRENCH
BROAD RIVER
STA: 27+92.05

FILL FLOODPLAIN SCOUR.

FORD
CROSSING

MATCHLINE STA 22+80
SEE
SHEET 23

WEST FORK FRENCH
BROAD RIVER
FLOW

FILL FLOODPLAIN
SCOUR.

BEGIN UT6
STA: 9+59.71

UT6
FLOW

WP

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LMG
LAND MANAGEMENT GROUP
a DAVEY company
FOR

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
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OWEN FARMS MITIGATION SITE
STREAM & WETLAND RESTORATION PROJECT
TRANSYLVANIA COUNTY, NORTH CAROLINA

WEST FORK FRENCH BROAD STA 22+80 – STA 30+25
–UT6– STA 9+60 – 27+92.05

GRAPHIC SCALE
50 25 0 25
PLANS

DATE:
03–11–2021

REPAIR
PLANS

SHEET
4

DMS ID #
100064

# Appendix G: Response to IRT Comments

July 2, 2021

United States Army Corps of Engineers
151 Patton Ave #208
Asheville, NC 28801

Re: MY0 As-Built Baseline Comments
Owen Farms Stream and Wetland Mitigation Site
French Broad River Basin; CU# 06010105 – Transylvania County
DMS Project ID No. 100064
Contract No. 7532
SAW-2018-01165

To Whom It May Concern,

As per your email dated June 29, 2021, we have reviewed and addressed the NCIRT's review comments as follows:

Erin Davis, DWR

1. DWR is ok with the planted vegetation species/quantity substitutions. Were there any species changes in the previously approved site seed mixes?
   *RE: There were no changes to the previously approved site seed mixes.*

2. DWR appreciates the inclusion of aerial photos. These images are helpful for agency review.
   *RE: Understood.*

3. During the IRT construction site walk following significant a storm event in November 2020, we observed areas of floodplain scour and major movement of stone from original bed/bank placement. Was there any adjustment of floodplain width and/or slope from the original design? And was there any adjustment is rock size for riffles and/or bank toe structures?
   *RE: Following the significant storm event in November 2020, the floodplain was widened on the right side of WFFB between STA 10+00 and STA 14+00, and along the left overbank area between STA 16+50 and STA 19+00. The floodplain was widened to relieve shear stress along the bench and the cut material was utilized to repair the eroded channel banks and floodplain scour. Revised redline plansheets have been attached as part the response to comments indicating the locations of where the floodplain bench was extended.*

   *There were no adjustments to slope, riffle particle size, or bank toe structures from the original design except for what was called out in the report and the redline plansheets.*

Casey Haywood, USACE

1. No issues with the changes to the species type and composition for the planted vegetation. Appreciate the effort in identifying the planting zones.
   *RE: Understood.*



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2. The report mentions Bog complex communities being planted with high percentages of shrub species; I understand that these are not expected to reach the height requirement/vigor standard, but I was wondering how success and/or survival is being monitored in these areas?
   *RE: LMG will continue to monitor these areas for planted stem density as an indicator of overall survival and health. As noted in the approved Mitigation Plan, Bog complex communities are not expected to reach the height requirement of other "tree dominated" communities open patches dominated by herbaceous species within the bog complex is typical for the community type.*

3. I did not see UT1, UT2, or UT3 in the Table 6 Project Attribute table. Why were these left out of the table?
   *RE: An updated Table 6 Project Attribute Table has been attached with this submittal.*

4. Given the amount of damage seen during the November site visit due to major storms, I also think it would be beneficial to schedule a site visit for next year.
   *RE: Understood.*

If you have any questions or need additional information, please do not hesitate to give me a call (843.830.1536).

Sincerely,
Land Management Group

Alex DiGeronimo



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