Mitigation Plan

Owen Farms Mitigation Site
Transylvania County, NC

NCDMS Project No. 100064
USACE ID: SAW-2018-01165

French Broad River Basin
Cataloging Unit 06010105

January 31, 2020

Prepared for:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Prepared by:

HDR Engineering
555 Fayetteville Street, Suite 900
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LMG Contributing Staff: Ben Furr, Ryan Smith, Alex DiGeronimo, Chris Smith, Yvette Mariotte, Kevin Williams

This Mitigation Plan 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.

These documents govern NCDEQ Division of Mitigation Services operations and procedures for the delivery of compensatory mitigation

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

February 13, 2020

Regulatory Division

Re: NCIRT Review and USACE Approval of the NCDMS Owen Farms Mitigation Site / Transylvania Co./ SAW-2018-01165/ NCDMS Project # 100064

Mr. Tim Baumgartner
North Carolina Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Owen Farms Draft Mitigation Plan, which closed on August 25, 2019. A follow-up meeting was held with the provider and the IRT January 8, 2020 to discuss concerns with the draft mitigation plan. These comments, and the revised asset map, are attached for your review.

Based on our review of these comments, we have determined that no major concerns have been identified with the Draft Mitigation Plan, which is considered approved with this correspondence. However, several minor issues were identified, as described in the attached comment memo, which must be addressed in the Final Mitigation Plan.

The Final Mitigation Plan is to be submitted with the Preconstruction Notification (PCN) Application for Nationwide permit approval of the project along with a copy of this letter. Issues identified above must be addressed in the Final Mitigation Plan. All changes made to the Final Mitigation Plan should be summarized in an errata sheet included at the beginning of the document. If it is determined that the project does not require a Department of the Army permit, you must still provide a copy of the Final Mitigation Plan, along with a copy of this letter, to the appropriate USACE field office at least 30 days in advance of beginning construction of the project. Please note that this approval does not preclude the inclusion of permit conditions in the permit authorization for the project, particularly if issues mentioned above are not satisfactorily addressed. Additionally, this letter provides initial approval for the Mitigation Plan, but this does not guarantee that the project will generate the requested amount of mitigation credit. As you are aware, unforeseen issues may arise during construction or monitoring of the project that may require maintenance or reconstruction that may lead to reduced credit.

Thank you for your prompt attention to this matter, and if you have any questions regarding this letter, the mitigation plan review process, or the requirements of the Mitigation Rule, please call me at 919-554-4884, ext 60.

Sincerely,

Kim Browning
Mitigation Project Manager
for Tyler Crumbley

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Paul Wiesner– NCDMS
Benjamin Furr, Ryan Smith—LMG
Vickie Miller—HDR

Meeting Minutes

Project:	Owen Farms Stream and Wetland Mitigation Site (DMS # 100064)	
Subject:	IRT Meeting to Discuss Comments on Mitigation Plan	
Date:	Wednesday, January 08, 2020	
Location:	USACE Office, Wake Forest, NC	
Attendees:	Ryan Smith (LMG)	Ben Furr (LMG)
	Paul Wiesner (via phone, DMS)	Vickie Miller (HDR)
	Mac Haupt (DWR)	Erin Davis (DWR)
	Kim Browning (USACE)	Andrea Leslie (via phone, WRC)
	Todd Tugwell (USACE)	

The IRT meeting to discuss comments on the Owen Farms Stream and Wetland Mitigation Plan was held at 10:00am on Wednesday, January 8, 2020 at the USACE Office in Wake Forest. The following represents highlights of discussions that occurred during the meeting:

1. Mac Haupt began by reviewing DWR comments, specifically regarding DWR concerns about bench width on West Fork French Broad River (WFFBR). DWR stated that they are concerned bench width is too narrow and may result in stream bank erosion, particularly through the reach depicted on plan sheets 5 and 6. HDR understands concerns voiced by DWR and assured all in attendance that proposed conditions models and previous experience have been reviewed to determine bank stress on proposed conditions.
2. Mac also discussed concerns about UT 3 originating in a headwater wetland and whether it will maintain single channel flow throughout the monitoring period. LMG explained that the enhancement work on UT 3 is simply being done to stabilize UT 3 as it converges with WFFBR and that there should be enough slope through the enhanced reach of UT 3 to maintain single channel flow. LMG stated that additional discussion will be added in the mitigation plan to explain why enhancement 1 is necessary on UT 3.
3. USACE questioned why some of the ratios and proposed mitigation approaches were changed between the proposal phase and the mitigation plan phase. LMG explained that additional data was collected during the design phase that led to revisions in mitigation approach in certain areas.

4. Mac questioned the floodplain interceptors and associated typical in the design sheets. Specifically, DWR wants to make sure that mitigation credit is not being granted to reaches with large portions of rip-rap along the stream banks. LMG explained that floodplain interceptors are typically small (i.e. ~ 5 feet wide) and intended to stabilize the bank in areas where concentrated overland flow enters the stream channel. LMG also stated that the intent is to use native material from on-site to construct the floodplain interceptors where material is readily available. LMG will add a statement on the typical, detailing use of native material.
5. Todd Tugwell asked a question about why an impervious channel plug was shown overlapping the wetland enhancement area on plan sheet 5, near the confluence of UT 5 and WFFBR. LMG noted that it appears to be a mistake and that it will be corrected on the plan sheets and credit tables to ensure that wetland enhancement credit is not being generated where channel plugs and/or floodplain interceptors are being installed. Wetlands that are currently shown as enhancement where UT 5 will be filled will be changed to wetland restoration since that area is not an existing wetland but will revert to wetlands once construction has been completed. DWR also mentioned that the area near the confluence of UT 5 and WFFBR may be a weak point in the left bank of WFFBR given the close proximity of W3 to the stream bank. LMG explained that soil lifts with toe wood and impervious channel plugs would be installed along the left bank at this location to promote bank stability.
6. DWR requested that one of the groundwater gauges proposed for the W3 Re-establishment area be moved slightly west into the W3 Rehabilitation area to improve coverage of groundwater gauges throughout W3. LMG agreed and will update the Mitigation Plan accordingly.
7. USACE and DWR also have questions concerning the limits of construction lines shown on plan sheet 11 and why they extended into wetland re-establishment/re-habilitation areas. LMG explained that restoration of UT 5 at this location was a Priority I restoration and that there would not be a bench cut to the limits of construction as there is on WFFBR. The limits of construction lines on UT 5 will be revised to more accurately depict where grading will occur.
8. Andrea Leslie explained that WRC wanted language added to the Mitigation Plan stating that some amount of herbaceous dominated coverage within wetlands on-site was acceptable and appropriate based on reference bog complexes in the area. LMG agreed to add language to the performance standards section and adaptive management sections of the Mitigation Plan to discuss the potential for herbaceous dominated areas within wetlands on-site. WRC also requested that additional shrubby species be included with the planting plan for W3 to improve diversity (swamp rose was mentioned as an example). LMG stated that additional shrubby species could be added to the planting plan but questioned how that would affect performance standards (i.e. would areas planted with mostly shrubby species still be held to the same vigor standards as tree species). USACE stated that the Swamp Forest/Bog complex communities are naturally dominated by shrubby and herbaceous species and would not be held to the same vigor standards as communities dominated by tree species. Everyone agreed that there are few, if any good reference Swamp Forest/Bog complex communities in the vicinity of the project and WRC suggested using Schafale and Weakley as a reference for potential vegetation that could be added to the planting plan to improve diversity. WRC also asked if herbaceous species would be planted in the wetlands. LMG explained that the existing wetlands already exhibit a variety of herbaceous wetland species but that any disturbed and/or restored wetland areas would be

planted with a native riparian seed mix. LMG will add the native seed mix to the planting plan within the Mitigation Plan.

9. Credit Ratio Discussion:
    a. LMG explained that tributary reaches were lumped together from a crediting standpoint to avoid having too many small reaches with different credit ratios (as was discussed during the initial IRT site walk). DWR and USACE agreed with this approach but disagreed with some of the credit ratios allocated to certain tributaries.
    b. Following discussion about the varying degrees of cattle impact across the site, buffer widths, and opportunity for functional uplift at each tributary, the following credit ratios were agreed upon for each tributary (ratios that were changed from what was proposed in the Mitigation Plan are highlighted):
        i. UT 1 (4:1)
        ii. UT 2 (3.5:1)
        iii. UT 2A (2.5:1)
        iv. UT 2B (2.5:1)
        v. UT 3 (1.5:1)
        vi. UT 4 (2.5:1)
        vii. UT 4A (2.3:1)
        viii. UT 4B (4:1)
        ix. UT 5 (1:1)
        x. UT 6 (10:1)
        xi. UT 6A (10:1)
        xii. UT 7 (R = 1:1, E2 = 3.5)
        xiii. UT 7A (10:1)
        xiv. UT 7B (2.5:1)
        xv. UT 8 (1:1)
    c. LMG will update the Mitigation Plan to reflect the credit ratios listed above. Kim Browning requested a more detailed discussion on how HDR determined ratios for each stream reach. LMG agreed to add language to the Mitigation Plan to provide more explanation on how some stream reaches are lumped together to determine credit ratio (for example UT 4). LMG will also add discussion in the Mitigation Plan to explain that the beaver dams on UT 2 appear to be relic (i.e. not active beaver dams).
10. Utility Lines:
    a. LMG explained that there is an existing utility easement overlapping the conservation easement.
    b. USACE explained that an exception for utility maintenance will need to be included in the stewardship transfer document and requested that language also be added to the Mitigation Plan discussing this issue.
    c. LMG clarified that no stream or wetland credits were being generated within the utility easement.
    d. USACE suggested using a different stream centerline color for portions of streams within utility easements that are not generating credits. LMG will modify Project Asset Map (Figure 17) accordingly.

e. IRT stated that the utility easement label should be changed from “proposed” to “existing”. LMG will update the plan sheets accordingly.
f. IRT requested that shrubby species be planted in the wetland rehabilitation area within the utility easement. LMG will update the Planting Plan to include the area within the utility easement.

11. USACE questioned the extent of grading that would occur within wetland restoration areas. LMG explained that restoration of W3 would require grading to a depth of less than 11 inches and that grading within W5 restoration areas would consist of removing distinct spoil piles adjacent to UT 7. USACE suggested adding language to the Mitigation Plan describing that distinct spoil piles will be removed as part of W5 restoration.
12. DMS asked what the IRT needed to move forward with approval of the Mitigation Plan. The IRT requested that HDR submit the following items for review and final approval of the Mitigation Plan:
    a. Revised Response to IRT Comments
    b. Revised Project Asset Map (Figure 17)
    c. Final Meeting Minutes from 01-08-2020 meeting

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January 31, 2020

Dear Ms. Browning,

We have reviewed and addressed IRT comments on the draft Mitigation Plan as follows:

NCWRC, Andrea Leslie:

1. We appreciate the provider's consideration of NCWRC's recommendations made in the field and via email earlier in 2019. One of these recommendations is to rescue any stranded aquatic animals (including fish, salamanders, and crayfish) in sections of channel that will be abandoned. It is important that this rescue operation be performed as soon as the flows are diverted from the old channel, and animals should be netted, placed into a bucket, and transported downstream of the impact area.

   Response: This recommendation will be noted in the construction documents and communicated to the contractor. HDR will have a representative on-site during the rescue operation.

2. If hellbenders are seen on site, place into a bucket and transport downstream of the project area. Please notify Lori Williams (lori.williams@ncwildlife.org) and Andrea Leslie (andrea.leslie@ncwildlife.org) if hellbenders are seen and/or moved.

   Response: HDR will show the contractor pictures of hellbenders and instruct them to transport hellbenders downstream of the project area if encountered during construction. Contractor will be instructed to notify HDR immediately if hellbenders are encountered.

3. The 130 ft section of the West Fork French Broad River that will be under a powerline will have pattern, profile, and dimension restored, but the plan notes that this will not be planted. We ask that at a minimum, the banks be planted with livestakes so that a narrow shrubby buffer can be established. This should help ensure longer term stability of this section of channel.

   Response: The planting plan was revised to show that live stakes will be planted along the stream banks through the utility easement. Language was also added to Section 5.1.1 and 5.1.2 to state that stream banks under the powerline easement will be planted with live stakes.

4. We ask that the streamside woody species list be expanded to include tree and shrub species seen on site and just upstream/downstream of the project – this would include rhododendron, dog hobble, and other species. Do not include black walnut, however.

   Response: Several of the species included in the planting plan currently occur on or near the site. Rhododendron is not included because it does not grow well in full sunlight. Rhododendron prefers partial to full shade underneath mature canopy. Given the abundance of rhododendron along the tributaries on-site, it is expected to colonize the floodplain of West Fork French Broad River (WFFBR) as the planted species mature. Doghobble is not included due to its propensity to form dense thickets and choke out other planted species before they have time to mature.

5. Please inform Andrea Leslie at least 2 weeks before project construction begins.

   Response: HDR will notify Andrea Leslie at least 2 weeks before project construction begins.

DWR Comments, Mac Haupt and Erin Davis:

1. HDR's response to the DMS comment letter included a response to Appendix J which was concerning Buffer calculations. DWR would like to see the spreadsheet table showing the footage above the minimum and the footage below the required. In addition, DWR would like to know what is the percentage of the buffers on site that are less than the minimum.

   Response: HDR will provide the buffer calculation spreadsheet to DMS for distribution to the IRT. The spreadsheet includes a summary tab that shows linear feet of stream below the minimum required buffer (354 LF) and linear feet of stream above the required buffer (8,421 LF).

2. One of the issues regarding this site will be the appropriate ratios for several of the enhancement reaches. Especially since Table 3 shows three of these reaches with Overall NCSAM ratings of High (UT1, UT2a, and UT6). While UT6 is preservation, the other reaches are proposed enhancement reaches and some discussion of appropriate ratios will follow in other DWR comments later in this document.

   Response: Stream reach conditions and impairments were discussed in depth during the initial IRT site visit as documented in the meeting minutes dated August 1, 2018 provided in Appendix H. HDR developed the proposed credit ratios based on existing site conditions, proposed enhancement measures, and feedback from the IRT during the initial site visit. Although UT 1 and UT 2A have similar NCSAM ratings the buffers and level of impact cattle are having on the streams is significantly different. Item 8 in the meeting minutes notes the severe impact cattle were having on UT 2A (cattle are accessing large portions of UT 2A for shade and water), in which members of the IRT were in agreement with during the site visit. In comparison, cattle are accessing UT 1 in select locations along the reach but severity of impact is less than it is on UT 2A. Cattle appear to only access UT 6 near its confluence with WFFBR and therefore impacts are minor and preservation is appropriate. Following further discussion with the IRT on 01-08-2020, HDR will revise the credit ratios for UT 1 and UT 4B to 4:1. In addition, UT 2 will be revised to 3.5:1. Credit ratios for other stream reaches will remain as proposed in the Mitigation Plan submitted on 12-12-2019.

3. DWR does not recall UT3 from the site visit but given the fact this reach originates from a wetland spring/seep, the provider should be warned that constructing single thread channels in and from these areas have shown a propensity for evolving into wetlands versus showing channel-like features.

   Response: Noted. UT3 is currently headcutting/eroding as it converges with WFFBR, enhancement measures are necessary to stabilize UT3 at its confluence with WFFBR. The slope of UT 3 through this enhancement reach should be steep enough to maintain single channel flow.

4. Section 5.6- DWR and the IRT take notice when significant grading is planned for wetland re-establishment or rehabilitation. While the plan states that spoil is to be removed at varying depths (3 to 11 inches), any grading of 12 inches or more will result in the wetland approach being classified as creation.

Response: Noted. The proposed grading is to remove spoil that was excavated from UT 5 and UT 7 and placed in the wetland areas adjacent to each stream. Removing this material will only be re-establishing natural contours in the floodplain of each tributary, not artificially lowering elevations to create wetlands. Additional language will be added to the Mitigation Plan to explain that spoil adjacent to UT 7 is in the form of distinct spoil piles, whereas spoil adjacent to UT 5 has been spread out.

5. Section 5.8- DWR suggests that the provider add verbiage that states some of the wetland restoration areas which may exhibit a Bog complex may have more herbaceous vegetation that may persist through the monitoring period. However, DWR would like to emphasize that these areas should be kept to a minimum.

   Response: The following verbiage was added to Section 5.8, "Bog Complex communities may have more herbaceous vegetation that may persist through the monitoring period, when compared to other Swamp Forest communities." The site will be planted to minimize areas dominated by herbaceous vegetation. Planted species within the Bog Complex will be dominated by shrubs and therefore may not meet the vigor standards as set forth in IRT monitoring guidance. A note will be added to the Performance Standards Table indicating that Box Complex communities may have a lower vigor and stem count when compared with other communities at the Site.

6. Table 13- DWR and the IRT are recommending that all Ash species be removed from planting plans because of the Emerald Ash Borer.

   Response: Based on comments from DWR and USACE, green ash will be removed from the planting plans.

7. Section 6.1- The 30-day flow requirement is for intermittent streams only. Perennial streams are expected to have near continuous flow.

   Response: Noted, the 30-day flow requirement was included in the performance standards simply to provide evidence that the streams proposed for mitigation credits were "at least" intermittent during the monitoring period and thus jurisdictional streams.

8. Section 6.3- The wetland performance criterion should be 12% based on the soil borings from the Licensed Soil Scientist. While the site may be mapped as Rosman (which is not a hydric soil series), the borings showed a hydric soil with the associated taxonomic subgroup (Fluvaquentic Humaquept) which corresponds to the Ela soil series in the October 2016 Mitigation Update. Please update Table 14 to reflect this required change.

   Response: Table 14 was updated to show the wetland performance criterion of 12% as requested. Verbiage was also added to Section 6.3 to reflect this update.

9. Table 15- DWR will be recommending the addition of 3 groundwater wetland gauges and we will specify the location when the Design sheets are reviewed. This table will need to reflect the change in number of gauges.

   Response: A total of 6 groundwater gauges (3 currently proposed plus 3 additional gauges requested by DWR) seems excessive for monitoring wetland hydrology on 1.32 acres of restored wetland (only 0.35 ac of the 1.32 ac is proposed as re-establishment). HDR will coordinate with DWR regarding placement of the 3 originally proposed groundwater gauges. HDR will also add an additional groundwater gauge in W5 as requested in DWR comment 16.

10. DWR is very concerned about the 15 foot minimum benches proposed for many sections of the West Fork of the French Broad. DWR noted but does not agree with the response letter to DMS regarding this matter. DWR strongly recommends for a stream of this drainage area that the floodplain benches be at least 2 times bankfull width. Particularly of interest are the bench widths on the meander bends where much of the flow energy vectors are directed.

    Response: The bankfull benches have been maximized where feasible and measures have been proposed to protect the channel (i.e. toe wood with soil lifts along outside meander bends). Additionally, the two dimensional HECRAS model did not result in erosive velocities in the proposed channel nor on the proposed floodplain.

11. Design sheet 2D- DWR is concerned with the Floodplain Interceptor typical. Basically this looks like a rip rapped stream bank. DWR will need to know where these are planned for, or where the designer thinks they may occur. Typically, we do not allow stream credit where banks are total rip rap.

    Response: The floodplain interceptor is a stabilized conveyance of a single point discharge where overland sheetflow is connected to the proposed channel. It is intended to protect the channel bank from erosion in locations that become apparent during construction and are therefore not located on the plans. Floodplain interceptors are only used when necessary. Floodplain interceptors will incorporate native channel material where available (a note regarding use of native channel material for interceptors will be added to the typical).

12. Design sheet 5: DWR is concerned about several issues on this sheet:

    a. The bench widths are not adequate for the meander bend at station 20+00. Even though there is channel fill on the inside of the bend with presumably a wider bench, the energy vectors from the flow are still directed primarily at the outer bend, especially the lower third of the meander bend.

       Response: The bench width along the outside meander bend has been modified around station 20+00 to accurately reflect the proposed grading plan and now proposes a wider floodplain in this area.

    b. In addition to the above, the UT5 confluence is located at the lower end of the meander bend and appears to be stepped down to the riffle. DWR believes this portion of UT5 is at a high risk for stability.

       Response: UT5 is proposed to be stepped down to connect to WFFBR via in-stream rock structure that will aid in stream stability.

    c. UT4 also has its confluence in virtually the same area. Does the Designer believe there is enough of a riffle to dissipate the energy from the two confluences in addition to West Fork of the French Broad as well?

Response: The model, which was completed to evaluate the proposed design, does not indicate velocities that are problematic.

d. To further exacerbate the above, a wetland is adjacent to the streambank on stream left just below the confluence of the two aforementioned tributaries. The wetland drainage toward the streambank will put lateral hydrologic pressure on the streambank and likely result in increased risk for streambank stability.

Response: Impervious channel material and toe wood with soil lifts are proposed along the outside channel meander in an effort to stabilize potentially vulnerable areas.

e. We looked for but could not find the profile representation of the lower end of UT5 where it has its confluence with the main stem. Was this included in the design sheets?

Response: The profile for UT5 can be found at the bottom of Sheets 10 and 11.

13. Design sheet 6- the bench widths are not adequate in the areas near station 28+25 to the next cross vane.

Response: The bench widths in this location transition to meet the existing top of bank for the enhancement reach where no channel modification is proposed with the exception of bank stabilization where indicated/necessary.

14. Design sheet 11- DWR recommends an additional wetland gauge be placed on stream right (20 feet beyond the bench cut, dotted line?) at station 16+00.

Response: HDR will locate one of the proposed wetland gauges at this location but additional wetland gauges will not be added to W3 (i.e. a total of 2 wetland gauges will be located within W3 Rehabilitation area, and 1 wetland gauge will be located within W3 Re-establishment area).

15. DWR recommends another gauge in W3 below the powerline.

Response: See response to DWR comment 14. One of the two groundwater gauges proposed for the W3 rehabilitation area will be located below the powerline as requested by DWR (Figure 17 has been updated accordingly).

16. Design sheet 12- DWR recommends an additional wetland gauge be placed on stream right at approximately station 10+75.

Response: Figure 17 and Table 15 have been updated to reflect adding an additional wetland gauge as requested.

17. Stream reach ratios: DWR has the following recommendations regarding the appropriate ratios on the following stream reaches:

a. UT1- DWR believes this tributary should be at least a 4:1 ratio if not higher. As you may recall, this is the tributary where we had a lot of discussion regarding the initially proposed 2.5:1 ratio. Our recommendation is based on the existing vegetation (mostly vegetated overstory), lack of a minimum required buffer, and minimal impact from cattle, and an Overall High rating from the NCSAM assessment.

Response: See response to DWR comment number 2. In addition, although cattle have not caused severe stream bank erosion/instability along UT 1, cattle routinely access UT 1 for shade and water resulting in direct fecal inputs. Excluding cattle from the stream and planting a wider riparian buffer will improve water quality in UT 1 and corresponds to the level of intervention discussed during the initial IRT site visit. Based on discussions with the IRT on 01-08-2020, HDR will revise the credit ratio for UT 1 to 4:1.

b. UT2A- this reach was ranked as an Overall High by your NCSAM assessment. Given that the reach is wooded with perhaps moderate cattle impact, DWR recommends a ratio of 3:1.

Response: See response to DWR comment number 2. In addition, the existing wooded buffer along UT 2A is narrow (~10-15') and has been degraded by frequent cattle access. Following enhancement activities UT 2A will exhibit a minimum buffer width of 30 feet with portions of the buffer exceeding 50 feet in width. HDR proposes to maintain a 2.5:1 credit ratio for UT 2A.

USACE Comments, Kim Browning:

1. The USACE ID for the cover page is SAW-2018-01165.

   Response: USACE ID number has been added to the cover page.

2. Please change the colors of the stream preservation and Enhancement II (2:1) on figure 17. It's very difficult to discern the difference between the two shades of green.

   Response: Figure 17 has been updated to address the color issue.

3. It's noted that there are several crossings, both culverts and fords. Please include who will be responsible for the culvert maintenance in the monitoring section, and how cattle will be excluded from these crossings.

   Response: Maintenance of crossings and fencing is addressed in Section 9.0. The property owner will be responsible for culvert maintenance. Gates will be installed at each crossing to promote cattle exclusion when the crossings are not in use.

4. There are several reaches of stream restoration proposed that will impact existing wetlands. Please describe how you will ensure that no functional loss/loss of waters occurs. Please include wetland gauge data in the monitoring reports annually.

   Response: See Item 3 from the meeting minutes dated August 1, 2018 provided in Appendix H. Existing wetland impacts resulting from stream restoration will be offset by wetland area gained in the footprint of the abandoned channel. In addition, raising the stream inverts will restore and enhance the hydrology of adjacent wetlands. Impacts to existing wetlands will be identified in the permit application and the overall net gain in wetland as a result of the mitigation project will be discussed in the permit as well. Wetland gauge data will be reported in the annual monitoring reports.

5. It would be beneficial to add some coarse woody debris to the depressional areas in the buffers and throughout the adjacent wetlands for habitat, and to help store sediment, increase water storage/infiltration, and absorb water energy during overbank events.

   Response: Woody material removed during restoration activities will be used on-site for stream bank stabilization and habitat creation within the floodplain/wetlands.

6. Please depict photo points/digital image stations on Figures 11. If the fixed cross-section locations are to be used, please describe that in the text.

   Response: Fixed cross section locations and vegetation plot locations will be used as photo points. Verbiage was added to Section 7.0 to explain.

7. Please discuss how fescue will be treated in conjunction with buffer establishment.

   Response: HDR does not plan to actively treat the site to eliminate fescue. As planted stems mature and the canopy develops, any remaining fescue within the buffer should be shaded out. The site will be treated to control fescue during the monitoring phase if the presence of fescue is jeopardizing the establishment of native woody vegetation.

8. UT4A: The majority of this reach (about 400 LF) will only have fencing and possible supplemental planting, while the bottom 71 LF of this reach will require channel work to tie into UT4. 3.5:1 is more appropriate for the 400' reach, and 1.5:1 is acceptable for the 71' at the confluence.

   Response: As discussed in the meeting minutes attached in Appendix H (see item 10), UT4A is routinely accessed by cattle. The buffer is significantly degraded from reference condition and the floodplain on both sides of UT4A shows signs of heavy cattle traffic. HDR agrees that the 400' reach should not receive a 1.5:1 ratio; however, based on existing conditions and proposed enhancement measures, HDR proposes that the 400' reach receive a 2.5:1 ratio similar to other reaches that have a minimal buffer and are heavily impacted by cattle. In addition, based on discussions and recommendations from the IRT during the initial site visit, HDR recommends using a weighted ratio (2.3:1) for the entire reach instead of splitting it out into two reaches (see item 9 in meeting minutes, Appendix H).

9. UT2A, UT2B, UT2 upstream of the crossing, UT7B: These areas are more appropriate for 3.5:1 or 4:1 due to some existing buffer which will require only supplemental planting and cattle exclusion.

   Response: See response to DWR comment number 2 and number 17. Based on discussions with the IRT on 01-08-2020, HDR will revise the credit ratio for UT 2 to 3.5:1. Credit ratios for UT 2A, UT 2B, and UT7B will remain as proposed in the Mitigation Plan.

10. Section 5.6.1: Please specify the amount of spoil that will be removed from W5 to ensure that this area is appropriate for wetland re-establishment rather than wetland creation. Typically any removal over 12" garners a 3:1 ratio.

Response: See response to DWR comment number 4. Spoil adjacent to UT 7 is in the form of distinct spoil piles. Spoil piles will be removed to match natural elevations in the floodplain adjacent to the spoil areas.

11. Please explain what you plan to stabilize the banks/floodplain with in restoration areas that fall under the powerline easement.

    Response: See response to NCWRC comment number 3. In addition, the floodplain underneath the powerline easement will also be planted. The planting plan will be revised accordingly.

12. Please include an estimate of trees to be cleared in the PCN in relation to NLEB habitat.

    Response: An estimate of trees to be cleared will be included in the PCN as requested.

13. Credit Release: NCDMS has recently requested that all previously mentioned As-Built reports will now be referred to as Record Drawing. Please verify this with DMS and correct as advised.

    Response: HDR will coordinate with DMS concerning reference of As-Built vs. Record Drawings and update project documents accordingly.

14. UT1: Please specify how much of this reach doesn't meet the minimum buffer width, and specify of overall buffers on site that do not meet the minimum width exceed 5% of the total easement.

    Response: See response to DWR comment number 1. The entirety of UT 1 meets the minimum buffer requirement (i.e. 30 feet) and the overall buffers that do not meet the minimum width are approximately 4% of the total.

15. Section 6.1, Stream Dimension: The 20% variance over as-built conditions is only applicable to individual bank pin measurements in the guidance. Bankfull cross-sectional area must not increase by more than 15% over the duration of the monitoring period.

    Response: 20 percent was changed to 15 percent in Section 6.1, Stream Dimension.

    a. Please remove the statement "Therefore, more leeway on pool section geometry is expected."

       Response: This statement has been removed.

16. Crossings shown on UT1 and UT2A seem like they could potentially be moved to the top of the reach and outside the easement. Please justify current placement. These two reaches also scored high on NCSAM, please justify the EII ratio proposed aside from cattle exclusion.

    Response: See response to DWR comment number 2 and number 17. The crossings could not be moved to the top of the reach for UT 1 and UT 2A because the existing topography is too steep in those areas.

17. Section 6.1, Hydraulics: 30-days consecutive flow is only applicable to intermittent streams.

    Response: See response to DWR comment number 7.

18. Section 6.2: Please remove the statement "Or a species included in the Classification of the Natural Communities of North Carolina descriptions for proposed vegetative communities at the site." NCIRT 2016 guidance should be used.

Response: This statement has been removed from Section 6.2.

   a. Any corrective measures or remediation proposal should be proposed to the IRT through an Adaptive Management Plan for IRT review and approval.

      Response: Language was added to Section 6.2 to reference Section 8.0 and state that IRT approval is required prior to implementing any corrective measures.

19. UT2 and UT2A: There is currently a beaver dam affecting the hydrology of Wetland 1. What is the anticipated effect of beaver on the stream channels and buffer of these reaches?

Response: Based on current observations, the downstream portions of UT 2 and UT 2A are affected by backwater from the beaver dams but the system is stable overall and provides high quality habitat. Vegetation in these areas is suited to a saturated/inundated hydrologic regime and vegetation mortality is not anticipated in the near future as a result of the beaver dams. HDR does not foresee the beaver dams having a negative effect on UT 2 or UT 2A or the project as a whole. Language will be added to the Mitigation Plan explaining that beaver dams on UT 2 and UT 2A appear to be relic (i.e. not active dams).

20. Veg Plots should be located in all wetland areas proposed for re-establishment (1:1).

Response: Vegetation Plots 12 and 18 will be relocated to occur inside of wetland re-establishment areas.

21. It is recommended to cap the proposed percentage of green ash (Fraxinus pennsylvanica) to be planted at 5% since emerald ash borer (Agrilus planipennis) has the potential to impact long-term tree density and canopy cover.

Response: See response to NCDWR comment number 6.

22. Table 14: Performance standard for flood attenuation should be four bankfull events in separate years.

Response: Table 14 was revised accordingly.

   a. Please include a vigor standard for riparian habitat.

      Response: A vigor standard (i.e. height measurement) of 6 feet at Year 5 and 8 feet at year 7 was added to Table 14 and Section 6.2. A note will also be added to the Performance Standards Table indicating that Bog Complex communities may exhibit lower vigor and stem density compared to other communities at the Site.

23. Table 15: Please include culvert/crossing maintenance.

Response: Visual inspection of culverts and crossings was added to Table 15.

24. General comment regarding fencing: Please depict all existing and planned fencing on the plan sheets. Additionally, it is recommended that gate access is provided to the easement for annual monitoring and Long Term Management.

    Response: Existing and proposed fencing was added to the plan sheets. Means of access to the easement will be provided via kissing gates.

Sincerely,
HDR Engineering

Vickie Miller

Vickie Miller
Project Manager

Contents

Figures

Tables

Appendices

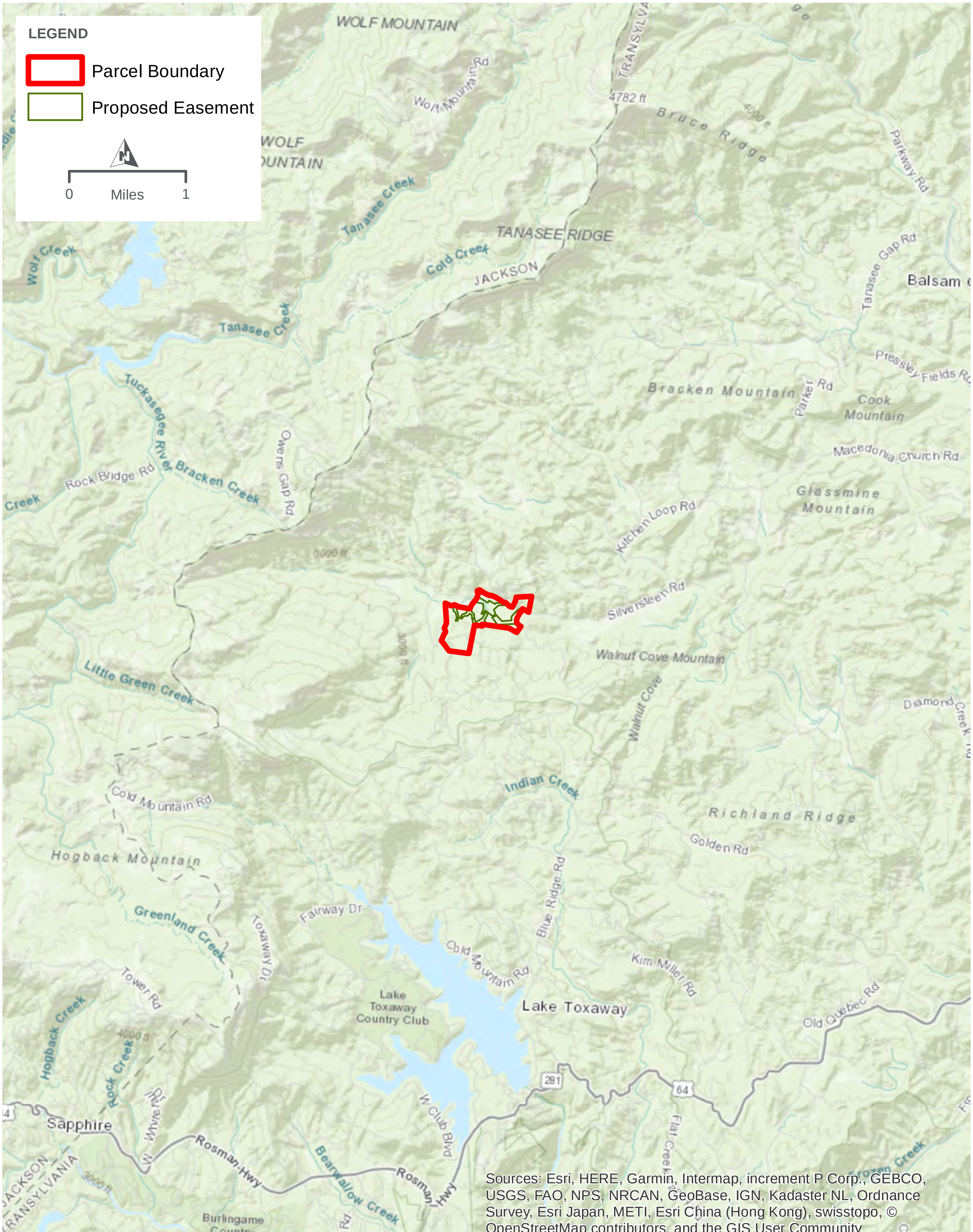
1.0 Introduction

The Owen Farms Stream and Wetland Mitigation Site (Site) has been selected by the NC Division of Mitigation Services (DMS) to provide Stream Mitigation Units (SMUs) and Wetland Mitigation Units (WMUs) in the French Broad River basin (Hydrologic Unit Code 06010105; 14-digit hydrologic unit 06010105010020). The Site is located approximately 3 miles north of Lake Toxaway in Transylvania County, NC (Figure 1). The Site encompasses approximately 25 acres of active cattle pasture and involves restoration, enhancement, and preservation of 8,565 existing linear feet of stream including the West Fork French Broad River (WFFBR, Index # 6-5-(0.5)) and 14 (fourteen) unnamed headwater tributaries. Stream mitigation at the Site will provide 5,044 SMUs. The site will also restore 1.32 acres of wetland and enhance 1.54 acres of wetland producing 1.76 WMUs.

The intent of mitigation activities is to establish a stable stream and wetland system and provide functional uplift of features within the existing landscape. Functional uplift will be provided through the restoration or enhancement of unstable and eroding streams; restoration and enhancement of altered, filled, or cattle impacted wetlands; planting a riparian buffer; and excluding cattle from the easement.

Table 1. Project Attributes

Project Attributes	
Project Name	Owen Farms Mitigation Site
County	Transylvania
Project Area (acres)	25
Project Coordinates (latitude and longitude)	35.183902 -82.937970
River Basin	French Broad (06010105)
14 digit HUC	06010105010020
EPA level IV Ecoregion	Southern Crystalline Mountains and Ridges
Existing Stream Length (linear feet)	8,565
Existing Wetland Acreage (acres)	3.39
Proposed SMUs	5,044
Proposed WMUs	1.76



LOCATION MAP

OWEN FARMS MITIGATION SITE

FIGURE 1

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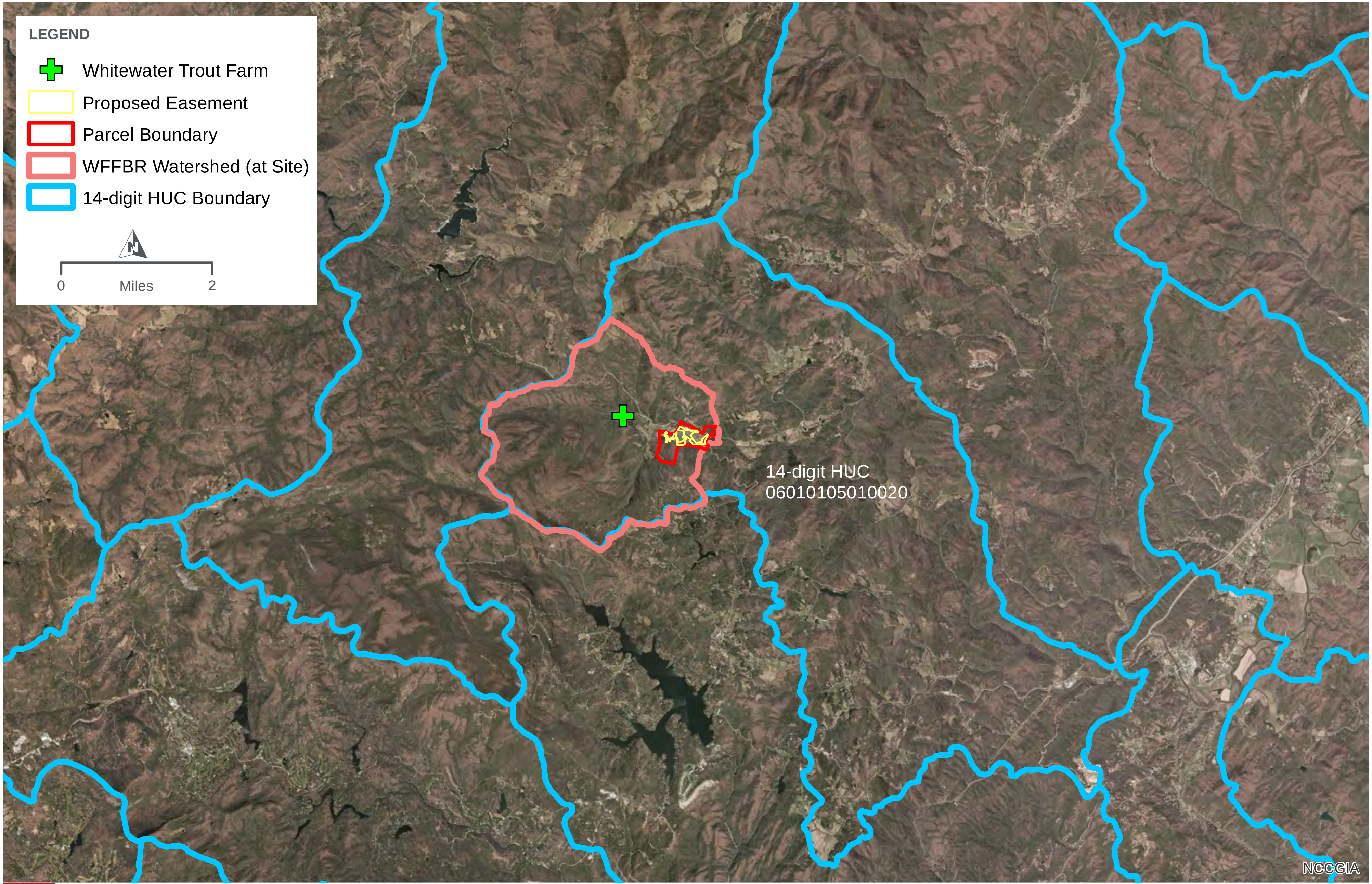
2.0 Watershed Approach and Site Selection

The Site is located within USGS 14-digit hydrologic unit 06010105010020 (Figure 2). A Local Watershed Plan has not been developed for this hydrologic unit as it is not listed as a Targeted Local Watershed (TLW). However, the Site drains into the Upper French Broad River TLW which is discussed in the 2009 River Basin Restoration Priorities (RBRP) report (NCEEP 2009). The RBRP notes a goal of sediment and nutrient reduction through riparian buffer restoration, bank stabilization, livestock exclusion, and restoring natural geomorphology, especially in headwater streams. The RBRP also notes a goal of restoring and protecting habitat for priority fish, mussel, snail, and crayfish species in the basin (Wildlife Resource Commission (2005) lists the Upper French Broad River Watershed as a Priority Watershed for freshwater conservation).

The 2011 French Broad River Basinwide Water Quality Plan (Water Quality Plan) was reviewed to determine significant stressors in the French Broad River Basin. Dominant stressors in the basin were determined to be: pathogens, turbidity, copper, pesticides, low pH, and habitat degradation. Recommendations to minimize stressors in the watershed included: stormwater management, erosion control, agricultural BMPs, and communication between trout farmers and regulatory agencies (DWQ, 2011). The Water Quality Plan discussed a study conducted in the WFFBR Subwatershed (060101050102) as part of the Collaborative Assessment of Watersheds and Streams (CAWS) project. The study occurred in 2002 and 2003 and was designed to determine discharge impacts from the Whitewater Trout Farm (see location on Figure 2) on benthic macroinvertebrate and fish community populations in the WFFBR. DWQ recommended that local agencies work with landowners to install best management practices (BMPs) to improve the riparian zone and limit livestock access to streams (DWQ, 2004).

Available mapping was used to evaluate land within the watershed and locate properties that exhibited stressors identified in the watershed planning documents. The Site was ultimately selected because it provides an opportunity to protect and restore streams and wetlands located in the headwaters of the WFFBR on a property that has high potential for future residential development. On-site streams and wetlands are severely degraded due to past human alterations and cattle access. The proposed mitigation project supports goals established in the RBRP and recommendations identified in the Water Quality Plan by restoring existing degraded streams, stabilizing channel banks, and reducing point and non-point source pollution. These actions will reduce pollutant inputs to project streams and wetlands and increase high quality aquatic, semi-aquatic and terrestrial habitat.



WATERSHED PLANNING CONTEXTUAL MAP

OWEN FARMS MITIGATION SITE

FIGURE 2

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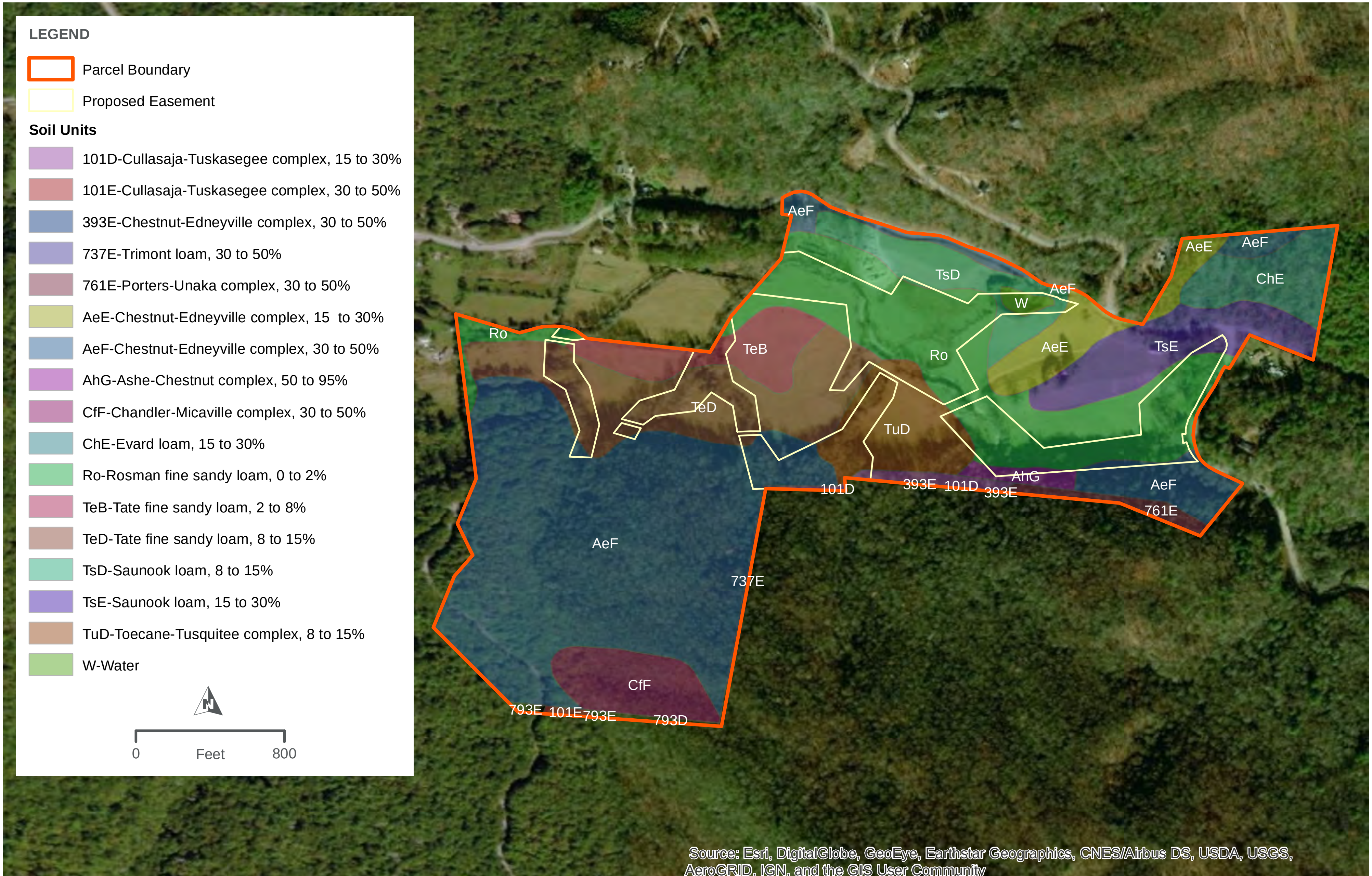
3.0 Baseline and Existing Conditions

3.1 Landscape Characteristics

The Site is located in Southern Crystalline Mountains and Ridges (level IV 66d) Ecoregion of the Blue Ridge Mountains physiographic province. The Southern Crystalline Mountains and Ridges is typified by low to high mountains with gently rounded to steep slopes and narrow valleys with elevations ranging from 990 to 5,500 feet above sea level. Natural vegetation includes Montane Oak-Hickory Forests, Pine Oak/Heath Forests, Rich Cove Forests and Acidic Cove Forests, and Northern Hardwoods Forests at higher elevations (Schafale and Weakley, 1990). The Site is located in the Intrusive Rocks group (Quartz diorite to granodiorite) of the Blue Ridge Belt (NCGS 1985). The Intrusive Rocks group (Quartz diorite to granodiorite) contains biotite, muscovite, and xenocrysts.

The site topography and relief ranges between approximately 2,700 feet MSL to 2,760 feet MSL. WFFBR meanders through the Site in a very gentle unconfined valley and transitions to a confined valley as it exits the site. UT 1, UT 2, UT 4, UT 4B, UT 5, UT 6, UT 6A, UT 7, and UT 8 originate as spring fed tributaries at higher elevations off-site (Figure 8). These tributaries flow through confined valleys before transitioning into the WFFBR floodplain. UT 2A, UT 2B, UT 3, UT 4A and UT 7A originate on-site as spring fed tributaries near the transition into the WFFBR valley. These tributaries are generally short and originate close to the valleys of larger receiving tributaries. Headwater wetlands (W1 through W9) are located adjacent to several of the unnamed tributaries. Wetland hydrology is primarily derived from groundwater seeps, with occasional overbank flooding. Beaver dams were observed along UT 2, downstream of the project easement, and are affecting hydrology associated with W1. The dams appear to have been in place for several years and do not appear to be currently active. Dominant vegetation within W1 is indicative of a semi-permanently to permanently inundated wetland.

Soil series depicted in the Transylvania County Soil Survey are shown on Figure 3. The majority of lands within the WFFBR floodplain and associated riparian wetlands are mapped as Rosman fine sandy loam. These soils are well drained, nearly level, frequently flooded and formed from loamy alluvium. These soils are typically found in depressions on stream terraces.



HDR

SOILS MAP

OWEN FARMS MITIGATION SITE

FIGURE 3

3.2 Land Use - Historic, Current and Future

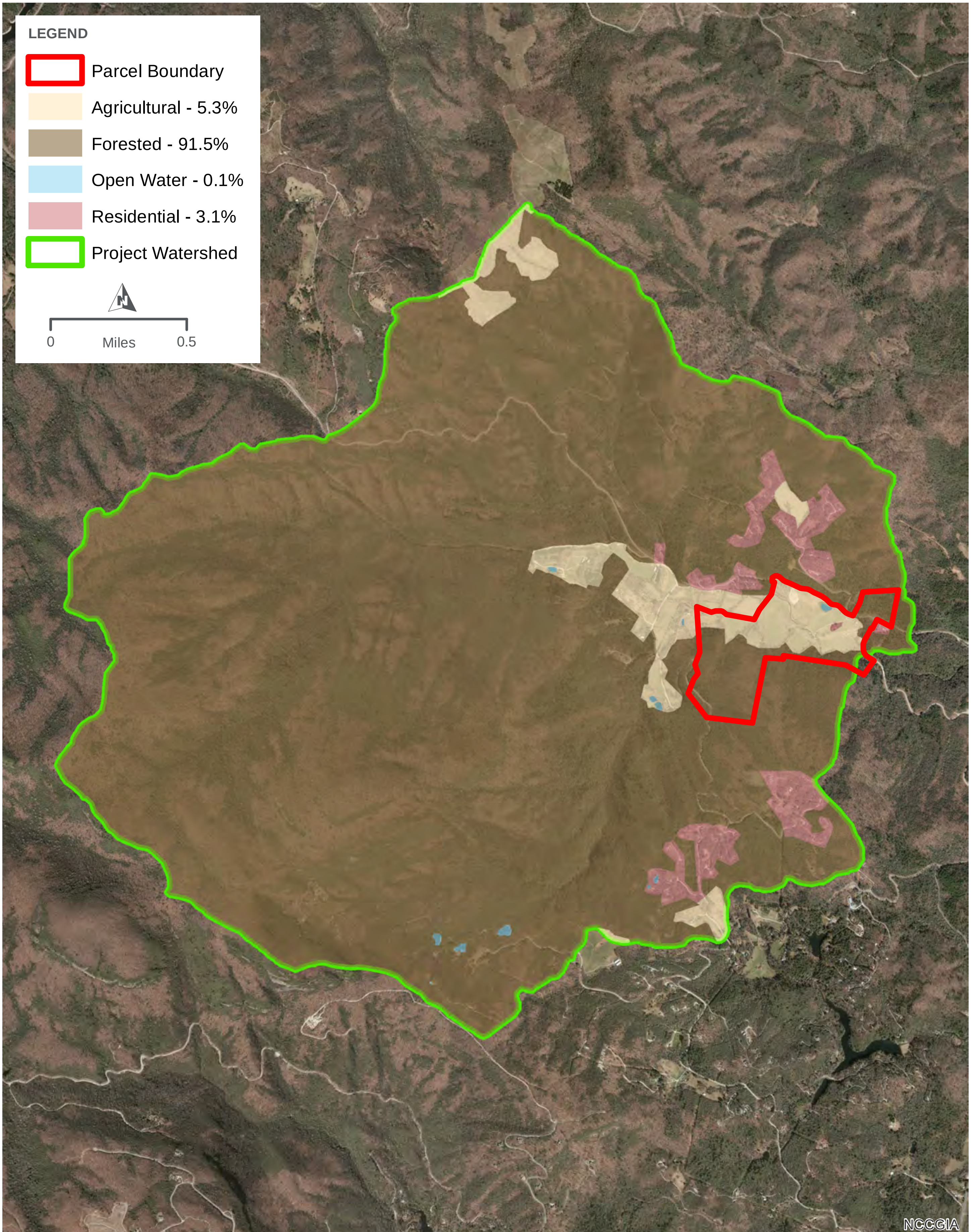
The watershed for WFFBR is 5.93 sq miles (3,795 acres) at the downstream extents of the Site. Land use within the WFFBR watershed upstream of the Site consists of forested land (92%), pasture and agriculture (5%), and residential properties, open water and roads (3%). Future land use changes in the watershed are expected to be minimal as a majority of the watershed is located within the Pisgah National Forest. However, the Site is located on property that is ideal for residential development and would likely be developed in the future if not protected. Current land use is shown in Figure 4.

Historic aerial photographs were utilized to collect information on Site changes in recent history. Environmental Data Resources, Inc. (EDR) provided aerials from the following years: 1951, 1976, 1986, 1995, 1998, 2006, 2009, 2012, and 2016. Select aerials are shown in Figures 5, 6, and 7.

According to the aerial imagery, current site conditions and uses have changed little since 1951. It appears the Site was cleared prior to 1951 and has been utilized for agricultural purposes including pasture and row crops. Portions of WFFBR appear to have been straightened between 1951 and 1976. On-site conditions suggest that UT 5 and UT 7 have been modified as evidenced by straightened and incised channels, spoil piles adjacent to banks and evidence of overburden spread within the floodplain. The existing channels display poor stability, moderate entrenchment and incision within the landscape. W3 and W5 appear to have been altered following the spread of overburden after the straightening of UT 5 and UT 7. Soil boring logs in Appendix A depict evidence of overburden within W3 and W5.

One ford crossing exists on WFFBR within the Site. Two rock weirs have been installed in the channel; one is approximately 80 feet upstream of the existing ford and one is approximately 260 feet downstream of the existing ford. The channel banks upstream of each rock weir have been lined with rip rap for approximately 150 feet. The rock was installed by the property owner in an attempt to stabilize the channel and create pool habitat for fish. Ford crossings are also present on UT 1 and UT 2A. Culvert crossings are present on UT 2, UT 4, and UT 5. Existing crossings are depicted on Figure 8. Two utility (powerline) easements cross through the proposed easement, crossing UT 5, W3, and WFFBR. The utility easements are 40 feet wide and are depicted on Figure 8.

Based on field evaluation and aerial imagery assessment, the Site has experienced physical and functional changes resulting from land clearing, cattle access to streams and wetlands, and channel modification. Current conditions are resulting in water quality degradation through direct input of nutrients, fecal matter and increased sedimentation.



LAND USE MAP

OWEN FARMS MITIGATION SITE

FIGURE 4

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Figure 5. Historic Photo 1951

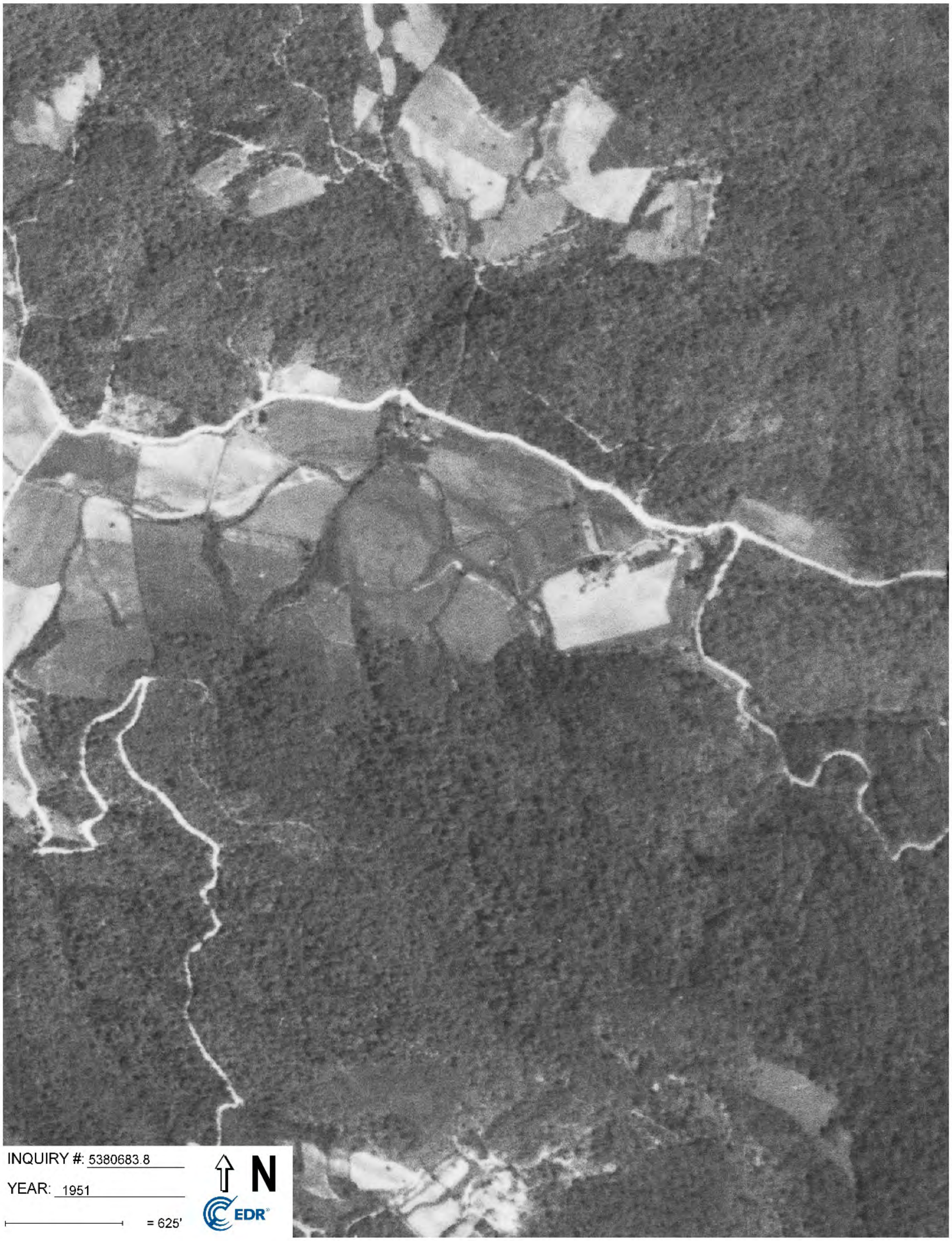


Figure 6. Historic Photo 1995

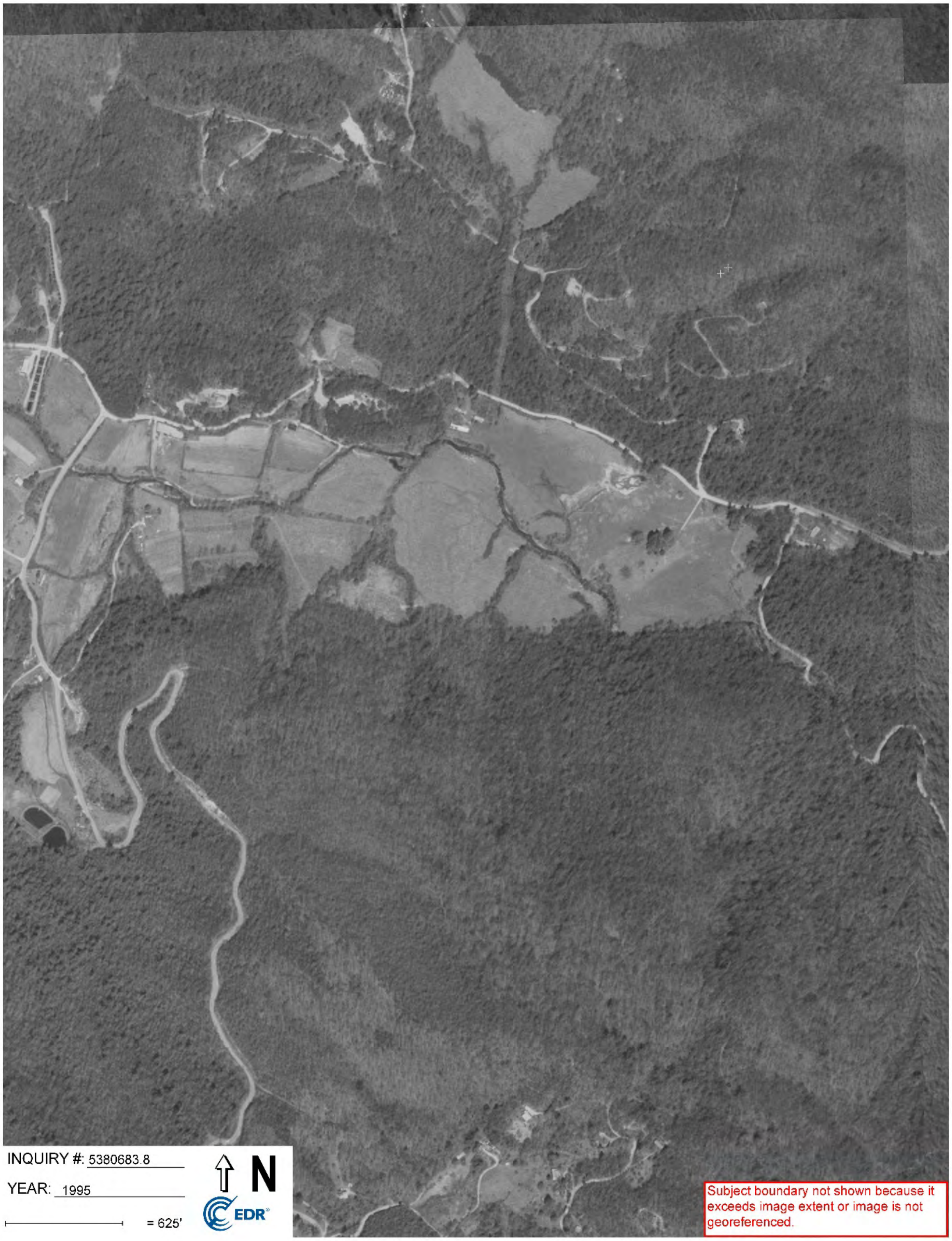
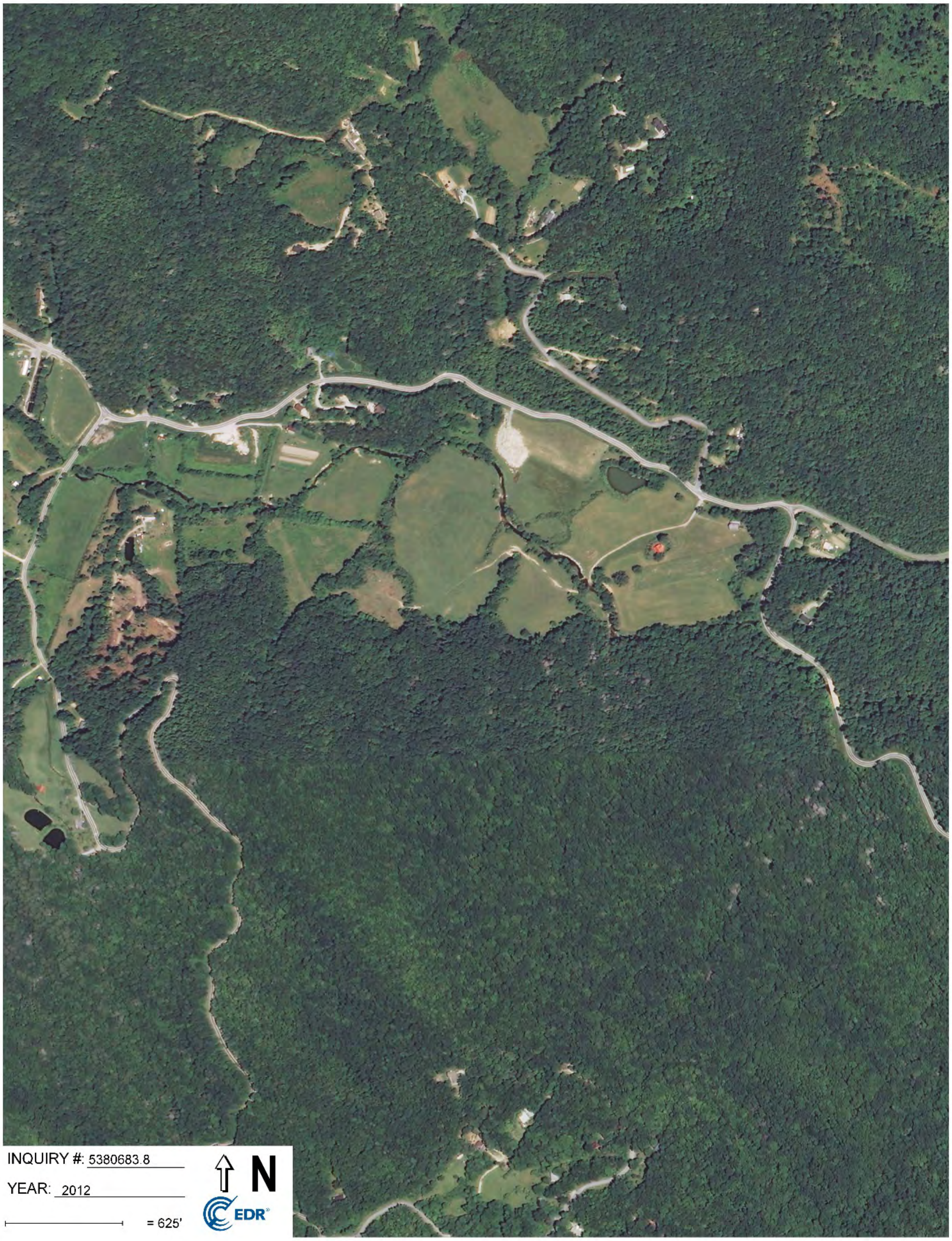
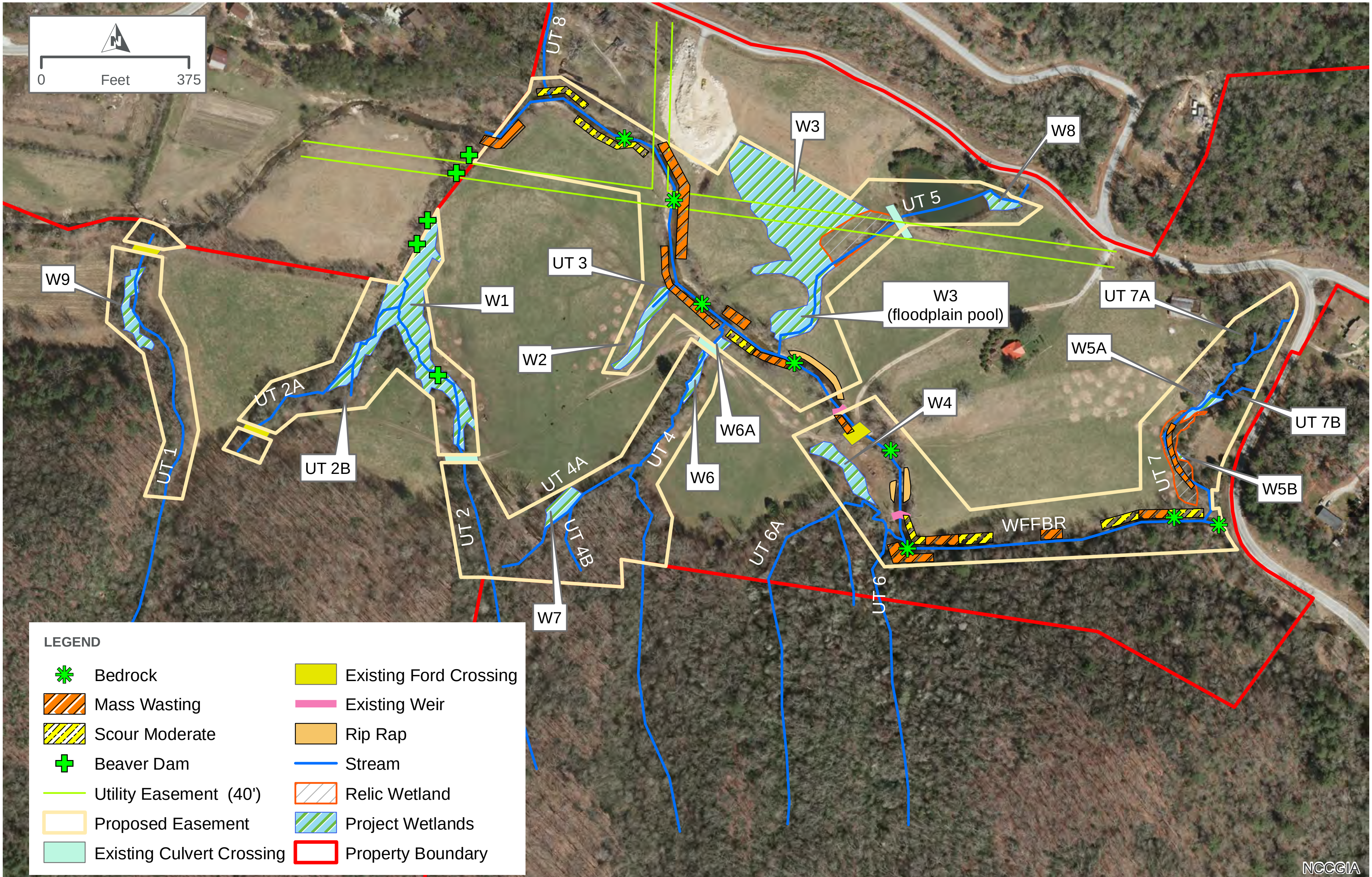


Figure 7. Historic Photo 2012





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EXISTING CONDITIONS MAP

OWEN FARMS MITIGATION SITE

FIGURE 8

3.3 Watershed Disturbance and Response

The Site watershed has experienced minimal change since 1951 according to aerial imagery. Approximately 30 percent of the pasture in the watershed is located on the Site. The presence of cattle is a direct water quality stressor on the Site. All wetlands and streams on-site are accessed by cattle with the exception of the upstream extents of each of the following resources: UT 2, UT 4A, UT 5, UT 6A, UT 7, UT 7A, UT 7B and wetland W8 above the existing pond on UT 5. Cattle have direct access to over 75 percent of the stream footage and 98 percent of wetland acreage on-site. Unabated cattle access is resulting in degraded vegetative communities in wetlands and buffers, fecal loading into the channels and hoof shear along stream banks. Photos of existing conditions on-site are presented in Appendix B.

3.3.1 Existing Streams

All on-site streams are stressed by cattle and vegetative maintenance. Site streams have physical impairments including:

- Substantial fine and coarse sediment loads from bank failure and mass wasting,
- Loss of physical habitat in bed form due to anthropogenic manipulation of meander geometry,
- Continual maintenance of riparian buffers and denudation of deep rooted vegetation from those buffers,
- Fecal loading into the channels from unabated access of cattle,
- Hoof shear of channel banks and bed form from cattle access and wading, and
- Agricultural machinery access.

These physical impairments have a significant effect on water quality and biological integrity of the Site. Effects of physical impairment include:

- Silting of habitat for trout and other fish species, Eastern hellbender, and macrobenthos in the stream channels,
- Loss of essential bed form features, which reduces habitat for trout and other fish species
- Potential of increased loading of nutrients and pathogens to all stream systems on-site due to maintenance of fields within riparian areas and access of cattle to stream channels,
- Abandonment of floodplain interaction (i.e. channel incision) reduces the ability of the Site to uptake and store nutrients and other pollutant inputs,
- Denudation of riparian vegetation substantially reduces potential woody debris inputs to the channel that are vital for aquatic propogation and cover habitat, and
- Denudation of riparian vegetation reduces semi-aquatic and terrestrial habitat corridors through the Site.

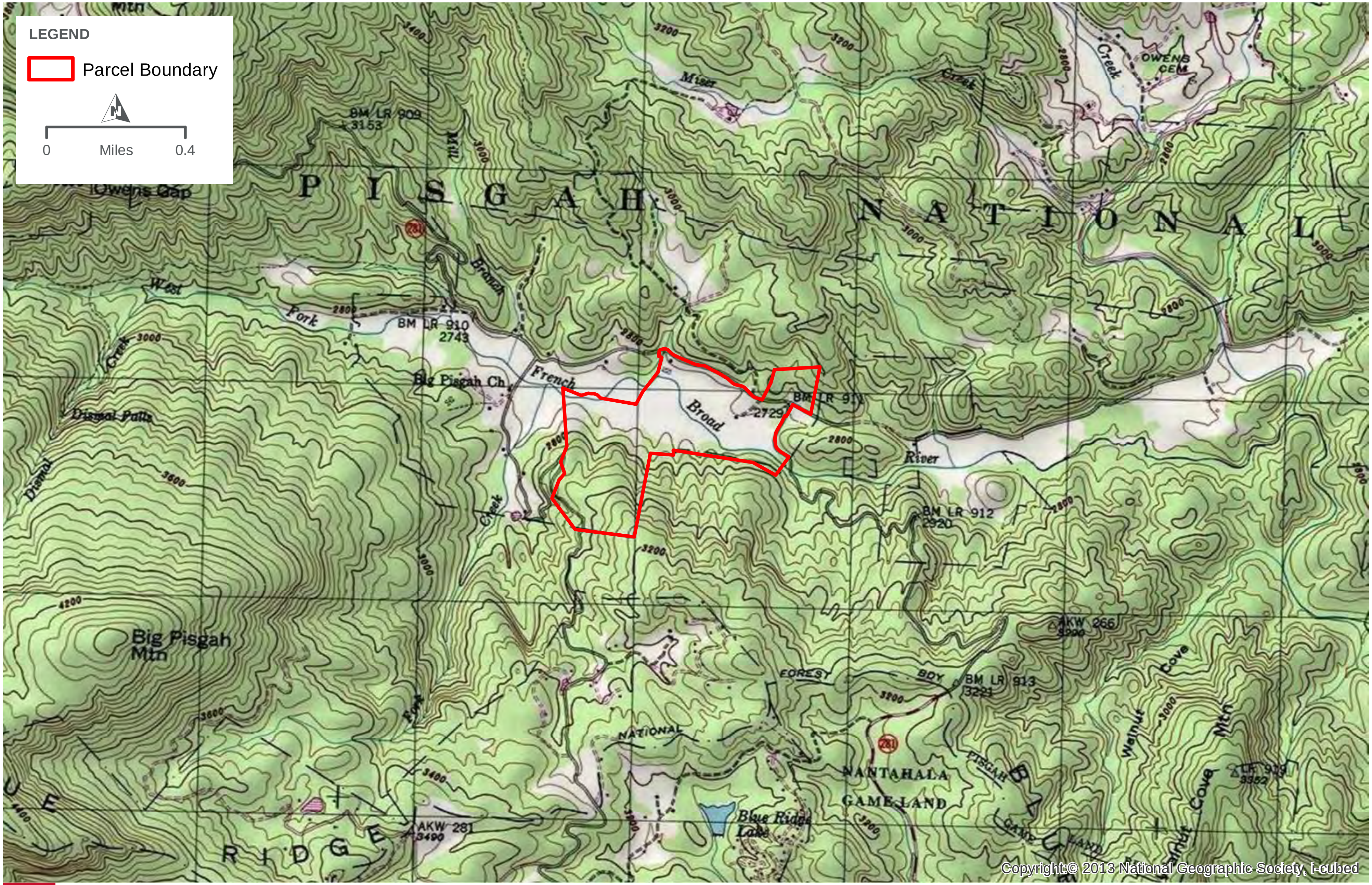
Table 2 provides a summary of existing stream conditions. Figures 9 and 10 provide supporting evidence for historical presence of streams on-site.

Table 2. Existing Stream Conditions

Reach	Historical Presence	Drainage Area (Acres)	DWQ Score*	Impairment
UT 1	Topographic crenulations in the valley (USGS) (Figure 9); LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	19.5	33.5	cattle and equipment access, narrow buffer
UT 2	Topographic crenulations in the valley (USGS) (Figure 9); LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	18.6	33.5	cattle and equipment access, narrow buffer
UT 2a	LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	7.3	30.5	cattle and equipment access, narrow buffer
UT 2b	LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	<1	21	cattle access, narrow buffer
UT 3	LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	<1	20	cattle access, narrow buffer, stream incision near confluence with WFFBR
UT 4	Topographic crenulations in the valley (USGS) (Figure 9); LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	30.6	31.5	cattle and equipment access, narrow buffer
UT 4a	LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	<1	26	cattle and equipment access, narrow buffer
UT 4b	LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	<1	22	cattle access
UT 5	Topographic crenulations in the valley (USGS) (Figure 9); LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	45.2	27.5	Entrenched, cattle and equipment access, relatively no buffer, straightened/channelized

Reach	Historical Presence	Drainage Area (Acres)	DWQ Score*	Impairment
UT 6	Topographic crenulations in the valley (USGS) (Figure 9); LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	21.7	29.5	Cattle access
UT 6a	Topographic crenulations in the valley (USGS) (Figure 9); LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	22.7	30	Cattle access, narrow buffer on left bank
UT 7	Topographic crenulations in the valley (USGS) (Figure 2); LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	32.1	32.5	Entrenched, channelized, relatively no buffer on right bank, cattle access, actively eroding streambanks
UT 7a	LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	<1	22.5	No impairment
UT 7b	Topographic crenulations in the valley (USGS) (Figure 9); LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	8.4	29.5	Cattle access
UT 8	Topographic crenulations in the valley (USGS) (Figure 9); LiDAR topographic breaks within WFFBR Floodplain (Figure 10)	41	38	Cattle access, relatively no buffer on right bank
WFFBR	Blue line stream on USGS and soil survey, LiDAR shows topographic breaks (Figure 9 and Figure 10)	3,795	N/A (large river)	Entrenched, cattle access, relatively no buffer, actively eroding streambanks, migrating riffles, mid channel bars

*DWQ Stream Identification Forms are provided in the PJD documentation provided in Appendix F.



USGS TOPOGRAPHIC MAP
OWEN FARMS MITIGATION SITE
FIGURE 9

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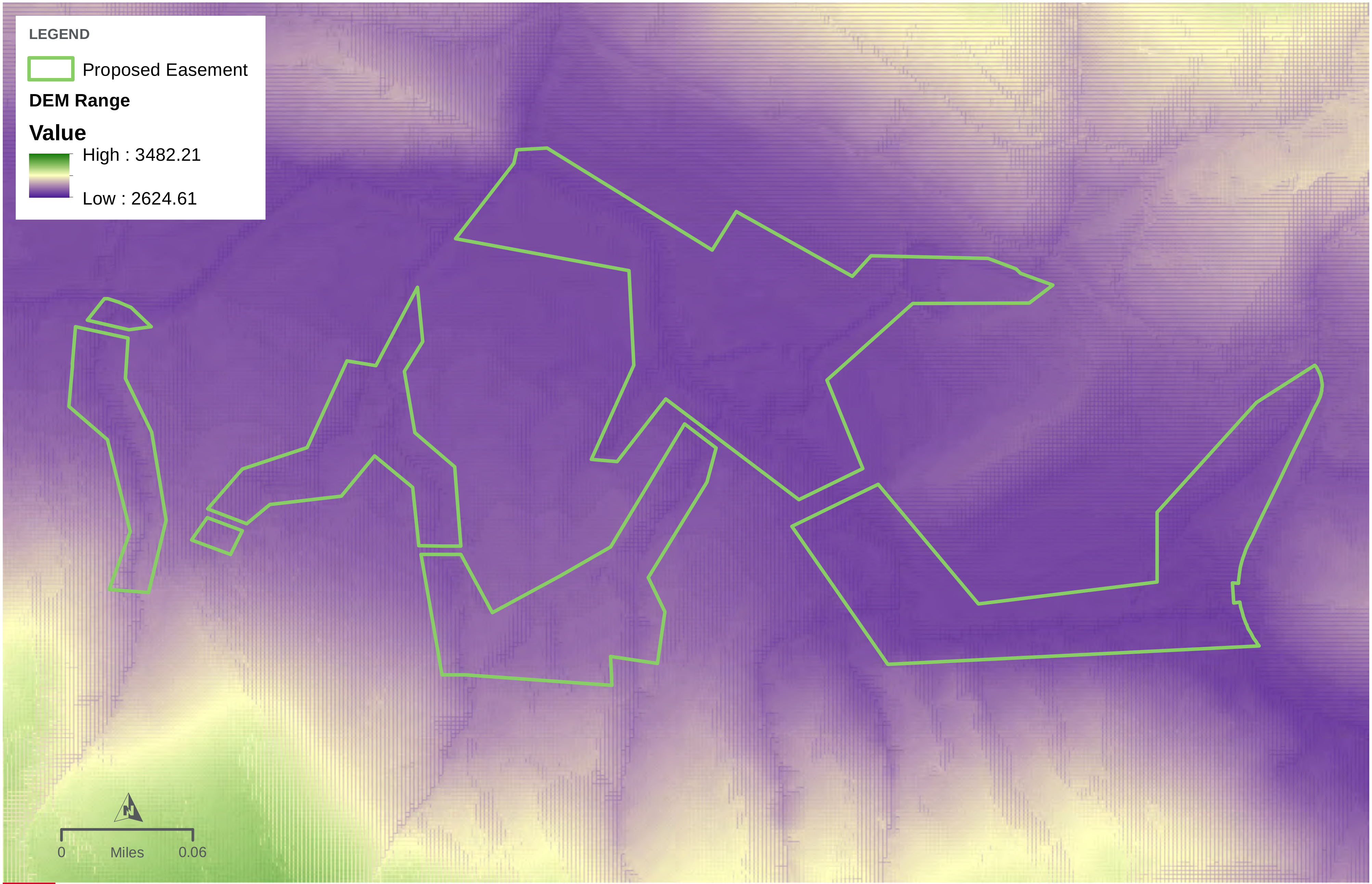


DEM MAP

OWEN FARMS MITIGATION SITE

FIGURE 10

The North Carolina Stream Assessment Method (NC SAM) was used to assess the functions and values of streams throughout the project area. NC SAM recognizes three major functions (Hydrology, Water Quality, and Habitat) that are rated based on several sub-functions. Cattle have direct access to over 75 percent of the stream footage on-site. Cattle access and degraded riparian buffers resulted in low functional ratings in one or more of the three major categories for nearly all streams on-site. Low functional ratings indicate that these streams fail to provide the benefits of a reference system. WFFBR, UT 5, and UT 7 received low overall ratings due to significant channel degradation, cattle access, and lack of riparian buffer. Most of the unnamed tributaries within the Site received a medium to high overall NC SAM rating because they are relatively stable channels with a narrow wooded buffer. Table 3 provides a summary of NC SAM ratings. Detailed NC SAM Rating Sheets are provided in Appendix C.

Table 3. NCSAM Ratings

Stream ID	NC SAM Stream Category	NC SAM Overall Rating	Hydrology	Water Quality	Habitat
WFFBR	Ma4	**Low**	Low	Low	Medium
UT 1	Mb1	**High**	High	Low	High
UT 2	Mb1	**Medium**	High	Medium	Low
UT 2a	Mb1	**High**	High	Low	High
UT 3	Mb1	**Medium**	High	Low	Medium
UT 4	Mb1	**Medium**	High	Low	Medium
UT 5	Ma1	**Low**	Low	Low	Medium
UT 6	Mb1	**High**	High	Medium	High
UT 7	Ma1	**Low**	Low	Low	Low
UT 8	Mb1	**High**	High	Medium	High

WFFBR, UT 5, and UT 7 are proposed for restoration due to high instability resulting from channel manipulation though channelization and lack of vegetative presence. UT 1, UT 2, UT 2a, UT 2b, UT 3, UT 4, UT 4a, UT 4b, UT 6, UT 6a, UT 7a, UT 7b, and UT 8 are all first or second order, spring fed, perennial tributaries with mild instability due to cattle hoof shear and limited buffer presence in some places. No in-stream work is proposed for these tributaries with the exception of constructing tie-ins at the confluences with WFFBR and stabilizing a headcut on UT 4a. The headcut on UT 4a, just upstream of the confluence with UT 4, will be stabilized with rock step structures. Tributaries proposed for restoration are discussed more in depth below. Although the majority of UT 8 is stable, it is discussed in detail as a restoration reach given its relatively large watershed and length of required tie in to WFFBR.

<u>West Fork French Broad River</u>

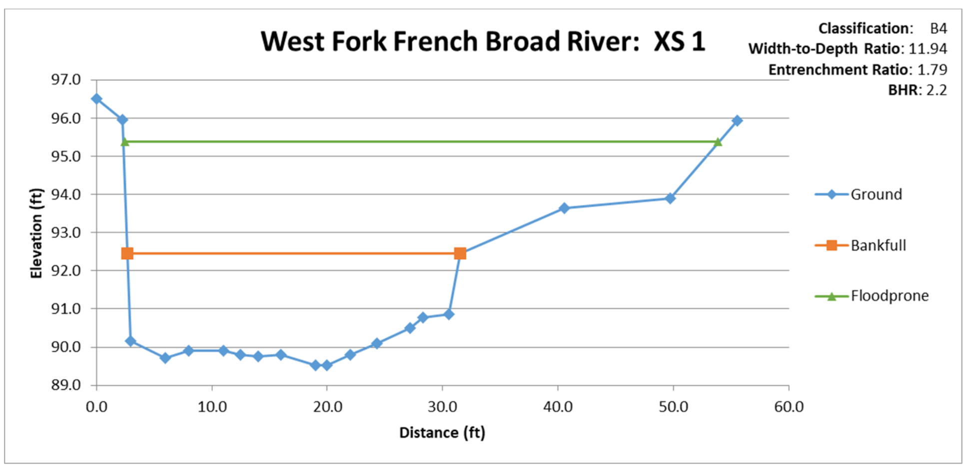
WFFBR is primarily a gravel bed stream with significant inputs of fine sediments due to actively eroding banks. Eroding banks are primarily a result of a lack in deeply-rooted stream bank and riparian vegetation and cattle accessing the stream for shading and as a watering source. Channel bed form displays several well defined riffles and pools, however substantial loads of fine sediments from bank scour has deposited in many of the channel’s riffles and pools. Significant fecal matter inputs to WFFBR are assumed due to direct cattle access and indirectly through the non-vegetated riparian buffer. Evidence of this includes visual observation of cattle in the stream channel during site visits and fecal matter along stream banks and within the stream channel. Down-valley migration of the channel is common throughout the Site as evidenced by riffles that often occur within arcs of meander bends, numerous trees and fence posts falling into the channel and large, newly formed bars dominated by fine sediments.

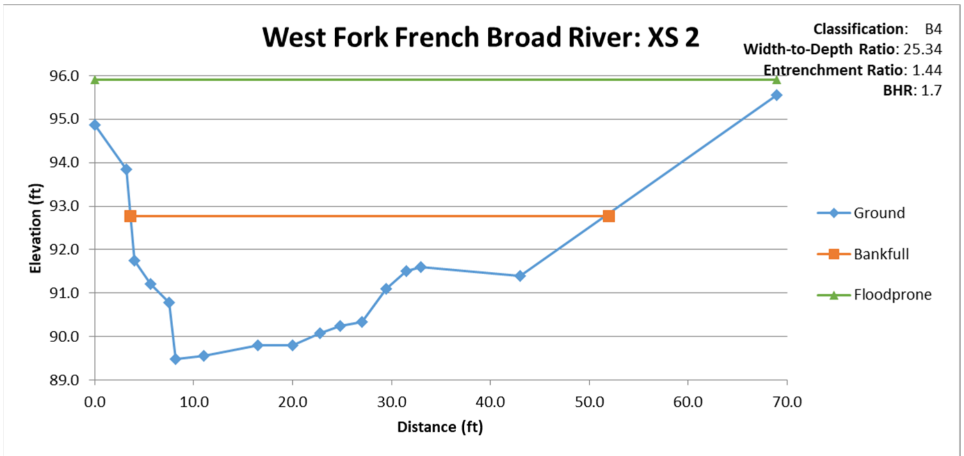
The large majority of the channel displays little to no deeply rooted bank or riparian vegetation. When a woody buffer is present, it is commonly only one tree wide, with vegetation typically sparse at best. Many of the trees within the one-tree buffer have been undercut because the channel has incised below the rooting depth. The lack of a mature vegetated buffer and the substantial influence of hoof shear have led to mass wasting of channel banks along large portions of the channel in both arc and tangent sections. It should be noted that the large majority of WFFBR contains channel banks that depict moderate to substantial bank erosion (Figure 8).

It would be anticipated that in undisturbed conditions entrenchment ratios of WFFBR should be much higher (meaning that flood flows should have greater access to its adjacent, well defined floodplain) with bank-height ratios approaching 1.0. Existing cross-sections of the channel clearly show that the bankfull elevation is well below the historic floodplain elevation (i.e. existing top of ground) with bank-height ratios ranging from 1.7 to above 2.0. Morphological data of the existing conditions of WFFBR confirms that the channel is in a state of flux. It appears that the channel is incising through the landscape and beginning to over widen in an attempt to scour a floodplain at the bankfull elevation.

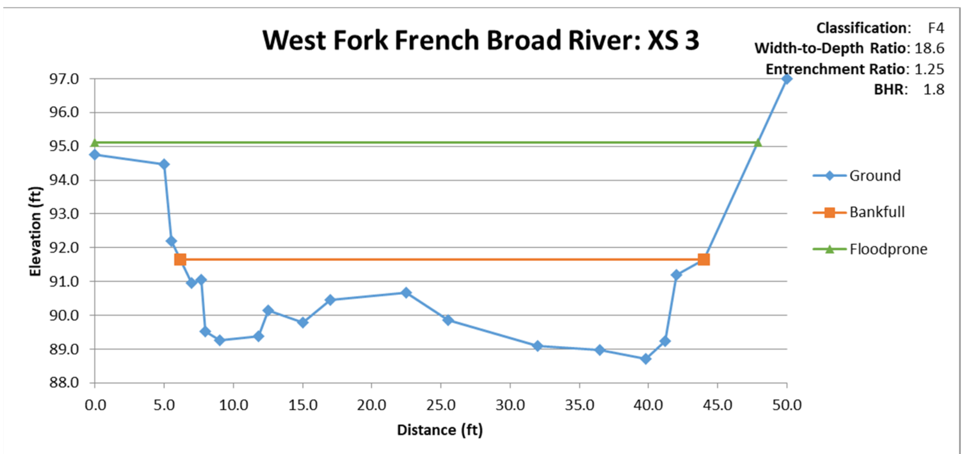
Multiple cross sections were analyzed throughout the Site and varying nature of morphological conditions indicate that the existing channel is in a state of flux.

Cross-section 1 is classified as a B4 type channel, displaying a width-to-depth ratio of 11.94 and entrenchment ratio of 1.79. The channel in this section has some erosion on the left bank and is incised to the point that it has abandoned its historic floodplain as evidenced by a bank-height ratio of 2.19.



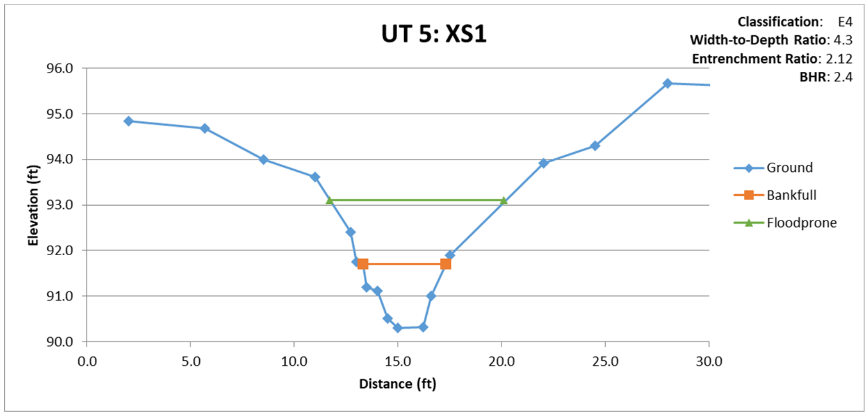


Cross-section 2 is classified as an overly wide, B4 type channel, as evidenced by a width-to-depth ratio 25.34. The left bank is eroding and the stream has deposited sediment on the right bank as it attempts to narrow and form a new floodplain inside the existing channel. The channel as incised to the point that is has abandoned its historic floodplain as evidenced by an entrenchment ratio of 1.44 and bank height ratio of 1.7



Cross-section 3 is classified as an F4 type channel with a width-to-depth ratio of 18.6 and entrenchment ratio of 1.25. This cross-section is typical of several reaches through the Site which have over widening due to mass bank failure and cattle access. Cattle access to the stream has eroded banks and denuded the riparian buffer of deep rooted vegetation which would allow for soil stabilization along the stream. The channel is in the process of widening to the point that flow has been split by a center bar in the channel. Additionally, like other reaches described above, the channel has abandoned its floodplain as evidenced by a bank-height ratio of 1.8.

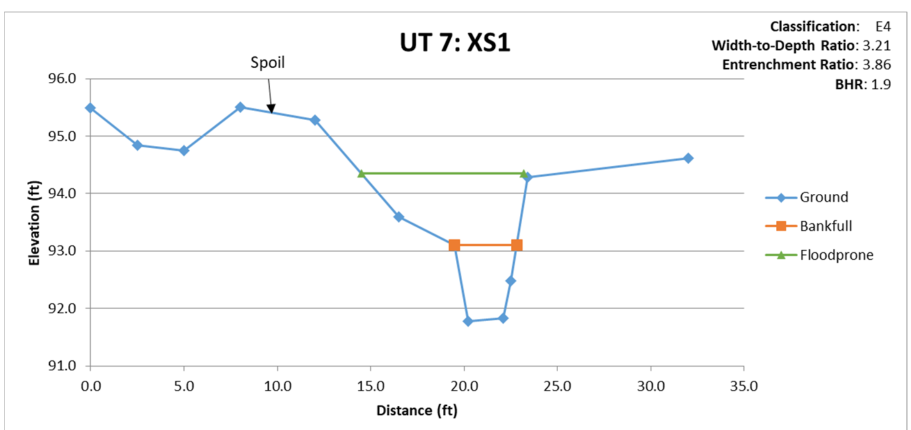
UT 5



UT 5 is a perennial, sand and gravel bed stream that originates off-site and enters the Site through a culvert under Silverstein Road. UT 5 flows into a pond immediately downstream of the culvert. UT 5 has been straightened and channelized downstream of the pond, creating a relatively uniform plan and bed form. Bankfull flows are entrenched and unable to access the historic floodplain causing high stress on the channel banks. UT 5 flows into a relic meander scroll prior to its confluence with WFFBR. The channel loses a defined bed and bank within the meander scroll. Flow dissipates in the meander scroll as the feature becomes an emergent wetland (W3).

Cattle have access to the entirety of UT 5; however, cattle access appears more common in the section that flows through W3. Morphological data was collected on the straightened portion of UT 5 between the pond and W3 (location depicted on Figure 10). Morphological data suggests that the channel is an E type channel based on the Rosgen Classification system, however the system appears to function more typical of a degraded B type channel because flood flows are confined as evidenced by a bank height ratio of 2.4. Tag alder along the banks serves to minimize stream bank erosion through this section; however, channel shear stress would remain high due to flow confinement. The drainage area for UT 5 is 45.2 acres (0.07 square miles). UT 5 scored 27.5 on the DWQ stream classification form but would have scored above 30 with natural sinuosity and in-channel structure. One culverted crossing is present immediately downstream of the pond dam. The successional trend of UT 5 is anticipated as follows: E/B » G » F » C.

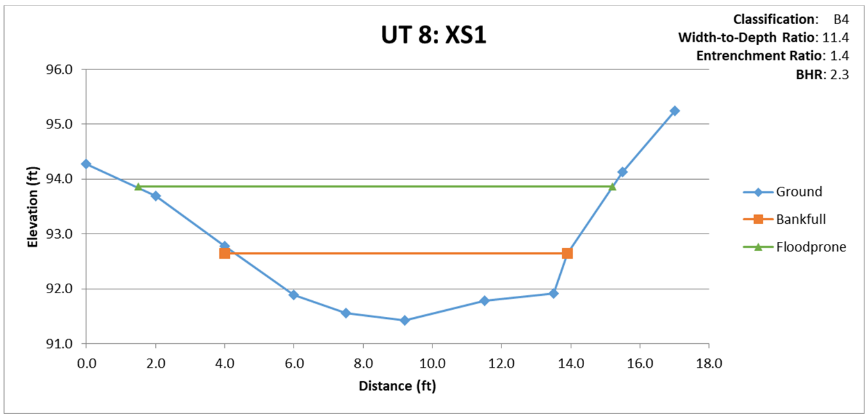
UT 7



UT 7 enters the site through a culvert under Silverstein Road (NC 281). The upstream most 248 feet of UT 7 within the Site is stable and displays an undisturbed vegetated buffer due to current cattle exclusion (fencing) within this section. Cattle have access to the channel immediately downstream of the fence. The riparian buffer is absent to minimal within areas where cattle are not fenced out. Hoof shear of channel bed and banks has led to slope failure, mass wasting and sedimentation within the channel as well as direct inputs of fecal matter. Spoil piles along the channel's left bank are present in the downstream half of the stream and signify apparent past manipulation of planform (channel has been straightened). An example of spoil is depicted in UT 7: XS1. Spoil piles and overburden have been placed over a relic wetland (W5). Morphological data suggests that the modified portion of the channel is an E type channel based on the Rosgen Classification system, however the system appears to function more typical of a degraded B type channel because flood flows are confined as evidenced by a bank height ratio of 1.9. The drainage area for UT 7 is approximately 32.1 acres (0.05 square miles) and the DWQ score is 32.5 indicating a perennial channel. The successional trend of UT 7 is anticipated as follows: E/B » G » F » C.

UT 8

UT 8 is a gravel bed B-Type channel that discharges into West Fork French Broad River at the northwest corner of the property. Upstream of the easement boundary, UT 8 is stable and exhibits a step-pool system with short, steep riffles averaging a riffle slope of 0.05 ft/ft. UT 8 is stable and functional except for the downstream most 40 feet of the reach which is down cutting to match the invert elevation of WFFBR at the confluence. In the downstream portion of the reach there is little to no deeply rooted vegetation along the banks. The banks have been lined with old bricks by the land owner in an attempt to prevent further mass wasting as the channel continues to incise and undercut the banks.



Other Unnamed Tributaries (UT 1, UT 2, UT 2A, UT 2B, UT 3, UT 4, UT 6, UT 6A, UT 7A, UT 7B, and UT 8)

UT 1

UT 1 is a spring fed, first order tributary that originates out of a steep bedrock face and flows through a confined, densely vegetated valley before entering the floodplain of WFFBR. UT 1 maintains stable bed and banks as it flows through the floodplain of WFFBR. The riparian buffer at the upstream extents of UT 1 exceeds 300 feet on each side and consists of mature hardwoods. As UT 1 flows into the pasture the buffer transitions to a narrow strip of hardwood trees along both sides of UT 1. The wooded buffer in this area ranges from 10 to 20 feet wide on each side of UT 1, then transitions into pasture. Cattle have full access through the buffer to UT 1 and are currently using the tributary as a source of shade and water. Visual evidence of cattle in the stream was observed on multiple site visits and several areas of hoof shear are present along the valley side slopes. The majority of cattle access occurs along the right side of UT 1. UT 1 has one ford crossing near its confluence with WFFBR. UT 1 has a drainage area of 19.5 acres (0.03 square miles) at its confluence with WFFBR.

UT 2, UT 2A, and UT 2B

Each of these tributaries can be characterized as spring fed first order perennial tributaries with gravel dominated substrate. The exception being the portions of UT 2 and UT 2a that flow through W1. Sections flowing through W1 are influenced by beaver dams, which have aided in the formation of a riverine swamp forest (W1) in the valley. Stream channels are discernable through the wetland but are dominated by sand, silt, and detritus. The stream and wetland complex appears stable. Beaver dams appear to have been built over 8 years ago as evidenced by the size of tag alder (*Alnus serrulata*) and black willow (*Salix nigra*) growing in the wetland as well as historic aerial photography. The beaver dams appear to be currently inactive. Upstream of W1, these streams are stable with a narrow vegetated buffer along both sides of each tributary. Cattle have access to each tributary except the upstream portion of UT 2, which is on the higher slope of the mountain; however; vegetation along the stream banks of each tributary has assisted in maintaining stable stream systems. UT 2 has a drainage area of 18.6 acres (0.03 square miles) at its confluence with UT 2a. UT 2a has a drainage area of 7.3 acres (0.01 square miles) at its confluence with UT 2. UT 2b is a small channel that originates from a hillside seep and flows directly into UT 2a. The drainage area for UT 2b is not discernable on a USGS quadrangle map. The perennial status of UT 2a and UT 2b is derived more from the spring fed nature of these streams than from drainage area. One ford crossing is present along UT 2a and one culverted crossing is present along UT 2. Both crossings occur near the boundary between the pasture and mature forest.

<u>UT 3</u>

UT 3 originates out of a spring fed wetland (W2) and flows as a first order, intermittent tributary into WFFBR. UT 3 is relatively stable with the exception of areas that have been accessed by cattle or where the stream has incised as it flows through the landscape to reach its confluence with WFFBR. Substrate consists of gravel, sand, silt, and detritus. Stream side vegetation consists mainly of tag alder, common rush (*Juncus effusus*), and various sedges (*Carex* spp.). The drainage area for UT 3 is not discernable on a map, as its hydrology is primarily derived from a groundwater seep. UT 3 scored 20 on the DWQ stream classification form due mainly to weak geomorphology indicators, which may score higher if not influenced by cattle.

<u>UT 4, UT 4a, and UT 4b</u>

Each of these tributaries can be characterized as spring fed first order, perennial tributaries with gravel dominated substrate. Cattle have access to each tributary except the upstream most limits of UT 4 and UT 4a. UT 4a appears to have been straightened upstream of its confluence with UT 4; however, stream bed and banks on UT 4a are relatively stable with the exception of a headcut that occurs approximately 20 feet upstream of its confluence with UT 4. The narrow, wooded buffer along UT 4 has stabilized the stream bed and banks despite cattle access. The drainage area for UT 4 is 30.6 acres (0.05 square miles). The drainage area for UT 4a and UT 4b is not discernable on a USGS quadrangle map. One culverted crossing exists on UT 4 just before its confluence with WFFBR.

<u>UT 6, UT 6a</u>

Each of these tributaries can be characterized as spring fed first order, perennial tributaries with gravel dominated substrate. Cattle have access to UT 6a along the left bank as it flows adjacent to the pasture. Cattle have access to UT 6 near its confluence with WFFBR. There is no fence to prevent the cattle from accessing upstream sections of either tributary. Woody vegetation along the stream banks has stabilized the streams and provides adequate shading. The drainage areas for UT 6 and UT 6a are 21.7 acres (0.03 square miles) and 22.7 acres (0.04 square miles), respectively. There are no crossings on either tributary.

UT 7a and UT 7b

UT 7a is a small spring fed, intermittent tributary that originates on-site and drains into UT 7. UT 7a is stable, with an undisturbed vegetated buffer. Cattle do not have access to the channel. The drainage area for UT 7a is not discernable on the topographic map. UT 7b originates off site and enters the Site through a culvert under NC 281. UT 7b enters the Site as a stable stream with mature vegetation along both banks. Stable sections of UT 7b are located upstream of a fence that excludes cattle. Downstream of the fence the riparian buffer is minimal to non-existent (especially along the banks) with significant cattle impacts which have resulted in sedimentation within the channel. The drainage area for UT 7b is approximately 8.4 acres (0.01 square miles).

3.3.2 Existing Wetlands

Several riparian wetlands have experienced loss and/or degradation of characteristic function due to prior site manipulation. Hydrologic and vegetative alteration of the Site has resulted in diminished nutrient uptake/transformation and sediment retention. The consequence of these impacts is the rapid delivery of pollutants to down-gradient waters. In addition, flood attenuation and wildlife habitat has also been compromised. The North Carolina Wetland Assessment Method (NC WAM) was used to assess the functions and values of wetlands throughout the project area. NC WAM wetland types within the Site include Riverine Swamp Forest, Headwater Forest and Floodplain Pool. NC WAM recognizes three major functions (Hydrology, Water Quality, and Habitat) that are rated based on several sub-functions. Most of the wetlands within the Site are Headwater Forests located adjacent to first or second order tributaries. The primary exceptions being W1, which is a beaver influenced Riverine Swamp Forest, and W3, which is separated into two wetland types; Riverine Swamp Forest and Floodplain Pool (located in a relic meaner scroll of WFFBR). Overall NC WAM ratings were low for the majority of wetlands onsite due to cattle disturbance, altered surface and subsurface water storage, and disturbed vegetative communities. Table 4 provides a summary of NC WAM ratings. Detailed NC WAM Rating Sheets are provided in Appendix C.

Table 4. NCWAM Ratings

Wetland ID*	NC WAM Wetland Type	NC WAM Overall Rating	Hydrology	Water Quality	Habitat
W1	Riverine Swamp Forest	**High**	High	High	Low
W2	Headwater Forest	**High**	High	High	Low
W3	Riverine Swamp Forest	**Low**	Low	Low	Low
W3	Floodplain Pool	**Low**	Low	Low	High
W4	Headwater Forest	**Low**	Medium	Low	Low
W5A and W5B	Headwater Forest	**Low**	Low	Low	Low
W6 and W6A	Headwater Forest	**High**	High	High	Low
W7	Headwater Forest	**Medium**	Medium	High	Low
W8	Headwater Forest	**Low**	Low	Medium	Low
W9	Headwater Forest	**High**	High	High	High

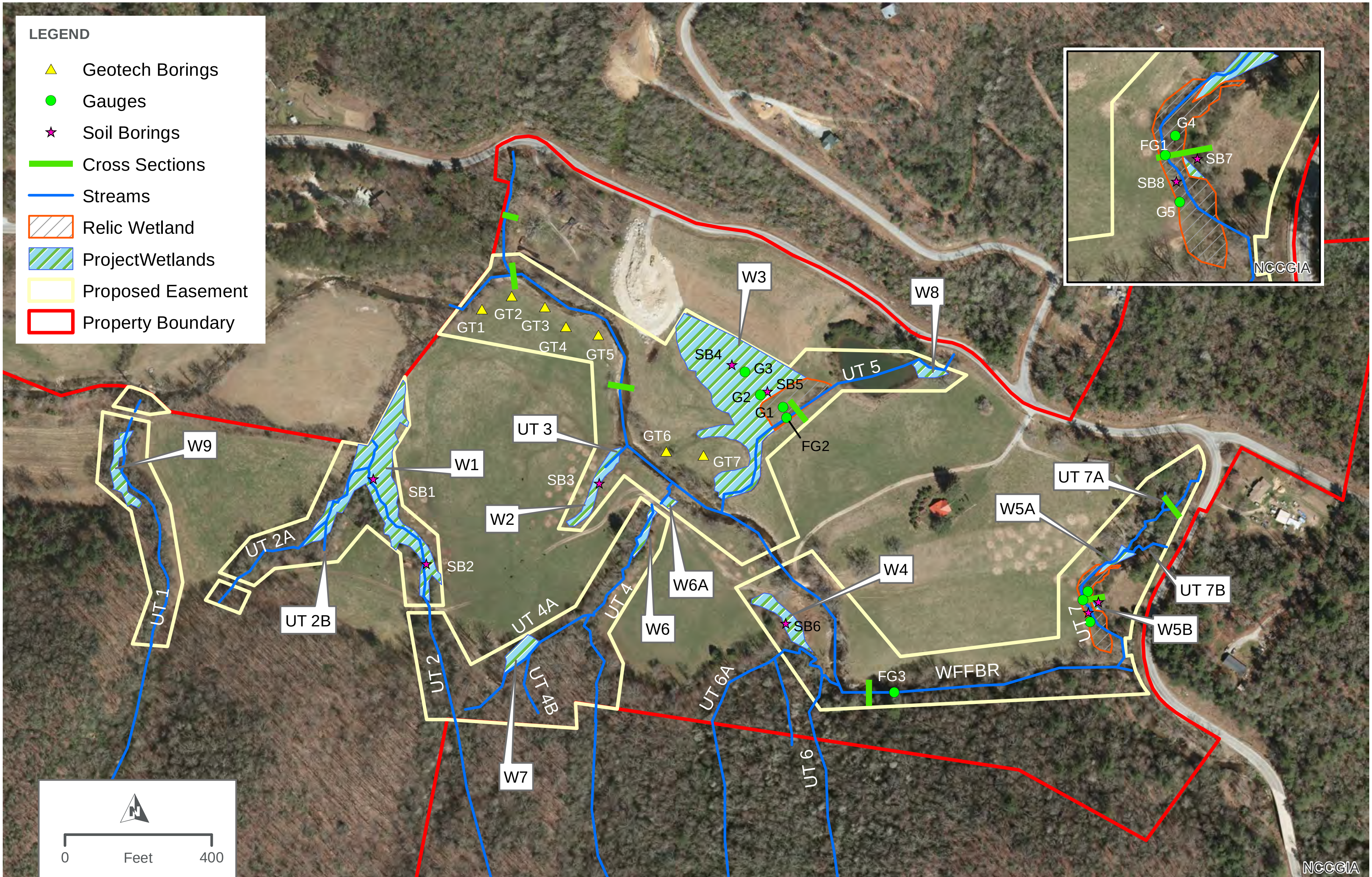
*NC WAM assessments were completed on existing wetlands at the Site.

W1 is located adjacent to UT 2 and is heavily influenced by beaver. Several beaver dams have been constructed along UT 2 that have created a Riverine Swamp Forest dominated by vegetation such as tag alder, black willow, common rush, and various sedges. The beaver dams appear to have been constructed over eight (8) years ago based on historic aerial photography and age of vegetation within the wetland. However, the beaver dams appear to be currently inactive. Surface water was persistent throughout W1 and hydric soil indicators included a thick dark surface layer. Cattle have direct access to W1 with hoof tracks evident throughout the wetland.

W3 is the largest wetland within the Site (1.8 acres). It can be divided into two distinct wetland types: Riverine Swamp Forest and Floodplain Pool. The Riverine Swamp Forest portion of W3 has a significantly altered vegetative community compared to reference condition. This portion of W3 consists solely of herbaceous vegetation which is dominated by common rush and serves as a cattle pasture. Fecal matter and cattle tracks are present throughout the wetland. Surface water was observed throughout the wetland during field investigations. Hydric soil indicators include depleted matrix. Historically, it is likely W3 extended to the current location of UT 5; however, there is an approximately 100 foot wide area between the existing wetland boundary and UT 5 that appears to be the location where overburden from the dredging and channelization of the channel has been spread (see “Relic Wetland” depicted on Figure 11). Soil boring logs in Appendix A depict evidence of overburden. Soil boring locations and corresponding naming conventions are depicted in Figure 11 below.

Channelization of UT 5 has also likely affected hydrology of this relic wetland area, as indicated by the Skaggs Method of determining lateral drainage effects (Skaggs 2005). The Skaggs Method indicates that UT 5 may have a lateral drainage effect between 60 feet and 100 feet from existing top of bank on the relic wetland area. HDR installed three groundwater gauges (Gauges 1 through 3) in this area on June 8, 2018 to collect data on the potential drainage effect of UT 5. Gauges were installed in a transect through W3 and perpendicular to UT 5 (Figure 11). Gauge 1 was installed closest to UT 5 with each subsequent gauge spaced approximately 70 feet apart. Groundwater data collected from the gauges supports the Skaggs Method results.

The average static water table at Gauge 1 was significantly lower than Gauges 2 and 3. Additionally, it appears that groundwater near Gauge 1 recharges to UT 5 faster than what is depicted for Gauges 2 and 3. Gauges 2 and 3 have maintained wetland hydrology (i.e. water table within 12 inches of surface) since the date of installation. Gauge 3 has exhibited a water table within 12 inches of the surface for short periods of consecutive days from June through August 2018 and November 2018 through February 2019. The longest consecutive day period of high water table at Gauge 3 was 13 days. Gauge data is presented in Figure 12.



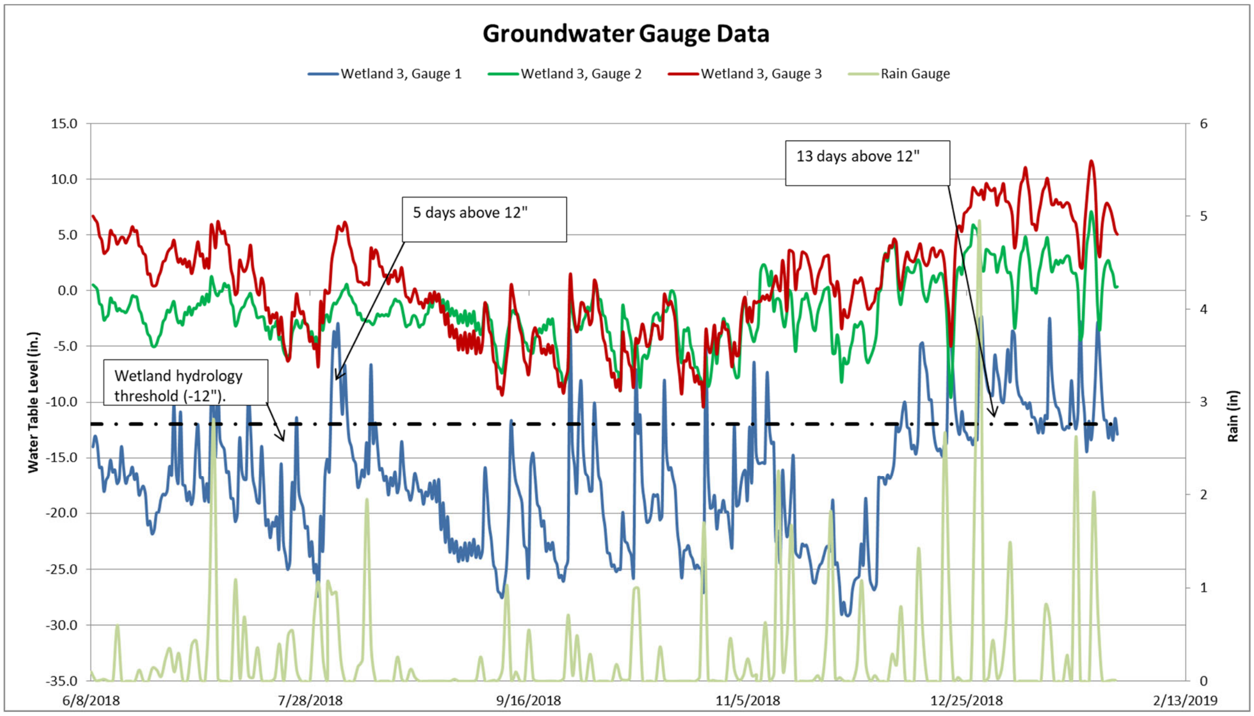
HDR

PRE-MONITORING FEATURE LOCATION MAP

OWEN FARMS MITIGATION SITE

FIGURE 11

Figure 12. Wetland 3 Groundwater Data

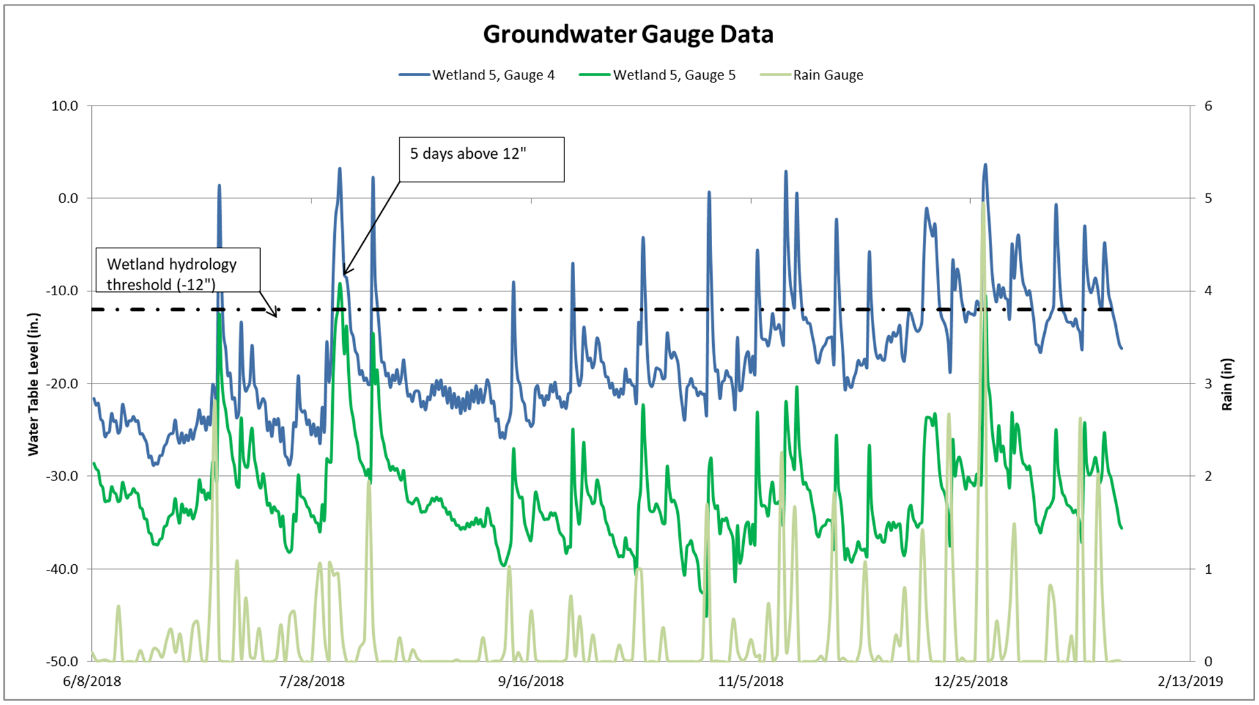


The Floodplain Pool portion of W3 formed in a relic meander scroll of WFFBR and appears to remain inundated for long durations, as evidenced by a predominance of hydrophytic herbaceous vegetation throughout the wetland. Tag alder dominates along the edges of the meander scroll. Surface water was present throughout the wetland during site investigations. UT 5 flows through the eastern portion of this Floodplain Pool prior to its confluence with WFFBR. Cattle have unrestricted access to the entirety of W3.

W5 is a relic Headwater Forest wetland area adjacent to UT 7. The relic wetland no longer supports wetland hydrology as it has been impacted by the channelization of UT 7 and placement of spoil in the floodplain. W5A and W5B are small portions of W5 that remain as existing wetland (Figure 11). W5A retains wetland hydrology because it is located upstream of the incised portion of UT 7. W5B retains wetland hydrology because it is a small depression located between the toe of slope and spoil piles, which trap water in the depression for extended periods of time. The relic wetland area for W5 appears to connect W5A and W5B, and extend into the right floodplain approximately 10 to 50 feet based on the extent of hydric soils adjacent to UT 7. Soil borings collected by a Licensed Soil Scientist on February 3, 2018 confirmed the presence of hydric soils adjacent to UT 7 (soil boring logs are presented in Appendix A and depicted on Figure 11). Spoil has been cast onto UT 7's floodplain (within relic wetland areas of W5) off both the left and right banks, as evidenced by distinct spoil piles and identification of overburden in soil profiles (see soil profiles in Appendix A). The Skaggs Method suggests that UT 7 may have a lateral drainage effect between 40 feet and 70 feet from existing top of bank on the relic wetland area. Two Groundwater gauges (Gauges 4 and 5, Figure 11) installed in relic portions of W5 in June 2018 support the Skaggs Method results. Gauge 4 was installed on the left side of UT 7 near the upstream extents of the spoil piles. The water table at Gauge 4 stayed between 15 and 30 inches below the surface from June through November, with brief spikes above 12 inches following rain events. During December and January, the water table remained within 15 inches of the surface most days. Gauge 5 was installed in the right floodplain of UT 7, downstream of Gauge 4. UT 7 was incised as it flowed adjacent to Gauge 5 with a bank height ratio of approximately 2.0 and depth to top of bank of 2.5 feet. The water table at Gauge 5 stayed between 30 and 40 inches below the surface from June 2018 through February 2019, with brief spikes above 12 inches following rain events. Gauge data is presented in Figure 13.

Hydrology indicators throughout the relic wetland portion of W5 were weak and consisted only of secondary indicators such as geomorphic position. Cattle have unrestricted access throughout W5, which has altered the vegetative structure and ground surface condition. Existing vegetation is sparse and consists of tag alder, American holly (*Ilex opaca*), common grape (*Vitis* sp.), green brier (*Smilax* sp.), and various sedges.

Figure 13. Wetland 5 Groundwater Data



Wetlands 2, 4, 6, 6A, 7, 8 and 9 are classified as headwater wetlands. Cattle have full access to these wetlands and routinely use the areas for water and shading as evidenced by cattle tracks and fecal matter throughout the wetlands. The vegetative structure of the wetlands is generally altered compared to reference conditions (with the exception of W9) due to human and agricultural manipulation. W6 and W6A are part of the same wetland system but are separated by an existing culverted crossing on UT 4.

3.4 Regulatory Considerations

Table 5 provides a summary of regulatory considerations for the Site. Additional information concerning protected species, cultural resources, and jurisdictional waters is presented in Sections 3.4.1 through 3.4.4. The Interagency Review Team (IRT), DMS, and HDR visited the site on August 1, 2018 to review existing conditions of aquatic resources and discuss mitigation approach. Meeting minutes are provided in Appendix H.

Table 5. Regulatory Considerations

Regulatory Considerations			
Parameters	Applicable?	Resolved?	Supporting Documentation?
Waters of the United States – Section 404	Yes	Yes	PCN*
Waters of the United States – Section 401	Yes	Yes	PCN*
Endangered Species Act	Yes	Yes	CE (Appendix D)
Historic Preservation Act	Yes	Yes	CE (Appendix D)
Coastal Zone Management Act	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	Floodplain Development Permit**
Essential Fisheries Habitat	No	N/A	N/A

*PCN will be provided to IRT with Final Mitigation Plan
**A floodplain development permit is not required but will be submitted to keep the local floodplain administrator informed.

3.4.1 Protected Species

Transylvania County has 12 federally listed species as Threatened or Endangered. Records at the North Carolina Natural Heritage Program (NHP) do not indicate an occurrence of a federally threatened or endangered species on-site. The Categorical Exclusion documentation provided in Appendix D provides details concerning threatened and endangered species at the Site. The proposed project was determined to have "no effect" on federally protected species. Coordination regarding the Northern long-eared bat was documented through completion of the 4(d) Streamlined Consultation Form (Appendix D).

The North Carolina Wildlife Resources Commission (NCWRC) noted in a letter dated September 13, 2018 that Eastern hellbender (*Cryptobranchus alleganiensis*) is known to occur immediately downstream of the Site. The letter also noted that brown trout and rainbow trout are present in the vicinity of the project. NCWRC conducted a Site visit on January 11, 2019 to assess the Site for hellbender habitat and collect water samples to test for hellbender DNA. HDR met NCWRC on-site on January 28, 2019 to discuss the results of their site visit, review hellbender habitat locations, and discuss how the mitigation project could improve habitat for hellbender. NCWRC concluded that the Site does provide habitat for Eastern hellbender but water samples were negative for hellbender DNA. Habitat was present in the form of large cover rocks scattered throughout WFFBR but the best habitat was concentrated in the downstream third of the Site. NCWRC recommended that in-stream work be minimized in the downstream third of WFFBR and that care be taken during construction to move aquatic species from the abandoned channel into the new channel. NCWRC requested to be contacted if hellbender are identified during construction. NCWRC also recommended a trout moratorium on in-channel work between October 15 and April 15. HDR has incorporated hellbender habitat improvement structures into the Site design based on habitat details provided by NCWRC and will continue coordination with NCWRC through construction.

3.4.2 Floodplain Compliance and Hydrologic Trespass

Review of the Floodplain Mapping Program website and the effective Flood Insurance Rate Map (FIRM) Map Number 3700852400J Effective Date October 2, 2009 indicates West Fork French Broad River is within a Zone X, area of minimal flood hazard. Therefore a CLOMR and LOMR will not be required as part of this project. Coordination with the floodplain administrator for Transylvania County on February 2, 2018 confirmed that a CLOMR/LOMR would not be required for this project. In addition, the floodplain administrator confirmed that the project would not require a floodplain development permit but one may be submitted to keep the County informed about the project.

Hydrologic trespass is not a concern based on the proposed design. Restoration of WFFBR is designed as Priority II restoration to avoid trespass on upstream property. Priority I restoration of UT 5, UT 7, and UT 8 will not result in hydrologic trespass due to the natural fall of the valley between the easement boundary and beginning of restoration on each tributary. Hydrologic trespass is also not a concern due to wetland re-establishment/rehabilitation because the location of wetlands and their surrounding topography limit any hydraulic trespass to be contained within the conservation easement. The DMS Floodplain Requirements Checklist was completed for this project and is provided in Appendix E.

3.4.3 Cultural Resources

A Categorical Exclusion (CE) for the Site was approved by FHWA on December 14, 2018. The CE included information regarding cultural resources at the Site and coordination with the State Historic Preservation Office. Based on results from the CE research and documentation there are no historic or cultural resources that would be affected by this project. CE documentation is provided in Appendix D.

3.4.4 401/404

The USACE issued a Preliminary Jurisdictional Determination (PJD) for the Site on September 14, 2018 (Appendix F). The Site contains approximately 8,565 existing feet of stream, 3.39 acres of riparian wetland, and 0.53 acre of open water. Impacts to jurisdictional streams and wetlands will be necessary for restoration and enhancement activities but this project will result in a net uplift of aquatic resources at the Site. A Pre-Construction Notification form will be completed and submitted to USACE to obtain a Nationwide General Permit 27 to complete restoration and enhancement activities.

4.0 Functional Uplift Potential and Project Goals and Objectives

Project goals are based on the French Broad RBRP (NCEEP 2009), current conditions observation, and on-site data collected during existing conditions collection. 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 presented in Section 3.3. Table 6 summarizes the functions targeted for uplift and the goals and objectives that will be achieved to provide the proposed uplift. Targeted functions listed in Table 6 are based on NC SAM and NC WAM functions and sub-functions.

Significant fecal and nutrient loads are entering WFFBR and its tributaries as a result of direct cattle access to streams and overland sheetflow from adjacent pastures. Evidence of this includes visual observation of cattle in the stream channel during site visits and fecal matter along stream banks and within the stream channel. HDR used equations and guidance set forth by DMS in the document titled “Quantifying Benefits to Water Quality from Livestock Exclusion and Riparian Buffer Establishment for Stream Restoration” (June 15, 2016) to estimate potential fecal load reductions that may result from proposed restoration activities at the Site. It is estimated that cattle exclusion and establishment of a riparian buffer would decrease the fecal load of the Site by approximately 3.96E+14 col/year. HDR also used equations set forth in the NC DEQ memorandum titled “Approval of Cattle Exclusion Nutrient Reduction Practices” (April 5, 2017) as well as the document titled “NC Division of Water Quality – Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment” to determine potential nitrogen and phosphorous reduction loads for the Site. Cattle exclusion and establishment of a riparian buffer is estimated to reduce the nitrogen loads for the Site by 1,718 lb/yr and reduce the phosphorous load for the site by 169 lb/yr. Although the project has the ability to reach partial uplift, some constraints prevent the Site from reaching full uplift potential. Watershed processes can only partially be controlled, as upstream uses will not be altered. In addition, local constraints are present including stream crossings and a utility easement over WFFBR, UT 5, and W3.

Table 6. Targeted Functions, Goals, and Objectives

Targeted Functions	Goals	Objectives
(1) Hydrology		
(2) Flood Flow	• Provide/enhance flood attenuation • Restore riparian habitat	• Restore UT 5, UT 7, and UT 8 as primarily a Priority I restoration where bankfull and larger flows can access the floodplain • Restore WFFBR as Priority II with a floodplain bench ranging from 15' to 100' wide on each side of the channel • Restore/enhance wetlands • Plant native vegetation along stream banks and adjacent riparian corridor (including wetlands)
(3) Streamside Area Attenuation		
(4) Floodplain Access		
(4) Wooded Riparian Buffer		
(4) Microtopography		
(3) Stream Stability	• Restore/enhance streams within the Site so that they are neither aggrading nor degrading.	• Construct stable dimension, pattern, and profile on WFFBR, UT 5, UT 7, and UT 8 • Install fencing to exclude cattle from streams, wetlands, and riparian corridors • Plant native vegetation along stream banks and adjacent riparian corridor (including wetlands) • Seed newly constructed channels with native substrate harvested from the existing channels
(4) Channel Stability		
(4) Sediment Transport		
(4) Stream Geomorphology		
Wetland Surface Storage and Retention	• Restore/enhance wetlands within the Site to remove hydrologic impairments	• Restore wetland hydrology by raising the inverts of adjacent, incised tributaries • Remove spoil and overburden from relic wetland areas • Plant native vegetation in wetlands
Wetland Sub-Surface Storage and Retention		

Targeted Functions	Goals	Objectives
(1) Water Quality		
(2) Streamside Area Vegetation	• Reduce sediment, nutrient and other pollutant sources that affect water quality • Restore riparian habitat	• Plant native vegetation along stream banks and adjacent riparian corridor (including wetlands) • Install fencing to exclude cattle from streams, wetlands, and riparian corridors • Restore/enhance wetlands • Restore UT 5, UT 7, and UT 8 as primarily a Priority I restoration where bankfull and larger flows can access the floodplain, allowing adjacent wetlands to treat nutrients and filter sediment • Restore WFFBR as Priority II with a floodplain bench ranging from 15’ to 100’ wide on each side of the channel • Remove agricultural equipment from streams by converting existing fords on UT 1 and UT 2A to culverted crossings
(3) Upland Pollutant Filtration		
(3) Thermoregulation		
(2) Indicators of Stressors		
Wetland Pathogen Change, Particulate Change, and Soluble Change		
(1) Habitat		
(2) In-stream Habitat	• Restoring and enhancing aquatic, semi-aquatic, and riparian habitat • Restoring and connecting riparian habitat with adjacent natural habitats • Permanently protecting the Site from undesirable uses	• Plant native vegetation along stream banks and adjacent riparian corridor (including wetlands) • Construct rock habitat structures for Eastern hellbender • Restore/enhance wetlands and create floodplain pools in abandoned channel of WFFBR • Protect riparian buffers with a perpetual conservation easement • Introduce woody material through toe wood and log sills on restored channels • Restore sinuous gravel bed channels that promote riffles and pools
(3) Stream Stability		
(3) In-stream Habitat		
(2) Stream-side Habitat		
(3) Stream-side Habitat		
(3) Thermoregulation		
Wetland Physical Structure, Landscape Patch Structure and Vegetation Composition		

5.0 Design Approach and Mitigation Work Plan

5.1 Design Approach Overview

5.1.1 West Fork French Broad River

Stream channel restoration of pattern, profile, dimension and riparian buffer is proposed for approximately 1,799 linear feet of WFFBR (excluding 127 feet that flows through a powerline easement and 60 feet that will be used as a ford crossing). WFFBR flows under a powerline easement from station 14+53 to 15+82. This portion of WFFBR will be restored to maintain stream stability throughout the project and the buffer under the powerline easement will be planted. No stream credits are proposed for the portion of WFFBR that flows under the powerline easement. The channel has experienced bank failure leading to the deposition of sediment (from channel banks) and nutrients (from cattle) loading to on-site and downstream receiving waters. Proposed mitigation activities include stabilizing channel banks by restoring a more natural and stable dimension and plan form while maintaining portions of the existing alignment where feasible, meandering WFFBR through the low point of the valley, providing overbank flood relief through the creation of bankfull benches through excavation (benches) and fill (abandoned channel areas), installation of wood and rock structures for grade control and habitat improvement, seeding riffles with existing, native channel material for immediate restoration of the hyporheic zone, restoration of a vegetated riparian buffer, and removal of agricultural operations from the channel and riparian buffer through fencing.

Woven wire fencing will be installed along the easement boundary to exclude cattle and clearly demarcate the easement boundary for the landowners. A riparian buffer populated with native vegetative species will be planted within the proposed conservation easement. Following restoration, WFFBR will exhibit a minimum riparian buffer between 50 feet and 75 feet wide off of the left and right banks throughout the restoration reach. Trees 12 inches and greater within the potential restored riparian areas were surveyed. The survey was used during the stream channel design to ensure that mature tree disturbance is limited to the greatest extent practical during construction. Portions of the existing buffer that are removed to facilitate restoration of WFFBR will be replanted with native vegetation.

The existing ford crossing of WFFBR will be relocated approximately 85 feet upstream of the current location but will not be included within the conservation easement. The crossing will be approximately 60 feet wide and is necessary to provide the landowner access between farming paddocks outside of the conservation easement.

Due to evidence of bedrock outcropping throughout the Site, geotech test pits were excavated along the proposed alignment to ensure that the proposed design is constructible. Test pits were excavated to a depth sufficient to exceed the proposed thalweg depth of WFFBR. No bedrock was encountered along the proposed alignment and therefore should not pose a problem during construction. The location of geotech test pits can be found on Figure 11.

Multiple factors necessitated Priority II stream restoration for WFFBR. The restoration of WFFBR cannot result in hydraulic trespass on the upstream landowner. Additionally, the restored stream must connect vertically downstream with the existing channel invert. Since, the upstream and downstream elevations are set, manipulating stream slope within the Site would be the only way to achieve some Priority I restoration. However, to maintain sediment transport through the Site the bankfull design slope could not be decreased. A minimum 15 foot floodplain bench will be excavated on each side of the channel to provide additional flood attenuation. In some areas the bench along the inside of meander bends will extend to approximately 100 feet.

Hellbenders have been recorded in WFFBR immediately downstream of the Site so HDR met with NCWRC onsite to discuss hellbender habitat within WFFBR. Based on discussions and details provided by NCWRC specific structures are proposed throughout the restoration reach of WFFBR to provide in-stream habitat for hellbenders. This includes the use of wood and rock that the hellbender can use for cover. In-channel rock structures will be located in runs and glides and toe wood will be incorporated into soil lifts along the stream banks.

Enhancement II is proposed for approximately 705 linear feet of WFFBR at the downstream extent of the project. Enhancement activities include stabilizing the unstable and eroding left channel bank. Approximately 264 feet of vertical and eroding banks will be reconstructed using soil lifts with toe wood and hellbender habitat. Efforts will be made to protect and preserve stable banks with mature vegetation. The right channel bank is stable and vegetated, therefore no construction activity is proposed for the right channel bank. Additionally, the invert of the channel is stable and, according to NCWRC, already exhibits hellbender habitat and therefore should not be modified. Soil lifts with toe wood and hellbender habitat will enhance the habitat available to the hellbender in the enhancement reach of WFFBR. Exclusionary fencing will be installed along the easement boundary to exclude cattle and clearly demarcate the easement boundary for the landowners. A riparian buffer populated with native vegetative species will be planted on the left side of WFFBR through the enhancement reach. The right side of WFFBR through the enhancement reach already exhibits a mature riparian buffer. Following enhancement activities, WFFBR will exhibit a minimum riparian buffer between 50 feet and 75 feet wide off of the left bank and 30 feet to 50 feet wide off of the right bank throughout the enhancement reach.

5.1.2 UT 5 West Fork French Broad River

Stream channel restoration of pattern, profile, dimension and riparian buffer is proposed for approximately 827 linear feet of UT 5 (excluding 72 feet that flows under a powerline easement). UT 5 flows under a powerline easement from station 14+33 to 15+05. This portion of WFFBR will be restored to maintain stream stability throughout the project and the buffer under the powerline easement will be planted. No stream credits are proposed for the portion of UT 5 that flows under the powerline easement. UT 5 will be restored through the existing pond, then through pasture within the Site, beginning upstream of the pond and ending at its convergence with WFFBR. The existing pond area is approximately 0.66 acres with a dam approximately 8 feet tall, 220 feet long, 12 feet wide at the top and 50 feet wide at the bottom. Proposed mitigation activities include removing the pond dam, meandering UT 5 through the low point of the valley, restoring a more natural and stable plan form, installation of wood and rock structures for grade control and habitat improvement, restoration of a vegetated riparian buffer, and removal of agricultural operations from the channel and riparian buffer through fencing. The existing pond dam will be removed by notching the dam and slowly discharging the retained water in a manner that reduces potential erosion and siltation (from potential sediment wedging behind the dam) to downstream receiving water. Once the water has been drained from the pond, the entire pond dam will be removed down to the natural floodplain elevation. The bottom of the pond has been surveyed and it does not appear that excessive sediment has formed any wedge at the pond dam. However, if excess sediment is discovered upon draining the pond then the sediment will be removed as necessary to ensure Priority I restoration of UT 5 through the existing pond. Any fine sediment accumulated in the bottom of the pond will be excavated before the proposed channel is constructed through the low point of the pond (i.e. low point of the valley).

The majority of UT 5 restoration will be Priority I which will provide greater connectivity of overbank flow with the wetland (W3) that does not currently occur due to the incised nature of UT 5. There are two reaches of Priority II restoration, one at the upstream extent and one at the downstream extent. Priority II restoration will be used at the upstream extent to transition from the existing channel to the proposed Priority I channel. The channel will be cascaded over a series of log structures which will allow the channel to drop in elevation while maintaining a stable riffle slope. A floodplain bench will not be constructed in this area, instead, gentle side slopes will be cut from the proposed top of bank and tie into existing ground which will also minimize the excavation impacts to Wetland 9. Priority II restoration is also proposed at the downstream extent of UT 5 to stably construct the convergence with WFFBR. However, a floodplain bench will be installed along the right bank to ensure overbank flow connectivity with the meander scroll in Wetland 3. Additionally, a half-bankfull channel is proposed on the left bank to connect flow into the downstream section of the meander scroll of Wetland 3 which will aid in maintaining the existing hydrology.

5.1.3 UT 7 West Fork French Broad River

Stream channel restoration of pattern, profile, dimension and riparian buffer is proposed for approximately 417 linear feet of UT 7. The downstream extent of the current channel has been modified and relocated from its natural valley position to a point at which it flows adjacent to an existing hill slope. UT 7 will be restored away from its current location back through the low point of its natural valley which is currently utilized as pasture. The channel has experienced bank failure leading to the deposition of sediment (from channel banks) and nutrient (from cattle) loading to downstream receiving waters. Proposed mitigation activities includes stabilizing channel banks, meandering through the low point of the valley, restoring a more natural and stable plan form, installation of wood and rock structures for grade control and habitat improvement, restoration of a vegetated riparian buffer, and removal of agricultural operations from the channel and riparian buffer through fencing.

The majority of UT 7 restoration will be Priority I, the only exception is at the downstream extent of the channel where Priority II is necessary to construct the convergence with WFFBR. The existing spoil piles along existing UT 7 will be removed to allow floodplain connectivity throughout the entire natural floodplain which will also aid in restoring adjacent relic wetlands.

Enhancement II is proposed for approximately 439 linear feet of UT 7, beginning at the easement boundary and extending to the beginning of restoration. This enhancement reach is proposed at a 3.5:1 ratio because the cattle are already excluded from the portion of UT 7 above the confluence with UT 7A. Woven wire fencing will be installed along the easement boundary to exclude cattle from the remainder of UT 7 and clearly demarcate the easement boundary for the landowners. The existing, degraded buffer will be populated with native vegetative species to restore natural vegetative structure and composition. Following enhancement activities, UT 7 will exhibit a minimum riparian buffer between 50 feet and 75 feet wide off of the left and right banks throughout most of the enhancement reach.

5.1.4 UT 8 West Fork French Broad River

Stream channel restoration of pattern, profile, dimension and riparian buffer is proposed for approximately 137 linear feet of UT 8. WFFBR will be diverted away from its current alignment, which will require the extension of UT 8 to converge with WFFBR. UT 8's alignment will be extended by 136 feet beginning at a stable cross section upstream of its current confluence with WFFBR. The extended channel will flow through a filled portion of the abandoned WFFBR until the point of their new convergence within existing pasture land. Channel pattern, profile, and dimension were designed to ensure that the channel will convey flow and transport sediment in a way where the channel will neither aggrade nor degrade. Additional mitigation activities include installation of wood and rock structures for grade control and habitat improvement, and restoration of a vegetated riparian buffer.

5.1.5 Other Unnamed Tributaries Proposed for Enhancement

UT 1 - Enhancement II is proposed for approximately 764 feet of UT 1 (excluding 25 feet that flows through an agricultural crossing). This enhancement reach is proposed at a 3.5:1 ratio because although cattle have full access to UT 1, a mature riparian buffer is present on both sides of the channel. The buffer narrows as UT 1 flows through the pasture but still maintains a width of approximately 10 to 20 feet. Woven wire fencing will be installed along the easement boundary to exclude cattle from UT 1 and clearly demarcate the easement boundary for the landowners. A riparian buffer populated with native vegetative species will be planted from the edge of the existing wooded buffer to the easement boundary. Following enhancement activities, UT 1 will exhibit a minimum riparian buffer 30 to 50 feet wide off of the left and right banks throughout the easement. The existing ford crossing on UT 1 will be replaced with a culvert crossing. A single 24 inch Corrugated Metal Pipe (CMP) will be installed at the culvert crossing.

UT 2, UT 2A, and UT 2B – Enhancement II is proposed for approximately 923 feet of UT 2 (excluding 20 feet that flows through an agricultural crossing), 546 feet of UT 2A (excluding 24 feet that flows through an agricultural crossing), and 75 feet of UT 2B. These enhancement reaches are proposed at a 2.5:1 ratio because cattle routinely access this area of the Site for water and shade, which has resulted in frequent inputs of nutrients and fecal matter, and degradation of the narrow riparian area adjacent to the streams. Woven wire fencing will be installed along the easement boundary to exclude cattle from UT 2, UT 2A, and UT 2B, and clearly demarcate the easement boundary for the landowners. The existing, degraded buffer will be populated with native vegetative species to restore natural vegetative structure and composition. Following enhancement activities, UT 2, UT 2A, and UT 2B will exhibit a minimum riparian buffer 30 to 50 feet wide off of the left and right banks throughout the easement. Portions of the buffer along UT 2 and UT 2A will exceed 50 feet in width. The existing ford on UT 2A will be replaced with a culvert crossing and the existing culvert crossing on UT 2 will be replaced with a new culvert crossing. A single 24 inch CMP will be installed at each crossing.

UT 3 – Enhancement I is proposed for approximately 125 feet of UT 3. Enhancement measures will consist of grading stream bed and banks and installing a rock step structure to stabilize UT 3 as it converges with WFFBR. Stabilization of UT 3 is necessary through this reach because the channel is currently degraded and eroding at the confluence with WFFBR. Woven wire fencing will be installed along the easement boundary to exclude cattle from UT 3 and clearly demarcate the easement boundary for the landowner. A riparian buffer populated with native vegetative species will be planted on both sides of UT 3. Following enhancement activities, UT 3 will exhibit a minimum riparian buffer 30 to 50 feet wide off of the left and right banks.

UT 4 – Enhancement II is proposed for approximately 809 linear feet of UT 4 (excluding 30 feet that flows through an agricultural crossing). This enhancement reach is proposed at a 2.5:1 ratio because cattle routinely access UT 4 for water and shade, which has resulted in frequent inputs of nutrients and fecal matter, and degradation of the narrow riparian area adjacent to the stream. The riparian buffer in some areas along UT 4 consists of a single tree buffer. In addition, WFFBR will be diverted away from its current alignment, which will require the extension of UT 4 to converge with WFFBR. Approximately 146 linear feet of UT 4 will be constructed with stable dimension, pattern, and profile to connect UT 4 with the newly constructed WFFBR. The extended channel will flow through a filled portion of the abandoned WFFBR until the point of their new convergence. Woven wire fencing will be installed along the easement boundary to exclude cattle from UT 4 and clearly demarcate the easement boundary for the landowner. A riparian buffer populated with native vegetative species will be planted on both sides of UT 4. Following enhancement activities, UT 4 will exhibit a minimum riparian buffer 30 to 50 feet wide off of the left and right banks. The existing culvert crossing on UT 4 will be replaced with a new culvert crossing. A single 36 inch CMP will be installed at the crossing.

UT 4A – Enhancement II is proposed for approximately 472 linear feet of UT 4A. This enhancement reach is proposed at a 2.3:1 ratio because cattle routinely access UT 4A for water and shade, which has resulted in frequent inputs of nutrients and fecal matter, and degradation of the riparian area adjacent to the stream. In addition, approximately 72 linear feet of UT 4A will be stabilized with rock step structures near the convergence with UT 4. Woven wire fencing will be installed along the easement boundary to exclude cattle from UT 4A and clearly demarcate the easement boundary for the landowner. A riparian buffer populated with native vegetative species will be planted on the left side of UT 4A. Following enhancement activities, UT 4A will exhibit a minimum riparian buffer 30 to 50 feet wide off of the left bank and 50 to 75 feet wide off of the right bank.

UT 4B – Enhancement II is proposed for approximately 178 linear feet of UT 4B. This enhancement reach is proposed at a 3.5:1 ratio because although cattle have full access to UT 4B, a mature riparian buffer is present on both sides of the channel. Woven wire fencing will be installed along the easement boundary to exclude cattle from UT 4B and clearly demarcate the easement boundary for the landowner. Following enhancement activities, UT 4B will exhibit a minimum riparian buffer 30 to 50 feet wide off of both sides of the channel.

UT 7B – Enhancement II is proposed for approximately 136 linear feet of UT 7B. This enhancement reach is proposed at a 2.5:1 ratio because cattle routinely access this area of the Site for water and shade, which has resulted in frequent inputs of nutrients and fecal matter, and degradation of the riparian area adjacent to the stream. Woven wire fencing will be installed along the easement boundary to exclude cattle from UT 7B and clearly demarcate the easement boundary for the landowners. The existing, degraded buffer will be populated with native vegetative species to restore natural vegetative structure and composition. Following enhancement activities, UT 7B will exhibit a minimum riparian buffer 30 to 50 feet wide off of the left and right banks throughout the easement.

5.1.6 Unnamed Tributaries Proposed for Preservation

UT 6, UT 6A, and UT 7A are proposed for preservation because they currently exhibit stable streams with a mature riparian buffer and cattle are either excluded from the streams or do not appear to access the streams. Two rock structures will be installed at the downstream extents of UT 6 in order to construct a stable convergence with WFFBR.

5.2 Design Channel Morphological Parameters

5.2.1 West Fork French Broad River

The proposed channel is designed as a moderate width to depth ratio, C4-type channel that conveys a bankfull discharge of approximately 300 cfs (proposed cross-sections shown on Sheet X-1). Proposed morphological conditions can be found in Table 7.

Table 7. WFFBR Morphological Conditions

Parameter	Existing Condition (XS1)	Existing Condition (XS2)	Existing Condition (XS3)	Reference Condition (SFMR)	Proposed
Valley Width (ft)	215	215	215	990	215
Contributing Drainage Area (acres)	3520	3520	3520	454	3520
Channel/Reach Classification	B4	B4	F4	C4	C4
Design Discharge Width (ft)	28.8	47.9	38.5	15.2	30
Design Discharge Depth (ft)	2.41	1.89	2.07	1.12	2.10
Design Discharge Area (ft^2)	69.31	90.63	79.6	17	69.6
Design Discharge Velocity (ft/s)	4.28	3.39	3.76	3.2	4.3
Design Discharge (cfs)	300	300	300	55	300
Water Surface Slope	0.0034	0.0034	0.0034	0.0097	0.0034
Sinuosity	1.06	1.06	1.06	1.12	1.12
Width/Depth Ratio	11.9	25.3	18.6	13.5	14
Bank Height Ratio	2.2	1.7	1.8	1.32	1.0
Entrenchment Ratio	1.79	1.44	1.25	2.31	3.1
d16 / d35 / d50 / d84 / d95 / dibar	7/20.6/32.1/ 66.7/77.9/83	7/20.6/32.1/ 66.7/77.9/83	7/20.6/32.1/ 66.7/77.9/83	5.7/22.6/40.1/ 85.1/115.3	7/20.6/32.1/ 66.7/77.9/83

Due to backwater constraints at the upstream extent of the project along with the required tie-in elevation at the downstream extent of the project, the restoration of WFFBR will be Priority II restoration in which a floodplain bench is excavated at the bankfull elevation.

5.2.2 UT 5 West Fork French Broad River

The proposed channel is designed as a moderate width to depth ratio, C4b-type channel through a relatively steep valley (0.027 ft/ft) (proposed cross-sections shown on Sheet X-2, Appendix G). UT 5's design discharge is estimated to be 10 cfs.

Short pool to pool spacing (averaging 4.2 bankfull widths) and grade control structures are utilized throughout the restored channel in an attempt to dissipate energy (through pools) and maintain a lower bankfull slope of 0.00569 ft/ft between drops. The lower bankfull slope is required to transport sediment and flow such that, over time, the stream neither aggrades nor degrades. Proposed morphological conditions are provided in Table 8.

Table 8. UT 5 Morphological Conditions

Parameter	Existing Condition	Reference Condition (UT SFMR)	Proposed
Valley Width (ft)	100	350	100
Contributing Drainage Area (acres)	44.8	160	44.8
Channel/Reach Classification	B4	C4	C4
Design Discharge Width (ft)	4.4	10.4	8.5
Design Discharge Depth (ft)	0.66	1.19	0.76
Design Discharge Area (ft^2)	2.9	8.2	5
Design Discharge Velocity (ft/s)	3.45	3.2	2
Design Discharge (cfs)	10	23.7	10
Water Surface Slope	0.012	0.0062	0.006
Sinuosity	1.08	1.07	1.14
Width/Depth Ratio	6.64	12.6	13.5
Bank Height Ratio	1.2	1.2	1
Entrenchment Ratio	1.83	8	11.8
d16 / d35 / d50 / d84 / d95 / dibar	3.6/7.2/11.5/26.7/32.9/40	0.9/9.8/13.7/25.7/34.6	3.6/7.2/11.5/26.7/32.9/40

5.2.3 UT 7 West Fork French Broad River

The proposed channel is designed as a moderate width to depth ratio, C4-type channel that conveys a bankfull discharge of approximately 13 cfs (proposed cross-sections shown on Sheet X-3, Appendix G). The design discharge was estimated by determining the existing channel forming discharge of a stable cross-section, within a stable, vegetated reach upstream of the proposed conservation easement.

The valley slope is relatively steep at approximately 0.026 ft/ft. Grade control structures are utilized in an attempt to dissipate energy and to maintain a relatively low bankfull slope of 0.00534 ft/ft between drops. The lower bankfull slope is required to transport sediment and flow such that, over time, the stream neither aggrades nor degrades. A large spoil berm is situated between the existing left channel bank of UT 7 and the toe of slope leading to Silverstein Road. The existing berm will be removed allowing for unimpeded floodwater access to the restored riparian buffer. Proposed morphological conditions are provided in Table 9.

Table 9. UT 7 Morphological Conditions

Parameter	Existing Condition	Reference Condition (UT SFMR)	Proposed
Valley Width (ft)	60	350	60
Contributing Drainage Area (acres)	41	160	41
Channel/Reach Classification	B4	C4	C4
Design Discharge Width (ft)	4.7	10.4	9
Design Discharge Depth (ft)	0.7	1.19	0.8
Design Discharge Area (ft^2)	2.7	8.2	5.6
Design Discharge Velocity (ft/s)	4.8	3.2	2.3
Design Discharge (cfs)	13	23.7	13
Water Surface Slope	0.0246	0.0062	0.0054
Sinuosity	1.54	1.07	1.24
Width/Depth Ratio	8.3	12.6	13.5
Bank Height Ratio	3.4	1.2	1
Entrenchment Ratio	2.7	8	14.4
d16 / d35 / d50 / d84 / d95 / dibar	0/0/3.4/25.4/61.7	0.9/9.8/13.7/25.7/34.6	0/0/3.4/25.4/61.7

5.2.4 UT 8 West Fork French Broad River

The proposed channel is designed as a moderate width to depth ratio, C4-type channel that conveys a bankfull discharge of approximately 45 cfs (proposed cross-sections shown on Sheet X-4, Appendix G). The design discharge was estimated by determining the existing channel forming discharge of a stable cross-section, within a stable, vegetated reach upstream of the proposed conservation easement.

The valley slope of UT 7 is approximately 0.025 ft/ft. Grade control structures are utilized to dissipate energy and drop the invert elevation to match the thalweg elevation of WFFBR at the confluence of the tributary and WFFBR. A design bankfull slope of 0.0110 ft/ft will be maintained to transport the sediment and flow such that, over time, the stream neither aggrades nor degrades. Proposed morphological conditions are provided in Table 10 Morphological Conditions.

Table 10. UT 8 Morphological Conditions

Parameter	Existing Condition	Reference Condition (UT SFMR)	Proposed
Valley Width (ft)	30	350	30
Contributing Drainage Area (acres)	198	160	198
Channel/Reach Classification	B4	C4	C4
Design Discharge Width (ft)	11.6	10.4	12
Design Discharge Depth (ft)	0.97	1.19	1.11
Design Discharge Area (ft^2)	8.19	8.2	10.3
Design Discharge Velocity (ft/s)	5.5	3.2	4.4
Design Discharge (cfs)	45	23.7	45
Water Surface Slope	0.0379	0.0062	0.0110
Sinuosity	1.03	1.07	1.09
Width/Depth Ratio	16.3	12.6	13
Bank Height Ratio	2.79	1.2	1.00
Entrenchment Ratio	1.47	8	2.5
d16 / d35 / d50 / d84 / d95 / dibar	0/7.2/16.8/65.3/76.8	0.9/9.8/13.7/25.7/34.6	0/7.2/16.8/65.3/76.8

5.3 Reference Streams

5.3.1 West Fork French Broad River

Morphological conditions of a reach of South Fork Mills River (SFMR) was surveyed and utilized as reference information for the design of WFFBR (Table 8). The stream maintains a moderate to high width/depth ratio and a low bank height ratio which allows the stream to access the floodplain. The reference reach's valley type (Rosgen valley type VIII) and valley slope are similar to valley conditions of WFFBR. The reference reach flows through a wooded, mature riparian buffer that displays minimal signs of instability.

The reference reach is classified as a C4 type channel. The C descriptor is designated because the channel displays a width to depth ratio of 13.5 and entrenchment ratio of 2.3 which indicates that the channel displays typical C type channel parameters. The channel's substrate is dominated by gravel which is indicated by the 4 descriptor. The bankfull discharge for SFMR where the reference was surveyed is 55 cubic feet per second. Figure 13 shows the location of SFMR reference reach. Photographs of SFMR reference reach are presented in Appendix B.

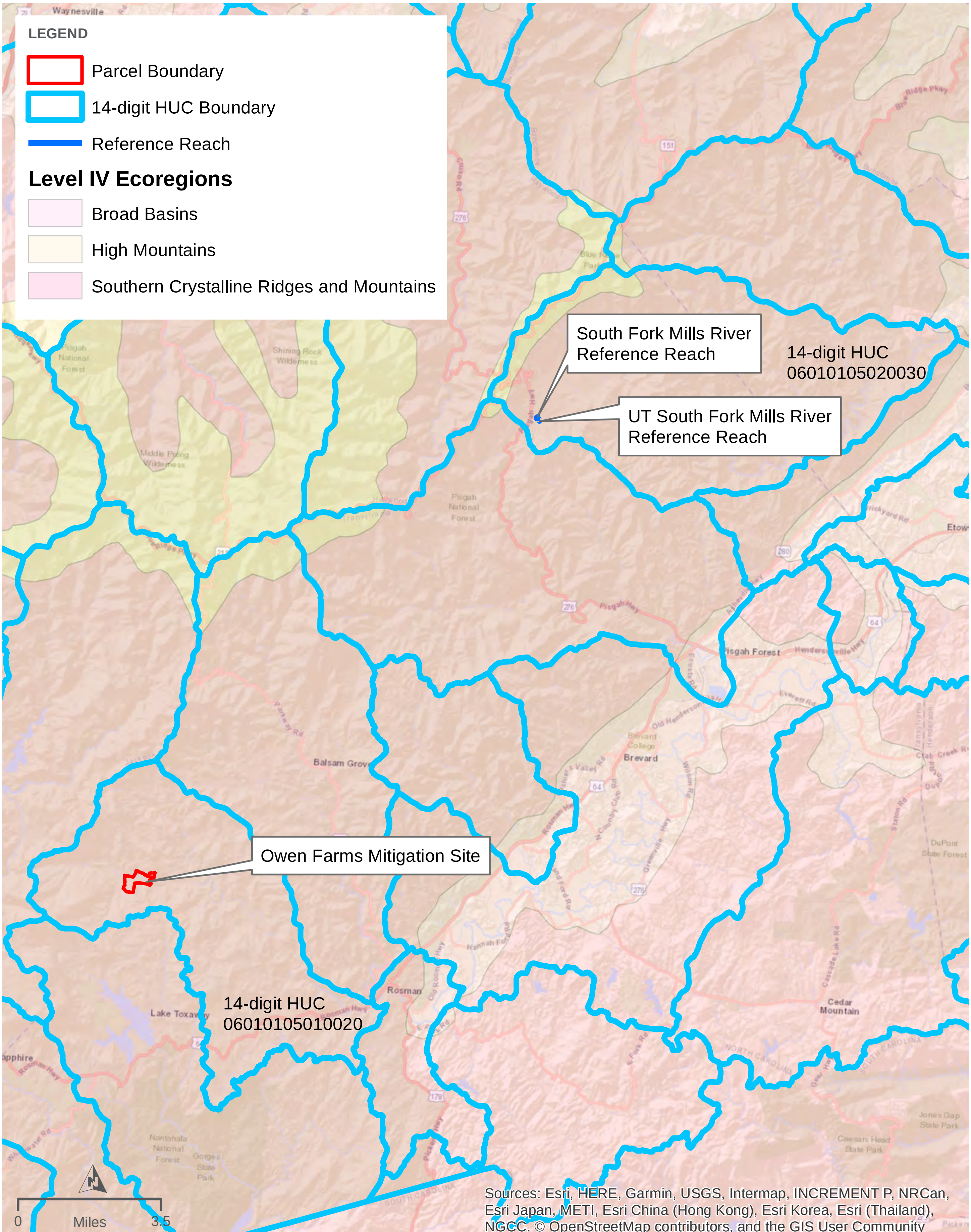
SFMR is surround by a mature (50 years or older) vegetated floodplain. The vegetated floodplain extends a minimum of 100 feet from both the left and right banks throughout the study area. Dominant vegetation within the floodplain includes Eastern hemlock (*Tsuga canadensis*), rhododendron (*Rhododendron maximum*), red maple (*Acer rubrum*), flowering dogwood (*Cornus florida*), white pine (*Pinus strobus*), mountain laurel (*Kalmia latifolia*), elderberry (*Sambucus candensis*), dog hobble (*Leucothoe fontanesiana*), American elm (*Ulmus americana*), and tulip poplar (*Liriodendron tulipifera*).

5.3.2 UT 5, UT 7, UT 8

Generally, each restored UT flows off high gradient hill slopes with confined valleys into a broader, lower slope floodplain before discharging into WFFBR. Several stream reaches within the same physiographic and eco-region were identified as potential references to be used in the design parameters for the restored stream reaches; however site inspections revealed that the overwhelming majority of reaches areas were identified as having broad valleys within the mountains were also cattle farms and showed signs of degradation similar to the tributaries to WFFBR. UT to South Fork Mills River (UT SFMR) was selected for having a similar valley type to the tributaries at Owen Farms. UT SFMR originates in a narrow, relatively steep valley and transitions into the broader floodplain of the South Fork Mills River. The reference reach is located within the Pisgah National Forest and flows through a mature riparian buffer, displaying minimal signs of instability.

Morphological conditions of the surveyed reach of UT SFMR is utilized as reference information for the design of UT 5, UT 7, and UT 8 (Tables 9, 10, and 11). The reference reach is classified as a C4 type channel. The C descriptor is designated because the channel displays a width to depth ratio of 12.6 and entrenchment ratios of 8 which indicates that the channel displays typical C type channel parameters. The channel's substrate is dominated by gravel which is indicated by the 4 descriptor. The bankfull discharge for UTSFMR where the reference was surveyed is 26 cubic feet per second. Figure 13 shows the location of UT SFMR reference reach. Photographs of UT SFMR reference reach are presented in Appendix B.

UT SFMR is surrounded by a mature vegetated floodplain, similar to that outlined in the section above for the reference of WFFBR.



REFERENCE REACH LOCATION MAP

SOUTH FORK MILLS RIVER

FIGURE 14

PATH: Z:\OWEN_FARMS\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MXD\MIT PLAN FIGURES\FIGURE 1- REFERENCEREACH_LOCATION MAP.MXD - USER: BFURR - DATE: 5/2/2019

OWEN FARMS MITIGATION PLAN

5.4 Design Discharge Analysis

Bankfull discharge on WFFBR and all restored tributaries was determined by two methods. The first method used to determine the discharge included identifying bankfull indicators within the Site. Several bankfull indicators were identified within the Site and while some of the design discharge determinations from the Site were not used due to the degree of channel instability; some clear bankfull indicators were located in stable sections that indicated the data is practical. Cross-sectional data was collected within a riffle where bankfull indicators were readily identifiable. Additionally, a longitudinal profile of the water surface, invert and bankfull indicators were collected within the reach in an attempt to identify an accurate Bankfull slope. A Manning's Roughness Coefficient was estimated for the reach. An estimated velocity, and ultimately discharge, was calculated using Manning's Equation solving for flow velocity using data obtained from the cross-section, the slope of the water surface profile, and Manning's Roughness Coefficient. Discharge calculations can be found in Appendix H.

The second method for determining bankfull discharge on-site included comparing the Site's data with existing hydraulic curves from Bankfull Hydraulic Geometry Relationships for Bankfull Regional Curves for North Carolina Rural Mountain Streams (Harman, W et. al.) (Mountain Regional Curve).

The bankfull discharge on WFFBR within the Site is determined to be approximately 300 cfs. The Mountain Regional Curves estimate bankfull discharge to be 367 cfs, for a watershed drainage area of 5.49 sq. mi. (drainage area of WFFBR within the Site's limits). It is recognized that the design discharge is less than the value provided using the equation generated by the data points for stable NC mountain streams. However, the published curve contains a data point at approximately 5.5 square mile drainage area that is below the curve line at approximately 240 cfs. Therefore, the data collected on-site falls within the range that is published on the Mountain Regional Curve.

The bankfull discharges of UT 5 and UT 7 are determined to be 10 cfs and 13 cfs, respectively. The Mountain Regional Curves estimate bankfull discharge to be 13 cfs for UT 5 which has a watershed drainage area of 0.07 sq. mi. within the Site's limits. The Mountain Regional Curves estimate a bankfull discharge of 12.5 cfs for UT 7 which has a watershed drainage area of 0.06 sq. mi. within the Site's limits. It is recognized that the design discharge is for UT 5 is less than the value provided using the equation generated by the data points for stable NC mountain streams. The published curve data does not provide data for a drainage area less than 1 sq. mile, therefore HDR placed a higher level of confidence in bankfull indicators and determined discharge of actual conditions for both tributaries.

On-site data revealed an estimated bankfull discharge of 45 cfs for UT 8. Additionally, the Mountain Regional Curves estimate a bankfull discharge of 41 cfs for UT 8 which has a watershed drainage area of 0.31 sq. mi. within the Site's limits.

HEC-RAS Version 5.0.4 was used to evaluate how the discharge of the restored channel flows within the proposed channel geometry. The two-dimensional (2D) option was utilized within HEC-RAS in order to observe modeled velocities and shear stresses in addition to flood inundation for multiple storm events. This evaluation verifies that the proposed plan, dimension, and profile would adequately convey the discharge at the bankfull stage; the point where water begins to overflow onto the floodplain. The 2 year storm was also modeled to evaluate the additional floodplain connectivity created as result of Site restoration activities. A map documenting the results of the HECRAS model can be found in Appendix H.

The 2 year storm models revealed that proposed conditions would inundate 6.4 acres in comparison to the 3.5 acres that are inundated under the existing conditions. An 83% increase in the area inundated by the 2-year flood from the existing to proposed model is a reflection of proposed activities (i.e. grading floodplain bench on WFFBR, Priority I restoration on UT5 and UT 7) providing functional uplift. Increasing the area of inundation improves habitat within the floodplain and increases the opportunity for treatment of nutrient and sediment laden floodwaters.

5.5 Sediment Transport Analysis

One of the goals of this project is to construct stable channels that will transport their sediment and flow such that, over time, the stream system neither aggrades nor degrades. This stability is achieved when the sediment input to the design reach generally equals the sediment output. Sediment concentration and capacity (using stream power models) have been utilized to model the channel's ability to transport potential sediment loads that enter the Site. Below is a discussion of the various methods used to analyze sediment transport and its relation to stability in the design:

5.5.1 West Fork French Broad River

The watershed of WFFBR is predominantly stable, consisting mostly of forest land. Much of WFFRB's channel was assessed during various site visits. Review of aerial photography and on-the-ground reconnaissance confirm that the majority of WFFBR's channel, side slopes and overbank areas upstream of the Site display general stability (with relatively minor areas of noted instability). The Site is the upstream most point of significant and consistent soil loss from channel banks and adjacent disturbed/maintained riparian areas. Observations support that the majority of fine sediment found in WFFBR within the Site's boundary originate from the Site, rather than upstream of the Site. Additionally, the channel invert is not actively down cutting immediately upstream of the Site or within the upstream most portion of the Site. Based on these observations, restoring the channel to a stable condition through the Site should remove the largest contributor of excess sediment loads to WFFBR.

The proposed channel was designed to transport sediment that enters the Site from the upstream, stable watershed. A pebble count and bulk sample sieve analysis was performed at the upstream extent of the Site in an effort to determine the particle distribution of contributing sediment entering the project area. Data for the pebble count and sieve analysis can be found in Appendix H. Sand fractions were determined based on the coarseness of the particle that was encountered while performing the pebble count.

Sediment competency and capacity models were completed to analyze the potential of restored conditions at the Site. This information is presented below:

<u>Competency (Entrainment)</u>

Collected soil data confirms that WFFBR's substrate is dominated by gravel. It is common practice in gravel bed streams to study the competency of the stream's ability to entrain the largest sized particle during bankfull flows for stability analysis. The primary factor studied is shear stress of the bankfull channel. The bankfull mean depth and slope are the two primary variables used to determine if the channel has the competency to entrain its largest particle size under bankfull flows. Entrainment calculations for both existing and proposed conditions on WFFBR are included as Appendix H.

Since WFFBR exhibits varying cross sectional measurements throughout the Site, the existing entrainment was analyzed through multiple sections. An upstream, stable section was analyzed for both bankfull discharge calculations and sediment competency, a middle section was analyzed that is over-widened and a downstream section was analyzed that is incised. Each section produced different competency results which are summarized in Table 11 below:

Table 11. WFFBR Sediment Competency

	Reach			
	WFFBR Existing Upstream	WFFBR Existing Middle	WFFBR Existing Downstream	WFFBR Design
Required* BKF Mean Depth (ft)	2.45	2.45	2.45	2.42
Existing BKF Mean Depth (ft)	2.41	1.11	3.01	2.14
Required* BKF Slope (ft/ft)	0.0035	0.0075	0.0028	0.0039
Existing BKF Slope (ft/ft)	0.0034	0.0034	0.0034	0.0034
Bankfull Shear Stress (lb/ft2)	0.46	0.23	0.58	0.43

* Required refers to the value needed to stably transport the sediment regime measured on-site based on entrainment calculations

The over widened middle section is aggrading while the downstream incised section is degrading. The proposed design reflects a similar shear stress to the existing stable section at the bankfull discharge of 0.43 lb/ft2, by reflecting a similar bankfull slope of 0.34 percent and mean bankfull depth of 2.14 ft. The proposed shear stress will entrain a particle size between 32 and 82 mm as predicted by the Shields Diagram and Revised Shields Diagram by Rosgen, respectively. The Site's largest particle size is 83 mm, which would indicate that the proposed channel dimensions and slope are adequate to transport sediment input through the Site. All existing and proposed entrainment calculations can be found in Appendix H.

<u>Capacity</u>

A sediment transport analysis model was completed using HEC-RAS to determine the potential change in invert elevation for the bankfull event. Since there is no existing sediment gauge data on WFFBR, a stable cross section (i.e. not aggrading or degrading) was used to model sediment input to the Site using the HEC-RAS equilibrium method. A model was generated for both the existing and the proposed conditions of the Site. A quasi-unsteady hydrograph was created from the bankfull event and this event was run back-to-back 4 times through the Site to simulate multiple events. The advantage of modeling the discharge in this manner provides an output that displays the trends that the Site may experience as a result of multiple bankfull flows as opposed to a singular event. Sediment data utilized for the model is the same data utilized for the entrainment calculations discussed above and can be found in Appendix H.

A comparison of pre-storm conditions and post-storm conditions of the channel invert was completed after running multiple bankfull flows through the model (Figure 15). Model results indicate minor adjustments of to both pool and riffle inverts as anticipated, however, the change in channel invert was limited to tenths of a foot and is within reason of what should be expected in a dynamic system.

It should also be noted that the invert comparison was completed for the existing conditions of the channel (Figure 16). The existing conditions produced similar results as the proposed conditions because there was some change to the channel invert but nothing significant. The existing conditions model results replicates field observations of the existing channel in that WFFBR is generally not aggrading nor degrading from a reach-wide standpoint. There are particular cross sections that were analyzed for entrainment purposes that resulted in aggradation or degradation but this vertical instability is localized to particular sections and not reflective of the entire Site. The main stressor to WFFBR is bank erosion due to lateral expansion and not invert instability due to vertical stress. The model's accurate portrayal of existing conditions provides confidence in the results of the proposed sediment model.

Figure 15. HECRAS Proposed Sediment Results

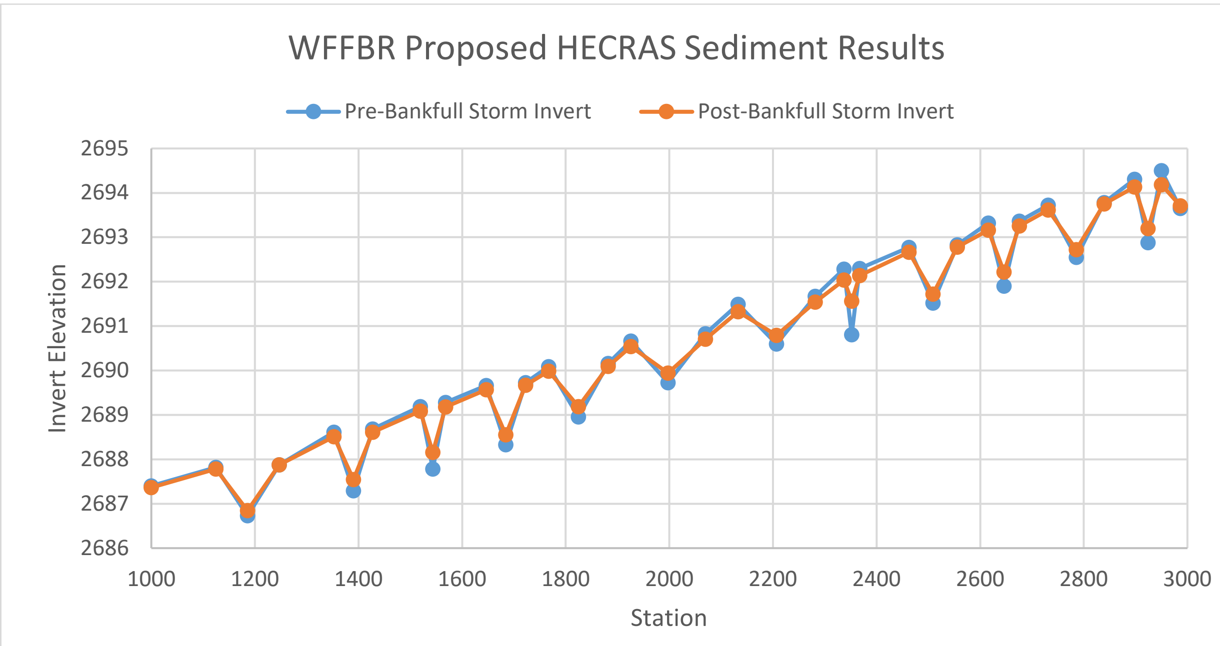
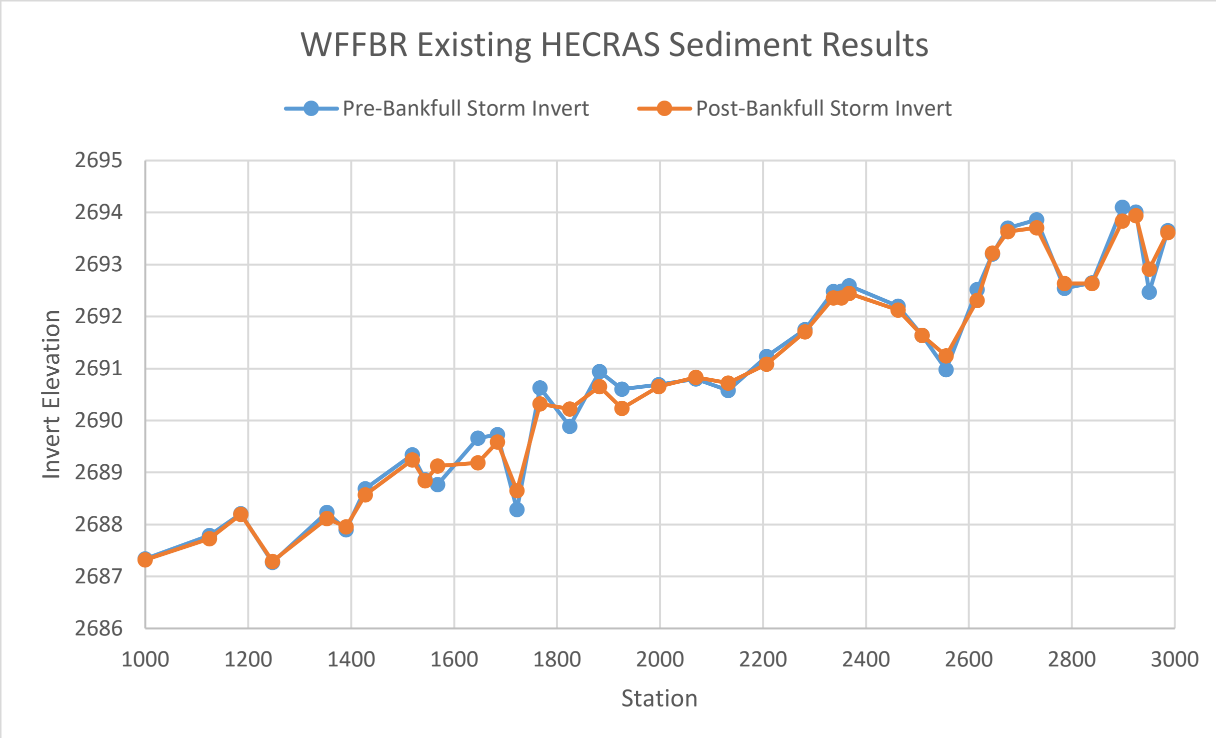


Figure 16. HECRAS Existing Sediment Results



Another method used to evaluate sediment transport through the Site is the Bedload Assessment for Gravel-bed Streams (BAGS) model. Specifically, the Wilcock and Crowe equation within the BAGS model was used to analyze bedload. This equation was used because it incorporates both sand and gravel in developing a sediment transport rate. The BAGS model was completed on both a stable section of existing WFFBR (the reference section) and proposed channel conditions in an effort to analyze the channel's ability to transport sediment volume entering the Site. The reference section is located at the upstream extents of the Site (as WFFBR enters the Site). It does not display significant signs of aggradation or degradation, nor does the reach display substantial sediment deposition on the floodplain. The lack of significant noticeable aggradation/degradation and floodplain deposition is an indicator that this portion of channel is transporting its sediment supply efficiently. Additionally, existing conditions entrainment calculations completed for the reference section indicate that it is currently stable (which is not the case for many of the other existing sections evaluated). According to the Wilcock and Crowe equation, the existing reference section and proposed conditions channel bedload transport rate are within 4 percent of each other. Therefore, this data suggests that proposed channel conditions are capable of transporting the contributing sediment load through the Site without significant aggradation or degradation.

5.5.2 UT 5, UT 7 and UT 8

As described previously, the restored UT's substrate is dominated by gravel. Competency (Entrainment) calculations were also conducted for each tributary. It is common practice in gravel bed streams to study the competency of the stream's ability to entrain the largest sized particle during bankfull flows for stability analysis. The primary factor studied is shear stress of the bankfull channel. The bankfull mean depth and slope are the two primary variables used to determine if the channel has the competency to entrain its largest particle size under bankfull flows. Entrainment calculations for both existing and proposed conditions of the tributaries are included as Appendix H and are summarized in Table 12 below.

Table 12. Sediment Competency for Restored UT's

	Reach					
	UT 5 Existing	UT 5 Design	UT 7 Existing	UT 7 Design	UT 8 Existing	UT 8 Design
Required* BKF Mean Depth (ft)	0.41	0.61	0.28	0.62	0.28	0.95
Existing BKF Mean Depth (ft)	0.52	0.63	0.60	0.67	1.13	0.92
Required* BKF Slope (ft/ft)	0.0063	0.0052	0.0091	0.0050	0.0092	0.0113
Existing BKF Slope (ft/ft)	0.0080	0.0053	0.0196	0.0054	0.0379	0.0110
Bankfull Shear Stress (lb/ft2)	0.23	0.19	0.64	0.20	1.63	0.57

* Required refers to the value needed to stably transport the sediment regime measured on-site based on entrainment calculations

5.6 Wetland Design Approach

5.6.1 Wetland Rehabilitation and Re-establishment

Relic wetland areas once connected to W3 and W5A/B were identified for wetland Re-establishment based on evidence of altered hydric soils (see sealed soil boring logs in Appendix A), existing groundwater gauge data, and jurisdictional delineations. Approximately 0.17 acres of relic wetland adjacent to W3 (excluding 0.10 acres of relic wetland within the powerline easement) and 0.19 acres of relic wetland adjacent to W5A/B will be restored and reconnected to the existing wetlands (Figure 17). Re-establishment of these relic wetland areas will consist of removing spoil and overburden material to expose the underlying hydric soils. Depth of spoil to be removed in the relic wetland adjacent to W3 ranges from approximately 3 inches to 11 inches. This material was spread fairly evenly across the relic wetland area when it was excavated from UT 5. Depth of spoil to be removed in the relic wetland area adjacent to W5A/B ranges from 4 inches to 15 inches. This material was placed in mounds along the left side of the channel when it was excavated from UT 7. Wetland hydrology will be restored by raising the invert of the incised tributaries adjacent to these wetlands and filling the existing ditched channels. The portion of relic wetland that falls within the powerline easement will also be planted. No wetland credits are proposed for areas that occur within the powerline easement.

W3 is an existing wetland that has been significantly altered as a result of anthropogenic disturbance and cattle access. W3 is dominated by herbaceous vegetation and currently serves as part of the cattle pasture at the Site. Rehabilitation of 0.97 acres of W3 will consist of replanting the wetland with native vegetation, installing exclusionary fencing to eliminate cattle access, and restoring UT 5 to increase the frequency of floodwaters accessing W3. HEC-RAS Version 5.0.4 was used to evaluate the additional floodplain connectivity created as result of Site restoration activities. Two figures are provided in Appendix H that depict the inundation boundary at the Site under existing and proposed conditions at the bankfull stage and 2 year storm stage. The 2 year storm is contained within the existing channel of UT 5, but under proposed conditions the 2 year storm floods into the restored and enhanced areas of W3, providing an opportunity for treatment of nutrients and sediment. All Re-establishment and Rehabilitation areas will be planted with native wetland vegetation as described in the planting plan.

5.6.2 Wetland Enhancement

Wetlands proposed for enhancement exhibit wetland hydrology and hydric soils but have a disturbed vegetative community and are impacted by cattle. W1, W2, W4, and W5A/B through W9 will be enhanced by excluding cattle and replanting with native hydrophytic vegetation as described in the planting plan. A total of approximately 1.53 acres of wetland will be enhanced at the Site.

5.7 Reference Wetland

Reference wetlands are difficult to obtain in the mountain region due to the scarcity of undisturbed bottomland areas. In addition, climatic variability in the mountain region can result in similar wetland types with divergent hydroperiods. A reference search was conducted in the project vicinity but no suitable reference wetlands were identified. Vegetative communities proposed to be restored at the Site will be based on descriptions provided in *Classification of the Natural Communities of North Carolina, Thrid Approximation* (Schafale and Weakley, 1990) for natural mountain vegetative communities. Reference hydrology for restored wetlands will be based on existing on-site wetlands. Groundwater gauges will be installed in existing wetland areas of W3 and W5A for comparison with groundwater data collected in the re-established wetland areas of W3 and W5.

5.8 Planting Plan

Target vegetation communities for the Site will be Piedmont/Mountain Bottomland Forest in the floodplain of WFFBR transitioning upslope to Montane Alluvial Forest along the tributaries. W3 and W2 are wetter than other areas within the floodplain of WFFBR and its associated tributaries. The target vegetative community for W3 and W2 will be Swamp Forest – Bog Complex (Typic Subtype). Bog Complex communities may have more herbaceous vegetation that may persist through the monitoring period, when compared to other Swamp Forest communities. Stream banks of restored and enhanced stream reaches will be planted with a streamside assemblage consisting of black willow, tag alder, and other common streamside species. Table 12 below identifies the proposed species composition for each planting zone. A plan view of the planting zones is depicted on Plan Sheet 13 (Appendix G). Bare root seedlings in Zones 2, 3, and 4 will be planted on approximately eight (8) foot spacing, corresponding to approximately 680 stems per acre. The stream bank (Zone 1) will be planted with a combination of live stakes and bare root seedlings on approximately four (4) foot spacing. It is expected that other characteristic species will recruit naturally into these areas subsequent to completion of construction. The herbaceous layer will be restored by seeding disturbed areas with a native seed mix.

Table 13. Planting Plan

Zone 1: Streamside Assemblage	**Footage 7,813 ft**	**Plant Spacing 4'**	
Common Name	**Scientific Name**	**% Composition**	
Black willow	*Salix nigra*	25	
Tag alder	*Alnus serrulata*	25	
Silky dogwood	*Cornus amomum*	25	
Sycamore	*Platanus occidentalis*	25	
Zone 2: Piedmont/Mountain Bottomland Forest	**Area 7.21 ac**	**Plant Spacing 8'**	
Tulip tree	*Liriodendron tulipifera*	15	
River birch	*Betula nigra*	15	
Sycamore	*Platanus occidentalis*	20	
Shagbark hickory	*Carya ovata*	15	
American elm	*Ulmus Americana*	10	
Flowering dogwood	*Cornus florida*	5	
Bitternut hickory	*Carya cordiformis*	15	
Mountain silverbell	*Halesia tetraptera*	5	
Zone 3: Swamp Forest-Bog Complex	**Area 1.99 ac**	**Plant Spacing 8'**	
Silky willow	*Salix sericea*	15	
Tag alder	*Alnus serrulata*	20	
Possumhaw viburnum	*Viburnum nudum*	20	
Red chokeberry	*Aronia arbutifolia*	15	
Silky dogwood	*Cornus amomum*	15	
Mountain holly	*Ilex montana*	10	
Swamp rose	*Rosa palustris*	5	
Zone 4: Montane Alluvial Forest	**Area 5.06**	**Plant Spacing 8'**	
Sycamore	*Platanus occidentalis*	15	
Yellow birch	*Betula alleghaniensis*	15	
White oak	*Quercus alba*	20	
Tulip tree	*Liriodendron tulipifera*	15	
Sweet birch	*Betula lenta*	10	
River birch	*Betula nigra*	15	
Witch-hazel	*Hamamelis virginiana*	10	
Permanent Native Seed Mix	**Area 7.1**	**Application Rate 20 lbs/ac**	
		% Composition	**lbs Planted**
Autumn bentgrass	*Agrostis perennans*	15	22
Big bluestem	*Andropogon gerardii*	10	15
Lanceleaf coreopsis	*Coreopsis lanceolata*	10	15
Virginia wildrye	*Elymus virginicus*	20	29
Fox sedge	*Carex vulpinoidea*	5	8
Switchgrass	*Panicum virgatum*	15	22
Blackeyed susan	*Rudbeckia hirta*	10	15
Little bluestem	*Schizachyrium scoparium*	5	8
Indian grass	*Sorghastrum nutans*	5	8
Eastern gamagrass	*Tripsacum dactyloides*	5	8
		Total	**150**

5.9 Project Risks and Uncertainties

A large portion of the watershed is part of the Pisgah National Forest, therefore land use change within the watershed should be minimal. One ford crossing and four culvert crossings will be installed to allow farming operations to continue on land adjacent to the project. The crossings will be designed to convey flow and sediment to maintain stability upstream and downstream of the crossings. Gates will be installed at the ford crossing to allow the landowner to restrict cattle access when the ford is not in use. Fencing will be erected to NRCS and DMS standards to restrict cattle from accessing land within the easement. Geotech test pits were conducted along the proposed alignment of WFFBR to check depth to bedrock. Test pits were excavated to a depth sufficient to exceed the proposed thalweg depth of WFFBR. No bedrock was encountered along the proposed alignment and therefore should not pose a problem during construction. The location of geotech test pits can be found on Figure 11. Beaver dams were observed along UT 2, downstream of the project easement. Based on conversations with the farm manager, review of historic aerial photography, and field observations, beaver activity has remained confined to the area around UT 2 for several years and is not anticipated to impact other streams on-site. The beaver dams appear to be currently inactive but beaver activity will be monitored closely throughout the project lifecycle and addressed as detailed in Section 8.0, if necessary.

6.0 Performance Standards

Site performance standards and required remediation actions are based on the Wilmington District Stream and Wetland Compensatory Mitigation Update (USACE et al. 2016) and the Annual Monitoring Report Format, Data Requirements, and Content Guidance (NCDMS 2017). Performance standards for stream morphology, hydrology, and vegetation are discussed below. Proposed project monitoring features are depicted on Figure 11.

6.1 Streams

<u>Stream Dimension</u>

General Maintenance of a stable cross-section and hydrologic access to the floodplain features over the course of the monitoring period will generally represent success in dimensional stability. Riffle cross-sections should remain stable and show little change in bankfull area, bank-height ratio, and width to depth ratio. Some changes in dimension (such as lowering of bankfull width-to-depth ratio) should be expected. Riffle sections should generally maintain a Bank Height Ratio (BHR) approaching 1.0 – 1.2, with some variation in this ratio naturally occurring, and display an entrenchment ratio of no less than 2.2. Both ratios should display no more than 10 percent change from year-to-year. Based on current DMS guidance regarding BHR, years that exhibit deposition in the channel may yield BHR ratios that are less than 1.0. Pool sections naturally adjust based on recent flows and time between flows. No individual measurements should exceed 15 percent variance over as-built conditions over the monitoring time frame.

<u>Stream Pattern and Profile</u>

Pattern features should show little adjustment over the standard 7 year monitoring period. The profile should not demonstrate significant trends towards degradation or aggradation over a significant portion of a reach. Visual assessment and photo documentation will be used to indicate that streams are remaining stable and do not indicate a trend toward vertical or lateral instability. Longitudinal profile survey will be conducted during the as-built survey, but will not be conducted during the seven-year monitoring period unless a trend towards vertical or lateral instability is observed.

Substrate and Sediment Transport

There should be an absence of any significant trend in the aggradational or depositional potential of the channel.

Hydraulics

All stream channels will maintain an ordinary high water mark (OHWM) through monitoring. Continuous surface water flow within tributaries must be documented to occur every year for at least 30 consecutive days during the prescribed monitoring period. A minimum of four bankfull events must be documented within the 7 year monitoring period. The four bankfull events shall occur within separate years.

6.2 Vegetation

Vegetation requirements state that there must be a minimum of 320 planted stems per acre surviving after year three, 260 stems per acre after year five, and 210 stems per acre after year seven. Trees should average 6 feet in height at year five and 8 feet in height at year seven. Bog Complex communities may exhibit areas with low stem density that are dominated by herbaceous species, which is acceptable for this community type. In addition, Bog Complex communities will be planted with a high percentage of shrub species, which are not expected to reach the height requirements listed above for trees. Volunteers must be present for a minimum of two growing seasons before being included in performance standards in Year 5 and Year 7. For any tree stem to count toward success, it may be either planted or volunteer, but it must be a species from the approved planting list included in the Mitigation Plan. Other species not included on the planting list or in the stated documentation may be considered by the IRT on a case-by-case basis. Additionally, any single species can only account for up to 50% of the required number of stems within any vegetation plot. Should the performance criteria outlined above not be met during the monitoring period, HDR will provide DMS with an Adaptive Management Plan, detailing corrective actions and/or maintenance actions proposed and an implementation schedule for said actions, planned to meet the criteria. Upon review and approval of said corrective measures by DMS and the IRT, HDR will implement the necessary corrective measures.

6.3 Wetlands

Final performance criteria for wetland hydrology will be a groundwater level within 12 inches of the soil surface for a minimum of 12% (25 consecutive days) of the growing season (April 7 through October 30, 206 days). Wetland hydrology performance standards are based on the Lake Toxaway WETS table and the wetland saturation range for Ela soils as presented in the Wetland Saturation Threshold Table. Ela soils were used to determine the wetland saturation range because soil borings taken on-site showed a hydric soil with the associated taxonomic subgroup Fluvaquentic Humaquept, which corresponds to the Ela soil series. Both tables are provided in Appendix H. In the event of non-typical years of climatic conditions, groundwater monitoring data may be compared to on-site reference groundwater data; however, reference gauge data will not be tied to success criteria.

7.0 Monitoring Plan

Annual monitoring reports will be produced and submitted to DMS by December 1st of the year for which monitoring was conducted. The Site will be monitored annually for a duration of 7 years. The seventh year monitoring report will include a Closeout Report that provides an assessment of monitoring data collected from the entire monitoring period. Fixed cross-sections and vegetation plots will be used as permanent photo points throughout the monitoring period.

Table 14. Monitoring Plan

Goal	Treatment	Performance Standards	Monitoring Metric	Outcome	Likely Functional Uplift
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.	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.	Stable stream channels with entrenchment ratios over 2.2 and BHRs below 1.2.	Reduction of nutrients and sediment to downstream locations, reduction of shear stress, and improved hydraulic function.
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.	Four bankfull events in separate monitoring years.	Flow gauges (Pressure transducers), and visual inspection.	Bankfull events within monitoring period.	Increase attenuation of floodwaters, increase biogeochemical cycling and recharge riparian wetlands.
Restore/enhance aquatic, semi-aquatic, and riparian habitat.	Restore native vegetation to the stream channel banks, wetlands, and the adjacent riparian corridor.	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.	Planted stems meet density and vigor requirements in MY7, with volunteer trees also growing on site.	Treatment of nutrient enriched surface runoff from adjacent pastureland, increased bank stability and increased habitat.
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.	Groundwater elevation within 12 inches of the ground surface for at least 12% of the growing season (April 7 - October 30).	Groundwater monitoring gauges.	Wetlands meeting criteria	Restoration of riparian habitat, treatment of nutrient enriched runoff from adjacent pastureland, increased flood attenuation.
Restore and connect riparian habitat with adjacent natural communities.	Conservation easement establishment.	Prevent Easement Encroachment.	Visual inspection.	No encroachment into the conservation easement.	Protect Site from encroachment in conservation easement.

Table 15. Monitoring Plan Components

Parameter	Monitoring Method	Quantity	Frequency	Notes
Dimension	Riffle Cross Sections	UT5 (2) UT7 (1) UT8 (1) WFFBR (4)	Years 1, 2, 3, 5 & 7	
	Pool Cross Sections	UT5 (2) UT7 (1) UT 8 (1) 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) UT7 (1) UT8 (1) 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, 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.

8.0 Adaptive Management Plan

In the event the mitigation site or a component of the mitigation site fails to achieve the necessary performance standards, HDR will notify the members of the IRT and work with the IRT to develop contingency plans and remedial actions. Although existing beaver dams at the Site appear to be inactive, beaver activity will be monitored following construction. A beaver control plan will be developed and implemented if hydrologic modification from beaver dams jeopardizes Site success.

9.0 Long-Term Management Plan

Upon approval for close-out by the IRT the Site will be transferred to the NCDEQ Stewardship Program (or 3rd party if approved). This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Funding will be supplied by the responsible party on a yearly basis until such time an endowment is established. The NCDEQ Stewardship Program is developing an endowment system within the non-reverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General Statue GS 113A-232(d)(3). Interest gained by the endowment fund may be used for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable.

The Stewardship Program will periodically install signage to identify boundary markings, as needed. Any livestock or associated fencing or permanent crossings will be the responsibility of the owner of the underlying fee to maintain.

The Site protection Instrument can be found in Appendix I.

A utility easement crosses through the conservation easement and will require an exception to be listed in the stewardship transfer document, allowing access to the utility easement for maintenance purposes.

10.0 Determination of Credits

Mitigation credits presented in Table 15 are projections based upon the proposed design. The assets included in Table 16 are depicted on Figure 17. If site conditions are encountered during construction of stream channels that result in significant deviations from the approved plan or credit amount (i.e. more than would typically result from measurement variations), the as-built report will clearly identify the difference in length and associated credit amount and explain how project design and construction were altered. These changes will be submitted to the USACE for approval as a project modification. Although the majority of stream buffers on-site exceed the minimum requirement of 30 feet for mountain counties (particularly along WFFBR and UT 7), additional stream credits are not requested at this time. Buffers associated with each stream reach are depicted on Figure 18.

Table 16. Project Assets Table

Project Component	Wetland Position and HydroType	Existing Footage or Acreage*	Mitigation Plan Stationing	Mitigation Plan Footage or Acreage*	As-Built Footage or Acreage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Credits*	Notes/Comments
West Fork French Broad River (WFFBR)*		1975	10+00 - 29+86	1799	-	R	PII	1	1799	Full channel Restoration, buffer planting, livestock exclusion, permanent easement
West Fork French Broad River (WFFBR)		705	29+86 - 36+91	705	-	EII	-	2.5	282	Bank stabilization along the left bank, buffer planting, livestock exclusion, and permanent easement
UT 1*		764	10+00 - 17+88	764	-	EII	-	4	191	Buffer planting, livestock exclusion, and permanent easement
UT 2*		923	10+00 - 19+43	923	-	EII	-	3.5	264	Buffer planting, livestock exclusion, and permanent easement
UT 2A*		546	10+00 - 15+70	546	-	EII	-	2.5	218	Buffer planting, livestock exclusion, and permanent easement
UT 2B		75	10+00 - 10+75	75	-	EII	-	2.5	30	Buffer planting, livestock exclusion, and permanent easement
UT 3		125	9+00 - 10+25	125	-	EI	-	1.5	83	Stabilization of channel dimension and profile, buffer planting, livestock exclusion, and permanent easement
UT 4*		731	2+98 - 11+36	809	-	EII	-	2.5	324	Buffer planting, livestock exclusion, and permanent easement
UT 4A		472	6+00 - 10+72	472	-	EII	-	2.3	205	Stabilization of channel dimension and profile near confluence with UT 4, buffer planting, livestock exclusion, and permanent easement
UT 4B		178	10+00 - 11+78	178	-	EII	-	4	45	Buffer planting, livestock exclusion, and permanent easement
UT 5*		652	10+00 - 18+99	827	-	R	PI	1	827	Full channel Restoration, buffer planting, livestock exclusion, permanent easement
UT 6		114	9+14 - 10+28	114	-	P	-	10	11	Preservation
UT 6A		206	10+00 - 12+06	206	-	P	-	10	21	Preservation
UT 7		372	10+00 - 14+17	417	-	R	PI	1	417	Full channel Restoration, buffer planting, livestock exclusion, permanent easement
UT 7		439	5+61 - 10+00	439	-	EII	-	3.5	125	Buffer planting, livestock exclusion, and permanent easement
UT 7A		103	10+00 - 11+03	103	-	P	-	10	10	Preservation
UT 7B		136	10+00 - 11+36	136	-	EII	-	2.5	54	Buffer planting, livestock exclusion, and permanent easement
UT 8		49	10+00 - 11+37	137	-	R	PI	1	137	Full channel Restoration near confluence with WFFBR, buffer planting, livestock exclusion, permanent easement
Wetland Group 1 (W1-W9)	RR	1.54		1.54	1.54	E		2	0.77	Planting, livestock exclusion, permanent easement
Wetland Group 2 (W3 and W5)	RR	0.35		0.35	0.35	Re-est.		1	0.35	Raising invert of adjacent tributaries and filling abandoned channels; livestock exclusion, planting, and removal of spoil
Wetland Group 3 (W3)	RR	0.97		0.97	0.97	Rehab		1.5	0.64	Planting, livestock exclusion, permanent easement; restoring adjacent tributaries to increase frequency of floodwaters accessing wetland

*Length of streams flowing through utility easements or agricultural crossings has been deducted from existing and proposed mitigation footage and credits.

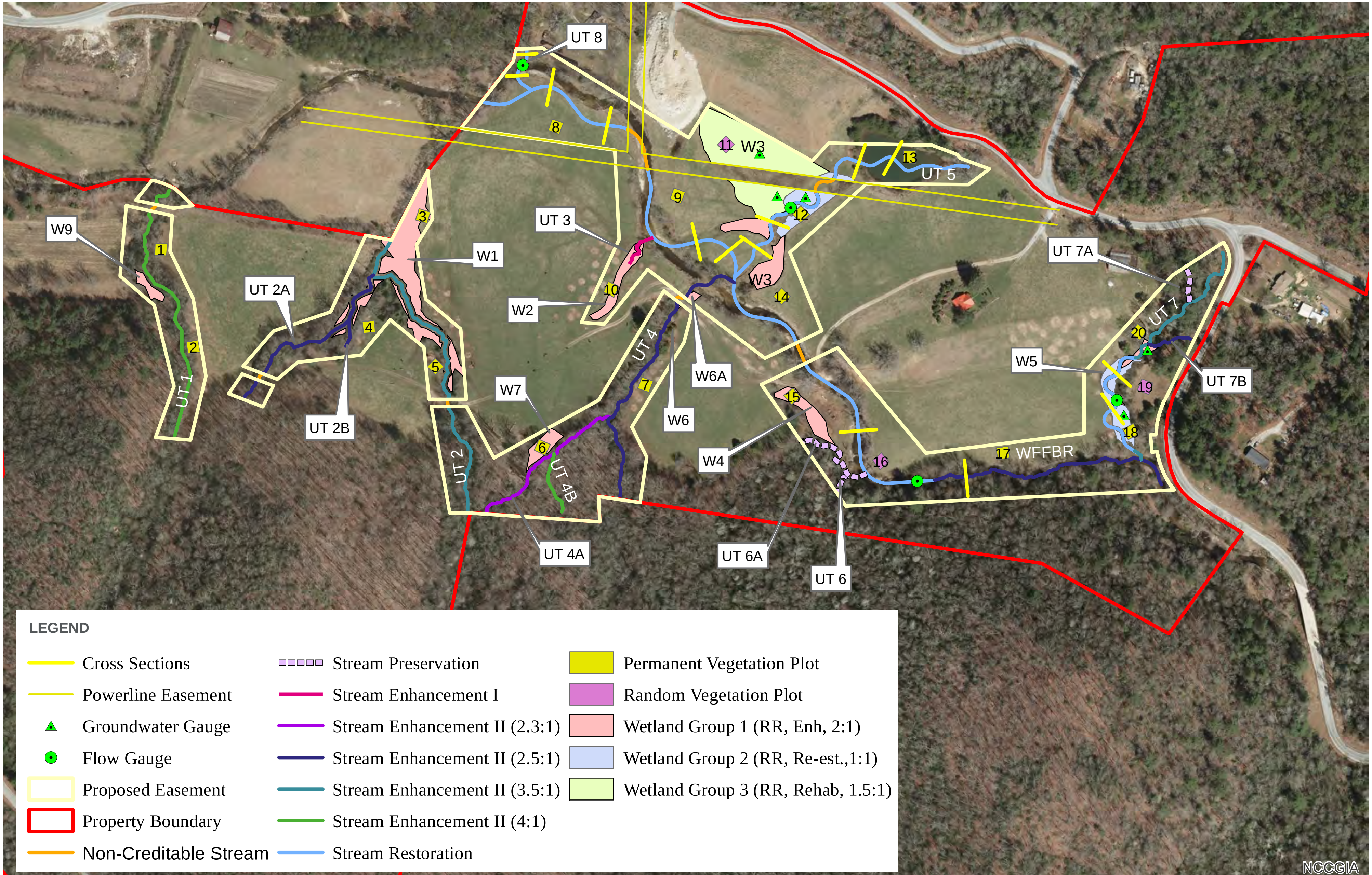
Table 16 (continued). Project Assets Table

Length and Area Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)	
		Riverine	Non-Riverine
Restoration	3180	1.32	-
Enhancement		1.54	-
Enhancement I	125		
Enhancement II	5047		
Preservation	423	-	-

Overall Assets Summary

Asset Category	Overall Credits
Stream	5,044
RP Wetland	1.76

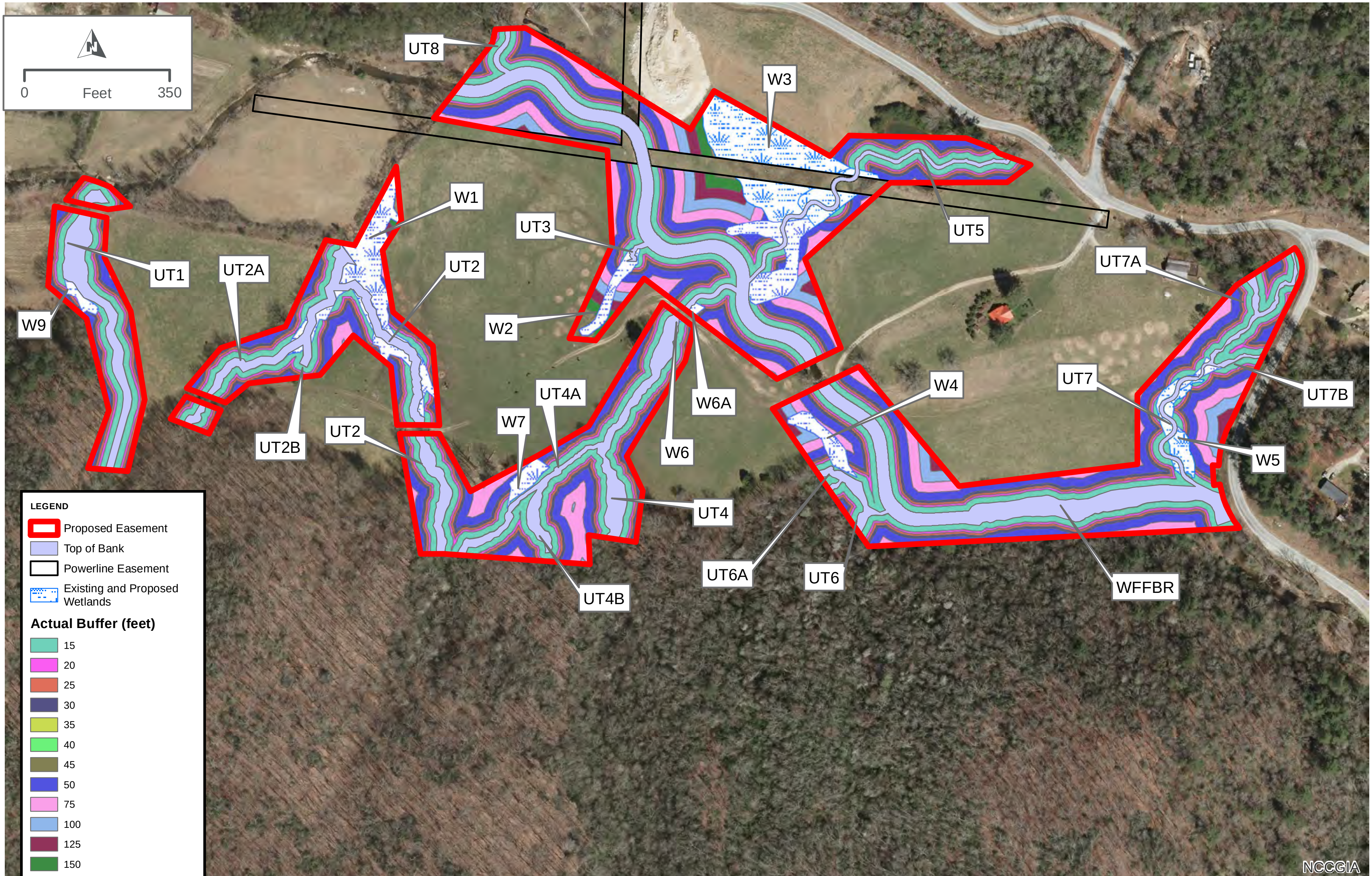


0 Feet 400

PROJECT ASSET MAP

OWEN FARMS MITIGATION SITE

FIGURE 17



BUFFER MAP

OWEN FARMS MITIGATION SITE

FIGURE 18

PATH: Z:\OWEN_FARMS\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MXD\MIT PLAN FIGURES\FIGURE 18- STREAM BUFFER MAP.MXD - USER: BFURR - DATE: 7/17/2019

OWEN FARMS MITIGATION PLAN

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Appendix A – Soil Boring Logs

(see Figure 11 for soil boring locations)

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Environmental Consultants

Project Site:	Owens Broad Mitigation Site			**Date:**	2/3/2018		
County:	Transylvania			**Job#:**			
Location:	Wolf Ridge			**State:**	NC		
Soil Series:	Ela			**Data Point:**	SB-1		
Soil Classification: Coarse-loamy, siliceous, superactive, acid, mesic Fluvaquentic Humaquepts							
OWT:	0"	**SHWT:**	0-6"	**Slope:**	1%	**Landscape:**	Drainage way
Elevation:			**Drainage:**	Very Poorly Drained		**Permeability:**	Moderately Rapid
Vegetation:	Hornbeam, Rhododendron, Doghobble, Holly, Red Maple						
Hydric Soil Indicator(s):		A7					

Horizon	Depth (in)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0-14	10YR 3/1		MuFSL	gr	fr, ns, np	
Cg1	14-24	10YR 4/1		CoSL	ma	fr, ns, np	
Cg2	24-40	10YR 6/2	10YR 5/6	SL	ma	fr, ss, np	10% distinct
							redox concentrations

Comments:	Described By: NPH
Very saturated sediment to surface, Zero order stream area, no defined stream channel near boring location.	LICENSED SOIL SCIENTIST NICHOLAS P. HOWELL 1294 STATE OF NORTH CAROLINA 2-5-18

LMG
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Environmental Consultants

Project Site:	Owens Broad Mitigation Site			**Date:**	2/3/2018		
County:	Transylvania			**Job#:**			
Location:	Wolf Ridge			**State:**	NC		
Soil Series:	Ela			**Data Point:**	SB-2		
Soil Classification: Coarse-loamy, siliceous, superactive, acid, mesic Fluvaquentic Humaquepts							
OWT:	0"	**SHWT:**	0-6"	**Slope:**	1%	**Landscape:**	Drainage way
Elevation:			**Drainage:**	Very Poorly Drained		**Permeability:**	Moderately Rapid
Vegetation:	Alder, Hornbeam, Rohdendron on edges of the topo break						
Hydric Soil Indicator(s):		A7					

Horizon	Depth (in)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0-7	10YR 3/2		MuFSL	gr	vfr, ss, np	lots of coarse roots
Cg	7-14	10YR 4/1	10YR 4/2	FSL	gr	vfr, ss, np	high o.m. not mucky
2Ab	14-24	10YR 3/2		L	sbk	fr, ss, np	old surface
							lot of root matter
2C'g	24-40	10RYR 4/2	10YR 4/1	CoSL	sbk	fr, ss, np	

Comments:		Described By:	NPH
Bisequal soil with burried surface		LICENSED SOIL SCIENTIST NICHOLAS P. HOWE 1294 STATE OF NORTH CAROLINA 2-5-18	

LMG
LAND MANAGEMENT GROUP INC
Environmental Consultants

Project Site:	Owens Broad Mitigation Site			**Date:**	2/3/2018		
County:	Transylvania			**Job#:**			
Location:	Wolf Ridge			**State:**	NC		
Soil Series:	Ela			**Data Point:**	SB-3		
Soil Classification: Coarse-loamy, siliceous, superactive, acid, mesic Fluvaquentic Humaquepts							
OWT:	0"	**SHWT:**	0-6"	**Slope:**	1%	**Landscape:**	Drainage way
Elevation:			**Drainage:**	Very Poorly Drained		**Permeability:**	Moderately Rapid
Vegetation:	Hornbeam, Rhodendendron, Doghobble, Holly, Red Maple						
Hydric Soil Indicator(s):		A7					

Horizon	Depth (in)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A	0-17	10YR 3/2		MuCoSL	gr	vfr, ss, np	
Cg	17-27	10YR 4/1	5YR 4/6	CoSL	sbk	fr, ns, np	5% redox concentration

Comments:

Very saturated sediment to surface, promanent mica flakes troughout profile, drainage patterns, small 1 foot wide channel at bottom of topo low. Boring terminated due to rock contact at 27 inches

Described By: NPH

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2-5-18

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Project Site:	Owens Broad Mitigation Site			**Date:**	2/3/2018		
County:	Transylvania			**Job#:**			
Location:	Wolf Ridge			**State:**	NC		
Soil Series:	Ela			**Data Point:**	SB-4		
Soil Classification: Coarse-loamy, siliceous, superactive, acid, mesic Fluvaquentic Humaquepts							
OWT:	0"	**SHWT:**	0-6"	**Slope:**	0-1%	**Landscape:**	Flood Plain
Elevation:			**Drainage:**	Very Poorly Drained		**Permeability:**	Moderately Rapid
Vegetation:	Juncus effusus						
Hydric Soil Indicator(s):		F3, F6					

Horizon	Depth (in)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A1	0-2	10YR 5/1	10YR 4/6	CoSL	gr	fr, ns, np	many mica flakes
		75%	25%				
A2	2-16	10YR 3/2	10YR 4/6	FSL	gr	fr, ss, np	common mica flakes
		75%	25%				
2Ab	16-27	10YR 3/1		L	sbk	fr, ss, np	5% small pebbles
2Cg	27-42"	10YR 4/1		CoSL	sbk	fr, ss, np	5-10% pebbles

Comments:	Described By:	NPH
Bisequal soil unit burried surface.		

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Project Site:	Owens Broad Mitigation Site			**Date:**	2/3/2018		
County:	Transylvania			**Job#:**			
Location:	Wolf Ridge			**State:**	NC		
Soil Series:	Ela			**Data Point:**	SB-5		
Soil Classification: Coarse-loamy, siliceous, superactive, acid, mesic Fluvaquentic Humaquepts							
OWT:	0"	**SHWT:**	0-6"	**Slope:**	0-1%	**Landscape:**	Flood plain
Elevation:			**Drainage:**	Very Poorly Drained		**Permeability:**	Moderate
Vegetation:	Juncus effusus						
Hydric Soil Indicator(s):		F3, F6					

Horizon	Depth (in)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A1	0-8	10YR 3/2	5YR 3/4	FSL	sbk	fr, ss, np	many roots, mica flakes
		75%	25%				
A2	8-24	10YR 3/1	10YR 4/6	Loam	sbk	fr, ss, np	few mica flakes
		85%	15%				
Cg1	24-36	10YR 4/1		Loam	sbk	fr, ss, np	common mica flakes
2Cg2	36-42	10YR 4/1		CoSL	sbk	fr, ss, np	common mica flakes

Comments:		Described By:	NPH

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Project Site:	Owens Broad Mitigation Site			**Date:**	2/3/2018		
County:	Transylvania			**Job#:**			
Location:	Wolf Ridge			**State:**	NC		
Soil Series:	Ela			**Data Point:**	SB-6		
Soil Classification: Coarse-loamy, siliceous, superactive, acid, mesic Fluvaquentic Humaquepts							
OWT:	0"	**SHWT:**	0-6"	**Slope:**	0-1%	**Landscape:**	flood plain
Elevation:			**Drainage:**	Very Poorly Drained		**Permeability:**	Moderate
Vegetation:	Hornbeam, Juncus effusus, Red Maple						
Hydric Soil Indicator(s):		A7					

Horizon	Depth (in)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A1	0-7	10YR 3/1	10YR 3/6	FSL	sbk		many mica flakes
		95%	5%				
A2	7-15	10YR 3/1	5Y 3/4	L	sbk		many mica flakes
		80%	20%				
2Cg	15-42	10YR 4/1		CoSL	sbk		common mica flakes

Comments:	Described By:	NPH
wet seep/floodplain pool		

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Project Site:	Owens Broad Mitigation Site			**Date:**	2/3/2018		
County:	Transylvania			**Job#:**			
Location:	Wolf Ridge			**State:**	NC		
Soil Series:	Ela			**Data Point:**	SB-7		
Soil Classification: Coarse-loamy, siliceous, superactive, acid, mesic Fluvaquentic Humaquepts							
OWT:	26"	**SHWT:**	0-6"	**Slope:**	0-1%	**Landscape:**	Flood Plain
Elevation:			**Drainage:**	Very Poorly Drained		**Permeability:**	Moderately Rapid
Vegetation:	Hornbeam, Doghobble, Wild Rose						
Hydric Soil Indicator(s):		F3, F6					

Horizon	Depth (in)	Matrix	Mottles	Texture	Structure	Consistence	Notes
A1	0-6	10YR 3/2	10YR 3/6	FSL	gr	fr, ss, np	10% pebbles
		80%	20%				
A2	6-24	10YR 3/1	5Y 3/4	FSL	sbk	fr, ss, np	Common Micas
		90%	10%				
2Ab	24-42	10YR 3/2	10YR 4/1	CoSL	sbk/gr	fr, ns, np	Common Micas
		70%	30%				

Comments:	Described By:	NPH
Relic Flood Plain behind berm of field	LICENSED SOIL SCIENTIST NICHOLAS P. HOWELL 1294 STATE OF NORTH CAROLINA 2-5-18	

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Project Site:	Owens Broad Mitigation Site			**Date:**	2/3/2018		
County:	Transylvania			**Job#:**			
Location:	Wolf Ridge			**State:**	NC		
Soil Series:	Modified Land / Ela			**Data Point:**	SB-8		
Soil Classification: Burried / Coarse-loamy, siliceous, superactive, acid, mesic Fluvaquentic Humaquepts							
OWT:	36"	**SHWT:**	19"	**Slope:**	1%	**Landscape:**	Modified
Elevation:			**Drainage:**	Very Poorly Drained		**Permeability:**	Moderately Rapid
Vegetation:	Grassed pasture						
Hydric Soil Indicator(s):		(A7 In burried natural soil below fill)					

Horizon	Depth (in)	Matrix	Mottles	Texture	Structure	Consistence	Notes
Fill 1	0-19	10YR 4/3		FSL	ma	fr, ss, np	graded fill material
Fill 2	19-32	10YR 4/1	5Y 3/4	CoSL	sbk	fr, ss, np	graded fill material
		75%	25%				
Ab	32-40	10YR 2/1		SiL	sbk/gr	fr, ss, np	old surface

Comments:		Described By:	NPH
Modified field area adjacent to incised stream			

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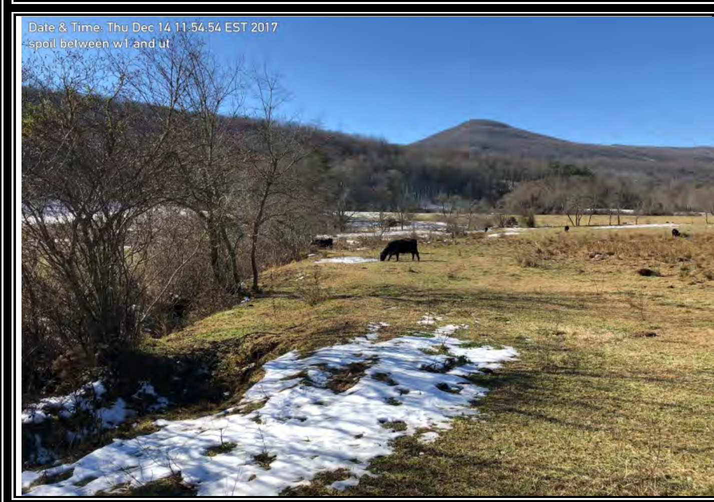
2-5-18

Appendix B - Photo Log

Appendix B - Site and Reference Reach Photographs

Hoof shear along WFFBR

Mass wasting along left bank of WFFBR



Spoil in relic portion of W3 adjacent to UT 5

Fallen trees along left bank of WFFBR

UT 2 and adjacent wetland W1

Ford crossing on UT 2

Appendix B - Site and Reference Reach Photographs

Cattle tracks in W2

W2 and Poor vegetated buffer of UT 3

Cattle access area on UT 4a

Incision of UT 5

Incision/mass wasting on UT 7 and Spoil in Relic W5

Cattle tracks in W4

Appendix B - Site and Reference Reach Photographs

Eroding bank along WFFBR near beginning of project

Large headcut on UT 4a near confluence with UT 4

Cattle access area on UT 2a

Standing on rock pile looking southeast at W3

Cattle access on UT 1 and W9

Cattle access on UT 7b

Appendix B - Site and Reference Reach Photographs

Area of severe erosion along enhancement section of WFFBR

Area of severe erosion along enhancement section of WFFBR

Cow chilling in WFFBR

Cattle access on UT 4

Incision/mass wasting on UT 7 and cattle access

Mass wasting and center bar on WFFBR

Appendix B - Site and Reference Reach Photographs

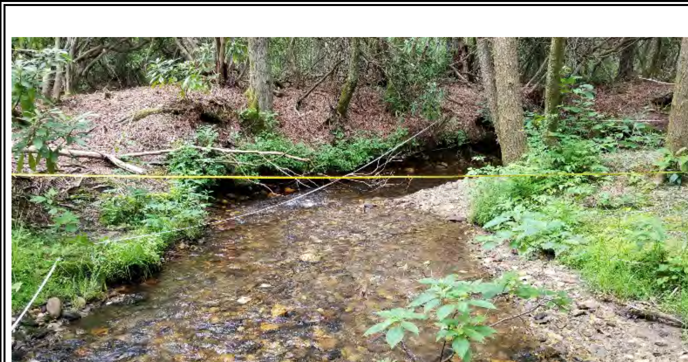
UT South Fork Mills River

Pool Cross Section on UT South Fork Mills River

Pool Cross Section on UT South Fork Mills River

Riffle Cross Section on UT South Fork Mills River

Riffle Cross Section on South Fork Mills River



Riffle Cross Section on South Fork Mills River

Appendix C – NC SAM and NC WAM Rating Sheets

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Owen Farms
2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR
4. Assessor name/organization: BNF/HDR
5. County: Transylvania
6. Nearest named water body on USGS 7.5-minute quad: West Fork French Broad
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.183813, -82.938275

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): WFFBR
10. Length of assessment reach evaluated (feet): 200
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4-6 ☐ Unable to assess channel depth.
12. Channel width at top of bank (feet): 30
13. Is assessment reach a swamp steam? ☐ Yes ☐ No
14. Feature type: ☒ Perennial flow ☐ Intermittent flow ☐ Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☒ A  (more sinuous stream, flatter valley slope)
☐ B  (less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☐ Size 1 (< 0.1 mi^2) ☐ Size 2 (0.1 to < 0.5 mi^2) ☐ Size 3 (0.5 to < 5 mi^2) ☒ Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒ Yes ☐ No If Yes, check all that apply to the assessment area.
   - ☐ Section 10 water
   - ☒ Classified Trout Waters
   - ☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)
   - ☐ Essential Fish Habitat
   - ☐ Primary Nursery Area
   - ☐ High Quality Waters/Outstanding Resource Waters
   - ☐ Publicly owned property
   - ☐ NCDWR Riparian buffer rule in effect
   - ☐ Nutrient Sensitive Waters
   - ☐ Anadromous fish
   - ☐ 303(d) List
   - ☐ CAMA Area of Environmental Concern (AEC)
   - ☐ Documented presence of a federal and/or state listed protected species within the assessment area.
     List species:
   - ☐ Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐ Yes ☐ No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)

☒ A Water throughout assessment reach.
☐ B No flow, water in pools only.
☐ C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric

☐ A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the point of obstructing flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
☒ B Not A

3. Feature Pattern – assessment reach metric

☐ A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☒ B Not A

4. Feature Longitudinal Profile – assessment reach metric

☒ A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
☐ B Not A

5. Signs of Active Instability – assessment reach metric

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

☐ A < 10% of channel unstable
☐ B 10 to 25% of channel unstable
☒ C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☐A	☐A	Little or no evidence of conditions that adversely affect reference interaction
☒B	☒B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
☐B Excessive sedimentation (burying of stream features or intertidal zone)
☐C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
☐D Odor (not including natural sulfide odors)
☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in “Notes/Sketch” section.
☒F Livestock with access to stream or intertidal zone
☐G Excessive algae in stream or intertidal zone
☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
☐I Other: ____________________ (explain in “Notes/Sketch” section)
☐J Little to no stressors

8. **Recent Weather – watershed metric (skip for Tidal Marsh Streams)**
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
☒C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. **Natural In-stream Habitat Types – assessment reach metric**
10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☒B Multiple sticks and/or leaf packs and/or emergent vegetation
☒C Multiple snags and logs (including lap trees)
☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
☐E Little or no habitat

Check for Tidal Marsh Streams Only
☐F 5% oysters or other natural hard bottoms
☐G Submerged aquatic vegetation
☐H Low-tide refugia (pools)
☐I Sand bottom
☐J 5% vertical bank along the marsh
☐K Little or no habitat

********************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS****************************

11. **Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
☒A Riffle-run section **(evaluate 11c)**
☒B Pool-glide section **(evaluate 11d)**
☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☐	☒	☐	☐	☐	Bedrock/saprolite
☐	☒	☐	☐	☐	Boulder (256 – 4096 mm)
☐	☐	☐	☒	☐	Cobble (64 – 256 mm)
☐	☐	☐	☒	☐	Gravel (2 – 64 mm)
☐	☐	☒	☐	☐	Sand (.062 – 2 mm)
☐	☒	☐	☐	☐	Silt/clay (< 0.062 mm)
☐	☒	☐	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: ______________________

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☒	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☒	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☒	Snails
☐	☒	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)

Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

- ☐A Streams and/or springs (jurisdictional discharges)
- ☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- ☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
- ☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
- ☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
- ☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)

Check all that apply.

- ☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- ☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- ☐C Urban stream (≥ 24% impervious surface for watershed)
- ☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
- ☐E Assessment reach relocated to valley edge
- ☒F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)

Consider aspect. Consider "leaf-on" condition.

- ☐A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- ☐B Degraded (example: scattered trees)
- ☒C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☐A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☐D	☐D	From 10 to < 30 feet wide
☐E	☐E	☒E	☒E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☐A	Mature forest
☐B	☐B	Non-mature woody vegetation or modified vegetation structure
☒C	☒C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☒D	☒D	☐D	☐D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☐A	☐A	Medium to high stem density
☐B	☐B	Low stem density
☒C	☒C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☒C	☒C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ______________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farms	Date of Assessment	12-14-17
Stream Category	Ma4	Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	**USACE/ All Streams**	**NCDWR Intermittent**
(1) Hydrology	**LOW**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**LOW**	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Owen Farm
2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR
4. Assessor name/organization: BNF/HDR
5. County: Transylvania
6. Nearest named water body on USGS 7.5-minute quad: West Fork French Broad
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.1765533, -82.9408917

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT 1
10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 ☐ Unable to assess channel depth.
12. Channel width at top of bank (feet): 3
13. Is assessment reach a swamp steam? ☐ Yes ☐ No
14. Feature type: ☒ Perennial flow ☐ Intermittent flow ☐ Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☐ A  (more sinuous stream, flatter valley slope)
☒ B  (less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☒ Size 1 (< 0.1 mi^2) ☐ Size 2 (0.1 to < 0.5 mi^2) ☐ Size 3 (0.5 to < 5 mi^2) ☐ Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒ Yes ☐ No If Yes, check all that apply to the assessment area.
    - ☐ Section 10 water
    - ☒ Classified Trout Waters
    - ☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)
    - ☐ Essential Fish Habitat
    - ☐ Primary Nursery Area
    - ☐ High Quality Waters/Outstanding Resource Waters
    - ☐ Publicly owned property
    - ☐ NCDWR Riparian buffer rule in effect
    - ☐ Nutrient Sensitive Waters
    - ☐ Anadromous fish
    - ☐ 303(d) List
    - ☐ CAMA Area of Environmental Concern (AEC)
    - ☐ Documented presence of a federal and/or state listed protected species within the assessment area.
      List species:
    - ☐ Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐ Yes ☐ No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)

☒ A Water throughout assessment reach.
☐ B No flow, water in pools only.
☐ C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric

☐ A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
☒ B Not A

3. Feature Pattern – assessment reach metric

☐ A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☒ B Not A

4. Feature Longitudinal Profile – assessment reach metric

☐ A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
☒ B Not A

5. Signs of Active Instability – assessment reach metric

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

☒ A < 10% of channel unstable
☐ B 10 to 25% of channel unstable
☐ C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☒A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. Water Quality Stressors – assessment reach/intertidal zone metric
Check all that apply.

☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
☐B <u>Excessive</u> sedimentation (burying of stream features or intertidal zone)
☐C Noticeable evidence of pollutant discharges entering the assessment reach <u>and</u> causing a water quality problem
☐D Odor (not including natural sulfide odors)
☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in “Notes/Sketch” section.
☒F Livestock with access to stream or intertidal zone
☐G Excessive algae in stream or intertidal zone
☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
☐I Other: ____________________ (explain in “Notes/Sketch” section)
☐J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

☐A Drought conditions <u>and</u> no rainfall or rainfall not exceeding 1 inch within the last 48 hours
☐B Drought conditions <u>and</u> rainfall exceeding 1 inch within the last 48 hours
☒C No drought conditions

9. Large or Dangerous Stream – assessment reach metric
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric

10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☒B Multiple sticks and/or leaf packs and/or emergent vegetation
☒C Multiple snags and logs (including lap trees)
☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
☐E Little or no habitat

Check for Tidal Marsh Streams Only

☐F 5% oysters or other natural hard bottoms
☐G Submerged aquatic vegetation
☐H Low-tide refugia (pools)
☐I Sand bottom
☐J 5% vertical bank along the marsh
☐K Little or no habitat

*******************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS****************************

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

☒A Riffle-run section **(evaluate 11c)**
☒B Pool-glide section **(evaluate 11d)**
☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☐	☒	☐	☐	☐	Boulder (256 – 4096 mm)
☐	☐	☒	☐	☐	Cobble (64 – 256 mm)
☐	☐	☐	☒	☐	Gravel (2 – 64 mm)
☐	☐	☒	☐	☐	Sand (.062 – 2 mm)
☐	☒	☐	☐	☐	Silt/clay (< 0.062 mm)
☐	☐	☒	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: ______

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☒	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☒	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☒	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☒A Streams and/or springs (jurisdictional discharges)
☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☐C Urban stream (≥ 24% impervious surface for watershed)
☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E Assessment reach relocated to valley edge
☒F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

☒A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☐B Degraded (example: scattered trees)
☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☐A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☒D	☒D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☒A	☒A	Mature forest
☐B	☐B	Non-mature woody vegetation or modified vegetation structure
☐C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☒D	☒D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☒C	☒C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ________________________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farm	Date of Assessment	12-14-17
Stream Category	Mb1	Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	**USACE/ All Streams**	**NCDWR Intermittent**
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**MEDIUM**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**HIGH**	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.
NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:
1. Project name (if any): Owen Farm 2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR 4. Assessor name/organization: BNF/HDR
5. County: Transylvania 6. Nearest named water body
7. River basin: French Broad on USGS 7.5-minute quad: West Fork French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.176462, -82.939442

STREAM INFORMATION: (depth and width can be approximations)
9. Site number (show on attached map): UT 2 10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 ☐ Unable to assess channel depth.
12. Channel width at top of bank (feet): 3 13. Is assessment reach a swamp steam? ☐ Yes ☐ No
14. Feature type: ☒ Perennial flow ☐ Intermittent flow ☐ Tidal Marsh Stream

STREAM CATEGORY INFORMATION:
15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☐ A  (more sinuous stream, flatter valley slope)
☒ B  (less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☒ Size 1 (< 0.1 mi^2) ☐ Size 2 (0.1 to < 0.5 mi^2) ☐ Size 3 (0.5 to < 5 mi^2) ☐ Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:
18. Were regulatory considerations evaluated? ☒ Yes ☐ No If Yes, check all that apply to the assessment area.
- ☐ Section 10 water
- ☒ Classified Trout Waters
- ☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)
- ☐ Essential Fish Habitat
- ☐ Primary Nursery Area
- ☐ High Quality Waters/Outstanding Resource Waters
- ☐ Publicly owned property
- ☐ NCDWR Riparian buffer rule in effect
- ☐ Nutrient Sensitive Waters
- ☐ Anadromous fish
- ☐ 303(d) List
- ☐ CAMA Area of Environmental Concern (AEC)
- ☐ Documented presence of a federal and/or state listed protected species within the assessment area.
  List species:
- ☐ Designated Critical Habitat (list species)

19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐ Yes ☒ No

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
   - ☒ A Water throughout assessment reach.
   - ☐ B No flow, water in pools only.
   - ☐ C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
   - ☒ A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the point of obstructing flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
   - ☐ B Not A

3. **Feature Pattern – assessment reach metric**
   - ☐ A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
   - ☒ B Not A

4. **Feature Longitudinal Profile – assessment reach metric**
   - ☒ A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
   - ☐ B Not A

5. **Signs of Active Instability – assessment reach metric**
   Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
   - ☒ A < 10% of channel unstable
   - ☐ B 10 to 25% of channel unstable
   - ☐ C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☒A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. Water Quality Stressors – assessment reach/intertidal zone metric
Check all that apply.
☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
☐B <u>Excessive</u> sedimentation (burying of stream features or intertidal zone)
☐C Noticeable evidence of pollutant discharges entering the assessment reach <u>and</u> causing a water quality problem
☐D Odor (not including natural sulfide odors)
☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in “Notes/Sketch” section.
☒F Livestock with access to stream or intertidal zone
☐G Excessive algae in stream or intertidal zone
☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
☐I Other: ____________________ (explain in “Notes/Sketch” section)
☐J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
☐A Drought conditions <u>and</u> no rainfall or rainfall not exceeding 1 inch within the last 48 hours
☐B Drought conditions <u>and</u> rainfall exceeding 1 inch within the last 48 hours
☒C No drought conditions

9. Large or Dangerous Stream – assessment reach metric
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric
10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☒B Multiple sticks and/or leaf packs and/or emergent vegetation
☒C Multiple snags and logs (including lap trees)
☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
☐E Little or no habitat

Check for Tidal Marsh Streams Only
☐F 5% oysters or other natural hard bottoms
☐G Submerged aquatic vegetation
☐H Low-tide refugia (pools)
☐I Sand bottom
☐J 5% vertical bank along the marsh
☐K Little or no habitat

****************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS****************************

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
☒A Riffle-run section **(evaluate 11c)**
☐B Pool-glide section **(evaluate 11d)**
☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☒	☐	☐	☐	☐	Cobble (64 – 256 mm)
☐	☒	☐	☐	☐	Gravel (2 – 64 mm)
☐	☐	☐	☒	☐	Sand (.062 – 2 mm)
☐	☐	☒	☐	☐	Silt/clay (< 0.062 mm)
☐	☐	☒	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☐ Yes ☒ No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐ No Water ☒ Other: ______________________

12b. ☐ Yes ☒ No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☐	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☒Y	☒Y	Are wetlands present in the streamside area?
☐N	☐N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)

Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☒A Streams and/or springs (jurisdictional discharges)
☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☒C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)

Check all that apply.

☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☐C Urban stream (≥ 24% impervious surface for watershed)
☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E Assessment reach relocated to valley edge
☒F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)

Consider aspect. Consider "leaf-on" condition.

☒A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☐B Degraded (example: scattered trees)
☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☐A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☒D	☒D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☐A	Mature forest
☒B	☒B	Non-mature woody vegetation or modified vegetation structure
☐C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☒D	☒D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☒C	☒C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ______________________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farm
Stream Category	Mb1
Date of Assessment	12-14-17
Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	NO
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	**USACE/ All Streams**	**NCDWR Intermittent**
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**MEDIUM**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**MEDIUM**	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Owen Farm
2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR
4. Assessor name/organization: BNF/HDR
5. County: Transylvania
6. Nearest named water body on USGS 7.5-minute quad: West Fork French Broad
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.176385, -82.940070

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT 2a
10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 ☐ Unable to assess channel depth.
12. Channel width at top of bank (feet): 5
13. Is assessment reach a swamp steam? ☐ Yes ☐ No
14. Feature type: ☒ Perennial flow ☐ Intermittent flow ☐ Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):

☐ A  (more sinuous stream, flatter valley slope)

☒ B  (less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☒ Size 1 (< 0.1 mi^2) ☐ Size 2 (0.1 to < 0.5 mi^2) ☐ Size 3 (0.5 to < 5 mi^2) ☐ Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒ Yes ☐ No If Yes, check all that apply to the assessment area.

☐ Section 10 water	☒ Classified Trout Waters	☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)
☐ Essential Fish Habitat	☐ Primary Nursery Area	☐ High Quality Waters/Outstanding Resource Waters
☐ Publicly owned property	☐ NCDWR Riparian buffer rule in effect	☐ Nutrient Sensitive Waters
☐ Anadromous fish	☐ 303(d) List	☐ CAMA Area of Environmental Concern (AEC)

☐ Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐ Designated Critical Habitat (list species)

19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐ Yes ☐ No

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
   - ☒ A Water throughout assessment reach.
   - ☐ B No flow, water in pools only.
   - ☐ C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
   - ☐ A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the point of obstructing flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
   - ☒ B Not A

3. **Feature Pattern – assessment reach metric**
   - ☐ A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
   - ☒ B Not A

4. **Feature Longitudinal Profile – assessment reach metric**
   - ☐ A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
   - ☒ B Not A

5. **Signs of Active Instability – assessment reach metric**
   Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
   - ☒ A < 10% of channel unstable
   - ☐ B 10 to 25% of channel unstable
   - ☐ C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☒A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☐B <u>Excessive</u> sedimentation (burying of stream features or intertidal zone)
- ☐C Noticeable evidence of pollutant discharges entering the assessment reach <u>and</u> causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
- ☒F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: ____________________ (explain in "Notes/Sketch" section)
- ☐J Little to no stressors

8. **Recent Weather – watershed metric (skip for Tidal Marsh Streams)**
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
- ☐A Drought conditions <u>and</u> no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions <u>and</u> rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. **Natural In-stream Habitat Types – assessment reach metric**

10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☒B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☒C Multiple snags and logs (including lap trees)
- ☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only
- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

**********************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****************************

11. **Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
- ☒A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☐	☒	☐	☐	☐	Boulder (256 – 4096 mm)
☐	☐	☒	☐	☐	Cobble (64 – 256 mm)
☐	☐	☐	☒	☐	Gravel (2 – 64 mm)
☐	☐	☒	☐	☐	Sand (.062 – 2 mm)
☐	☒	☐	☐	☐	Silt/clay (< 0.062 mm)
☐	☐	☒	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. **Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)**

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: ______

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☒	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☒	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☒	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. **Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)**
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☒A Streams and/or springs (jurisdictional discharges)
☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**
Check all that apply.

☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☐C Urban stream (≥ 24% impervious surface for watershed)
☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E Assessment reach relocated to valley edge
☒F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**
Consider aspect. Consider "leaf-on" condition.

☒A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☐B Degraded (example: scattered trees)
☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
☒A	☒A	☐A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☒D	☒D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☒A	☒A	Mature forest
☐B	☐B	Non-mature woody vegetation or modified vegetation structure
☐C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☒D	☒D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☒C	☒C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ________________________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farm	Date of Assessment	12-14-17
Stream Category	Mb1	Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	**USACE/ All Streams**	**NCDWR Intermittent**
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**MEDIUM**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**HIGH**	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Owen Farm 2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR 4. Assessor name/organization: BNF/HDR
5. County: Transylvania 6. Nearest named water body
7. River basin: French Broad on USGS 7.5-minute quad: West Fork French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.183500, -82.938302

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT 3 10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 ☐ Unable to assess channel depth.
12. Channel width at top of bank (feet): 2 13. Is assessment reach a swamp steam? ☐ Yes ☐ No
14. Feature type: ☒ Perennial flow ☐ Intermittent flow ☐ Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☐ A  (more sinuous stream, flatter valley slope)
☒ B  (less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☒ Size 1 (< 0.1 mi^2) ☐ Size 2 (0.1 to < 0.5 mi^2) ☐ Size 3 (0.5 to < 5 mi^2) ☐ Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒ Yes ☐ No If Yes, check all that apply to the assessment area.
☐ Section 10 water ☒ Classified Trout Waters ☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)
☐ Essential Fish Habitat ☐ Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters
☐ Publicly owned property ☐ NCDWR Riparian buffer rule in effect ☐ Nutrient Sensitive Waters
☐ Anadromous fish ☐ 303(d) List ☐ CAMA Area of Environmental Concern (AEC)
☐ Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐ Designated Critical Habitat (list species)

19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐ Yes ☐ No

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
   ☒ A Water throughout assessment reach.
   ☐ B No flow, water in pools only.
   ☐ C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
   ☐ A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
   ☒ B Not A

3. **Feature Pattern – assessment reach metric**
   ☐ A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
   ☒ B Not A

4. **Feature Longitudinal Profile – assessment reach metric**
   ☐ A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
   ☒ B Not A

5. **Signs of Active Instability – assessment reach metric**
   Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
   ☐ A < 10% of channel unstable
   ☒ B 10 to 25% of channel unstable
   ☐ C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☒A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
☐B <u>Excessive</u> sedimentation (burying of stream features or intertidal zone)
☐C Noticeable evidence of pollutant discharges entering the assessment reach <u>and</u> causing a water quality problem
☐D Odor (not including natural sulfide odors)
☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
☒F Livestock with access to stream or intertidal zone
☐G Excessive algae in stream or intertidal zone
☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
☐I Other: ____________________ (explain in "Notes/Sketch" section)
☐J Little to no stressors

8. **Recent Weather – watershed metric (skip for Tidal Marsh Streams)**
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
☐A Drought conditions <u>and</u> no rainfall or rainfall not exceeding 1 inch within the last 48 hours
☐B Drought conditions <u>and</u> rainfall exceeding 1 inch within the last 48 hours
☒C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. **Natural In-stream Habitat Types – assessment reach metric**
10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☒B Multiple sticks and/or leaf packs and/or emergent vegetation
☐C Multiple snags and logs (including lap trees)
☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
☐E Little or no habitat

Check for Tidal Marsh Streams Only
☐F 5% oysters or other natural hard bottoms
☐G Submerged aquatic vegetation
☐H Low-tide refugia (pools)
☐I Sand bottom
☐J 5% vertical bank along the marsh
☐K Little or no habitat

*********************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS****************************

11. **Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
☒A Riffle-run section **(evaluate 11c)**
☒B Pool-glide section **(evaluate 11d)**
☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☐	☒	☐	☐	☐	Cobble (64 – 256 mm)
☐	☐	☐	☒	☐	Gravel (2 – 64 mm)
☐	☐	☐	☒	☐	Sand (.062 – 2 mm)
☐	☐	☒	☐	☐	Silt/clay (< 0.062 mm)
☐	☐	☒	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: ______

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☒	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☒Y	☒Y	Are wetlands present in the streamside area?
☐N	☐N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☒A Streams and/or springs (jurisdictional discharges)
☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☐C Urban stream (≥ 24% impervious surface for watershed)
☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E Assessment reach relocated to valley edge
☒F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

☐A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☒B Degraded (example: scattered trees)
☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☐A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☒D	☒D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☐A	Mature forest
☒B	☒B	Non-mature woody vegetation or modified vegetation structure
☐C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☒D	☒D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☒C	☒C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ______________________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farm	Date of Assessment	12-14-17
Stream Category	Mb1	Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**MEDIUM**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**MEDIUM**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**HIGH**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**LOW**	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Owen Farm
2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR
4. Assessor name/organization: BNF/HDR
5. County: Transylvania
6. Nearest named water body on USGS 7.5-minute quad: West Fork French Broad
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.176167, -82.938400

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT 4
10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 ☐ Unable to assess channel depth.
12. Channel width at top of bank (feet): 8
13. Is assessment reach a swamp steam? ☐ Yes ☐ No
14. Feature type: ☒ Perennial flow ☐ Intermittent flow ☐ Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):

☐ A 
(more sinuous stream, flatter valley slope)

☒ B 
(less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☒ Size 1 (< 0.1 mi^2) ☐ Size 2 (0.1 to < 0.5 mi^2) ☐ Size 3 (0.5 to < 5 mi^2) ☐ Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒ Yes ☐ No If Yes, check all that apply to the assessment area.
    - ☐ Section 10 water
    - ☒ Classified Trout Waters
    - ☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)
    - ☐ Essential Fish Habitat
    - ☐ Primary Nursery Area
    - ☐ High Quality Waters/Outstanding Resource Waters
    - ☐ Publicly owned property
    - ☐ NCDWR Riparian buffer rule in effect
    - ☐ Nutrient Sensitive Waters
    - ☐ Anadromous fish
    - ☐ 303(d) List
    - ☐ CAMA Area of Environmental Concern (AEC)
    - ☐ Documented presence of a federal and/or state listed protected species within the assessment area.
      List species:
    - ☐ Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐ Yes ☐ No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)

- ☒ A Water throughout assessment reach.
- ☐ B No flow, water in pools only.
- ☐ C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric

- ☐ A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the point of obstructing flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
- ☒ B Not A

3. Feature Pattern – assessment reach metric

- ☐ A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
- ☒ B Not A

4. Feature Longitudinal Profile – assessment reach metric

- ☐ A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
- ☒ B Not A

5. Signs of Active Instability – assessment reach metric

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

- ☒ A < 10% of channel unstable
- ☐ B 10 to 25% of channel unstable
- ☐ C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☒A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☐B Excessive sedimentation (burying of stream features or intertidal zone)
- ☐C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
- ☒F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: ____________________ (explain in "Notes/Sketch" section)
- ☐J Little to no stressors

8. **Recent Weather – watershed metric (skip for Tidal Marsh Streams)**
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
- ☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. **Natural In-stream Habitat Types – assessment reach metric**

10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☒B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☒C Multiple snags and logs (including lap trees)
- ☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only
- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

**********************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS****************************

11. **Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
- ☒A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☐	☒	☐	☐	☐	Boulder (256 – 4096 mm)
☐	☐	☒	☐	☐	Cobble (64 – 256 mm)
☐	☐	☐	☒	☐	Gravel (2 – 64 mm)
☐	☐	☒	☐	☐	Sand (.062 – 2 mm)
☐	☒	☐	☐	☐	Silt/clay (< 0.062 mm)
☐	☐	☒	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: ______

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☒	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☒	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

- ☒A Streams and/or springs (jurisdictional discharges)
- ☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- ☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
- ☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
- ☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
- ☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

- ☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- ☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- ☐C Urban stream (≥ 24% impervious surface for watershed)
- ☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
- ☐E Assessment reach relocated to valley edge
- ☒F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

- ☒A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- ☐B Degraded (example: scattered trees)
- ☐C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☐A	☐A	≥ 100 feet wide _or_ extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☒D	☒D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide _or_ no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☐A	Mature forest
☐B	☐B	Non-mature woody vegetation _or_ modified vegetation structure
☒C	☒C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☒D	☒D	☐D	☐D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer _or_ predominantly herbaceous species _or_ bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. **Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)**
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing _or_ communities with non-native invasive species present, but not dominant, over a large portion of the expected strata _or_ communities missing understory but retaining canopy trees.
☒C	☒C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent _or_ communities with non-native invasive species dominant over a large portion of expected strata _or_ communities composed of planted stands of non-characteristic species _or_ communities inappropriately composed of a single species _or_ no vegetation.

25. **Conductivity – assessment reach metric (skip for all Coastal Plain streams)**
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ____________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farm	Date of Assessment	12-14-17
Stream Category	Mb1	Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	**USACE/ All Streams**	**NCDWR Intermittent**
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**MEDIUM**	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Owen Farm
2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR
4. Assessor name/organization: BNF/HDR
5. County: Transylvania
6. Nearest named water body on USGS 7.5-minute quad: West Fork French Broad
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.183678, -82.937415

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT 5
10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 3
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☒Perennial flow ☐Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):

☒A 
(more sinuous stream, flatter valley slope)

☐B 
(less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☒Size 1 (< 0.1 mi^2) ☐Size 2 (0.1 to < 0.5 mi^2) ☐Size 3 (0.5 to < 5 mi^2) ☐Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
    - ☐Section 10 water
    - ☒Classified Trout Waters
    - ☐Water Supply Watershed (☐I ☐II ☐III ☐IV ☐V)
    - ☐Essential Fish Habitat
    - ☐Primary Nursery Area
    - ☐ High Quality Waters/Outstanding Resource Waters
    - ☐Publicly owned property
    - ☐NCDWR Riparian buffer rule in effect
    - ☐Nutrient Sensitive Waters
    - ☐Anadromous fish
    - ☐303(d) List
    - ☐CAMA Area of Environmental Concern (AEC)
    - ☐Documented presence of a federal and/or state listed protected species within the assessment area.
      List species:
    - ☐Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐Yes ☒No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)

☒A Water throughout assessment reach.
☐B No flow, water in pools only.
☐C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric

☐A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the point of obstructing flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
☒B Not A

3. Feature Pattern – assessment reach metric

☒A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☐B Not A

4. Feature Longitudinal Profile – assessment reach metric

☒A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
☐B Not A

5. Signs of Active Instability – assessment reach metric

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

☒A < 10% of channel unstable
☐B 10 to 25% of channel unstable
☐C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☐A	☐A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☒C	☒C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.

- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☐B Excessive sedimentation (burying of stream features or intertidal zone)
- ☐C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in “Notes/Sketch” section.
- ☒F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: ____________________ (explain in “Notes/Sketch” section)
- ☐J Little to no stressors

8. **Recent Weather – watershed metric (skip for Tidal Marsh Streams)**
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- ☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. **Natural In-stream Habitat Types – assessment reach metric**

10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☒B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☐C Multiple snags and logs (including lap trees)
- ☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only

- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

************************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*******************************

11. **Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- ☒A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☐	☒	☐	☐	☐	Cobble (64 – 256 mm)
☐	☐	☐	☒	☐	Gravel (2 – 64 mm)
☐	☐	☒	☐	☐	Sand (.062 – 2 mm)
☐	☒	☐	☐	☐	Silt/clay (< 0.062 mm)
☐	☒	☐	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. **Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)**

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: ____________________

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☒	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☒Y	Are wetlands present in the streamside area?
☒N	☐N	

16. **Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)**
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

- ☒A Streams and/or springs (jurisdictional discharges)
- ☒B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- ☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
- ☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
- ☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
- ☐F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**
Check all that apply.

- ☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- ☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- ☐C Urban stream (≥ 24% impervious surface for watershed)
- ☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
- ☐E Assessment reach relocated to valley edge
- ☒F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**
Consider aspect. Consider "leaf-on" condition.

- ☐A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- ☒B Degraded (example: scattered trees)
- ☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☐A	☐A	≥ 100 feet wide <u>or</u> extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☐D	☐D	From 10 to < 30 feet wide
☐E	☐E	☒E	☒E	< 10 feet wide <u>or</u> no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☐A	Mature forest
☐B	☐B	Non-mature woody vegetation <u>or</u> modified vegetation structure
☒C	☒C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☒D	☒D	☐D	☐D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing <u>or</u> communities with non-native invasive species present, but not dominant, over a large portion of the expected strata <u>or</u> communities missing understory but retaining canopy trees.
☒C	☒C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent <u>or</u> communities with non-native invasive species dominant over a large portion of expected strata <u>or</u> communities composed of planted stands of non-characteristic species <u>or</u> communities inappropriately composed of a single species <u>or</u> no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ______________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farm	Date of Assessment	12-14-17
Stream Category	Ma1	Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	NO
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	**USACE/ All Streams**	**NCDWR Intermittent**
(1) Hydrology	**LOW**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**HIGH**	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**LOW**	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.
NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:
1. Project name (if any): Owen Farm 2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR 4. Assessor name/organization: BNF/HDR
5. County: Transylvania 6. Nearest named water body
7. River basin: French Broad on USGS 7.5-minute quad: West Fork French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.175767, -82.937128

STREAM INFORMATION: (depth and width can be approximations)
9. Site number (show on attached map): UT 6 10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 ☐ Unable to assess channel depth.
12. Channel width at top of bank (feet): 8 13. Is assessment reach a swamp steam? ☐ Yes ☐ No
14. Feature type: ☒ Perennial flow ☐ Intermittent flow ☐ Tidal Marsh Stream

STREAM CATEGORY INFORMATION:
15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☐ A  (more sinuous stream, flatter valley slope)
☒ B  (less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☒ Size 1 (< 0.1 mi^2) ☐ Size 2 (0.1 to < 0.5 mi^2) ☐ Size 3 (0.5 to < 5 mi^2) ☐ Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:
18. Were regulatory considerations evaluated? ☒ Yes ☐ No If Yes, check all that apply to the assessment area.
☐ Section 10 water ☒ Classified Trout Waters ☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)
☐ Essential Fish Habitat ☐ Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters
☐ Publicly owned property ☐ NCDWR Riparian buffer rule in effect ☐ Nutrient Sensitive Waters
☐ Anadromous fish ☐ 303(d) List ☐ CAMA Area of Environmental Concern (AEC)
☐ Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐ Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐ Yes ☒ No

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
☒ A Water throughout assessment reach.
☐ B No flow, water in pools only.
☐ C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
☐ A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the point of obstructing flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
☒ B Not A

3. **Feature Pattern – assessment reach metric**
☐ A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☒ B Not A

4. **Feature Longitudinal Profile – assessment reach metric**
☐ A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
☒ B Not A

5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
☒ A < 10% of channel unstable
☐ B 10 to 25% of channel unstable
☐ C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☒A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☐B <u>Excessive</u> sedimentation (burying of stream features or intertidal zone)
- ☐C Noticeable evidence of pollutant discharges entering the assessment reach <u>and</u> causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
- ☒F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: ____________________ (explain in "Notes/Sketch" section)
- ☐J Little to no stressors

8. **Recent Weather – watershed metric (skip for Tidal Marsh Streams)**
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
- ☐A Drought conditions <u>and</u> no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions <u>and</u> rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. **Natural In-stream Habitat Types – assessment reach metric**

10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☒B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☒C Multiple snags and logs (including lap trees)
- ☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only
- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

**********************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS****************************

11. **Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
- ☒A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☐	☒	☐	☐	☐	Bedrock/saprolite
☐	☒	☐	☐	☐	Boulder (256 – 4096 mm)
☐	☐	☒	☐	☐	Cobble (64 – 256 mm)
☐	☐	☐	☒	☐	Gravel (2 – 64 mm)
☐	☐	☒	☐	☐	Sand (.062 – 2 mm)
☐	☒	☐	☐	☐	Silt/clay (< 0.062 mm)
☐	☐	☒	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: ____________________

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☒	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☒	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☒	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☒A Streams and/or springs (jurisdictional discharges)
☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☐C Urban stream (≥ 24% impervious surface for watershed)
☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E Assessment reach relocated to valley edge
☒F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

☒A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☐B Degraded (example: scattered trees)
☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☒A	☒A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☐D	☐D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☒A	☒A	Mature forest
☐B	☐B	Non-mature woody vegetation or modified vegetation structure
☐C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☒

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☐D	☐D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☒A	☒A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☐C	☐C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ______________________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farm	Date of Assessment	12-14-17
Stream Category	Mb1	Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	NO
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	**USACE/ All Streams**	**NCDWR Intermittent**
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**HIGH**	
(3) Upland Pollutant Filtration	**HIGH**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**HIGH**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**HIGH**	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Owen Farm
2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR
4. Assessor name/organization: BNF/HDR
5. County: Transylvania
6. Nearest named water body on USGS 7.5-minute quad: West Fork French Broad
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.176378, -82.935693

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT 7
10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 ☐ Unable to assess channel depth.
12. Channel width at top of bank (feet): 3
13. Is assessment reach a swamp steam? ☐ Yes ☐ No
14. Feature type: ☒ Perennial flow ☐ Intermittent flow ☐ Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):

☒ A 
(more sinuous stream, flatter valley slope)

☐ B 
(less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☒ Size 1 (< 0.1 mi^2) ☐ Size 2 (0.1 to < 0.5 mi^2) ☐ Size 3 (0.5 to < 5 mi^2) ☐ Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒ Yes ☐ No If Yes, check all that apply to the assessment area.

☐ Section 10 water	☒ Classified Trout Waters	☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)
☐ Essential Fish Habitat	☐ Primary Nursery Area	☐ High Quality Waters/Outstanding Resource Waters
☐ Publicly owned property	☐ NCDWR Riparian buffer rule in effect	☐ Nutrient Sensitive Waters
☐ Anadromous fish	☐ 303(d) List	☐ CAMA Area of Environmental Concern (AEC)

☐ Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐ Designated Critical Habitat (list species)

19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐ Yes ☒ No

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
   - ☒ A Water throughout assessment reach.
   - ☐ B No flow, water in pools only.
   - ☐ C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
   - ☐ A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the point of obstructing flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
   - ☒ B Not A

3. **Feature Pattern – assessment reach metric**
   - ☒ A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
   - ☐ B Not A

4. **Feature Longitudinal Profile – assessment reach metric**
   - ☒ A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
   - ☐ B Not A

5. **Signs of Active Instability – assessment reach metric**
   Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
   - ☐ A < 10% of channel unstable
   - ☐ B 10 to 25% of channel unstable
   - ☒ C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☐A	☐A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☒C	☒C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☐B <u>Excessive</u> sedimentation (burying of stream features or intertidal zone)
- ☐C Noticeable evidence of pollutant discharges entering the assessment reach <u>and</u> causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in “Notes/Sketch” section.
- ☒F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: ______________________ (explain in “Notes/Sketch” section)
- ☐J Little to no stressors

8. **Recent Weather – watershed metric (skip for Tidal Marsh Streams)**
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
- ☐A Drought conditions <u>and</u> no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions <u>and</u> rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. **Natural In-stream Habitat Types – assessment reach metric**

10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☒B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☐C Multiple snags and logs (including lap trees)
- ☐D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only
- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

*********************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS****************************

11. **Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
- ☒A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☒	☐	☐	☐	☐	Cobble (64 – 256 mm)
☐	☐	☐	☒	☐	Gravel (2 – 64 mm)
☐	☐	☒	☐	☐	Sand (.062 – 2 mm)
☐	☐	☒	☐	☐	Silt/clay (< 0.062 mm)
☐	☒	☐	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: ____________________

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☒	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☒Y	☒Y	Are wetlands present in the streamside area?
☐N	☐N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)

Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☒A Streams and/or springs (jurisdictional discharges)
☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)

Check all that apply.

☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☐C Urban stream (≥ 24% impervious surface for watershed)
☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E Assessment reach relocated to valley edge
☒F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)

Consider aspect. Consider "leaf-on" condition.

☐A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☒B Degraded (example: scattered trees)
☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☐A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☒C	☐C	From 30 to < 50 feet wide
☐D	☐D	☐D	☐D	From 10 to < 30 feet wide
☐E	☐E	☐E	☒E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☐A	Mature forest
☒B	☐B	Non-mature woody vegetation or modified vegetation structure
☐C	☒C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☒D	☒D	☐D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☒C	☒C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ____________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farm	Date of Assessment	12-14-17
Stream Category	Ma1	Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	**USACE/ All Streams**	**NCDWR Intermittent**
(1) Hydrology	**LOW**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	**HIGH**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**MEDIUM**	
(4) Stream Geomorphology	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**HIGH**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**LOW**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**LOW**	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Owen Farms
2. Date of evaluation: 12-14-17
3. Applicant/owner name: HDR
4. Assessor name/organization: BNF/HDR
5. County: Transylvania
6. Nearest named water body on USGS 7.5-minute quad: West Fork French Broad
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.185026, -82.942697

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT 8
10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 ☐ Unable to assess channel depth.
12. Channel width at top of bank (feet): 3
13. Is assessment reach a swamp steam? ☐ Yes ☐ No
14. Feature type: ☒ Perennial flow ☐ Intermittent flow ☐ Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☒ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☐ A  (more sinuous stream, flatter valley slope)
☒ B  (less sinuous stream, steeper valley slope)

17. Watershed size: (**skip for Tidal Marsh Stream**) ☒ Size 1 (< 0.1 mi^2) ☐ Size 2 (0.1 to < 0.5 mi^2) ☐ Size 3 (0.5 to < 5 mi^2) ☐ Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒ Yes ☐ No If Yes, check all that apply to the assessment area.
    - ☐ Section 10 water
    - ☒ Classified Trout Waters
    - ☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)
    - ☐ Essential Fish Habitat
    - ☐ Primary Nursery Area
    - ☐ High Quality Waters/Outstanding Resource Waters
    - ☐ Publicly owned property
    - ☐ NCDWR Riparian buffer rule in effect
    - ☐ Nutrient Sensitive Waters
    - ☐ Anadromous fish
    - ☐ 303(d) List
    - ☐ CAMA Area of Environmental Concern (AEC)
    - ☐ Documented presence of a federal and/or state listed protected species within the assessment area.
      List species:
    - ☐ Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐ Yes ☒ No

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
   - ☒ A Water throughout assessment reach.
   - ☐ B No flow, water in pools only.
   - ☐ C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
   - ☐ A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the point of obstructing flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
   - ☒ B Not A

3. **Feature Pattern – assessment reach metric**
   - ☐ A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
   - ☒ B Not A

4. **Feature Longitudinal Profile – assessment reach metric**
   - ☐ A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
   - ☒ B Not A

5. **Signs of Active Instability – assessment reach metric**
   Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
   - ☐ A < 10% of channel unstable
   - ☒ B 10 to 25% of channel unstable
   - ☐ C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☐A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☒B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
☐B Excessive sedimentation (burying of stream features or intertidal zone)
☐C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
☐D Odor (not including natural sulfide odors)
☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
☒F Livestock with access to stream or intertidal zone
☐G Excessive algae in stream or intertidal zone
☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
☐I Other: ____________________ (explain in "Notes/Sketch" section)
☐J Little to no stressors

8. **Recent Weather – watershed metric (skip for Tidal Marsh Streams)**
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
☒C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. **Natural In-stream Habitat Types – assessment reach metric**
10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☒B Multiple sticks and/or leaf packs and/or emergent vegetation
☒C Multiple snags and logs (including lap trees)
☐D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
☐E Little or no habitat

Check for Tidal Marsh Streams Only
☐F 5% oysters or other natural hard bottoms
☐G Submerged aquatic vegetation
☐H Low-tide refugia (pools)
☐I Sand bottom
☐J 5% vertical bank along the marsh
☐K Little or no habitat

********************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS****************************

11. **Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
☒A Riffle-run section **(evaluate 11c)**
☒B Pool-glide section **(evaluate 11d)**
☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☐	☒	☐	☐	☐	Bedrock/saprolite
☐	☒	☐	☐	☐	Boulder (256 – 4096 mm)
☐	☐	☒	☐	☐	Cobble (64 – 256 mm)
☐	☐	☐	☒	☐	Gravel (2 – 64 mm)
☐	☐	☒	☐	☐	Sand (.062 – 2 mm)
☐	☒	☐	☐	☐	Silt/clay (< 0.062 mm)
☐	☒	☐	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒ Yes ☐ No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐ No Water ☐ Other: ____________________

12b. ☒ Yes ☐ No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1 >1 Numbers over columns refer to “individuals” for Size 1 and 2 streams and “taxa” for Size 3 and 4 streams.

☐ ☐ Adult frogs
☐ ☐ Aquatic reptiles
☐ ☐ Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐ ☐ Beetles
☐ ☒ Caddisfly larvae (T)
☐ ☐ Asian clam (*Corbicula*)
☐ ☐ Crustacean (isopod/amphipod/crayfish/shrimp)
☐ ☐ Damselfly and dragonfly larvae
☐ ☐ Dipterans
☐ ☒ Mayfly larvae (E)
☐ ☐ Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐ ☐ Midges/mosquito larvae
☐ ☐ Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐ ☐ Mussels/Clams (not *Corbicula*)
☐ ☐ Other fish
☐ ☐ Salamanders/tadpoles
☐ ☐ Snails
☐ ☒ Stonefly larvae (P)
☐ ☐ Tipulid larvae
☐ ☐ Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB RB
☒ A ☒ A Little or no alteration to water storage capacity over a majority of the streamside area
☐ B ☐ B Moderate alteration to water storage capacity over a majority of the streamside area
☐ C ☐ C Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB RB
☐ A ☐ A Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐ B ☐ B Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒ C ☒ C Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB RB
☐ Y ☐ Y Are wetlands present in the streamside area?
☒ N ☒ N

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☒ A Streams and/or springs (jurisdictional discharges)
☐ B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐ C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☐ D Evidence of bank seepage or sweating (iron in water indicates seepage)
☒ E Stream bed or bank soil reduced (dig through deposited sediment if present)
☐ F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

☐ A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☐ B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☐ C Urban stream (≥ 24% impervious surface for watershed)
☐ D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐ E Assessment reach relocated to valley edge
☒ F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider “leaf-on” condition.

☐ A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☒ B Degraded (example: scattered trees)
☐ C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☐A	☒A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☐D	☐D	From 10 to < 30 feet wide
☐E	☐E	☒E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☒A	Mature forest
☐B	☐B	Non-mature woody vegetation or modified vegetation structure
☒C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☒D	☐D	☐D	☐D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☐A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☒C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☒A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☒C	☐C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☒Other: ______________________________

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Owen Farms	Date of Assessment	12-14-17
Stream Category	Mb1	Assessor Name/Organization	BNF/HDR

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	NO
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	**USACE/ All Streams**	**NCDWR Intermittent**
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**MEDIUM**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**MEDIUM**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**HIGH**	

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W1
Wetland Type	Riverine Swamp Forest	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.183539, -82.943839

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☒ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☒ Yes ☐ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☒A	Not severely altered
☐B	☐B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☒C	☒C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐D	☐D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☐C From 15 to < 30 feet
☒D From 5 to < 15 feet
☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☒E	☒E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. **Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)**

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. **Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)**

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. **Wetland Size – wetland type/wetland complex condition metric**

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select “K” for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☒H	☒H	☒H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. **Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)**

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. **Connectivity to Other Natural Areas – landscape condition metric**

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☒A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. **Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)**

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option ”C.”

☐A 0
☐B 1 to 4
☒C 5 to 8

15. **Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)**

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☒B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, <u>or</u> expected species are unnaturally absent (planted stands of non-characteristic species <u>or</u> at least one stratum inappropriately composed of a single species), <u>or</u> exotic species are dominant in at least one stratum.

16. **Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)**

☒A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☒B	☒B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☒A	☒A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric (skip for all marshes)

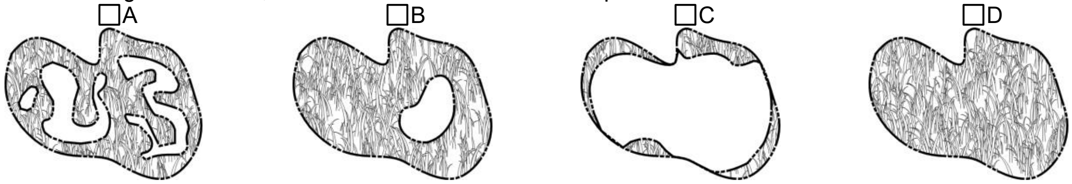
Include both natural debris and man-placed natural debris.

☒A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☐B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☒A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W1	Date of Assessment	12-14-17
Wetland Type	Riverine Swamp Forest	Assessor Name/Organization	BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	YES
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	HIGH
	Sub-surface Storage and Retention	Condition	MEDIUM
Water Quality	Pathogen Change	Condition	HIGH
		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Particulate Change	Condition	HIGH
		Condition/Opportunity	HIGH

		Opportunity Presence (Y/N)	**YES**
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**MEDIUM**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **HIGH**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W2
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.183595, -82.941644

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.
- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☒ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No
Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☐C From 15 to < 30 feet
☒D From 5 to < 15 feet
☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☒F	☒F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☒I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.
☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☐B 1 to 4
☒C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☒A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☒B	☒B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

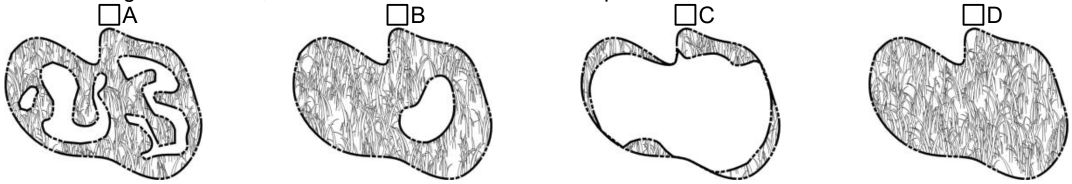
18. Snags – wetland type condition metric (skip for all marshes)
☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)
☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric (skip for all marshes)
Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)
Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)
Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☒A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W2	Date of Assessment	12-14-17
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	MEDIUM
	Sub-surface Storage and Retention	Condition	HIGH
Water Quality	Pathogen Change	Condition	LOW
		Condition/Opportunity	MEDIUM
		Opportunity Presence (Y/N)	YES
	Particulate Change	Condition	HIGH
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	ME

			DIUM
		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Physical Change	Condition	HIGH
		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	LOW
	Landscape Patch Structure	Condition	LOW
	Vegetation Composition	Condition	LOW

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **HIGH**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W3
Wetland Type	Floodplain Pool	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.183774, -82.940355

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☒ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No
Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS VS
☒A ☒A Not severely altered
☐B ☐B Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf Sub
☐A ☒A Water storage capacity and duration are not altered.
☒B ☐B Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C ☐C Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)**

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

AA WT
3a. ☐A ☐A Majority of wetland with depressions able to pond water > 1 deep
☒B ☒B Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
☐C ☐C Majority of wetland with depressions able to pond water 3 to 6 inches deep
☐D ☐D Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric (skip for all marshes)**

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☒A Sandy soil
☐B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric (skip for non-riparian wetlands)**

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☐C From 15 to < 30 feet
☒D From 5 to < 15 feet
☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)**

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☒F	☒F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. **Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)**

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. **Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)**

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. **Wetland Size – wetland type/wetland complex condition metric**

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☒I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. **Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)**

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. **Connectivity to Other Natural Areas – landscape condition metric**

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. **Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)**

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☐B 1 to 4
☒C 5 to 8

15. **Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)**

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☒B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. **Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)**

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☒B	☒B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☒A	☒A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

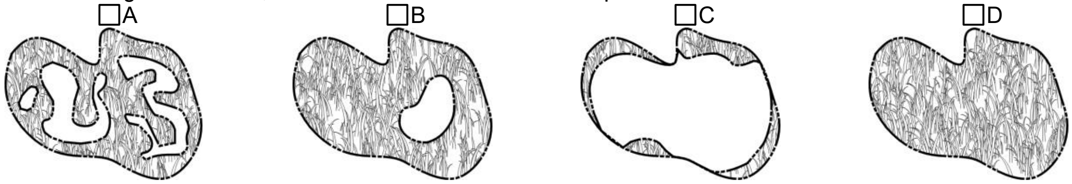
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W3	Date of Assessment	12-14-17
Wetland Type	Floodplain Pool	Assessor Name/Organization	BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-surface Storage and Retention	Condition	NA
Water Quality	Pathogen Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**

		Opportunity Presence (Y/N)	**NO**
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Physical Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**HIGH**
	Landscape Patch Structure	Condition	**MEDIUM**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**HIGH**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W3
Wetland Type	Riverine Swamp Forest	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.183774, -82.940355

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.
- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☒ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No
Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☒C	☒C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐D	☐D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric (skip for all marshes)**

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric (skip for non-riparian wetlands)**

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☐C From 15 to < 30 feet
☒D From 5 to < 15 feet
☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)**

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☒A	☒A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☒G	☒G	☒G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☐B 1 to 4
☒C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, <u>or</u> expected species are unnaturally absent (planted stands of non-characteristic species <u>or</u> at least one stratum inappropriately composed of a single species), <u>or</u> exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☒A	☒A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

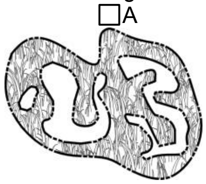
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.

☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A

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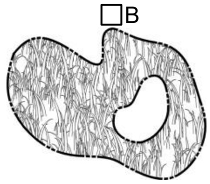
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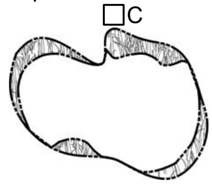
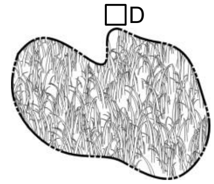

☐D


22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☐A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W3	Date of Assessment	12-14-17
Wetland Type	Riverine Swamp Forest	Assessor Name/Organization	BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	LOW
	Sub-surface Storage and Retention	Condition	MEDIUM
Water Quality	Pathogen Change	Condition	MEDIUM
		Condition/Opportunity	MEDIUM
		Opportunity Presence (Y/N)	NO
	Particulate Change	Condition	LOW
		Condition/Opportunity	LOW
		Opportunity Presence (Y/N)	NO

	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Physical Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W4
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.182288, -82.939861

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☒ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)**

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric (skip for all marshes)**

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric (skip for non-riparian wetlands)**

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☐C From 15 to < 30 feet
☒D From 5 to < 15 feet
☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)**

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☒G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

- ☐A Evidence of short-duration inundation (< 7 consecutive days)
- ☐B Evidence of saturation, without evidence of inundation
- ☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

- ☒A Sediment deposition is not excessive, but at approximately natural levels.
- ☐B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☒I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☒A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

- ☐A 0
- ☒B 1 to 4
- ☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒C Vegetation severely altered from reference in composition, <u>or</u> expected species are unnaturally absent (planted stands of non-characteristic species <u>or</u> at least one stratum inappropriately composed of a single species), <u>or</u> exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
- ☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☒B	☒B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric (skip for all marshes)

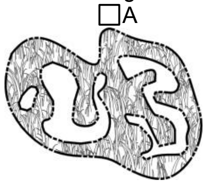
Include both natural debris and man-placed natural debris.

☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

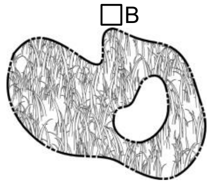
21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

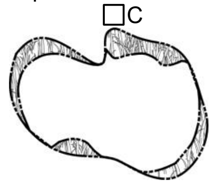
☐A



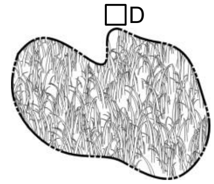
☐B



☐C



☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☐A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W4	Date of Assessment	12-14-17
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	**LOW**

		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Physical Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W5A and W5B
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
[x] Yes [ ] No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.183025, -82.936953

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations - Were regulatory considerations evaluated? [x] Yes [ ] No If Yes, check all that apply to the assessment area.

- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWR riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [x] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
[ ] A	[ ] A	Not severely altered
[x] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[ ] A	[ ] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[x] C	[x] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[x] D	[x] D	Depressions able to pond water < 3 inches deep

3b. [ ] A Evidence that maximum depth of inundation is greater than 2 feet
[ ] B Evidence that maximum depth of inundation is between 1 and 2 feet
[x] C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric (skip for all marshes)**

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric (skip for non-riparian wetlands)**

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☒C From 15 to < 30 feet
☐D From 5 to < 15 feet
☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)**

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☒F	☒F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☒I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☐B 1 to 4
☒C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☒B	☒B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric (skip for all marshes)

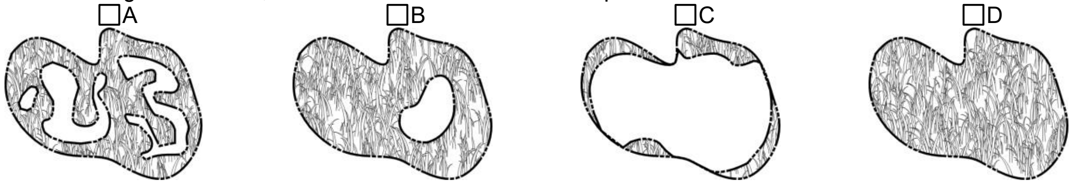
Include both natural debris and man-placed natural debris.

☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☐A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W5A and W5B	Date of Assessment	12-14-17
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	**LOW**

		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Physical Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W6
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.183195, -82.941280

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☒ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)**

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), <u>and</u> within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed <u>or</u> hydrologic alterations that prevent drainage <u>and/or</u> overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☐C From 15 to < 30 feet
☒D From 5 to < 15 feet
☐E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☒F	☒F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☒J	☒J	☒J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.
☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☐B 1 to 4
☒C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☒B	☒B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☒B	☒B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric (skip for all marshes)

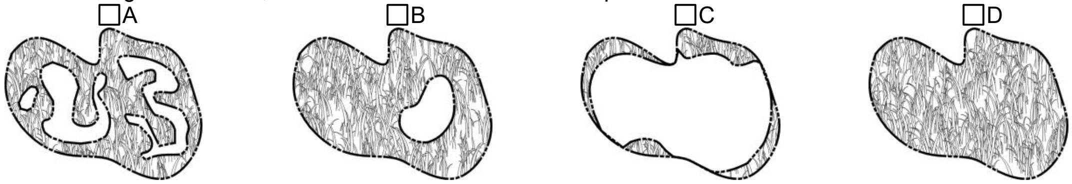
Include both natural debris and man-placed natural debris.

☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☒A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W6	Date of Assessment	12-14-17
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**MEDIUM**
	Sub-surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	**MEDI**

			UM
		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Physical Change	Condition	HIGH
		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	MEDIUM
	Landscape Patch Structure	Condition	LOW
	Vegetation Composition	Condition	LOW

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **HIGH**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W7
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.182151, -82.942415

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☒ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No
Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☐A	☐A	Not severely altered
☒B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☒A	Water storage capacity and duration are not altered.
☒B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☐A Soil ribbon < 1 inch
☒B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☒B From 30 to < 50 feet
☐C From 15 to < 30 feet
☐D From 5 to < 15 feet
☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☒D	☒D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☒J	☒J	☒J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☒A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, <u>or</u> expected species are unnaturally absent (planted stands of non-characteristic species <u>or</u> at least one stratum inappropriately composed of a single species), <u>or</u> exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☒B	☒B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric (skip for all marshes)

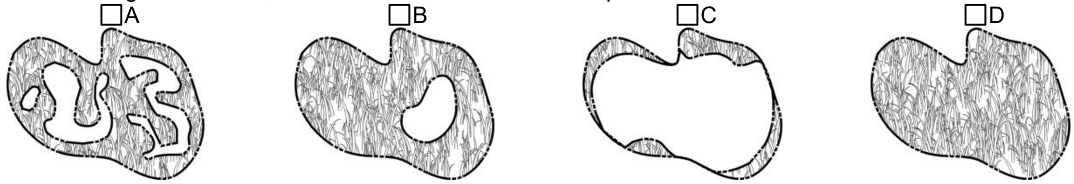
Include both natural debris and man-placed natural debris.

☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☒A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W7	Date of Assessment	12-14-17
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	MEDIUM
	Sub-surface Storage and Retention	Condition	MEDIUM
Water Quality	Pathogen Change	Condition	HIGH
		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Particulate Change	Condition	HIGH
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	HI

		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Physical Change	Condition	HIGH
		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	LOW
	Landscape Patch Structure	Condition	LOW
	Vegetation Composition	Condition	LOW

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **MEDIUM**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W8
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.184325, -82.938741

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☒ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☐A	☐A	Not severely altered
☒B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☐A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☒C	☒C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☒A Sandy soil
☐B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), <u>and</u> within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed <u>or</u> hydrologic alterations that prevent drainage <u>and/or</u> overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☒C From 15 to < 30 feet
☐D From 5 to < 15 feet
☐E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☒E	☒E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☐A Sediment deposition is not excessive, but at approximately natural levels.
☒B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select “K” for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☒J	☒J	☒J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option ”C.”

☐A 0
☐B 1 to 4
☒C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, <u>or</u> expected species are unnaturally absent (planted stands of non-characteristic species <u>or</u> at least one stratum inappropriately composed of a single species), <u>or</u> exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☒B	☒B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☒B	☒B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric (skip for all marshes)

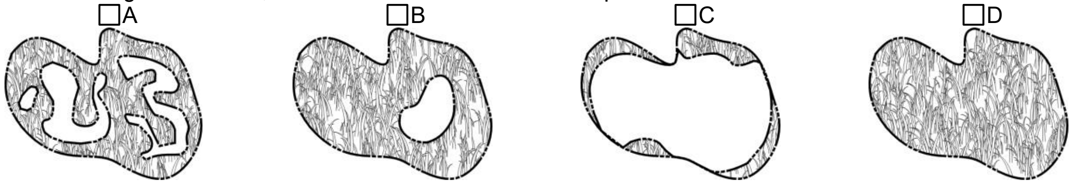
Include both natural debris and man-placed natural debris.

☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☒A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W8	Date of Assessment	12-14-17
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	LOW
	Sub-surface Storage and Retention	Condition	LOW
Water Quality	Pathogen Change	Condition	LOW
		Condition/Opportunity	MEDIUM
		Opportunity Presence (Y/N)	YES
	Particulate Change	Condition	MEDIUM
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA

	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**MEDIUM**
	Condition/Opportunity	**HIGH**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Owen Farms	Date of Evaluation	12-14-17
Applicant/Owner Name	HDR	Wetland Site Name	W9
Wetland Type	Headwater Forest	Assessor Name/Organization	BNF/HDR
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	West Fork French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	03010105
County	Transylvania	NCDWR Region	Asheville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.183534, -82.946157

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☒ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☒A	Not severely altered
☐B	☐B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)**

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric (skip for all marshes)**

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric (skip for non-riparian wetlands)**

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☒C From 15 to < 30 feet
☐D From 5 to < 15 feet
☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)**

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☒F	☒F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.
☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).
☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☒I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☒A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.
☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."
☐A 0
☐B 1 to 4
☒C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☒A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☒A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☒A	☒A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☒B	☒B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

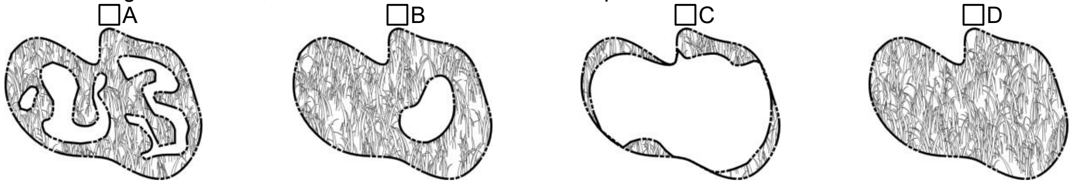
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☒A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name: W9
Date of Assessment: 12-14-17
Wetland Type: Headwater Forest
Assessor Name/Organization: BNF/HDR

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**HIGH**
	Sub-surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	**MEDI**

			UM
		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Physical Change	Condition	HIGH
		Condition/Opportunity	HIGH
		Opportunity Presence (Y/N)	YES
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**HIGH**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**HIGH**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**HIGH**

Overall Wetland Rating **HIGH**

Appendix D – Categorical Exclusion Documentation

(NCDMS can provide the full CE-ERTR document upon request. Results are summarized in Section 3.4 Regulatory Considerations.)

Appendix A

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Note: Only Appendix A should be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Owen Farms Stream and Wetland Mitigation Project
County Name:	Transylvania
EEP Number:	100064
Project Sponsor:	HDR
Project Contact Name:	Ben Furr
Project Contact Address:	555 Fayetteville Street, Suite 900, Raleigh, NC 27601
Project Contact E-mail:	benjamin.furr@hdrinc.com
EEP Project Manager:	Paul Wiesner

Project Description

Restoration, enhancement, and preservation of streams and wetlands within the French Broad River Basin. Specifically, restoration and enhancement of West Fork French Broad River and several associated unnamed tributaries and wetlands.

For Official Use Only

Reviewed By:

12/13/18

Paul Wiesner

Date

EEP Project Manager

Conditional Approved By:

Date

For Division Administrator FHWA

☐ **Check this box if there are outstanding issues**

Final Approval By:

12-14-18

Date

For Division Administrator FHWA

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☑ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☑ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☑ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☑ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☑ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☑ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☑ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☑ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☑ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☑ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☑ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☑ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Does the project require the acquisition of real estate?	☑ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☑ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☑ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as “territory” by the Eastern Band of Cherokee Indians?	☑ Yes ☐ No
2. Is the site of religious importance to American Indians?	☐ Yes ☑ No ☐ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☑ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☑ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☑ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☑ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☑ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☑ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☑ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☑ Yes ☐ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☑ No ☐ N/A
4. Is the project “likely to adversely affect” the species and/or “likely to adversely modify” Designated Critical Habitat?	☐ Yes ☐ No ☑ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?	☐ Yes ☐ No ☑ N/A
6. Has the USFWS/NOAA-Fisheries rendered a “jeopardy” determination?	☐ Yes ☐ No ☑ N/A

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as “territory” by the EBCI?	☐ Yes ☑ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☑ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☑ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☑ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	☑ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☑ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☑ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted?	☑ Yes ☐ No ☐ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☑ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☑ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☑ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☑ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☑ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☑ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☑ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☑ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☑ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☑ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☑ N/A

Appendix E – DMS Floodplain Requirements Checklist

EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. State NFIP Engineer), NC Floodplain Mapping Unit (attn. State NFIP Coordinator) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Owen Farms Mitigation Site
Name if stream or feature:	West Fork French Broad River and four unnamed tributaries (UT 4A, UT 5, UT 7 & UT 8)
County:	Transylvania
Name of river basin:	French Broad
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Transylvania
DFIRM panel number for entire site:	3700852400J Effective Date October 2, 2009
Consultant name:	HDR
Phone number:	919-900-1627 (Chris Smith)
Address:	555 Fayetteville Street, Suite 900 Raleigh, NC 27601-3034

Design Information

Owen Farms Mitigation Site is a stream and wetland restoration project for the Division of Mitigation Services. The site contains West Fork French Broad River (WFFBR) and eight unnamed tributaries (UT 1 - UT 8). However, only four of the tributaries will be restored more than simply connected them to WFFBR (UT 4A, UT 5, UT 7 and UT 8). WFFBR lies within a well-defined alluvial floodplain in the Mountain Ecoregion. Elevations range between 2755 ft MSL and 2685 ft MSL on Site. WFFBR enters the Site as a third order tributary and has approximately 3,980 acres (6.2 square miles) in drainage area is at the downstream terminus of the Site. Roses Creek is a gravel/cobble bed stream that is actively eroding due to 1.) a lack of stream bank and riparian vegetation and 2.) cattle accessing the stream for shading and as a watering source.

Summary of stream reaches and/or wetland areas according to their restoration priority:

Reach	Length	Priority
West Fork French Broad	*1,807*	*Two (Restoration)*
West Fork French Broad	*705*	*Enhancement II*
UT 4A	*72*	*One (Restoration)*
UT 5	*827*	*One (Restoration)*
UT 7	*417*	*One (Restoration)*
UT 8	*136*	*One (Restoration)*
Wetland	*<1 acre*	*Rehabilitation*
Wetland	*<1 acre*	*Restoration*

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

○ Yes ◉ No

If project is located in a SFHA, check how it was determined:

☐ Redelineation

☐ Detailed Study

☐ Limited Detail Study

☐ Approximate Study

☐ Don't know

List flood zone designation:

Check if applies:

☐ AE Zone

○ Floodway

○ Non-Encroachment

◉ None

☐ A Zone

○ Local Setbacks Required

◉ No Local Setbacks Required

If local setbacks are required, list how many feet:

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

○ Yes ○ No

Land Acquisition (Check)

☐ State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☑ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program?

◉ Yes ○ No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000)

Name of Local Floodplain Administrator: Joy Fields
Phone Number: 828-884-3205

Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

☑ No Action

☐ No Rise

☐ Letter of Map Revision

☐ Conditional Letter of Map Revision

☐ Other Requirements

List other requirements:

Comments:
Chris Smith spoke Joy Fields on 2/2/18 and she confirmed that no CLOMR/LOMR is required. She also explained that the project does not require a floodplain development permit, however, we will still submit the permit in an effort to keep the county informed about the project.

Name: ______________________________ Signature: ______________________________

Title: ______________________________ Date: ______________________________

Appendix F – Jurisdictional Determination Documentation

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action ID: **SAW-2018-01165** County: **Transylvania** U.S.G.S. Quad: **Lake Toxaway**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner:	**HDR Engineering, Inc. of the Carolinas / Attn.: Benjamin Furr**		
Address:	**555 Fayetteville Street, Suite 900** **Raleigh, NC 27601**		
Telephone Number:	**919-900-1613**		
Size (acres):	**22**	Nearest Town:	**Lake Toxaway**
Nearest Waterway:	**UTs West Fork French Broad River and West Fork French Broad River**	Coordinates:	**35.18348 N, 82.94126 W**
River Basin/ HUC:	**Upper French Broad (06010105)**		

Location description: **The project site is located on an approximate 22 acre portion of a larger 127 acre tract of land (PIN 8524-24-1875-000) at 8049 Silverstein Road (NC Highway 281), south of the intersection of Silverstein Road and Allen McCall Road, in Lake Toxaway, Transylvania County, North Carolina.**

Indicate Which of the Following Apply:

A. Preliminary Determination

X There are waters, including wetlands, on the above described project area, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). The waters, including wetlands, have been delineated, and the delineation has been verified by the Corps to be sufficiently accurate and reliable. Therefore this preliminary jurisdiction determination may be used in the permit evaluation process, including determining compensatory mitigation. For purposes of computation of impacts, compensatory mitigation requirements, and other resource protection measures, a permit decision made on the basis of a preliminary JD will treat all waters and wetlands that would be affected in any way by the permitted activity on the site as if they are jurisdictional waters of the U.S. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). However, you may request an approved JD, which is an appealable action, by contacting the Corps district for further instruction.

_ There are wetlands on the above described property, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). However, since the waters, including wetlands, have not been properly delineated, this preliminary jurisdiction determination may not be used in the permit evaluation process. Without a verified wetland delineation, this preliminary determination is merely an effective presumption of CWA/RHA jurisdiction over all of the waters, including wetlands, at the project area, which is not sufficiently accurate and reliable to support an enforceable permit decision. We recommend that you have the waters of the U.S. on your property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403) and Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are waters of the U.S. including wetlands on the above described property subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We recommend you have the waters of the U.S. on your property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

_ The waters of the U.S. including wetlands on your project area have been delineated and the delineation has been verified by the Corps. If you wish to have the delineation surveyed, the Corps can review and verify the survey upon completion. Once verified, this survey will provide an accurate depiction of all areas subject to CWA and/or RHA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on_____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described project area which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management to determine their requirements.

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). Placement of dredged or fill material, construction or placement of structures, or work within navigable waters of the United States without a Department of the Army permit may constitute a violation of Sections 9 and/or 10 of the Rivers and Harbors Act (33 USC § 401 and/or 403). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **David Brown** at **828-271-7980, ext. 4232** or **david.w.brown@usace.army.mil**.

C. Basis for Determination:

See attached preliminary jurisdictional determination form.

D. Remarks:

The potential waters of the U.S., at this site, were verified on-site by the Corps on September 11, 2018, and are as approximately depicted on the attached *Figure 6 – Aquatic Resources Map, Owen Farms Stream & Wetland Mitigation Site* (dated August 10, 2018), submitted by HDR Engineering, Inc.

E. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

F. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

US Army Corps of Engineers
South Atlantic Division
Attn: Jason Steele, Review Officer
60 Forsyth Street SW, Room 10M15
Atlanta, Georgia 30303-8801

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by, N/A (Preliminary-JD).

It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: ____________________
David Brown

Issue Date of JD: **September 14, 2018** Expiration Date: N/A Preliminary JD

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

Copy furnished:
Troy Owen Farms, LLLP, Bonnie Owen, 227 June Bug Lane, Alapaha, GA 31622

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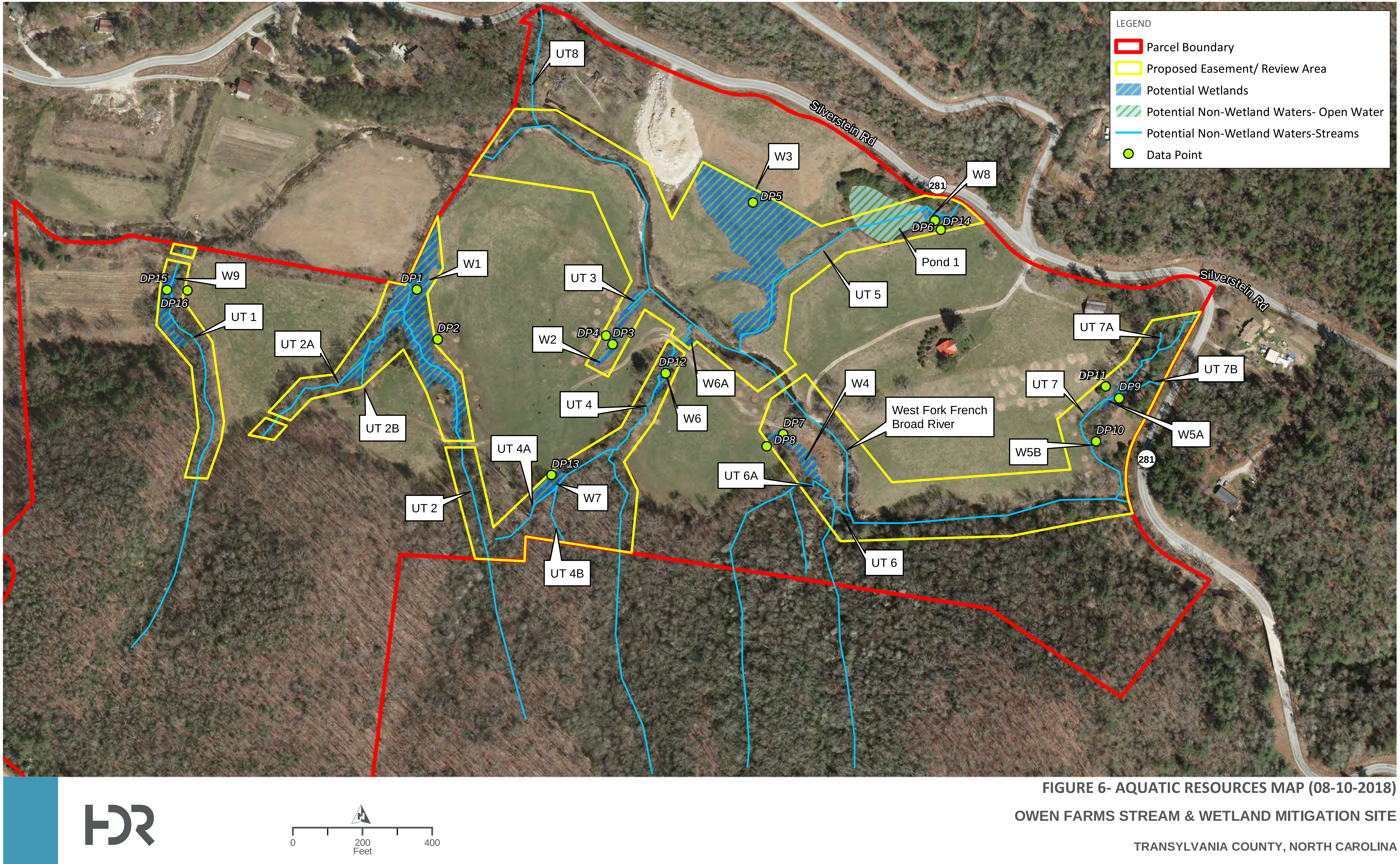


FIGURE 6- AQUATIC RESOURCES MAP (08-10-2018)

OWEN FARMS STREAM & WETLAND MITIGATION SITE

TRANSYLVANIA COUNTY, NORTH CAROLINA

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: **HDR Engineering, Inc. of the Carolinas / Attn.: Benjamin Furr**	File Number: **SAW-2018-01165**	Date: **September 14, 2018**

Attached is:	See Section below
☐ INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
☐ PROFFERED PERMIT (Standard Permit or Letter of permission)	B
☐ PERMIT DENIAL	C
☐ APPROVED JURISDICTIONAL DETERMINATION	D
☒ PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the district engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division,** **Attn: David Brown** **151 Patton Avenue, Room 208** **Asheville, North Carolina 28801-5006** **828-271-7980, ext. 4232**	If you only have questions regarding the appeal process you may also contact: Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

Signature of appellant or agent.	Date:	Telephone number:

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, Attn.: David Brown, 69 Darlington Avenue, Wilmington, North Carolina 28403

For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:

Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Jason Steele, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

PRELIMINARY JURISDICTIONAL DETERMINATION (JD) FORM
U.S. Army Corps of Engineers

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PRELIMINARY JD: September 14, 2018

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:
HDR Engineering, Inc. of the Carolinas / Attn.: Benjamin Furr
555 Fayetteville Street, Suite 900
Raleigh, NC 27601

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:
CESAW-RG-A, SAW-2018-01165, NCDMS-ILF Owen Farms Mitigation Site

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
The project site is located on an approximate 22 acre protion of a larger 127 acre tract of land (PIN 8524-24-1875-000) at 8049 Silverstein Road (NC Highway 281), south of the intersection of Silverstein Road and Allen McCall Road, in Lake Toxaway, Transylvania County, North Carolina.

State: **NC** County/parish/borough: **Transylvania** City: **Lake Toxaway**
Center coordinates of site (lat/long in degree decimal format): **35.18348 N, 82.94126 W**
Universal Transverse Mercator: **N/A**
Name of nearest waterbody: **UTs West Fork French Broad River and West Fork French Broad River**

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: **September 14, 2018**
☒ Field Determination. Date(s): **September 11, 2018**

Use the table below to document aquatic resources and/or aquatic resources at different sites

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION

Site Number	Centered Coordinates (decimal degrees) Latitude	Longitude	Estimated Amount of Aquatic Resource in Review Area[1] (linear feet or acre)	Type of Aquatic Resources	Geographic Authority to Which Aquatic Resource "May Be" Subject
West Fork French Broad River	35.182097	-82.938193	2615 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
[2] UT 1	35.183503	-79.626503	709 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 2	35.18293	-82.94609	769 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 2A	35.183002	-82.943477	582 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 2B	35.182642	-82.944328	78 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 3	35.183224	-82.943172	84 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 4	35.182511	-82.941879	765 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404

UT 4A	35.181845	-82.941684	447 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 4B	35.181959	-82.942379	172 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 5	35.184087	-82.942092	884 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 6	35.181852	-82.939869	119 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 6A	35.182214	-82.93962	187 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 7	35.183197	-82.93986	765 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 7A	35.18364	-82.936657	50 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 7B	35.183409	-82.936478	134 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT 8	35.185139	-82.9427	40 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Pond 1	35.184393	-82.939262	0.53 ac	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 1	35.183545	-82.943765	1.04 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 2	35.183368	-82.941803	0.14 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 3	35.18412	-82.940287	1.62 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 4	35.182564	-82.940172	0.16 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 5A	35.183025	-82.936953	0.04 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 5B	35.182608	-82.937158	0.01 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 6	35.183195	-82.94128	0.05 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 6A	35.18328	-82.941137	0.02 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 7	35.182151	-82.942415	0.1 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 8	35.184325	-82.938741	0.06 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W 9	35.183534	-82.946157	0.15 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404

[1] Review area for estimated amount of aquatic resource is the area within the proposed easement
[2] All UTs are unnamed tributaries of the West Fork French Broad River

1. The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre- construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA

Data reviewed for preliminary JD (check all that apply) - Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

☒ Maps, plans, plots or plat submitted by or on behalf of preliminary JD requester: **HDR Engineering, Inc.**
☒ Data sheets prepared/submitted by or on behalf of preliminary JD requester. **HDR Engineering, Inc.**
  ☒ Office concurs with data sheets/delineation report.
  ☐ Office does not concur with data sheets/delineation report. Rational:
☐ Data sheets prepared by the Corps:
☐ Corps navigable waters' study:
☐ U.S. Geological Survey (USGS) Hydrologic Atlas:
  ☐ USGS NHD data.
  ☐ USGS 8 and 12 digit HUC maps.
☒ USGS map(s). Cite scale & quad name: **Lake Toxaway.**
☒ Natural Resources Conservation Service (NRCS) Soil Survey.
  Citation: **Transylvania County, NC**
☐ National wetlands inventory (NWI) map(s). Cite name:
☐ State/Local wetland inventory map(s):
☒ Federal Emergency Management Agency (FEMA) / Flood Insurance Rate Map (FIRM) maps: **Map No. 3700852400J, effective date October 2, 2009**
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)

☒ Photographs: ☒ Aerial (Name & Date): **Google Earth Pro, Apr. 2018, Mar. 2017, Oct. 2015, Apr. 2014, Feb. 2012, Jun. 2008, Jun. 2006, Apr. 1998, and Mar. 1995**
or ☐ Other (Name & Date):
☐ Previous determination(s). File no. and date of response letter:
☐ Applicable/supporting scientific literature:
☒ Other information (please specify): **The site contains wetlands as determined by the *1987 Corps of Engineers Wetland Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Eastern Mountain and Piedmont Region (Version 2.0)*. These wetlands are abutting to stream channels located at the site and flow into the channels. Wetland hydrology is enhanced with the abutting stream channels via normal down gradient flows and periods of high water.**

The site also contains open water (impoundment) that abuts wetlands and is an impoundment of UT 5 at the site. The impoundment receives waters and/or flow directly into associated abutting wetlands and/or stream.

The streams on the property are UTs of West Fork French Broad River and West Fork French Broad River, all exhibit physical ordinary high water mark (OHWM) indicators including, break in slope; developed bed and bank; changes in sediment texture and soil character; natural line impressed on the bank; shelving; absence of vegetation; leaf litter washed away; sediment deposition and sorting; presence of fish and other aquatic life; water staining; presence of debris; and scour. Some of the UTs and West Fork French Broad River are depicted as solid blue lines on the USGS 7.5 minute quadrangle map Lake Toxaway and the most current Natural Resource Conservation Service Soil Survey for Transylvania County. Solid blue line features on these mapping conventions typically represent perennial streams.

The UTs West Fork French Broad River flow into the West Fork French Broad River, which flows into the French Broad River, a traditional navigable river. The French Broad River merges with the Holston River to form the Tennessee River. The Tennessee River flows into the Ohio River then to the Mississippi River before entering the Gulf of Mexico.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

David Brown, September 14, 2018
Signature and date of Regulatory staff member completing preliminary JD

Bonnie Owen (Property Owner)
OR
HDR Engineering, Inc. of the Carolinas / Attn.: Benjamin Furr
(per Agent Authorization)
Signature and date of person requesting preliminary JD (REQUIRED, unless obtaining the signature is impracticable)

Two copies of this Preliminary JD Form have been provided. Please sign both copies. Keep one signed copy for your record and return a signed copy to the Asheville Regulatory Field Office by mail or e-mail.

US Army Corps of Engineers-Wilmington District
Asheville Regulatory Field Office
151 Patton Avenue, Room 208
Asheville, NC 28801-5006

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

Jurisdictional Determination Request

A. PARCEL INFORMATION

Street Address: 8049 Silversteen Rd

City, State: Lake Toxaway, NC

County: Transylvania

Parcel Index Number(s) (PIN): 8524-24-1875-000

B. REQUESTOR INFORMATION

Name: HDR Engineering, Inc. of the Carolinas

Mailing Address: 555 Fayetteville St, Suite 900

Raleigh, NC 27601

Telephone Number: 919.900.1613

Electronic Mail Address: Benjamin.Furr@hdrinc.com

Select one:

- [ ] I am the current property owner.
- [x] I am an Authorized Agent or Environmental Consultant[1]
- [ ] Interested Buyer or Under Contract to Purchase
- [ ] Other, please explain. ________________

C. PROPERTY OWNER INFORMATION[2]

Name: Troy Owen Farms, LLLP

Mailing Address: 227 June Bug Ln

Alapaha, Ga 31622

Telephone Number: 229.388.2169

Electronic Mail Address: ________________

[1] Must provide completed Agent Authorization Form/Letter.

[2] Documentation of ownership also needs to be provided with request (copy of Deed, County GIS/Parcel/Tax Record).

D. PROPERTY ACCESS CERTIFICATION[3,4]

By signing below, I authorize representatives of the Wilmington District, U.S. Army Corps of Engineers (Corps) to enter upon the property herein described for the purpose of conducting on-site investigations, if necessary, and issuing a jurisdictional determination pursuant to Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899. I, the undersigned, am either a duly authorized owner of record of the property identified herein, or acting as the duly authorized agent of the owner of record of the property.

Ben Furr
Print Name

Capacity: ☐ Owner ☑ Authorized Agent[5]

08/10/2018
Date

Signature

E. REASON FOR JD REQUEST: (Check as many as applicable)

☐ I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all aquatic resources.

☐ I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all jurisdictional aquatic resources under Corps authority.

☑ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps, and the JD would be used to avoid and minimize impacts to jurisdictional aquatic resources and as an initial step in a future permitting process.

☐ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps; this request is accompanied by my permit application and the JD is to be used in the permitting process.

☐ I intend to construct/develop a project or perform activities in a navigable water of the U.S. which is included on the district Section 10 list and/or is subject to the ebb and flow of the tide.

☐ A Corps JD is required in order obtain my local/state authorization.

☐ I intend to contest jurisdiction over a particular aquatic resource and request the Corps confirm that jurisdiction does/does not exist over the aquatic resource on the parcel.

☐ I believe that the site may be comprised entirely of dry land.

☐ Other:____________________

3 For NCDOT requests following the current NCDOT/USACE protocols, skip to Part E.

4 If there are multiple parcels owned by different parties, please provide the following for each additional parcel on a continuation sheet.

5 Must provide agent authorization form/letter signed by owner(s).

F. JURISDICTIONAL DETERMINATION (JD) TYPE (Select One)

☑ I am requesting that the Corps provide a preliminary JD for the property identified herein.

A Preliminary Jurisdictional Determination (PJD) provides an indication that there may be "waters of the United States" or "navigable waters of the United States"on a property. PJDs are sufficient as the basis for permit decisions. For the purposes of permitting, all waters and wetlands on the property will be treated as if they are jurisdictional "waters of the United States". PJDs cannot be appealed (33 C.F.R. 331.2); however, a PJD is "preliminary" in the sense that an approved JD can be requested at any time. PJDs do not expire.

☐ I am requesting that the Corps provide an approved JD for the property identified herein.

An Approved Jurisdictional Determination (AJD) is a determination that jurisdictional "waters of the United States" or "navigable waters of the United States" are either present or absent on a site. An approved JD identifies the limits of waters on a site determined to be jurisdictional under the Clean Water Act and/or Rivers and Harbors Act. Approved JDs are sufficient as the basis for permit decisions. AJDs are appealable (33 C.F.R. 331.2). The results of the AJD will be posted on the Corps website. A landowner, permit applicant, or other "affected party" (33 C.F.R. 331.2) who receives an AJD may rely upon the AJD for five years (subject to certain limited exceptions explained in Regulatory Guidance Letter 05-02).

☐ I am unclear as to which JD I would like to request and require additional information to inform my decision.

G. ALL REQUESTS

☑ Map of Property or Project Area. This Map must clearly depict the boundaries of the review area.

☑ Size of Property or Review Area 22 acres.

☑ The property boundary (or review area boundary) is clearly physically marked on the site.

H. REQUESTS FROM CONSULTANTS

☑ Project Coordinates (Decimal Degrees): Latitude: 35.183539
Longitude: -82.943839

☑ A legible delineation map depicting the aquatic resources and the property/review area. Delineation maps must be no larger than 11x17 and should contain the following: (Corps signature of submitted survey plats will occur after the submitted delineation map has been reviewed and approved).[6]

- North Arrow
- Graphical Scale
- Boundary of Review Area
- Date
- Location of data points for each Wetland Determination Data Form or tributary assessment reach.

For Approved Jurisdictional Determinations:

- Jurisdictional wetland features should be labeled as Wetland Waters of the US, 404 wetlands, etc. Please include the acreage of these features.
- Jurisdictional non-wetland features (i.e. tidal/navigable waters, tributaries, impoundments) should be labeled as Non-Wetland Waters of the US, stream, tributary, open water, relatively permanent water, pond, etc. Please include the acreage or linear length of each of these features as appropriate.
- Isolated waters, waters that lack a significant nexus to navigable waters, or non-jurisdictional upland features should be identified as Non-Jurisdictional. Please include a justification in the label regarding why the feature is non-jurisdictional (i.e. "Isolated", "No Significant Nexus", or "Upland Feature"). Please include the acreage or linear length of these features as appropriate.

For Preliminary Jurisdictional Determinations:

- Wetland and non-wetland features should not be identified as Jurisdictional, 404, Waters of the United States, or anything that implies jurisdiction. These features can be identified as Potential Waters of the United States, Potential Non-wetland Waters of the United States, wetland, stream, open water, etc. Please include the acreage and linear length of these features as appropriate.

☑ Completed Wetland Determination Data Forms for appropriate region
(at least one wetland and one upland form needs to be completed for each wetland type)

[6] Please refer to the guidance document titled "Survey Standards for Jurisdictional Determinations" to ensure that the supplied map meets the necessary mapping standards. http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Jurisdiction/

- [x] Completed appropriate Jurisdictional Determination form
  - **PJDs,** please complete a Preliminary Jurisdictional Determination Form[7] and include the Aquatic Resource Table
  - **AJDs,** please complete an Approved Jurisdictional Determination Form[8]
- [x] Vicinity Map
- [x] Aerial Photograph
- [x] USGS Topographic Map
- [x] Soil Survey Map
- [ ] Other Maps, as appropriate (e.g. National Wetland Inventory Map, Proposed Site Plan, previous delineation maps, LIDAR maps, FEMA floodplain maps)
- [ ] Landscape Photos (if taken)
- [ ] NCSAM and/or NCWAM Assessment Forms and Rating Sheets
- [x] NC Division of Water Resources Stream Identification Forms
- [ ] Other Assessment Forms

7 www.saw.usace.army.mil/Portals/59/docs/regulatory/regdocs/JD/RGL_08-02_App_A_Prelim_JD_Form_fillable.pdf
8 Please see http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Jurisdiction/

Principal Purpose: The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the project area subject to federal jurisdiction under the regulatory authorities referenced above.
Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in the approved jurisdictional determination (AJD), which will be made available to the public on the District's website and on the Headquarters USAGE website.
Disclosure: Submission of requested information is voluntary; however, if information is not provided, the request for an AJD cannot be evaluated nor can an AJD be issued.

LANDOWNER AUTHORIZATION FORM

PROPERTY LEGAL DESCRITION:

Deed Book: 00108 **Page: 0212** **County: Transylvania**

Parcel ID Number: 8524241875000

Street Address: 8049 SILVERSTEEN RD
Lake Toxaway, NC 28747

Property Owner (please print: Troy Owen Farms LLLP

Property Owner (please print):____________________________

The undersigned, registered property owner(s) of the above property, do hereby authorize

Ben Furr **of** **HDR Engineering, Inc. of the Carolinas**
(Contractor/Agent/Project Manager)[1] **(Name of Contractor/Agent Firm/Agency)[2]**

to take all actions necessary for the evaluation of the property as a potential stream, wetland and/or riparian buffer mitigation project, including conducting stream and/or wetland determinations and delineations, as well as issuance and acceptance of any required permit(s) or certification(s). I agree to allow regulatory agencies, including the US Army Corps of Engineers, to visit the property as part of these environmental reviews.

Property Owners(s) Address: 227 June Bug Ln
(if different from above) Alapaha, Ga 31622

Property Owner Telephone Number: (229) 388-2169

Property Owner Telephone Number: ____________________________

We hereby certify the above information to be true and accurate to the best of our knowledge.

Bonnie H. Owen 6-5-18
(Property Owner Authorized Signature) **(Date)**

____
(Property Owner Authorized Signature) **(Date)**

[1]Name of full delivery staff member (full-deliveries) or DMS project manager (design-bid-build).
[2]Name of company (full-deliveries) or DMS (design-bid-build).

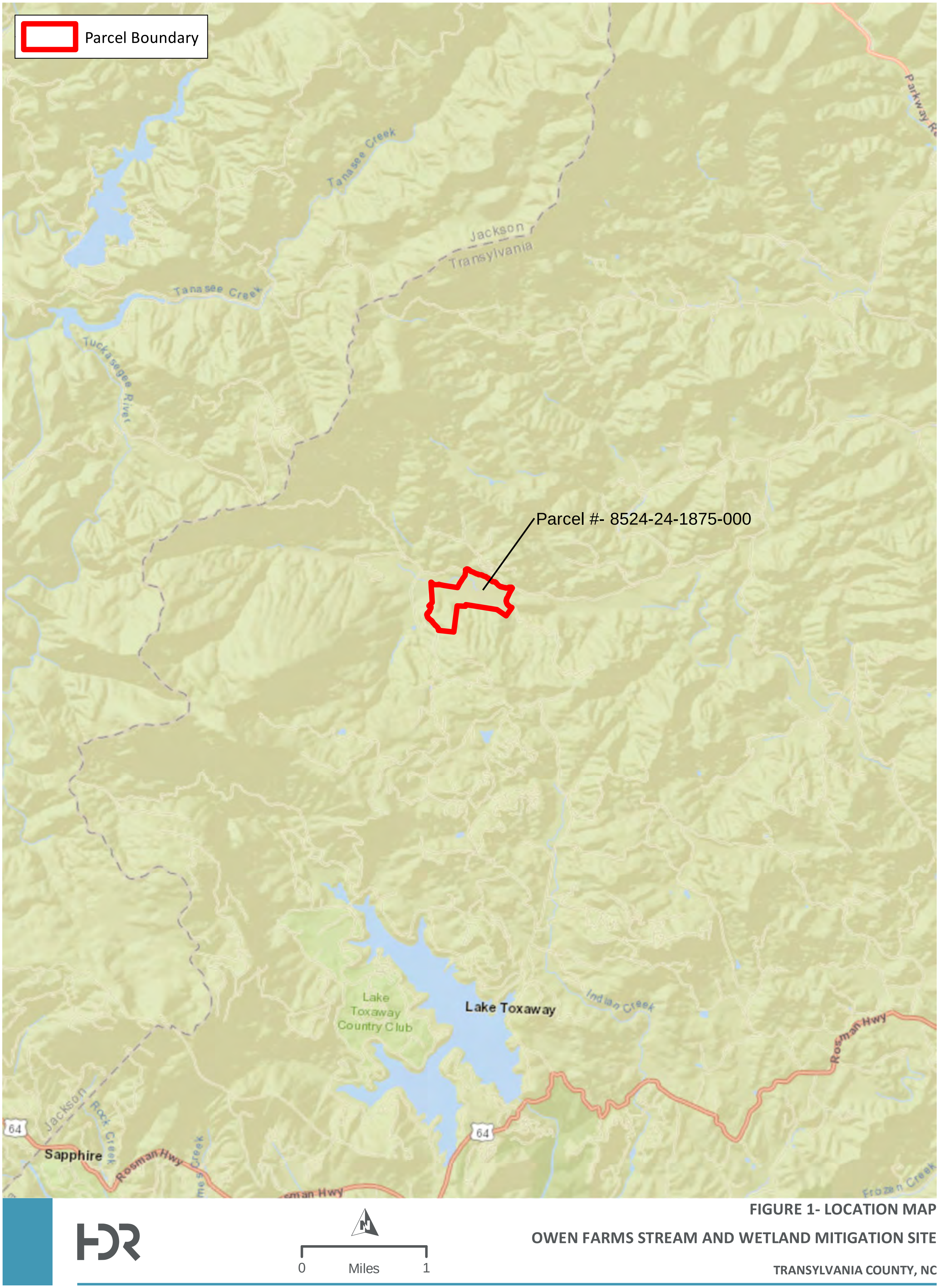


FIGURE 1- LOCATION MAP

OWEN FARMS STREAM AND WETLAND MITIGATION SITE

TRANSYLVANIA COUNTY, NC

FIGURE 2-AERIAL MAP

OWEN FARMS STREAM AND WETLAND MITIGATION SITE

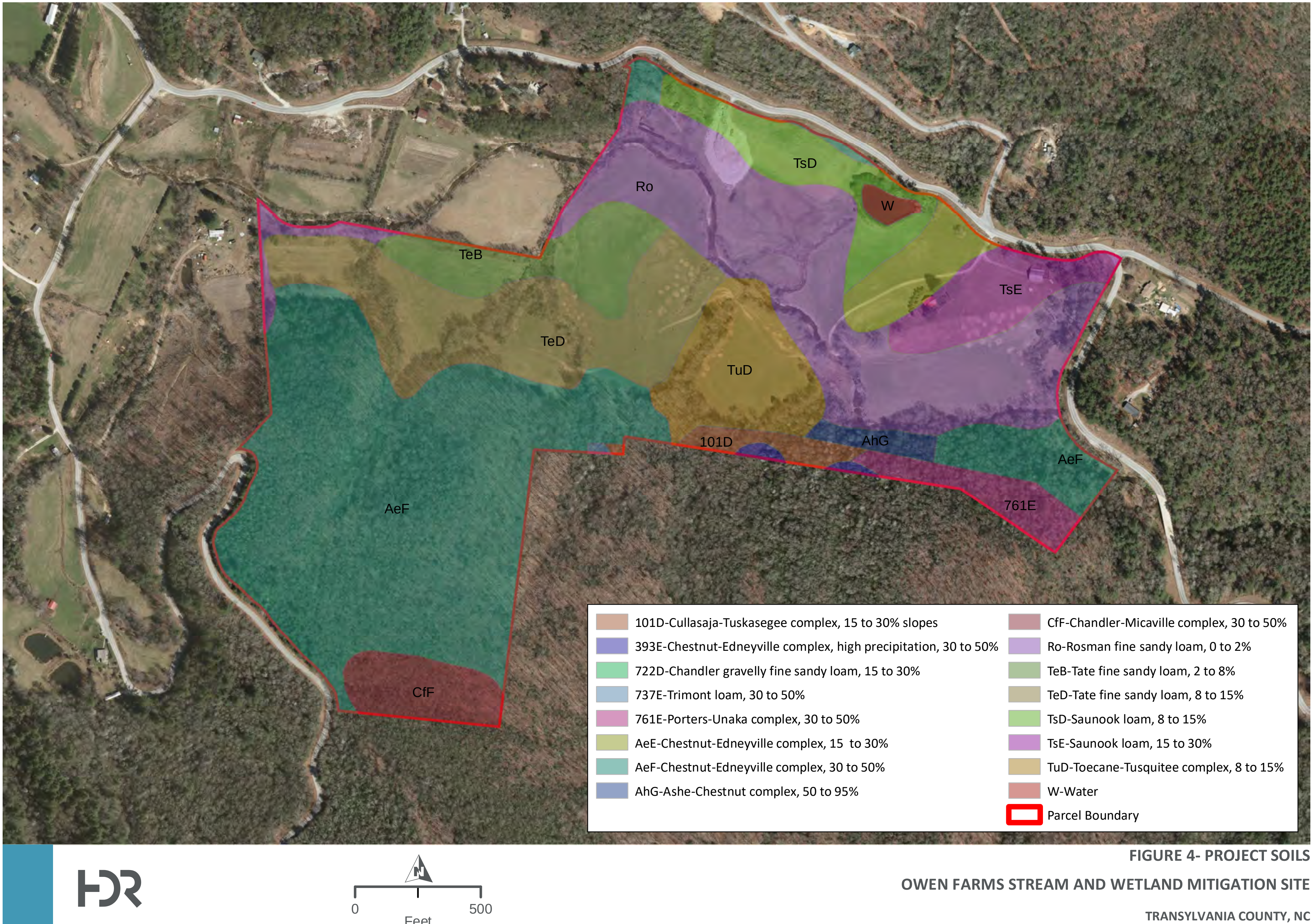
TRANSYLVANIA COUNTY, NC

Lake Toxaway 7.5 Minute Topographic Quadrangle

FIGURE 3- USGS TOPOGRAPHIC MAP

OWEN FARMS STREAM AND WETLAND MITIGATION SITE

TRANSYLVANIA COUNTY, NC



HDR

FIGURE 4- PROJECT SOILS

OWEN FARMS STREAM AND WETLAND MITIGATION SITE

TRANSYLVANIA COUNTY, NC

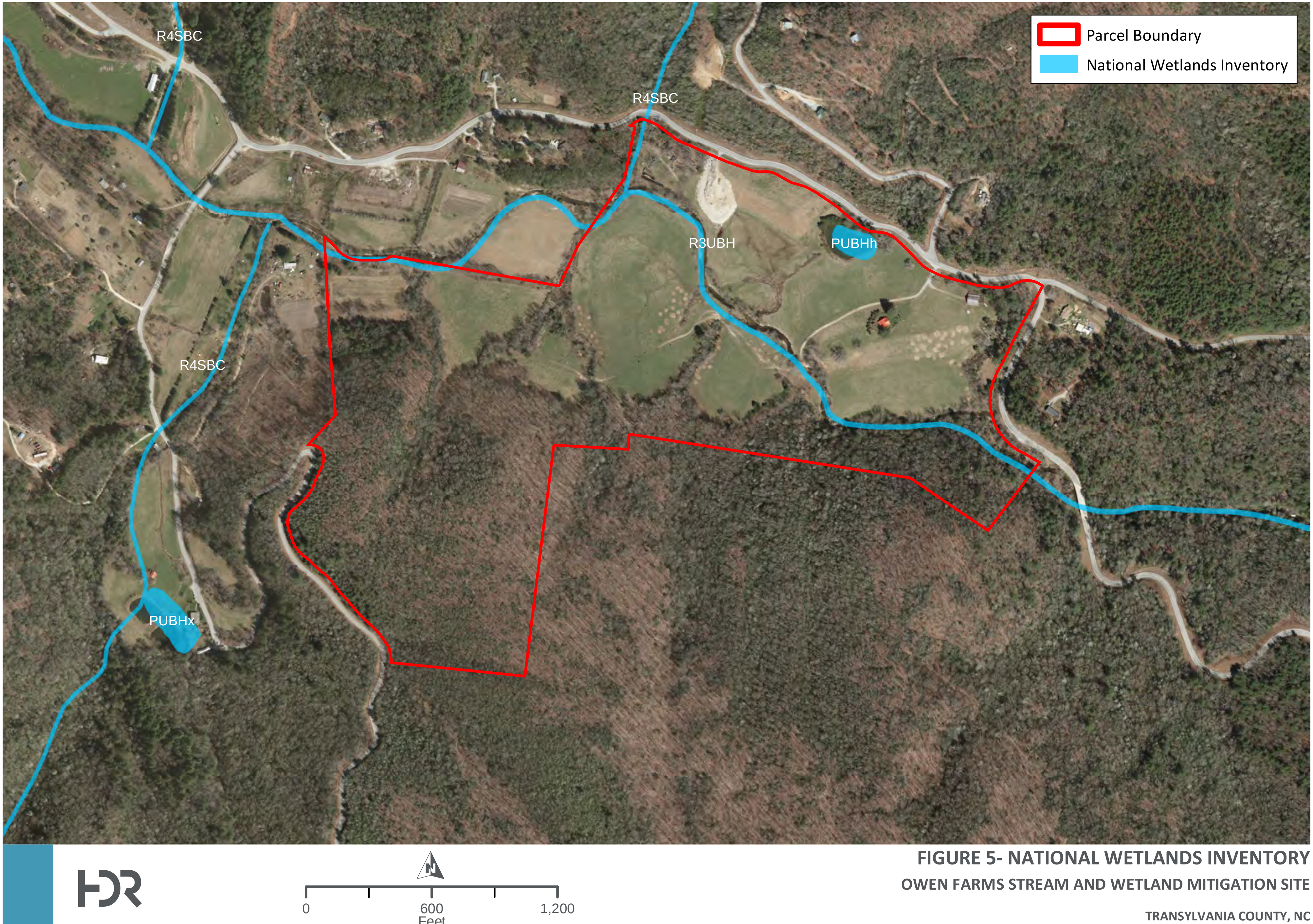
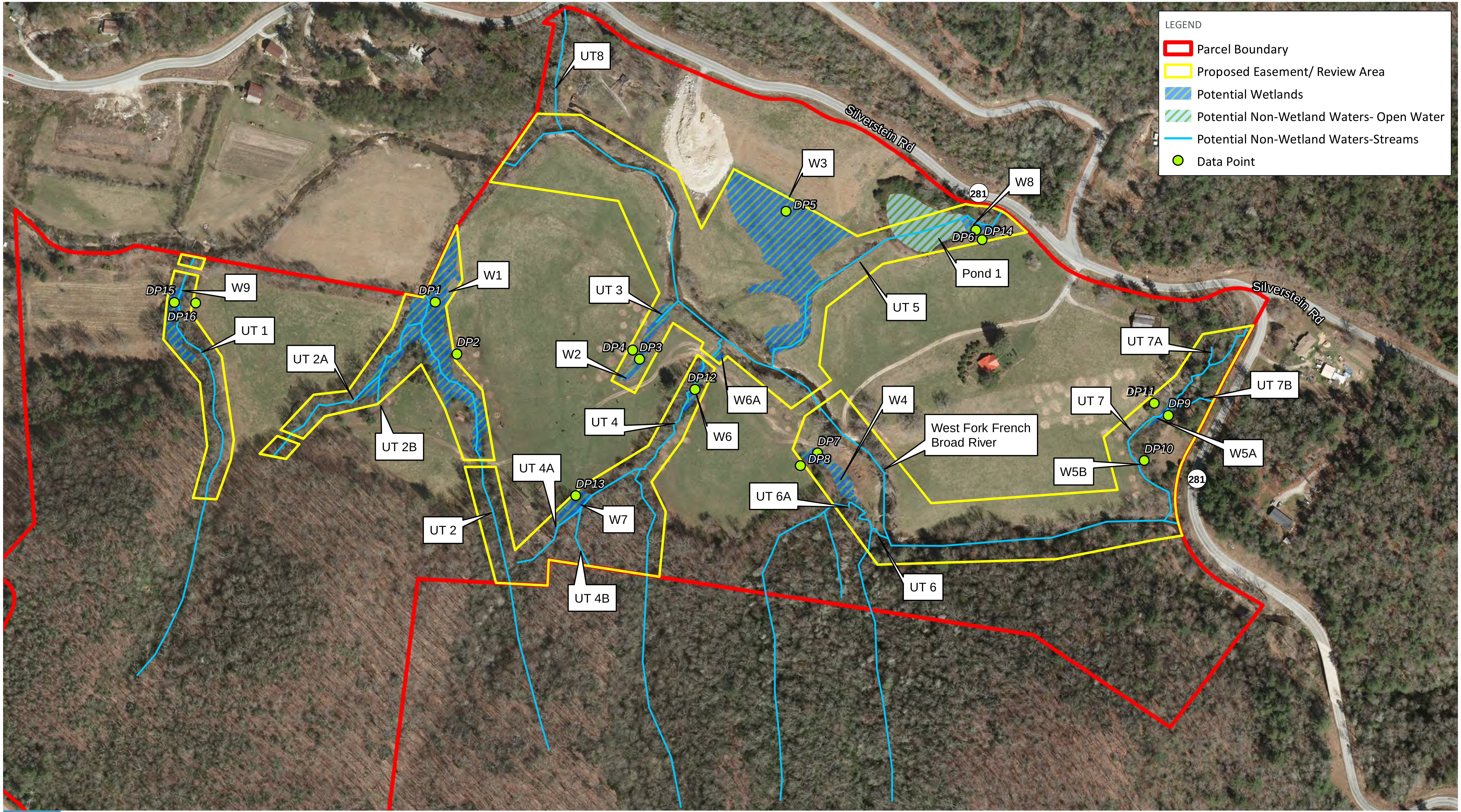


FIGURE 5- NATIONAL WETLANDS INVENTORY

OWEN FARMS STREAM AND WETLAND MITIGATION SITE

TRANSYLVANIA COUNTY, NC



0 200 400
Feet

FIGURE 6- AQUATIC RESOURCES MAP (08-10-2018)

OWEN FARMS STREAM & WETLAND MITIGATION SITE

TRANSYLVANIA COUNTY, NORTH CAROLINA

Table 1. Streams and Open Water

Feature ID	Latitude	Longitude	Estimated Amount of Aquatic Resource in Review Area			Type of Aquatic Resource	Geographic Authority to which aquatic resource "may be" subject
			Length (LF)	Width (FT)	Area (AC)	Potential Non-Wetland Waters: Perennial (P) Streams or Open Water (OW)	
West Fork French Broad	35.182097	-82.938193	2615	20	1.2	P	Section 404
UT1	35.183503	-79.626503	709	3	0.05	P	Section 404
UT2	35.18293	-82.94609	769	3	0.05	P	Section 404
UT2A	35.183002	-82.943477	582	7	0.09	P	Section 404
UT2B	35.182642	-82.944328	78	5	0.01	P	Section 404
UT3	35.183224	-82.943172	84	2	84.3	P	Section 404
UT4	35.182511	-82.941879	765	6	0.11	P	Section 404
UT4A	35.181845	-82.941684	447	3	0.03	P	Section 404
UT4B	35.181959	-82.942379	172	3	0.01	P	Section 404
UT5	35.184087	-82.942092	884	3	0.06	P	Section 404
UT6	35.181852	-82.939869	119	3	0.01	P	Section 404
UT6A	35.182214	-82.93962	187	3	0.01	P	Section 404
UT7	35.183197	-82.93986	765	5	0.09	P	Section 404
UT7A	35.18364	-82.936657	50	5	0.01	P	Section 404
UT7B	35.183409	-82.936478	134	5	0.02	P	Section 404
UT 8	35.185139	-82.9427	40	10	0.01	P	Section 404
PERENNIAL		SUB-TOTAL	8400	-	86.06	-	-
Pond 1	35.184393	-82.939262	-	-	0.53	OW	Section 404
TOTAL			**8400**		**86.59**		

Table 2. Wetlands

Feature ID	Latitude	Longitude	Estimated Amount of Aquatic Resource in Review Area	Type of Aquatic Resource	Geographic Authority to which aquatic resource "may be" subject
			Area (AC)	Potential Wetland: Cowardin Classification	
W1	35.183545	-82.943765	1.04	PSS	Section 404
W2	35.183368	-82.941803	0.14	PSS	Section 404
W3	35.18412	-82.940287	1.62	PEM	Section 404
W4	35.182564	-82.940172	0.16	PSS	Section 404
W5A	35.183025	-82.936953	0.04	PFO	Section 404
W5B	35.182608	-82.937158	0.01	PSS	Section 404
W6	35.183195	-82.94128	0.05	PFO	Section 404
W6A	35.18328	-82.941137	0.02	PEM	Section 404
W7	35.182151	-82.942415	0.1	PFO	Section 404
W8	35.184325	-82.938741	0.06	PFO	Section 404
W9	35.183534	-82.946157	0.15	PFO	Section 404
		Total	**3.39**		

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 12/14/2017

Applicant/Owner: HDR Engineering/ NC DMS State: NC Sampling Point: DP1-W1

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 2%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183539 Long: -82.943839 Datum: UTM 17

Soil Map Unit Name: Tate fine sandy loam NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:
Located at confluence of UT2 and UT2a. Beaver are present downstream.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 2	
Water Table Present?	Yes X	No ___	Depth (inches): 6	
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 6	**Wetland Hydrology Present?** **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP1-W1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus serrulata*	20	Yes	OBL
2. *Platanus occidentalis*	5	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	25	=Total Cover	
50% of total cover: 13		20% of total cover:	5

Sapling/Shrub Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus serrulata*	20	Yes	OBL
2. *Rhododendron maximum*	40	Yes	FAC
3. *Rubus pensilvanicus*	10	No	FAC
4. *Rosa palustris*	10	No	OBL
5.			
6.			
7.			
8.			
9.			
	80	=Total Cover	
50% of total cover: 40		20% of total cover:	16

Herb Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juncus effusus*	20	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20	=Total Cover	
50% of total cover: 10		20% of total cover:	4

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Lonicera japonica*	10	Yes	FACU
2. *Smilax rotundifolia*	5	Yes	FAC
3.			
4.			
5.			
	15	=Total Cover	
50% of total cover: 8		20% of total cover:	3

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 85.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	50	x 1 =	50
FACW species	25	x 2 =	50
FAC species	55	x 3 =	165
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	140 (A)		305 (B)

Prevalence Index = B/A = 2.18

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP1-W1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 2/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
X Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 12/14/2017

Applicant/Owner: HDR Engineering/ NC DMS State: NC Sampling Point: DP2- Up

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 3%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183491 Long: -82.939639 Datum: UTM 17

Soil Map Unit Name: Tate fine sandy loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___	No X	
Wetland Hydrology Present?	Yes ___	No X	

Remarks:
Approximately 50' from W2 in active pasture.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? Yes ___ No X Depth (inches): ___
(includes capillary fringe)

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP2- Up 1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30)			
1. *Festuca arundinacea*	90	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 =Total Cover		
50% of total cover: 45		20% of total cover: 18	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	90 (A)		360 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP2- Up 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100					Loamy/Clayey	
5-15	10YR 3/3	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ____________
Depth (inches): ____________

Hydric Soil Present? **Yes** _____ **No** X

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 12/14/2017

Applicant/Owner: HDR Engineering State: NC Sampling Point: DP3-W2

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): headwater/valley Local relief (concave, convex, none): Concave Slope (%): 2%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183595 Long: -82.941644 Datum: UTM 17

Soil Map Unit Name: Tate fine sandy loam NWI classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___ , Soil ___ , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___ Hydric Soil Present? Yes X No ___ Wetland Hydrology Present? Yes X No ___	**Is the Sampled Area within a Wetland? Yes X No ___**

Remarks:
Headwater wetland that drains to UT3.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 2
Water Table Present?	Yes X	No ___	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 6

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Spring fed

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP3-W2

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus serrulata*	50	Yes	OBL
2. *Rosa multiflora*	10	No	FACU
3. *Rubus pensilvanicus*	10	No	FAC
4. *Ilex opaca*	5	No	FACU
5. *Leucothoe fontanesiana*	2	No	FACW
6.			
7.			
8.			
9.			
	77	=Total Cover	
50% of total cover: 39		20% of total cover:	16

Herb Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juncus effusus*	30	Yes	FACW
2. *Carex abscondita*	30	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	60	=Total Cover	
50% of total cover: 30		20% of total cover:	12

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Lonicera japonica*	5	Yes	FACU
2. *Smilax rotundifolia*	2	Yes	FAC
3.			
4.			
5.			
	7	=Total Cover	
50% of total cover: 4		20% of total cover:	2

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	50	x 1 =	50
FACW species	32	x 2 =	64
FAC species	42	x 3 =	126
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	144 (A)		320 (B)

Prevalence Index = B/A = 2.22

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

DP3-W2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 4/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? **Yes** X **No** ___

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 12/14/2017

Applicant/Owner: HDR Engineering/ NC DMS State: NC Sampling Point: DP4- Up

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 3%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183278 Long: -82.9941936 Datum: UTM 17

Soil Map Unit Name: Tate fine sandy loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks:
Approximately 50' from W2 in active pasture.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___	
Water Table Present?	Yes ___	No X	Depth (inches): ___	
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___	**Wetland Hydrology Present? Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP2- Up

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size: 30)			
1. *Festuca arundinacea*	90	Yes	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90	=Total Cover	
50% of total cover: 45		20% of total cover: 18	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	0 (A)	0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP2- Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	10YR 4/3	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 12/14/2017

Applicant/Owner: HDR Engineering/ NC DMS State: NC Sampling Point: DP5-W3

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 2%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183774 Long: -82.940355 Datum: UTM 17

Soil Map Unit Name: Rosman fine sandy loam NWI classification: Not mapped

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:
Wetland locatd in floodplain of WFFB and UT5 and is heavily impacted by cattle.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 3
Water Table Present?	Yes X	No ___	Depth (inches): 14
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 12

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP5-W3

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
=Total Cover			

50% of total cover: ____ 20% of total cover: ____

Sapling/Shrub Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
=Total Cover			

50% of total cover: ____ 20% of total cover: ____

Herb Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juncus effusus*	60	Yes	FACW
2. *Solidago gigantea*	2	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
=Total Cover	62		

50% of total cover: 31 20% of total cover: 13

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
=Total Cover			

50% of total cover: ____ 20% of total cover: ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	62	x 2 =	124
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	62 (A)		124 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)
Tag alder, black willow are present along edges of linear portionn of wetland

SOIL

Sampling Point: DP5-W3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1	90	10Yr 3/4	10	C	PL/M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
_X_ Redox Dark Surface (F6)
Depleted Dark Surface (F7)
_?_ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** _X_ **No** ___

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 12/14/2017

Applicant/Owner: HDR Engineering/ NC DMS State: NC Sampling Point: DP6- Up

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 3%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183491 Long: -82.939639 Datum: UTM 17

Soil Map Unit Name: Tate fine sandy loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks:
Upland near W8 in active pasture

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___	
Water Table Present?	Yes ___	No X	Depth (inches): ___	
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___	**Wetland Hydrology Present? Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP5-Up 3,8

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Festuca heterophylla*	90	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90	=Total Cover	
50% of total cover: 45		20% of total cover: 18	

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	90 (A)		360 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP5-Up 3,8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5Yr 4/2	100					Loamy/Clayey	
6-12	10YR 5/4	100					Loamy/Clayey	
12-20	10YR 4/4	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 12/14/2017

Applicant/Owner: HDR Engineering/ NC DMS State: NC Sampling Point: DP7- W4

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.182288 Long: -82.939861 Datum: UTM 17

Soil Map Unit Name: Rosman fine sandy loam NWI classification: Not Mapped

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:
Narrow wetland that drains into UT 6. Wetland is heavily impacted by cattle.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 4	
Water Table Present?	Yes X	No ___	Depth (inches): 10	
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0	**Wetland Hydrology Present? Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP7- W4

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus serrulata*	30	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
	30	=Total Cover	
50% of total cover: 15		20% of total cover:	6

Sapling/Shrub Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus serrulata*	30	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	30	=Total Cover	
50% of total cover: 15		20% of total cover:	6

Herb Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juncus effusus*	5	No	FACW
2. *Carex abscondita*	40	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	45	=Total Cover	
50% of total cover: 23		20% of total cover:	9

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	5	x 2 =	10
FAC species	40	x 3 =	120
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	105 (A)		190 (B)

Prevalence Index = B/A = 1.81

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP7- W4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 2/1	100					Mucky Loam/Clay	Oxidized Rhizospheres

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
X Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ____________
Depth (inches): ____________

Hydric Soil Present? **Yes** X **No** ___

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 12/14/2017

Applicant/Owner: HDR Engineering State: NC Sampling Point: DP8- Up

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 3%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.182515 Long: -82.940364 Datum: UTM 17

Soil Map Unit Name: Toecane-Tusquitee complex NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks:
Upland along hillside above W4

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___	
Water Table Present?	Yes ___	No X	Depth (inches): ___	
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___	**Wetland Hydrology Present?** **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP8- Up

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size: 30)			
1. *Festuca arundinaceus*	90	Yes	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90	=Total Cover	
50% of total cover:	45	20% of total cover:	18
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	0 (A)		0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP8- Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-5	10YR 3/3	100					Loamy/Clayey	
5-15	10YR 3/4	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 6/5/2018

Applicant/Owner: HDR Engineering State: NC Sampling Point: DP9- W5A

Investigator(s): BNF Section, Township, Range: ____

Landform (hillside, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183025 Long: -82.936953 Datum: UTM 17

Soil Map Unit Name: Rosman fine sandy loam NWI classification: Not mapped

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:
Narrow wetland along toe of slope near UT7

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- X Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 1
Water Table Present?	Yes X	No ___	Depth (inches): 24
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 20

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP9- W5A

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	20	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	20	=Total Cover	
50% of total cover: 10		20% of total cover:	4
Sapling/Shrub Stratum (Plot size: 15')			
1. *Alnus serrulata*	20	Yes	OBL
2. *Ilex opaca*	20	Yes	FACU
3. *Rubus pensilvanicus*	20	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
	60	=Total Cover	
50% of total cover: 30		20% of total cover:	12
Herb Stratum (Plot size: 15')			
1. *Carex abscondita*	10	Yes	FAC
2. *Juncus effusus*	10	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20	=Total Cover	
50% of total cover: 10		20% of total cover:	4
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	30	x 2 =	60
FAC species	30	x 3 =	90
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	100 (A)		250 (B)

Prevalence Index = B/A = 2.50

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP9- W5A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-24	10YR 3/1	98	10YR 3/4	2	C	PL/M	Loamy/Clayey	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
_X_ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** _X_ **No** ___

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 6/5/2018

Applicant/Owner: HDR Engineering State: NC Sampling Point: DP10- W5B

Investigator(s): BNF Section, Township, Range: ____

Landform (hillside, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.182608 Long: -82.937158 Datum: UTM 17

Soil Map Unit Name: Rosman fine sandy loam NWI classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:
Wetland is located in left floodplain of UT7 between TOB and spoil berm.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- X Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 1
Water Table Present?	Yes X	No ___	Depth (inches): 15
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 12

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP10- W5B

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	20	Yes	FACW
2. *Liriodendron tulipifera*	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	30	=Total Cover	
50% of total cover: 15		20% of total cover:	6

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus serrulata*	70	Yes	OBL
2. *Cornus amomum*	10	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	80	=Total Cover	
50% of total cover: 40		20% of total cover:	16

Herb Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Carex spp*	60	Yes	FACW
2. *Juncus effusus*	5	No	FACW
3. *Impatiens*	20	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85	=Total Cover	
50% of total cover: 43		20% of total cover:	17

Woody Vine Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	70	x 1 =	70
FACW species	115	x 2 =	230
FAC species	0	x 3 =	0
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	195 (A)		340 (B)

Prevalence Index = B/A = 1.74

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP10- W5B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100					Loamy/Clayey	
6-15	2.5Y 4/1	90	5YR 4/6	10	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
_X_ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
_X_ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** _X_ **No** ___

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 6/6/2018

Applicant/Owner: HDR Engineering State: NC Sampling Point: DP11- Up

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183190 Long: -82.937072 Datum: UTM 17

Soil Map Unit Name: Rosman fine sandy loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks:
Hillside adjacent to W5B

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP11- Up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30')			
1. *Schedonorus arundinaceus*	90	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90	=Total Cover	
50% of total cover:	45	20% of total cover:	18

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	90 (A)		360 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP11- Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/2	100					Loamy/Clayey	
4-15	2.5Y 6/3	98	2.5Y 6/4	2	C	PL	Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 6/5/2018

Applicant/Owner: HDR Engineering/ NC DMS State: NC Sampling Point: DP12- W6

Investigator(s): BNF Section, Township, Range: ____

Landform (hillside, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183195 Long: -82.941280 Datum: UTM 17

Soil Map Unit Name: Toecane-Tusquitee Complex NWI classification: Not mapped

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____ Hydric Soil Present? Yes X No ____ Wetland Hydrology Present? Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____

Remarks:
Narrow wetland directly abbuting UT4. Wetland is impacted by cattle and broken apart by crossing (seperated between W6 and W6A).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- X Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 1

Water Table Present? Yes X No ____ Depth (inches): 0

Saturation Present? Yes X No ____ Depth (inches): 0

(includes capillary fringe)

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP12- W6

Tree Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	40	Yes	FACW
2. *Liriodendron tulipifera*	40	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	80	=Total Cover	
50% of total cover: 40		20% of total cover:	16

Sapling/Shrub Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Rhododendron maximum*	20	Yes	FAC
2. *Ilex opaca*	15	Yes	FACU
3. *Leucothoe fontanesiana*	5	No	
4.			
5.			
6.			
7.			
8.			
9.			
	40	=Total Cover	
50% of total cover: 20		20% of total cover:	8

Herb Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Carex spp*	10	No	FACW
2. *Juncus effusus*	5	No	FACW
3. *impatiens canadensis*	60	Yes	FACW
4. *Rosa multiflora*	10	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85	=Total Cover	
50% of total cover: 43		20% of total cover:	17

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	115	x 2 =	230
FAC species	20	x 3 =	60
FACU species	65	x 4 =	260
UPL species	0	x 5 =	0
Column Totals:	200 (A)		550 (B)

Prevalence Index = B/A = 2.75

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP12- W6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 2/1	100					Loamy/Clayey	
10-15	10YR 2/1	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
X Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 6/5/2018

Applicant/Owner: HDR Engineering State: NC Sampling Point: DP13- W7

Investigator(s): BNF, KEB Section, Township, Range: ____

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.182151 Long: -82.942415 Datum: UTM 17

Soil Map Unit Name: Chesnut-Edneyville complex NWI classification: Not mapped

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:
Wetland is on left floodplain of UT4A

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
X Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 24
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 20

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP13- W7

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	40	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	40	=Total Cover	
50% of total cover: 20		20% of total cover:	8

Sapling/Shrub Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30)			
1. *Carex spp*	20	Yes	FACW
2. *Polygonum sp.*	50	Yes	FACW
3. *Fescue spp*	30	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100	=Total Cover	
50% of total cover: 50		20% of total cover:	20

Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	110	x 2 =	220
FAC species	30	x 3 =	90
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	140 (A)		310 (B)

Prevalence Index = B/A = 2.21

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP13- W7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5YR 3/1	100					Loamy/Clayey	
2-8	10YR 4/1	98	10YR 4/6	2	C	PL	Loamy/Clayey	
8-20	10YR 6/2	90	10YR 4/6	10	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
_X_ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
_X_ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** _X_ **No** ___

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 6/5/2018

Applicant/Owner: HDR Engineering State: NC Sampling Point: DP14- W8

Investigator(s): KEB Section, Township, Range: ____

Landform (hillside, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.184325 Long: -82.938741 Datum: UTM 17

Soil Map Unit Name: Saunook loam NWI classification: Not Mapped

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes X No ____	

Remarks:
Wetland adjacent to UT5 and along fringe of pond

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

X Surface Water (A1)	___ True Aquatic Plants (B14)
X High Water Table (A2)	___ Hydrogen Sulfide Odor (C1)
X Saturation (A3)	___ Oxidized Rhizospheres on Living Roots (C3)
___ Water Marks (B1)	___ Presence of Reduced Iron (C4)
___ Sediment Deposits (B2)	___ Recent Iron Reduction in Tilled Soils (C6)
___ Drift Deposits (B3)	___ Thin Muck Surface (C7)
___ Algal Mat or Crust (B4)	___ Other (Explain in Remarks)
___ Iron Deposits (B5)	
___ Inundation Visible on Aerial Imagery (B7)	
___ Water-Stained Leaves (B9)	
___ Aquatic Fauna (B13)	

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 1
Water Table Present?	Yes X	No ____	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 6

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Pond area is affecting wetland hydrology.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP14- W8

Tree Stratum (Plot size: 10x10)

	Absolute % Cover	Dominant Species?	Indicator Status
1. *Carpinus caroliniana*	40	Yes	FACW
2. *Alnus serrulata*	40	Yes	OBL
3.			
4.			
5.			
6.			
7.			
	80	=Total Cover	

50% of total cover: 40 20% of total cover: 16

Sapling/Shrub Stratum (Plot size: 10x10)

	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus serrulata*	20	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	20	=Total Cover	

50% of total cover: 10 20% of total cover: 4

Herb Stratum (Plot size: 10x10)

	Absolute % Cover	Dominant Species?	Indicator Status
1. *Carex spp*	20	Yes	FACW
2. *Juncus effusus*	20	Yes	FACW
3. *Impatiens*	20	Yes	FACW
4. *Polygonum*	20	Yes	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80	=Total Cover	

50% of total cover: 40 20% of total cover: 16

Woody Vine Stratum (Plot size:)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	120	x 2 =	240
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	180 (A)		300 (B)

Prevalence Index = B/A = 1.67

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP14- W8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5YR 5/2	90	7.5YR 4/3	10	C	PL	Loamy/Clayey	
2-10	7.5YR 3/1	100					Sandy	
10-20	7.5YR 4/1	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 6/5/2018

Applicant/Owner: HDR Engineering State: NC Sampling Point: DP15- W9

Investigator(s): KEB Section, Township, Range: ____

Landform (hillside, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183534 Long: -82.946157 Datum: UTM 17

Soil Map Unit Name: Tate fine sandy loam NWI classification: Not Mapped

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland?	**Yes X No ____**
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks:
Wetland adjacent to UT1 as UT1 enters floodplain of WFFB. Wetland is heavily impacted by cattle.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ True Aquatic Plants (B14)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 4
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 6

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP15- W9

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	30	Yes	FACW
2. *Liquidambar styraciflua*	30	Yes	FAC
3. *Oxydendrum arboretum*	20	Yes	
4.			
5.			
6.			
7.			
	80	=Total Cover	
50% of total cover: 40		20% of total cover:	16

Sapling/Shrub Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Rhododendron maximum*	20	Yes	FAC
2. *Ilex opaca*	5	No	FACU
3. *Leucothoe fontanesiana*	5	No	
4.			
5.			
6.			
7.			
8.			
9.			
	30	=Total Cover	
50% of total cover: 15		20% of total cover:	6

Herb Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juncus effusus*	30	Yes	FACW
2. *Polygonum pensylvanicum*	20	Yes	FACW
3. *Impatiens*	10	No	FACW
4. *Carex spp*	10	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	70	=Total Cover	
50% of total cover: 35		20% of total cover:	14

Woody Vine Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	50	x 3 =	150
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	155 (A)		370 (B)

Prevalence Index = B/A = 2.39

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP15- W9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/1	100					Loamy/Clayey	
6-12	10YR 3/2	100					Loamy/Clayey	
12-16	10YR 4/1	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
_X_ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** _X_ **No** ___

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Owen Farms Stream and Wetland Mitigation Site City/County: Transylvania County Sampling Date: 12/14/2017

Applicant/Owner: HDR Engineering State: NC Sampling Point: DP16- Up 9

Investigator(s): BNF Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Hillside Local relief (concave, convex, none): None Slope (%): 2%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.183564 Long: -82.945911 Datum: UTM 17

Soil Map Unit Name: Tate fine sandy loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks:
Located within active cattle pasture outside of floodplain of UT1

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___	
Water Table Present?	Yes ___	No X	Depth (inches): ___	
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___	**Wetland Hydrology Present? Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP16- Up 9

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Schedonorus arundinaceus*	90	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90	=Total Cover	
50% of total cover:	45	20% of total cover:	18

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	90 (A)		360 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP16- Up 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-6	10YR 5/2	100					Loamy/Clayey	
6-12	2.5YR 5/4	100					Loamy/Clayey	
12-18	2.5Y 5/3	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Mucky Mineral (F1) **(MLRA 136)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 122, 136)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? **Yes** ___ **No** X

Remarks:
This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen / UT1	Latitude: 35°10'59.32"N
Evaluator: BNF	County: Transylvania	Longitude: 82°56'45.35"W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 33.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 17)

	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: mayfly, stonefly, & caddisfly observed but not abundant

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen / UT 2	Latitude: 35°10'58.51"N
Evaluator: BNF	County: Transylvania	Longitude: 82°56'36.36"W
Total Points: 33.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** **Ephemeral Intermittent Perennial**	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 17)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: mayfly, stonefly, & caddisfly observed but not abundant

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen / UT 2a	Latitude: 35°10'57.67" N
Evaluator: BNF	County: Transylvania	Longitude: 82°56'41.78" W
Total Points: 30.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** **Ephemeral Intermittent Perennial**	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 15.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: caddisfly, mayfly, stonefly - not adundant

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen / UT 2b	Latitude: 35°10'58.52" N
Evaluator: BNF	County: Transylvania	Longitude: 82°56'34.21" W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 21	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 8.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

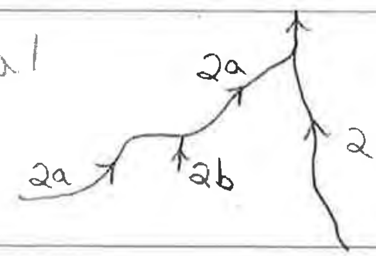
B. Hydrology (Subtotal = 6.5)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 6)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: - spring fed perennial that drains into UT 2a



NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen / UT 3	Latitude: 35°11'00.93"N
Evaluator: BNF	County: Transylvania	Longitude: 82°56'29.90" W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 20	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 7.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 6.5)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 6)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: caddisfly

Sketch: - stream is at least intermittent & may be a perennial spring fed wetland/stream complex

NC DWQ Stream Identification Form Version 4.11

Date: 1-16-18	**Project/Site:** Owen/UT4	**Latitude:** 35°10'57.76"N
Evaluator: BNF	**County:** Transylvania	**Longitude:** 82°56'27.7"W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 31.5	**Stream Determination (circle one)** Ephemeral Intermittent **Perennial**	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 15.5)	Absent	Weak	Moderate	Strong
1[a.] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: mayfly, caddisfly, stonefly - not abundant

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen / UT 4a	Latitude: 35°10'55.80" N
Evaluator: BNK	County: Transylvania	Longitude: 82°56'32.12" W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 26	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	Other *e.g. Quad Name:*

A. Geomorphology (Subtotal = 13)	Absent	Weak	Moderate	Strong
1ª Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

ª artificial ditches are not rated; see discussions in manual

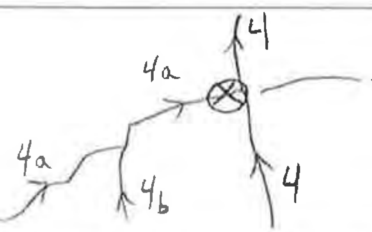
B. Hydrology (Subtotal = 6)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 7)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: caddisfly

Sketch:



big headcut at confluence with UT 4; stream appears straightened above headcut

* rated intermittent but likely spring fed perennial

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	**Project/Site:** Owen/UT 46	**Latitude:** 35°10'54.36"N
Evaluator: BNF	**County:** Transylvania	**Longitude:** 82°56'31.57"W
Total Points: 22 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** **Ephemeral Intermittent Perennial**	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 10)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 6)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 6)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: springfed perennial

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen/UT 5	Latitude: 35°11'02.66"N
Evaluator: BNF	County: Transylvania	Longitude: 82°56'23.58"W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 27.5	**Stream Determination (circle one)** **Ephemeral Intermittent Perennial**	Other *e.g. Quad Name:*

A. Geomorphology (Subtotal = 12)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: caddisfly, mayfly - not abundant

Sketch: pond located at head of UT 5

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	**Project/Site:** Owen/UT 6	**Latitude:** 35°10'54.60" N
Evaluator: BNF/RVS	**County:** Transylvania	**Longitude:** 82°56'22.77" W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 29.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 19)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 4.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen / UT 6a	Latitude: 35°10'55.95" N
Evaluator: BNF	County: Transylvania	Longitude: 82°56'23.78" W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 30	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	Other *e.g. Quad Name:*

A. Geomorphology (Subtotal = 15.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7.5)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 7)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: caddisfly

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen / UT 7	Latitude: 35°10'58.07" N
Evaluator: BNF / RVS	County: Transylvania	Longitude: 82°56'14.19" W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 32.5	**Stream Determination (circle one)** **Ephemeral Intermittent Perennial**	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 16)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: caddisfly, mayfly observed - not abundant

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen/UT 7a	Latitude: 35°11'00.77"N
Evaluator: BNF/RVS	County: Transylvania	Longitude: 82°56'11.87"W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 22.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 12)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 3.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 7)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: caddisfly

Sketch: small spring fed tributary

NC DWQ Stream Identification Form Version 4.11

Date: 12-14-17	Project/Site: Owen/UT 7b	Latitude: 35°10'59.52" N
Evaluator: BNF/RVS	County: Transylvania	Longitude: 82°56'11.59" W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 29.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 15)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 6-6-18	Project/Site: Owen / UT 8	Latitude: 35°11′06.80″N
Evaluator: BNF	County: Transylvania	Longitude: 82°56′33.74″W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 38	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 17.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9.5)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 11)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: mayflies, caddisflies, stoneflies; stable stream flowing near NW property boundary

Sketch:
Bank height: 1-2′
Bankfull width: 8-10′
Water depth: 4-10″
Substrate: cobble/gravel
Velocity: fast, moderate, slow
Clarity: clear, turbid, slightly turbid

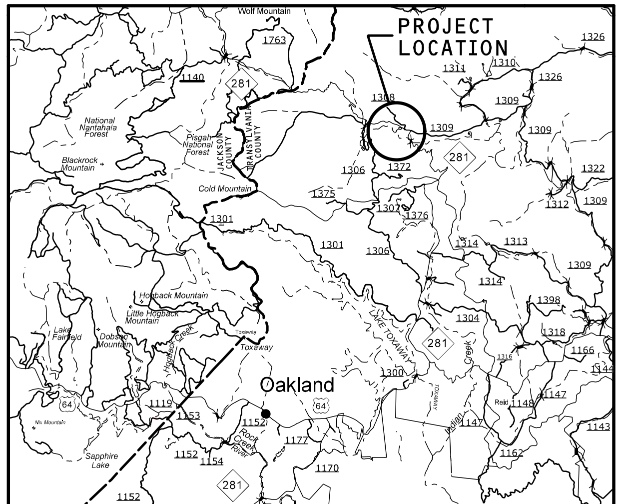
Appendix G – Plan Sheets

MITIGATION PLANS
OWEN FARMS
MITIGATION SITE

LOCATION: TRANSYLVANIA COUNTY, NORTH CAROLINA

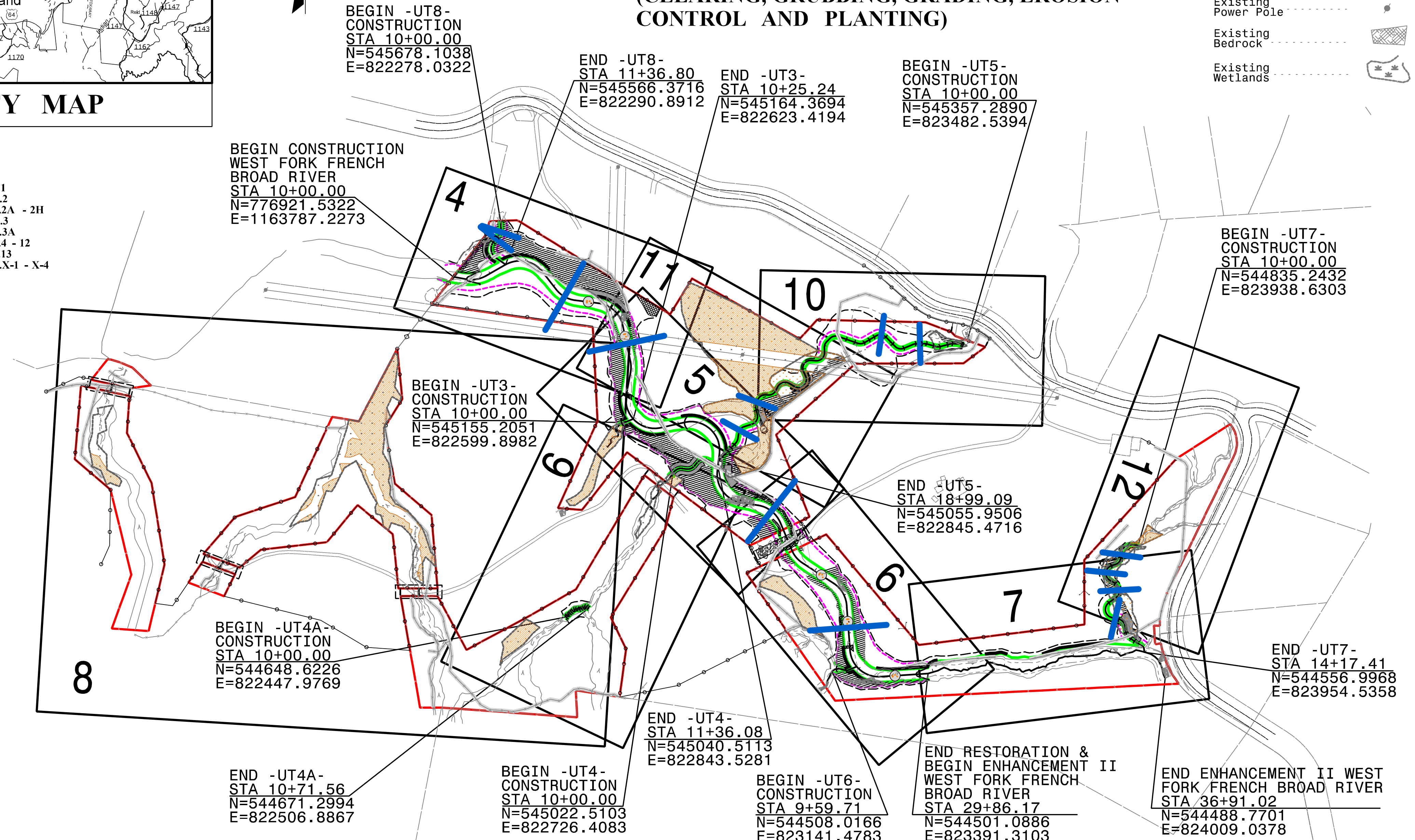
LAT: 35°11' 01" **LONG: -82 56' 46"**

TYPE OF WORK: STREAM & WETLAND RESTORATION (CLEARING, GRUBBING, GRADING, EROSION CONTROL AND PLANTING)



VICINITY MAP

INDEX OF SHEETS



CONVENTIONAL SYMBOLS

- Stream or Body of Water
- Pipe Culvert
- Existing Fence
- Existing Guardrail
- Existing Top of Bank
- Existing Over Head Power Line
- Existing Power Pole
- Existing Bedrock
- Existing Wetlands
- Existing Boulder Toe
- Conservation Easement — E —
- Temporary Construction Easement — TCE —
- Selected Cross-Sections
- Proposed Bankfull
- Proposed Floodplain Bench
- Proposed Limits of Construction
- Fill In Existing Channel
- Spoil Removal
- Impervious Channel Plug
- Soil Lift w/ Toewood and Hellbender Habitat
- Proposed Ford Crossing
- Proposed Fill Protection
- Rock Step Structure w/ Boulders and Hellbender Habitat
- Rock Step Structure w/ Class B Rip Rap
- Log Sill
- Hellbender Habitat
- Floodplain Interceptor (FPI)
- Rock Cross Vane W/ Hellbender Habitat
- Wetland Enhancement (E)
- Wetland Rehabilitation (R)
- Wetland Re-Establishment
- Proposed Gate
- Proposed 3-Strand Barbed Wire Fence
- Proposed Woven Wire Fence
- Proposed Kissing Gate
- Existing Fence To Be Removed

GRAPHIC SCALES

PLANS: 50 25 0 50 100

PROFILE (HORIZONTAL): 10 5 0 10 20

PROFILE (VERTICAL): 20 10 0 20 40

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

PROJECT LENGTH

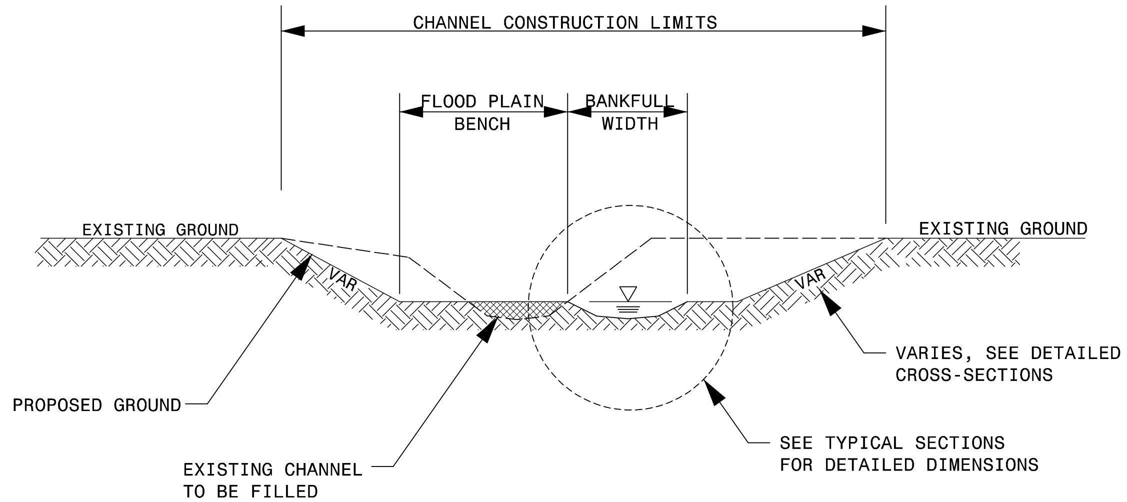
		EXISTING STREAM LENGTH	PROPOSED DESIGN STREAM LENGTH
WEST FORK FRENCH BROAD RIVER	=	2,859.55 FT	2,691.02 FT
-UT4A-	=	471.56 FT	71.56 FT
-UT5-	=	652.00 FT	899.09 FT
-UT7-	=	811.00 FT	417.41 FT
-UT8-	=	49.00 FT	136.80 FT

Prepared in the Office of:

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

CHRISTOPHER L. SMITH
PROJECT DESIGNER / ENGINEER

CONTRACT: OWEN FARMS MITIGATION SITE



TYPICAL CHANNEL SECTION

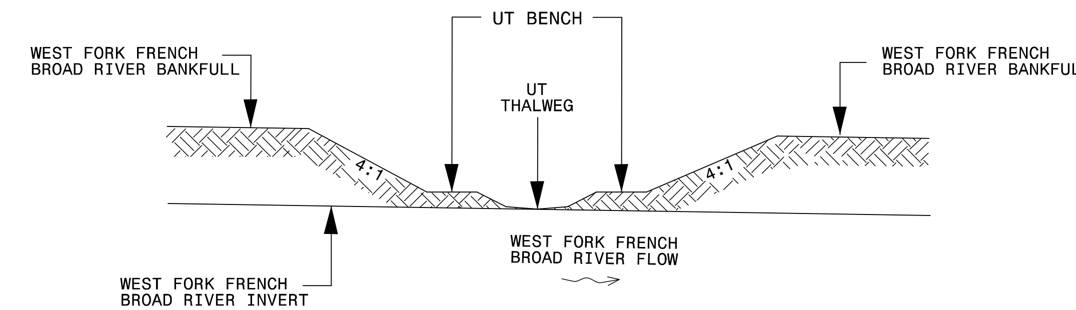
VARIABLE	STATION - STATION	MINIMUM FLOODPLAIN BENCH
WEST FORK FRENCH BROAD RIVER	10+00.00 - 29+86.17	15'
TRIBUTARY 4A	10+00.00 - 10+71.56	10'
TRIBUTARY 5	10+00.00 - 18+99.09	10'
TRIBUTARY 7	10+00.00 - 14+17.41	10'
TRIBUTARY 8	10+00.00 - 11+36.80	10'

TYPICAL TRIBUTARY CONFLUENCE GRADING

SCALE: NTS

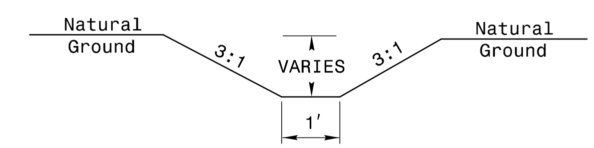
NOTES:

1. SEE TYPICAL SECTIONS FOR WEST FORK FRENCH BROAD RIVER & UT CHANNEL DIMENSIONS



HALF BANKFULL CHANNEL -UT5-

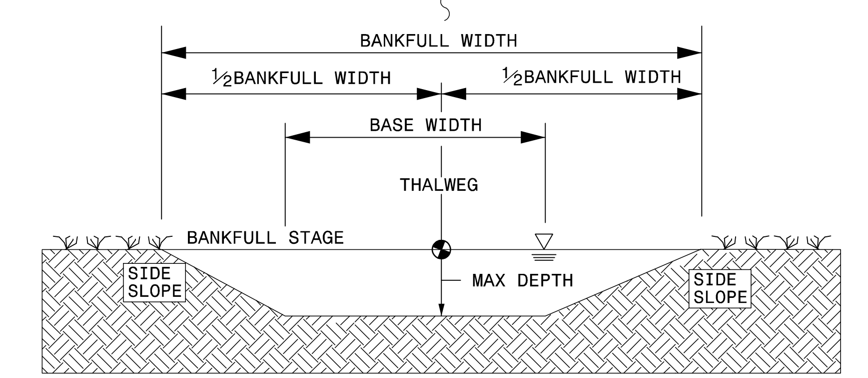
SCALE: NTS



TYPICAL SECTION - RIFFLE

SCALE: NTS
ALL UNITS ARE IN FEET

VARIABLE	WEST FORK FRENCH BROAD RIVER	TRIBUTARY 4A	TRIBUTARY 5	TRIBUTARY 7	TRIBUTARY 8
BANKFULL WIDTH	30.0	10.5	8.5	9.0	12.0
BASE WIDTH	16.7	4.0	4.8	5.05	6.7
MAXIMUM DEPTH	2.68	1.0	0.76	0.79	1.10
SIDE SLOPE	2.5:1	3.2:1	2.5:1	2.5:1	2.4:1



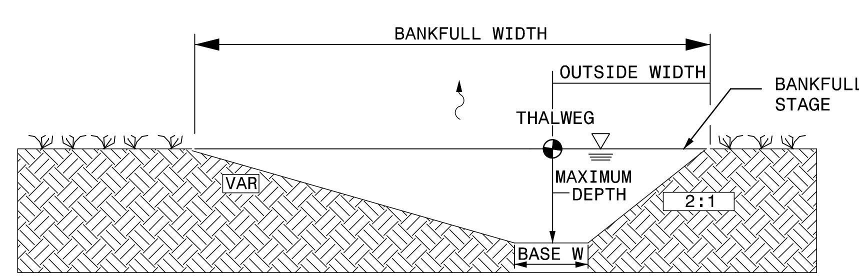
THALWEG (DEEPEST POINT IN CROSS SECTION) IS LOCATED IN CENTER OF CHANNEL IN A RIFFLE.

NOTES:
- ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE (DOWNSTREAM) DIRECTION.
- GRADE POINT IS THE ELEVATION SHOWN ON PROFILE.
- ALL SHARP CORNERS SHOULD BE ROUNDED

TYPICAL SECTION - POOL RIGHT

SCALE: NTS
ALL UNITS ARE IN FEET

VARIABLE	WEST FORK FRENCH BROAD RIVER	TRIBUTARY 5	TRIBUTARY 7	TRIBUTARY 8
BANKFULL WIDTH	37.5	10.63	11.25	15.0
BASE WIDTH	7.5	2.13	2.25	3.0
MAX DEPTH	4.29	1.26	1.33	1.85
OUTSIDE WIDTH	12.33	3.59	3.79	5.20
BAR SIDE SLOPE	5.0	4.75	4.8	4.75
RIGHT BANK SIDE SLOPE	2.0	2.0	2.0	2.0



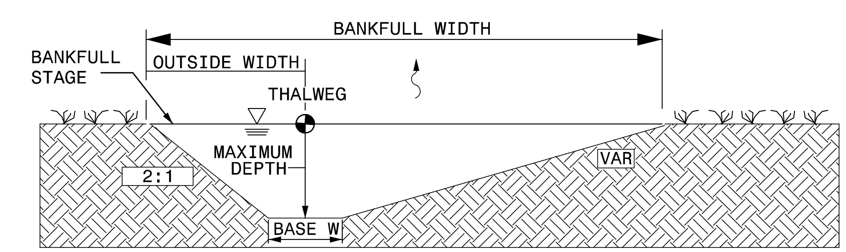
THALWEG (DEEPEST POINT IN A CROSS SECTION) IS LOCATED IN THE MIDDLE OF THE BASE WIDTH.

NOTES:
- ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE (DOWNSTREAM) DIRECTION.
- GRADE POINT IS THE ELEVATION SHOWN ON PROFILE.
- ALL SHARP CORNERS SHOULD BE ROUNDED

TYPICAL SECTION - POOL LEFT

SCALE: NTS
ALL UNITS ARE IN FEET

VARIABLE	WEST FORK FRENCH BROAD RIVER	TRIBUTARY 5	TRIBUTARY 7	TRIBUTARY 8
BANKFULL WIDTH	37.5	10.63	11.25	15.0
BASE WIDTH	7.5	2.13	2.25	3.0
MAX DEPTH	4.29	1.26	1.33	1.85
OUTSIDE WIDTH	12.33	3.59	3.79	5.20
BAR SIDE SLOPE	5.0	4.75	4.8	4.75
LEFT BANK SIDE SLOPE	2.0	2.0	2.0	2.0



THALWEG (DEEPEST POINT IN A CROSS SECTION) IS LOCATED IN THE MIDDLE OF THE BASE WIDTH.

NOTES:
- ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE (DOWNSTREAM) DIRECTION.
- GRADE POINT IS THE ELEVATION SHOWN ON PROFILE.
- ALL SHARP CORNERS SHOULD BE ROUNDED

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OWEN FARMS MITIGATION SITE
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TRANSYLVANIA COUNTY, NORTH CAROLINA

NOT TO SCALE

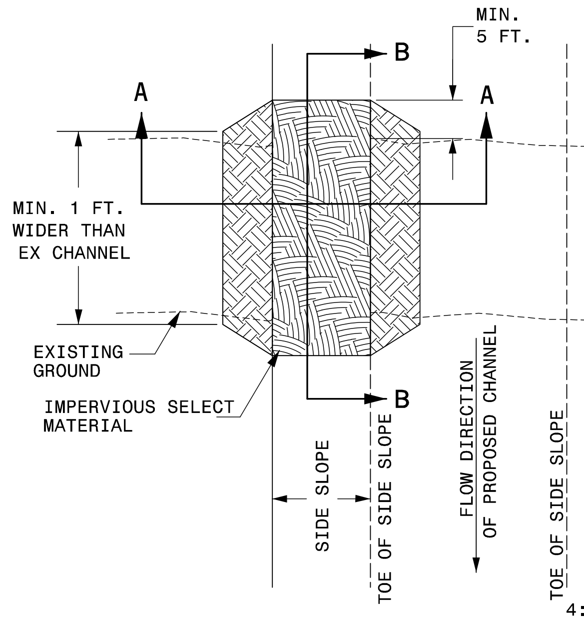
DATE: 11-14-19

TYPICAL SECTIONS

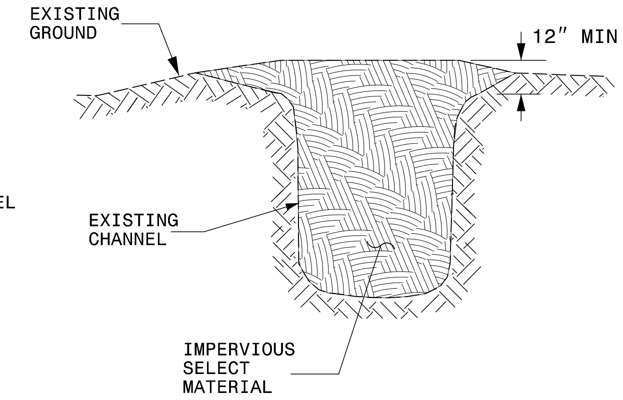
SHEET 2

IMPERVIOUS CHANNEL PLUG

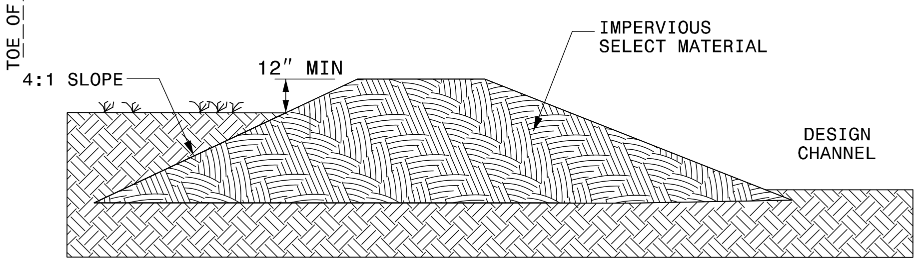
SCALE: NTS



PLAN VIEW



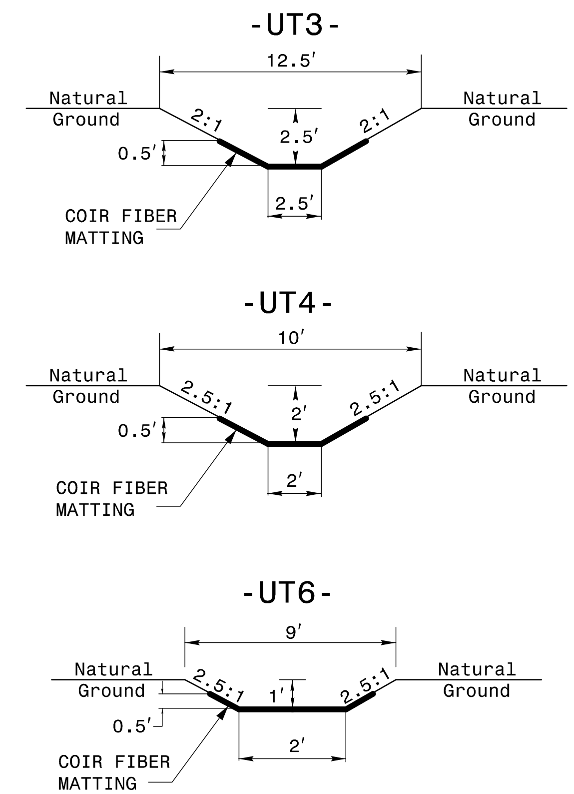
SECTION B-B



SECTION A-A

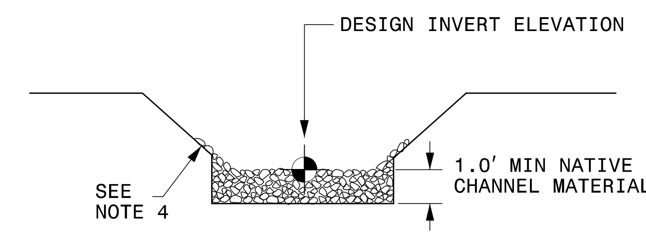
CHANNEL CONFLUENCE

SCALE: NTS



RIFFLE SEEDING

SCALE:NTS

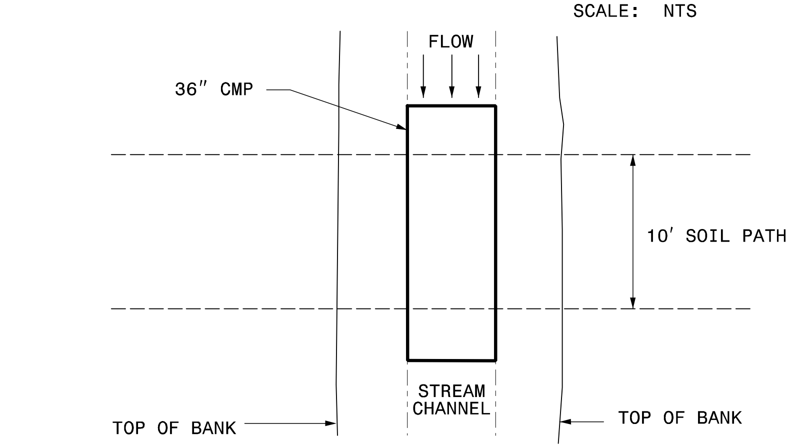


NOTES:

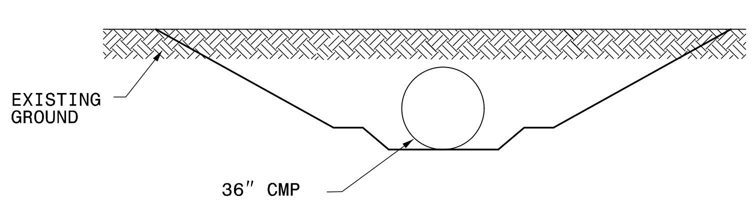
1. CONTRACTOR SHALL EXCAVATE GRAVEL MATERIAL FROM THE EXISTING CHANNELS ON ALL RESTORED STREAMS FOR USE AS RIFFLE SEEDING.
2. CONTRACTOR SHALL SEED ALL RIFFLES (LENGTH BETWEEN "TOP OF RIFFLE" AND "BOTTOM OF RIFFLE" AS DEPICTED ON PROFILE DATA SHEETS) WITH NATIVE GRAVEL MATERIAL.
3. CONTRACTOR SHALL OVER EXCAVATE CHANNEL INVERT A MINIMUM OF 1.0′ AND BACKFILL WITH NATIVE GRAVEL.
4. CONTRACTOR SHALL LINE CHANNEL SIDE SLOPE WITH A MINIMUM OF 0.2′ OF GRAVEL MATERIAL ON THE TRIBUTARIES AND 0.5′ MINIMUM OF GRAVEL MATERIAL ON WEST FORK FRENCH BROAD RIVER.

PERMANENT STREAM CROSSING NO. 1 W/ 36″ CMP

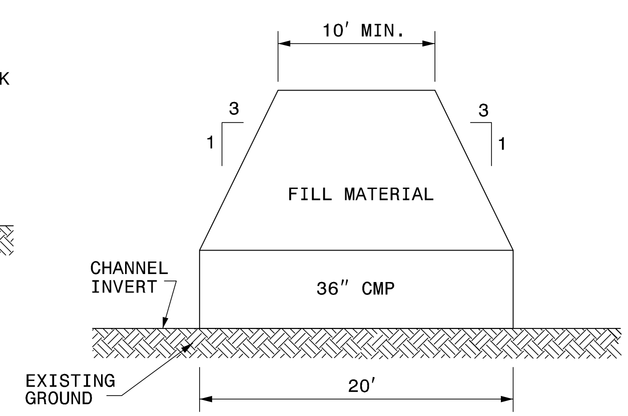
SCALE: NTS



PLAN VIEW



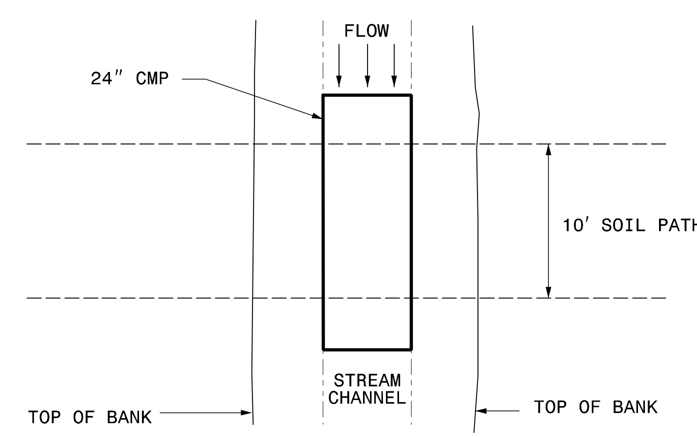
CROSS-SECTION VIEW



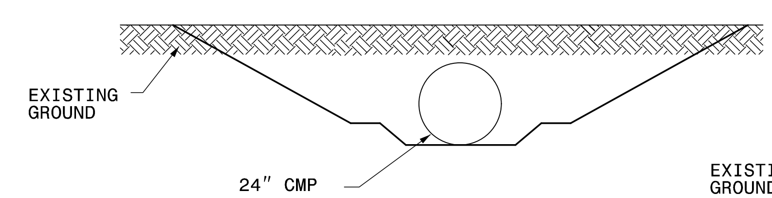
PROFILE ALONG CULVERT

PERMANENT STREAM CROSSINGS NO. 2,3 & 4 W/ 24″ CMP

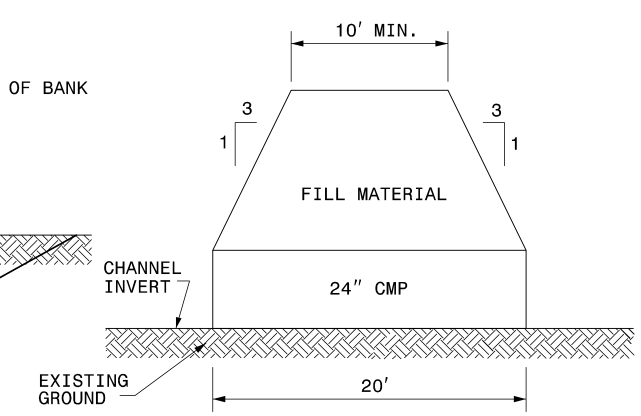
SCALE: NTS



PLAN VIEW



CROSS-SECTION VIEW



PROFILE ALONG CULVERT

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OWEN FARMS MITIGATION SITE
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DETAILS

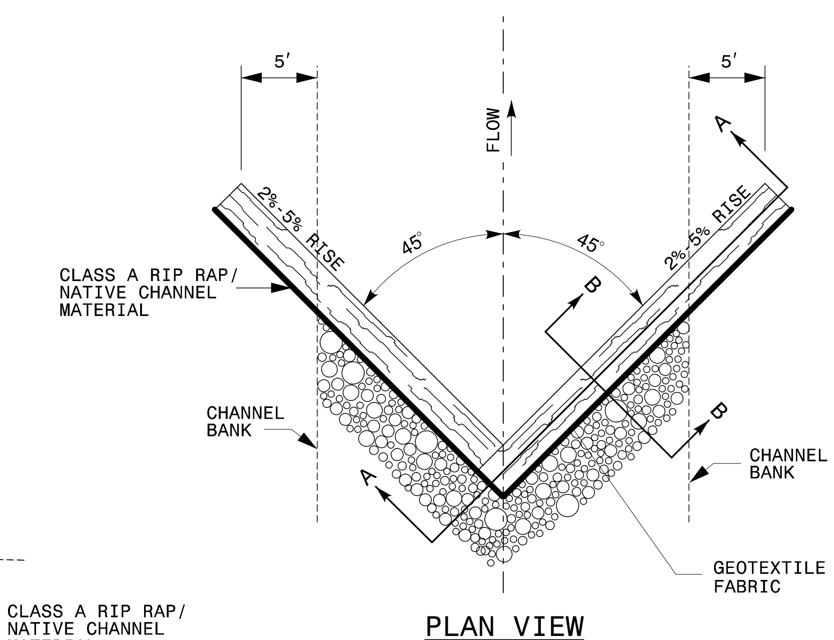
SHEET

2A

LOG SILL
SCALE: NTS

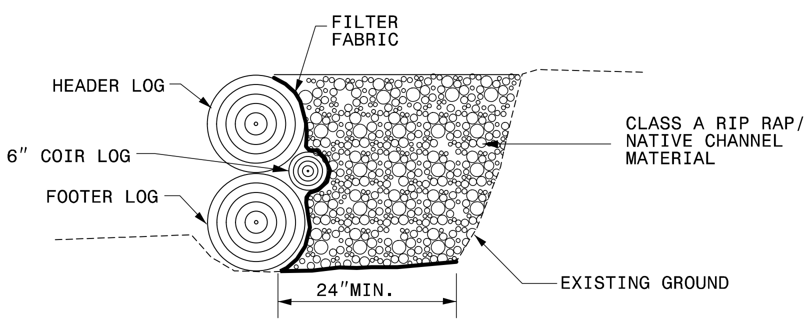
NOTES:

1. LOG SILL LOGS SHALL BE OF A HARDWOOD SPECIES, AND SHALL BE A MINIMUM 18″ IN DIAMETER, MEASURED AT ANY POINT ALONG THE LOG (FOOTER LOG MAY BE SUBSTITUTED WITH PINE).
2. ANGLE OF LOGS IN CHANNEL SHALL MATCH THE ANGLE OF THE LOG AS SHOWN ON THE PLAN VIEW WITHIN THE PLANS OR DIRECTED BY DESIGNER.
3. LENGTH OF LOG SHALL EXTEND A MINIMUM OF 5′ (MEASURED PERPENDICULAR TO BANKLINE) INTO EACH BANK.
4. LOGS SHALL BE SLOPED BETWEEN 2% - 5% TO DIRECT FLOW AWAY FROM EACH BANK.
5. CHANNEL MATERIAL CAN BE USED TO BACKFILL IF MATERIAL HAS AN ADVERAGE SIZE OF 2″ OR GREATER. MATERIAL TO BE MEASURED ALONG THE MEDIAN AXIS.

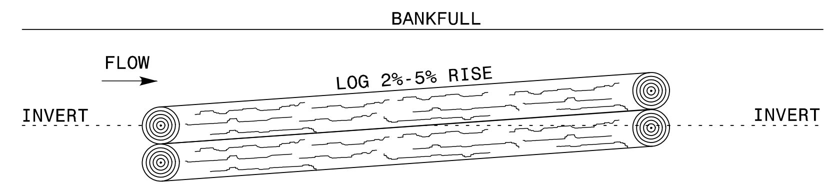


PLAN VIEW

LOG SILL LENGTH
15′



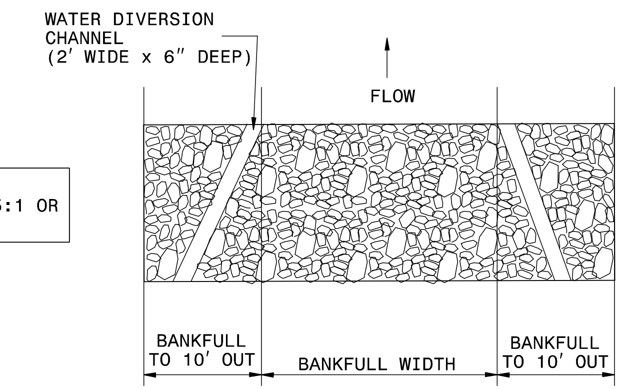
SECTION B-B



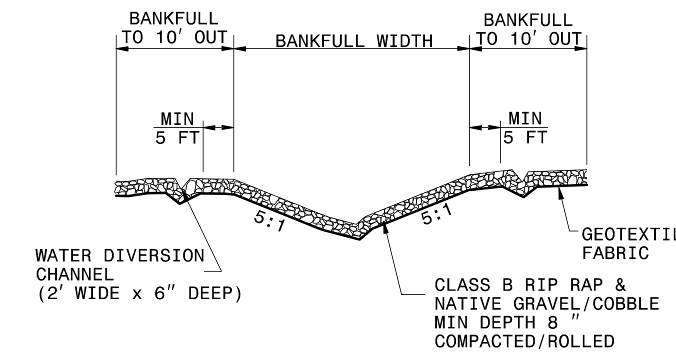
SECTION A-A

PERMANENT FORD CROSSING
SCALE: NTS

NOTE:
FORD APPROACH TO BE 5:1 OR FLATTER.



PLAN VIEW

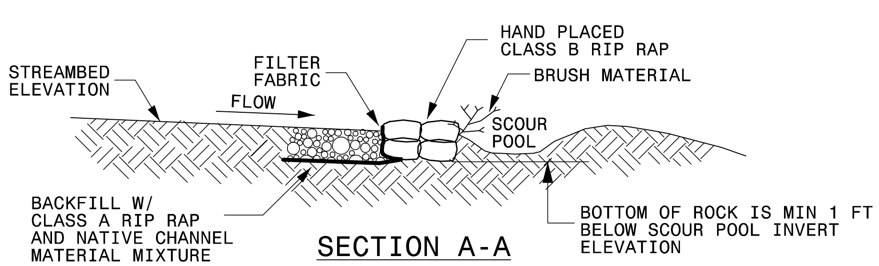


CROSS-SECTION

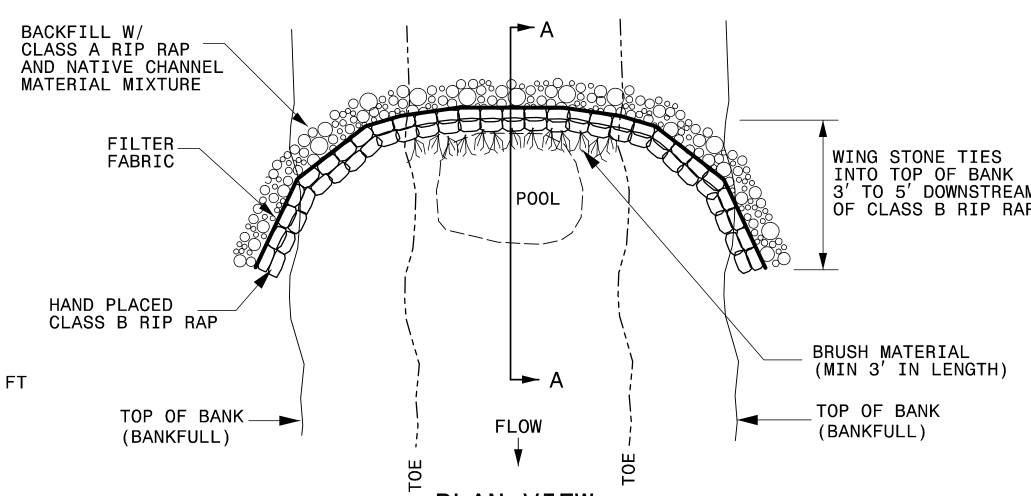
NOTES:

1. FILTER FABRIC SHALL BE PLACED AT LEAST 5′ BEHIND CLASS B RIP RAP AND BACKFILLED WITH CLASS A RIP RAP AND NATIVE CHANNEL MATERIAL MIXTURE (AS APPROVED BY DESIGNER).
2. BRUSH MATERIAL SHALL CONSIST OF WOODY DEBRIS NO LESS THAN 0.25″ DIAMETER, SPACED NO GREATER THAN 6″ CENTERS. BRUSH MATERIAL SHALL BE A MINIMUM OF 3′ LONG WITH A MINIMUM OF 1.5′ IN THE CHANNEL BED AND 1.5′ PROTRUDING OUT OF THE BANK.
3. BOULDER SIZE SHALL MEET THE MINIMUM DIMENSIONS OF 30″(L) X 30″(W) X 24″(D).

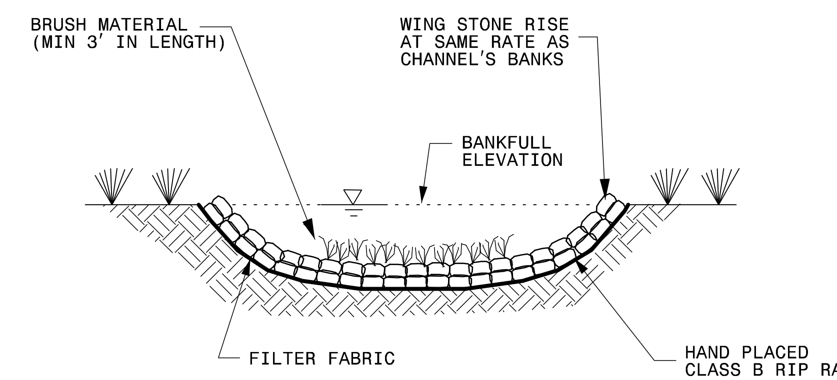
ROCK STEP STRUCTURE W/ CLASS B RIP RAP
SCALE:NTS



SECTION A-A



PLAN VIEW



CROSS-SECTION

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

NOT TO SCALE

DATE: 11-14-19

DETAILS

SHEET

2B

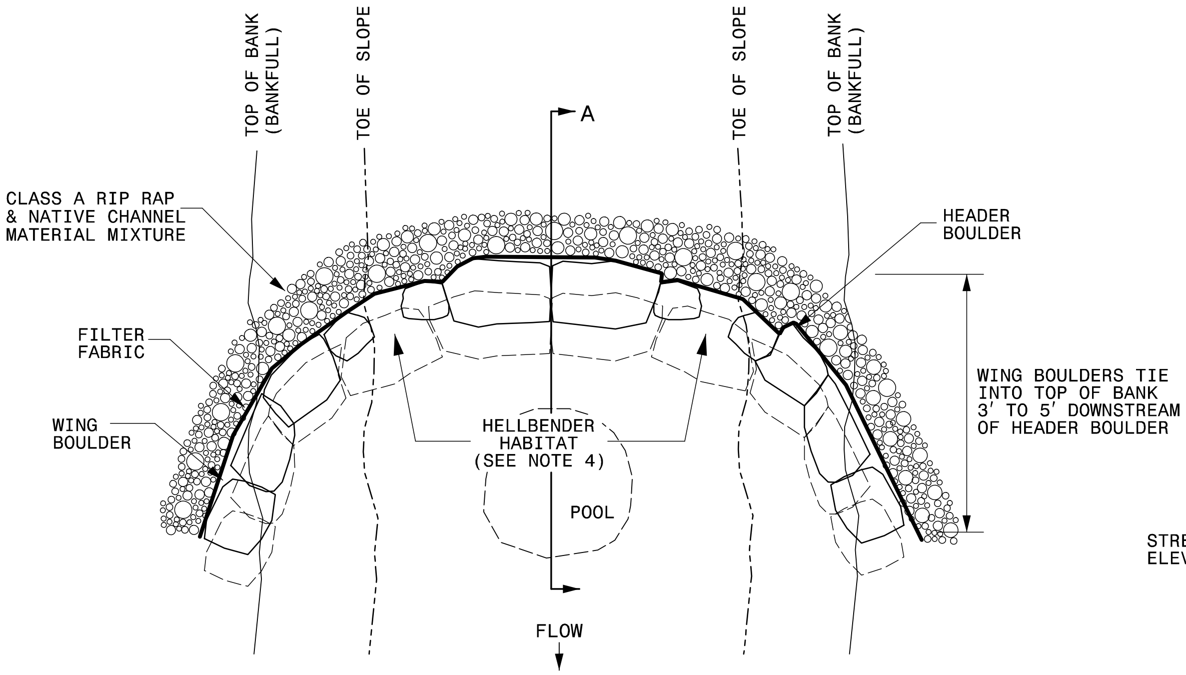
$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$$$$$USERNAME$$$$$

ROCK STEP STRUCTURE W/ BOULDERS AND HELLBENDER HABITAT

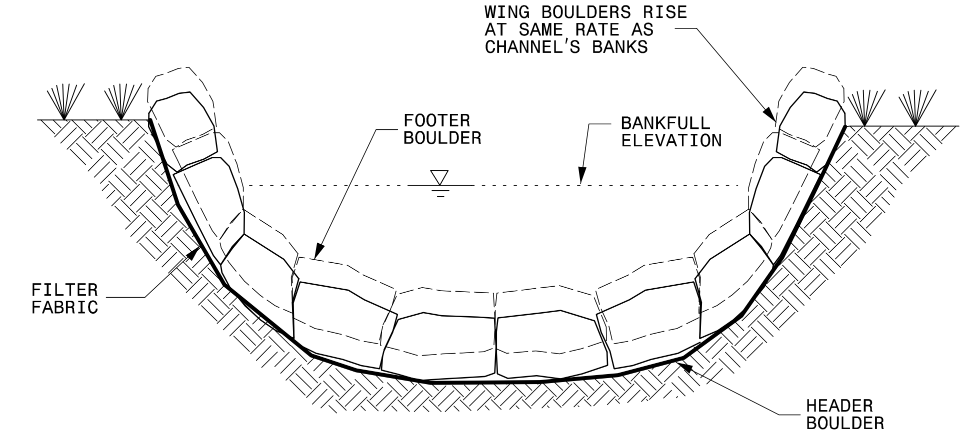
SCALE:NTS

NOTES:

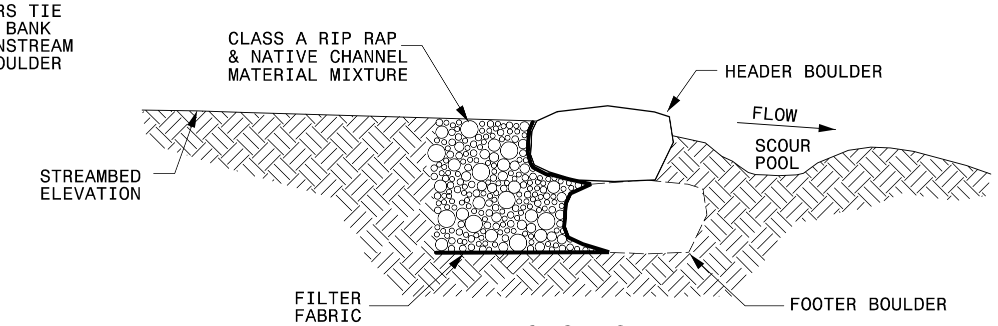
1. ALL STONES ARE TO BE STRUCTURE STONE.
2. BOULDERS SHALL BE NATIVE STONE OR SHOT ROCK, CUBICAL OR RECTANGULAR IN NATURE. WING BOULDERS MAY BE MORE RECTANGULAR THEN CUBICAL.
3. FILTER FABRIC SHALL BE PLACED AT LEAST 5' BEHIND HEADER BOULDERS AND BACKFILLED WITH CLASS A RIP RAP & NATIVE CHANNEL MATERIAL MIXTURE.
4. CONSTRUCT GAPS IN FOOTER BOULDER FOR HELLBENDER HABITAT.
5. BOULDER SIZE SHALL MEET THE MINIMUM DIMENSIONS OF 30"(L) X 30"(W) X 24"(D).



PLAN VIEW



CROSS-SECTION



SECTION A-A

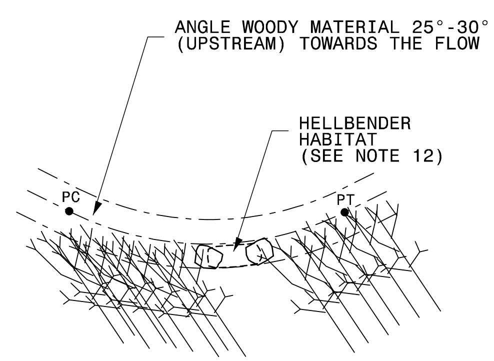
SOIL LIFT W/ BRUSH TOE AND HELLBENDER HABITAT

SCALE: NTS

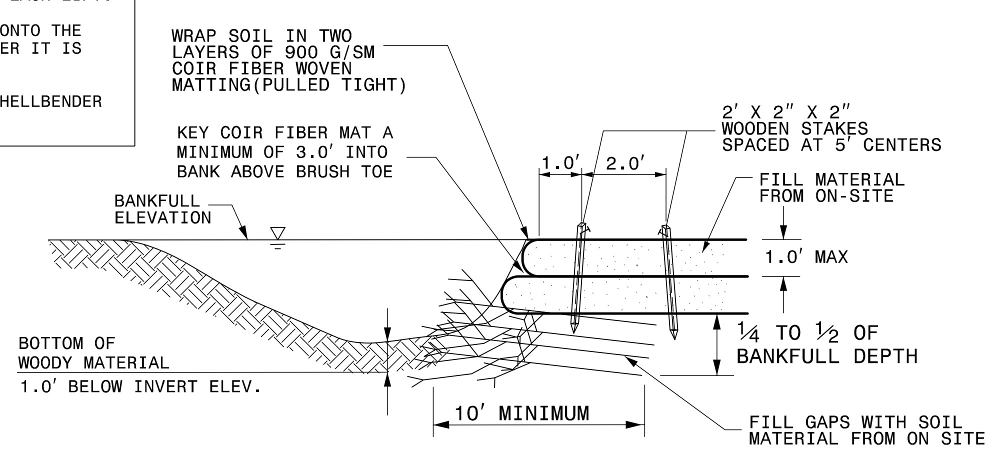
NOTES:

1. WOODEN STAKES SHALL HAVE A 2" GALVANIZED ROOFING NAIL INSERTED AT THE TOP TO HOLD MATTING IN PLACE.
2. WOODEN STAKES SHALL BE SPACED AT 5' CENTER AT THE TOP OF SLOPE.
3. BRUSH TOE MATERIAL SHALL BE HARDWOOD SPECIES, AND SHOULD NOT BE DETERIORATED AT THE TIME OF INSTALLATION.
4. WHEN BACKFILLING OVER AND AROUND WOODY MATERIAL PACK FIRMLY TO SECURE ALL CONNECTIONS AND GAPS. THERE SHOULD BE NO GAP BETWEEN BOTTOM OF WOODY MATERIAL & STREAMBED. SOIL MATERIAL SHALL BE USED TO FILL GAPS.
5. WOODY MATERIAL SHALL OVERLAP.
6. WOODY MATERIAL SHALL BE A MINIMUM OF 3" DIAMETER AND A MINIMUM OF 10' IN LENGTH.
7. WOODY MATERIAL SHALL BE DENSLY PACKED TO FILL AND PROTECT STREAMBANK TOE.
8. CONTRACTOR IS TO USE 10' WIDE COIR FIBER MATTING TO WRAP SOIL LIFTS.
9. FILL MATERIAL SHALL BE COMPOSED OF MATERIALS OBTAINED ON SITE AND APPROVED BY DESIGNER.
10. THE CONTRACTOR IS TO MECHANICALLY COMPACT FILL MATERIAL UPON COMPLETION OF EACH LIFT.
11. THE CONTRACTOR IS TO BRUSH SEED ONTO THE FACE OF THE ENTIRE SOIL LIFT AFTER IT IS COMPLETED.
12. CONSTRUCT GAPS IN BRUSH TOE FOR HELLBENDER HABITAT.

NOTE:
HELLBENDER HABITAT IS NOT NEEDED ON UT5 SOIL LIFT.



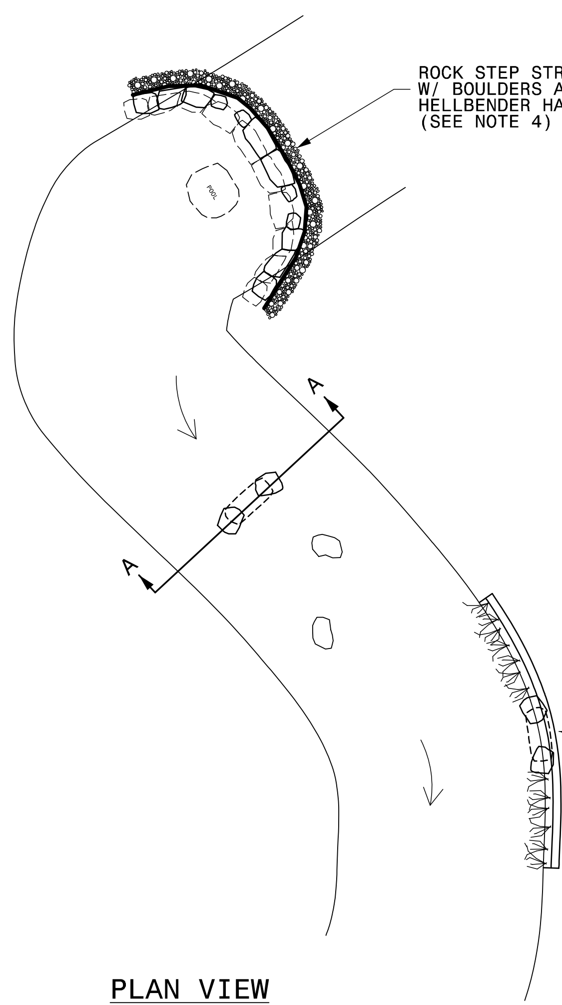
TYPICAL INSTALLATION PLAN VIEW



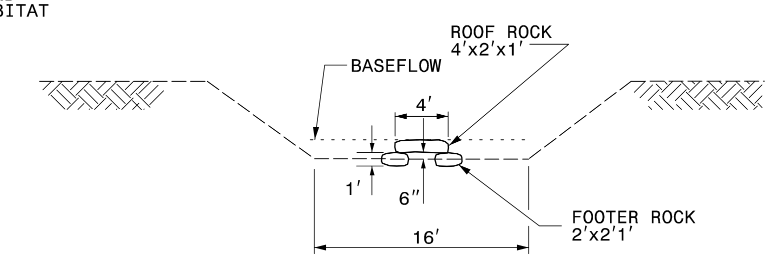
INSTALLATION CROSS SECTION VIEW

HELLBENDER HABITAT

SCALE: NTS



PLAN VIEW



SECTION A-A

NOTES:

1. FOR LOCATIONS OF HELLBENDER HABITATS SEE PLAN SHEETS.
2. BOULDER SIZE SHALL MEET THE MINIMUM DIMENSIONS OF 30"(L) X 30"(W) X 24"(D).

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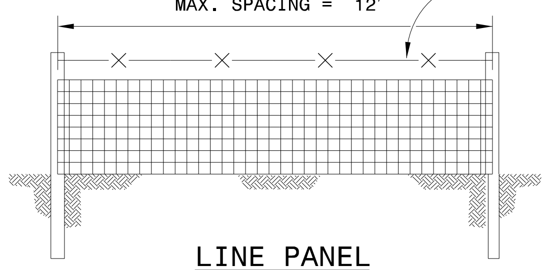
DATE: 11-14-19

DETAILS

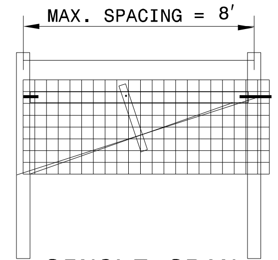
SHEET

2C

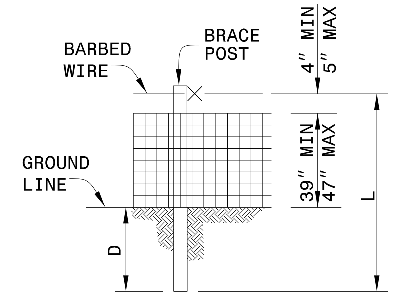
WOVEN WIRE FENCING DETAIL
SCALE: NTS



LINE PANEL



SINGLE SPAN BRACE ASSEMBLY



WOVEN WIRE FENCE

- MIN CLASS 1 ZINC-COATING 12½ GAUGE WOVEN WIRE
- THE TOP AND BOTTOM WIRE SHALL BE 10 GAUGE STEEL
- VERTICAL WIRES SHALL BE 12½ GAUGE STEEL AND SHALL BE SPACED 6 TO 12 INCHES APART.
- FILLER WIRES SHALL BE 12½ GAUGE STEEL

BARBED WIRE

- WOVEN WIRE FENCE SHALL HAVE 1 STRAND OF BARBED WIRE PLACED 4 TO 5 INCHES ABOVE THE WOVEN WIRE
- MIN CLASS 3 ZINC-COATING FOR 12½ GAUGE HIGH TENSILE AND 15½ GAUGE BARBED WIRE
- 2 TWISTED STRANDS WITH 15½ GAUGE TWO-POINT BARBS ON APPROX. 5 INCH CENTERS.

"H" BRACE ASSEMBLY

- BRACE WIRE SHALL BE 2 ROUNDS OF 12½ GAUGE WIRE (4 WIRES TOP TO BOTTOM) OR 1 ROUND OF 9 GAUGE WIRE (2 WIRES TOP TO BOTTOM)
- TWITCH STICK SHALL BE ⅜" DIAMETER DOWEL OR EQUAL AT BOTTOM AND TOP OF POST

POST REQUIREMENTS PULL AND BRACE POST

WOOD:
L = 8 FT. MIN.
DIA. = 5 IN. MIN.

POST REQUIREMENTS HORIZONTAL BRACE

WOOD:
L = 8 FT. MIN.
DIA. = 4 IN. MIN.

6" AND 12" X ⅜" DIA DOWELS OR EQUIVALENT SHALL BE USED TO ATTACH BRACE TO POST

STAY REQUIREMENTS

WOOD: 1½" DIA. MIN. OF DURABLE WOOD

POST REQUIREMENTS ALONG LINE

WOOD:
L = 6½ FT. MIN.
D = 24 IN. MIN.
DIA. = 3 IN. MIN.

STABLES SHALL BE 9 GAUGE GALVANIZED WIRE MIN LENGTH 1½" FOR SOFTWOODS

POST REQUIREMENTS AT CORNER OR GATE

WOOD:
L = 8 FT. MIN.
D = 3½ FT. MIN.
DIA. = 5 IN. MIN.

GATE

CONTRACTOR IS TO INSTALL 5 BAR 16 FT TUBE GATES AS SHOWN IN CONSTRUCTION DOCUMENTS. CONTRACTOR IS TO USE A LATCH DEVICE AS APPROVED BY DESIGNER.

LINE POSTS

NINETY-FIVE PERCENT OF TOP DIAMETERS OF WOODEN LINE POST (TWO INCHES ABOVE THE TOP WIRE) MUST BE THREE INCHES LARGER. LENGTH MUST BE SUFFICIENT TO PROVIDE FOR THE CONSTRUCTION OF AT LEAST A 42 INCH-HIGH FENCE 3 TO PERMIT STAPLING OF THE TOP WIRE WITHOUT SPLITTING. TREATED POSTS SHALL BE MADE OF BLACK LOCUST, TREATED PINE OROTHER WOOD OF EQUAL LIFE AND STRENGTH.

TREATMENT FOR PINE & OAK POSTS	RETENTION LB/FT
CREOSOTE COAL TAR	6.0
PENTACHLOROPHENO	0.3
ACID COPPER CHROMATE	0.5
AMONIACAL COPPER ARSENATE	0.4
CHROMATED COPPER ARSENATE (CCA)	0.4

NOTES

LINE POSTS MUST BE SET SOLIDLY IN THE GROUND A MINIMUM DEPTH OF TWO FEET.

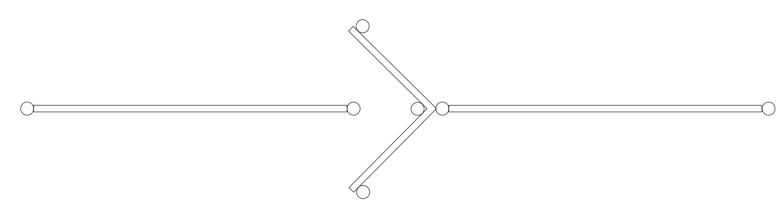
POST BACKFILLED WITH CONCRETE SHALL HAVE NO STRESS APPLIED UNTIL AT LEAST 24 HOURS AFTER CONCRETE IS POURED.

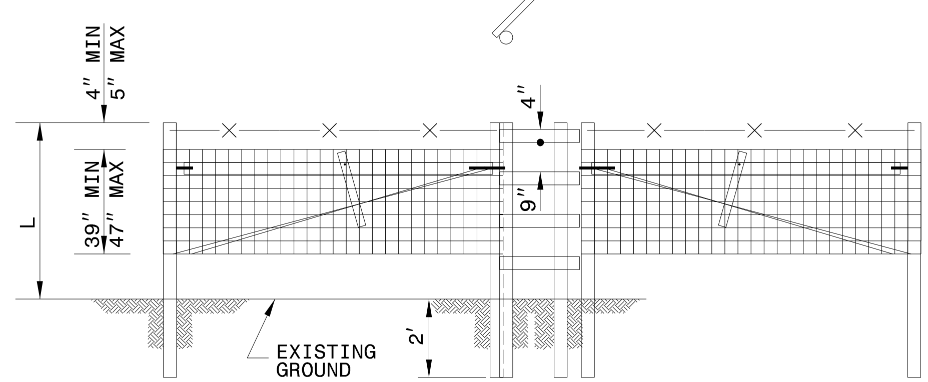
STEEL ASSEMBLY AND POST ASSEMBLY MUST BE PROTECTED WITH GALVANIZATION OR RUST-RESISTANT PAINT OR COATING.

WIRE CLIPS OR FASTENERS MUST BE GALVANIZED AND SIMILAR TO STRENGTH OF FENCE WIRE.

LOCATION OF BRACES AND/OR END ASSEMBLIES ARE REQUIRED AT ALL CORNERS, GATES, AND AT ALL DEFINITE ANGLES IN THE FENCE.

KISSING GATE
SCALE: NTS





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

NOT TO SCALE

DATE: 11-14-19

DETAILS

SHEET
2E

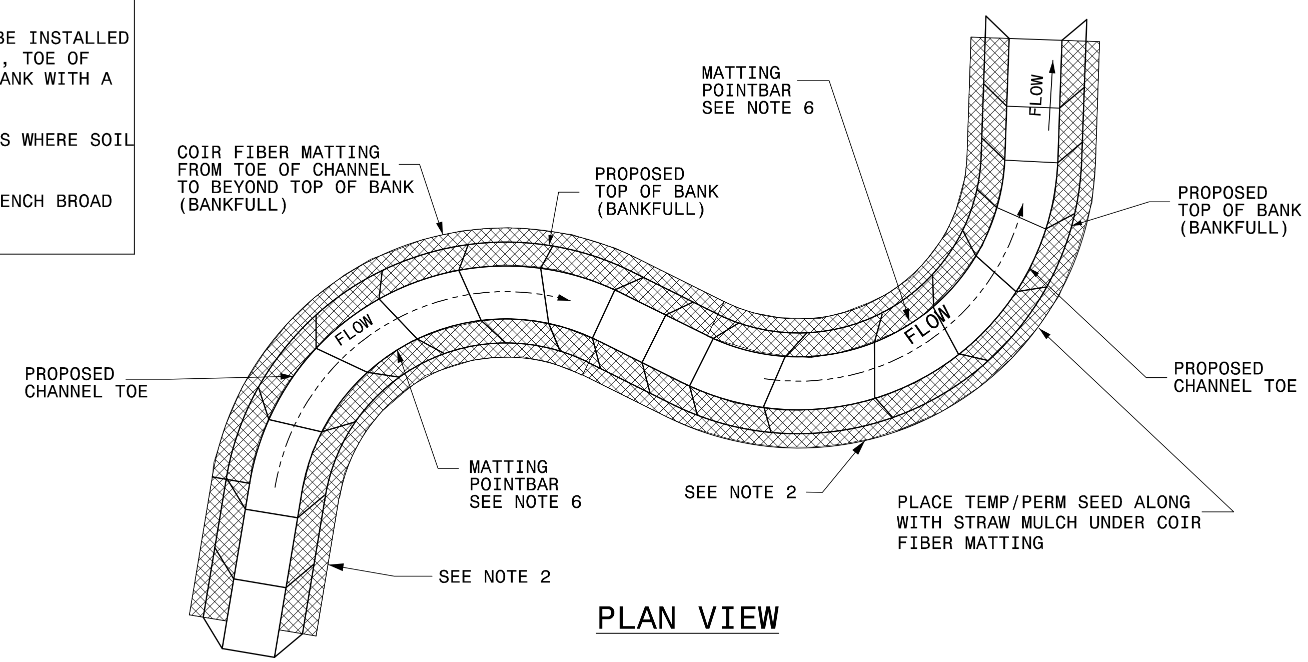
$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

TYPICAL MATTING LOCATION DETAIL

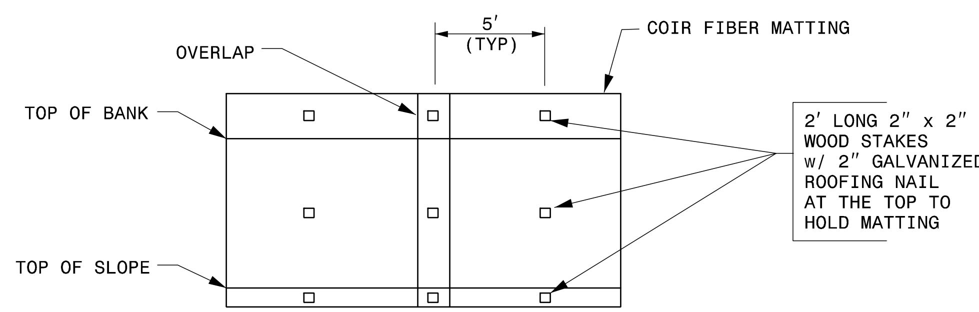
SCALE: NTS

NOTES:

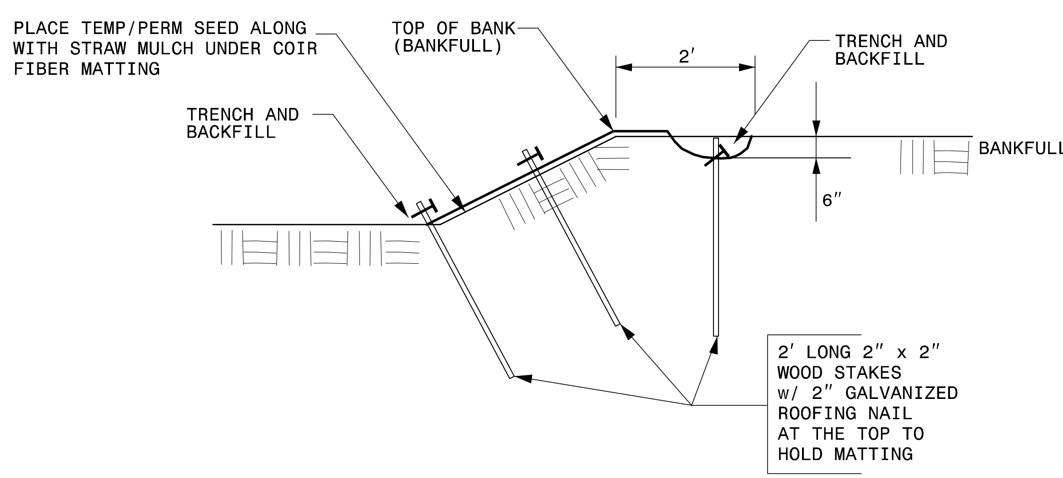
1. COIR FIBER MATTING SHALL BE PLACED ALONG BOTH BANKS THROUGHOUT THE PROJECT.
2. USE WOOD STAKES (NOT METAL) FOR MATTING.
3. INSTALL STAKES ACROSS MATTING AT ENDS, JUNCTIONS, OUTER EDGES, TOE OF SLOPES, AND DOWN THE CENTER .
4. 2′ X 2″ X 2″ HARDWOOD STAKES SHALL BE INSTALLED ALONG THE OUTER EDGES (TOP OF BANK), TOE OF SLOPE, AND DOWN THE CENTER OF THE BANK WITH A MAXIMUM 5′ SPACING.
5. DO NOT PLACE COIR MATTING OVER BANKS WHERE SOIL LIFTS ARE SPECIFIED.
6. MATTING OF POINTBAR ON WEST FORK FRENCH BROAD RIVER IS OPTIONAL.



PLAN VIEW



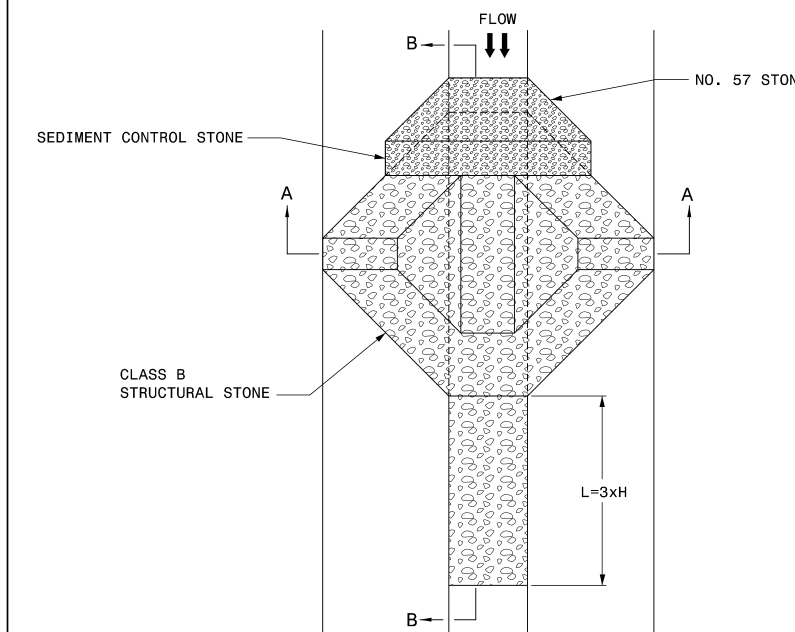
MATTING STAKING VIEW



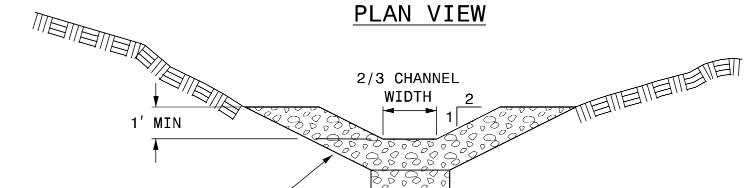
SECTION A-A

TEMPORARY ROCK SILT CHECK, TYPE A

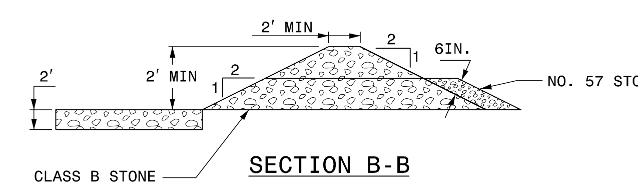
SCALE: NTS



PLAN VIEW



SECTION A-A



SECTION B-B

NOTES:
- REMOVE SEDIMENT ACCUMULATION WHEN IT REACHES ONE-THIRD OF THE ORIGINAL CHECKED HEIGHT.

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EROSION CONTROL DETAILS

SHEET

2F

PUMP-AROUND OPERATION

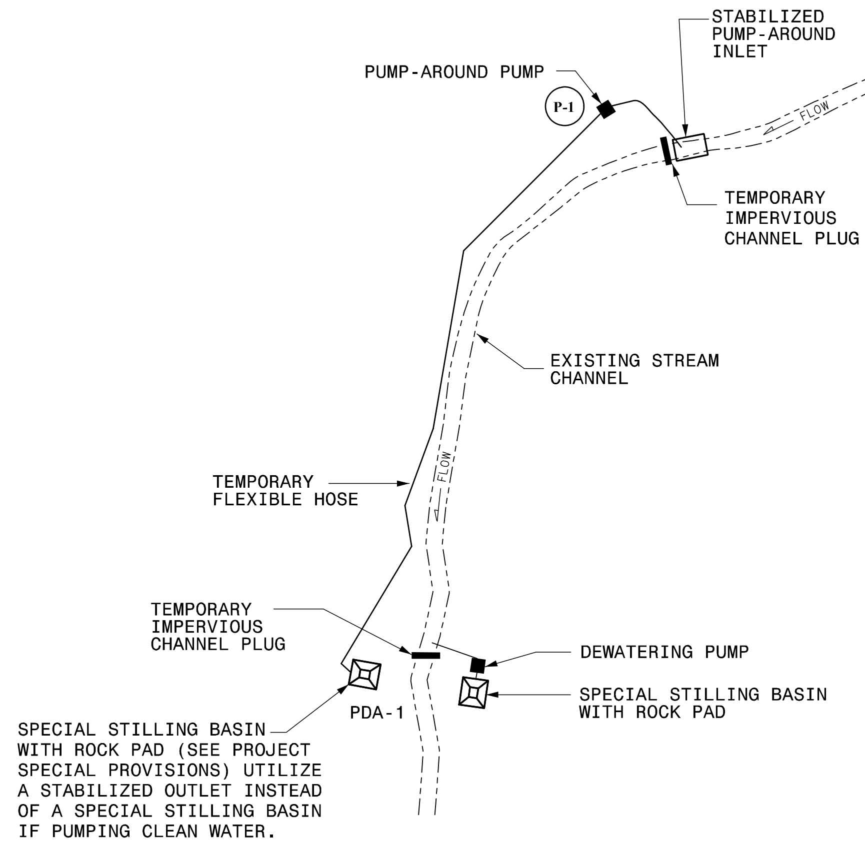
SCALE:NTS

SEQUENCE OF CONSTRUCTION FOR TYPICAL WORK AREA

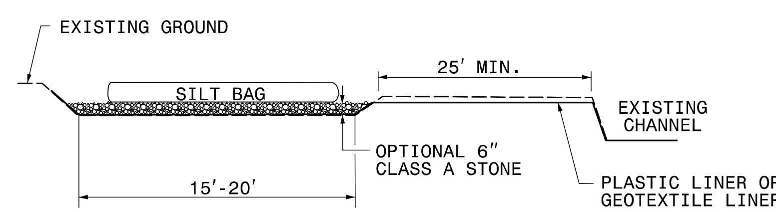
1. INSTALL SPECIAL STILLING BASIN(S).
2. INSTALL STABILIZED PUMP AROUND INLET, UPSTREAM PUMP, AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS CHANNEL PLUG AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS CHANNEL PLUG AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS CHANNEL PLUGS. REMOVE IMPERVIOUS CHANNEL PLUGS, PUMPS, AND TEMPORARY FLEXIBLE HOSE.(DOWNSTREAM IMPERVIOUS CHANNEL PLUG FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED AT THE END OF EACH WORK DAY WITHIN THE PUMP AROUND AREAS BETWEEN THE IMPERVIOUS CHANNEL PLUGS. THE IMPERVIOUS CHANNEL PLUG LOCATIONS AS SHOWN ON THIS SHEET ONLY SHOW THE UPPER AND LOWER EXTENT OF WORK FOR EACH STREAM SEGMENT. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS CHANNEL PLUG FOR EACH DAY'S WORK.
8. REMOVE SPECIAL STILLING BASIN(S) AND BACKFILL. STABILIZE DISTURBED AREA WITH SEED AND MULCH.

NOTES:

1. ALL EXCAVATION SHALL BE PERFORMED IN ONLY DRY OR ISOLATED SECTIONS OF CHANNEL.
2. IMPERVIOUS CHANNEL PLUGS ARE TO BE USED TO ISOLATE WORK FROM STREAM FLOW WHEN NECESSARY.
3. SAND BAGS SHALL BE FILLED WITH CLEAN MASONRY SAND OR CLEAN #57 STONE.
4. ALL GRADED AREAS SHALL BE STABILIZED WITHIN 24 HOURS.
5. MAINTENANCE OF STREAM FLOW OPERATIONS SHALL BE INCIDENTAL TO THE WORK. THIS INCLUDES POLYETHYLENE SHEETING, DIVERSION PIPES, PUMPS AND HOSES.
6. PUMPS AND HOSES SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA.
7. SIDESLOPES OF RESTORED CHANNEL SHALL BE MATTED PRIOR TO TURNING WATER INTO CHANNEL. SEE TYPICAL MATTING LOCATION DETAIL.
8. CONTRACTOR IS RESPONSIBLE FOR DETERMINING & AQUIRING THE PROPER SIZED PUMP.
9. WATER PUMPED FROM EXCAVATIONS SHALL BE DISCHARGED INTO A GEOTEXTILE SILT BAG AND SHALL PROVIDE MEASURES TO PREVENT DISCHARE FROM EXCEEDING 10 NTU'S. CONTRACTOR MAY UTILIZE FLOCCULANTS TO SETTLE OUT PARTICLES.
10. ALL SEDIMENT BAGS (GEOTEXTILE SILT BAG) MUST BE EMPTIED OF ACCUMULATED MATERIAL SPREAD OUT AND PERMANENTLY STABILIZED.

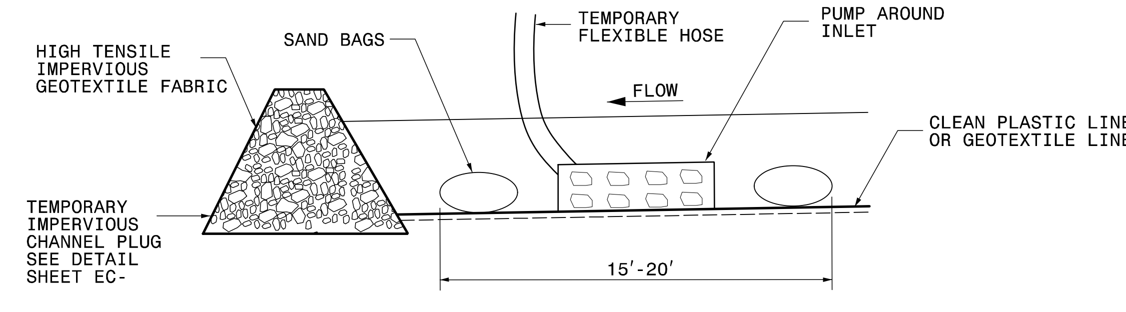


PUMP-AROUND OPERATION
PLAN VIEW

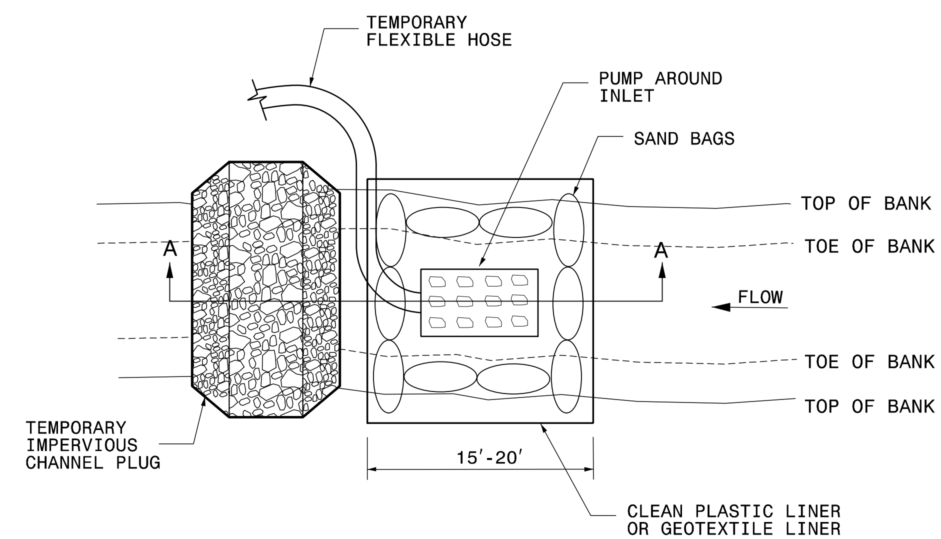


NOTE: PROVIDE STABILIZED OUTLET

STILLING BASIN WITH ROCK PAD



STABILIZED PUMP-AROUND INLET
SECTION A-A



STABILIZED PUMP-AROUND INLET
PLAN VIEW

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EROSION CONTROL DETAILS

SHEET

2G

STANDARD TEMPORARY SILT FENCE

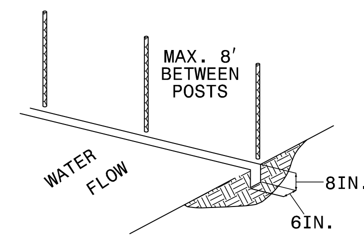
SCALE: N.T.S.

CONSTRUCTION SPECIFICATIONS

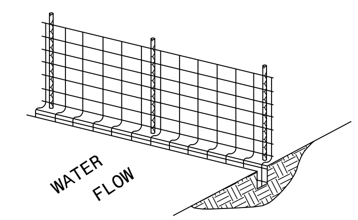
1. CONSTRUCT SEDIMENT FENCE ON LOW SIDE OF TOPSOIL STOCKPILE TO PREVENT SEDIMENT FROM BEING WASHED INTO THE DRAINAGE SYSTEM. FENCE TO EXTEND AROUND APPROXIMATELY 70% OF THE PERIMETER OF THE STOCKPILE.
2. LOCATE POSTS DOWNSLOPE OF FABRIC TO HELP SUPPORT FENCING.
3. BURY TOE OF FENCE APPROXIMATELY 8″ DEEP TO PREVENT UNDERCUTTING.
4. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FABRIC AT A SUPPORT POST WITH OVERLAP TO THE NEXT POST.
5. FILTER FABRIC TO BE ON NYLON, PLOYESTER, PROPYLENE OR ETHYLENE YARN WITH EXTRA STRENGTH-50LB/ LIN. IN. (MINIMUM) AND WITH A FLOW RATE OF AT LEAST 0.3 GAL./FT / MINUTE. FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABLIZERS.
6. IF USING WOOD, POST IS TO BE 4″ DIAMETER PINE WITH A MINIMUM LENGTH OF 4′.

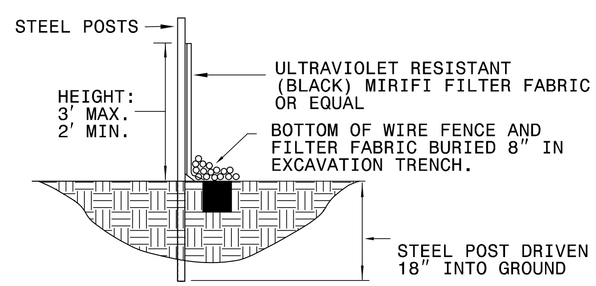
NOTE:
BOTTOM OF FILTER MUST BE PLACED IN TRENCH AND SECURED BY BACK-FILLING WITH SOIL MATERIAL AND TAMPING TO A HEIGHT OF A HEIGHT OF 6″ ABOVE GROUND LEVEL.

STEP 1:
DRIVE STEEL POSTS 18IN. INTO GROUND AND EXCAVATE A 6IN.x 6IN. TRENCH UPHILL ALONG THE LINE OF POSTS. WOOD POSTS 4IN. IN DIAMETER MAY BE USED.



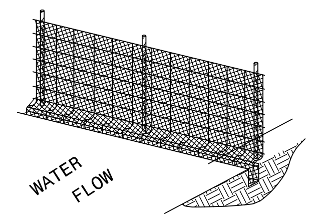
STEP 2:
ATTACH WIRE FENCE TO POSTS AND EXTEND THE BOTTOM OF THE FENCE 8IN. INTO THE EXCAVATED TRENCH.



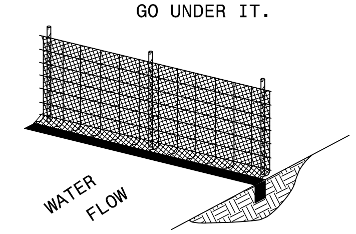


SECTION

STEP 3:
ATTACH THE FILTER FABRIC TO THE POST AND EXTEND THE BOTTOM OF THE FABRIC 8IN. INTO THE TRENCH.



STEP 4:
BACKFILL THE TRENCH AND COMPACT THE SOIL FIRMLY TO ANCHOR THE BOTTOM OF THE SILT FENCE SO THAT RUNOFF IS FORCED TO GO THROUGH THE FENCE AND CANNOT GO UNDER IT.



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EROSION CONTROL DETAILS

SHEET

2H

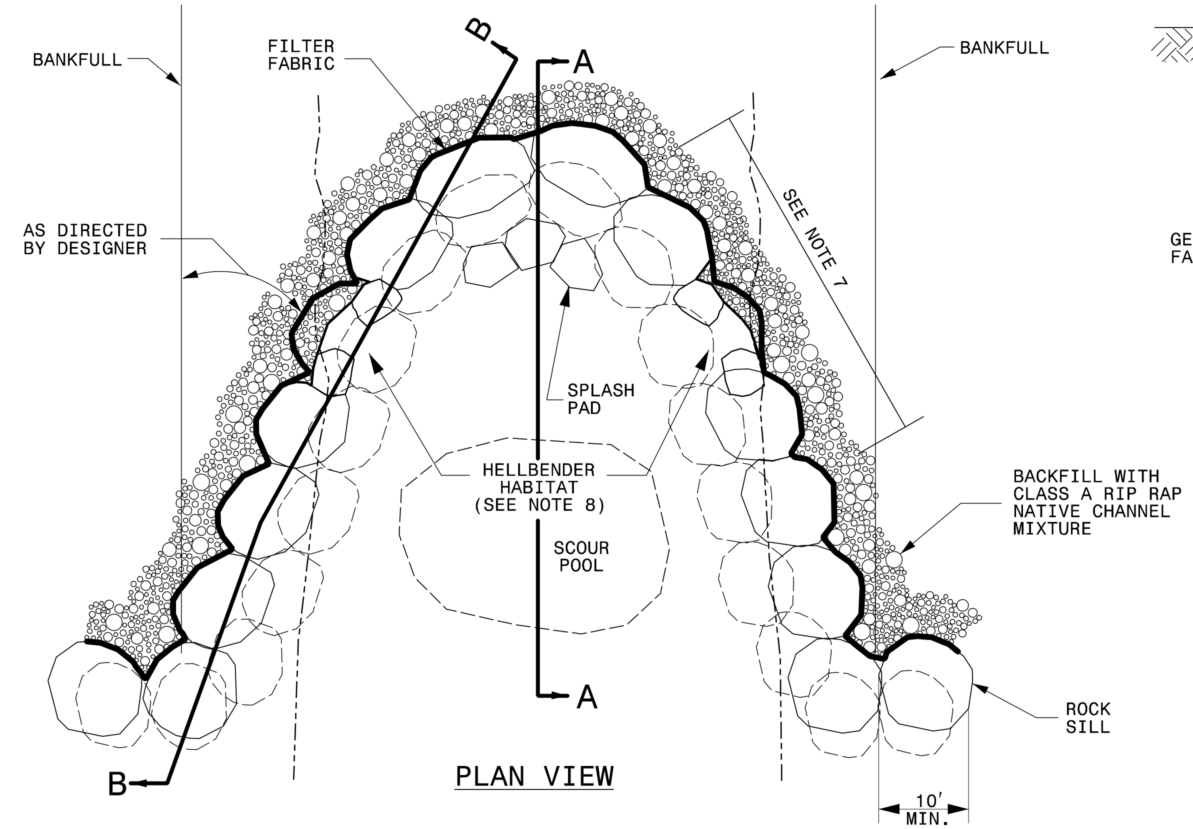
ROCK CROSS-VANE W/ HELLBENDER HABITAT

SCALE:NTS

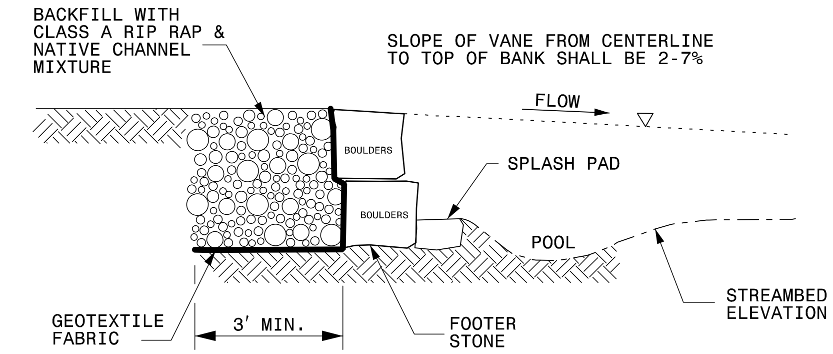
NOTES:

1. ALL STONES ARE TO BE STRUCTURE STONE.
2. GAPS BETWEEN BOULDERS SHALL BE MINIMIZED BY FITTING BOULDERS TOGETHER, PLUGGING WITH RIP RAP AND LINING WITH FILTER FABRIC.
3. DIMENSIONS AND SLOPES MAYBE ADJUSTED TO FIT BY THE ENGINEER.
4. A DOUBLE FOOTER BOULDER SHALL BE UTILIZED IN SAND BED MATERIAL.
5. CONTRACTOR WILL BE REQUIRED TO FIT BOULDERS TIGHTLY.
6. FOOTER BOULDERS AND VANE BOULDERS SHALL BE NATIVE STONE OR SHOT ROCK, CUBICAL OR RECTANGULAR IN NATURE.
7. VANE ARM SHALL TIE INTO THE BANK AS SHOWN ON PLANS OR AS DIRECTED BY DESIGNER. THE ARM SHALL RISE AT 2-7% FROM THE CHANNEL INVERT AT AN ANGLE AS DIRECTED BY THE DESIGNER. THE VANE ARM SHALL CONTINUE UP TO THE BANKFULL ELEVATION BUT THE ARM'S SLOPE MAY BE INCREASED TO GREATER THAN 7% AT THE DIRECTION OF THE DESIGNER. ADDITIONALLY, THE VANE ARM'S ANGLE OF DEPARTURE MAY BE ADJUSTED AT THE DIRECTION OF THE DESIGNER.
8. CONSTRUCT GAPS IN FOOTER BOULDER FOR HELLBENDER HABITAT.
9. BOULDER SIZE SHALL MEET THE MINIMUM DIMENSIONS OF 30"(L) X 30"(W) X 24"(D).
10. FILTER FABRIC SHALL BE PLACED ON THE UPSTREAM SIDE OF THE STRUCTURE TO PREVENT WASHOUT OF SEDIMENT THROUGH BOULDER GAPS. FILTER FABRIC SHALL EXTEND FROM THE BOTTOM OF THE FOOTER BOULDER TO THE FINISHED GRADE ELEVATION AND SHALL BE PLACED THE ENTIRE LENGTH OF STRUCTURE.

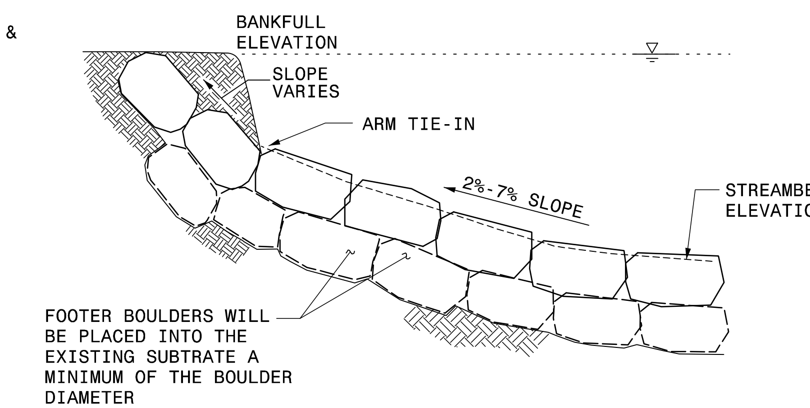
VANE ARM LENGTH	ARM TIE-IN DEPTH BELOW BANKFULL



PLAN VIEW



SECTION A-A

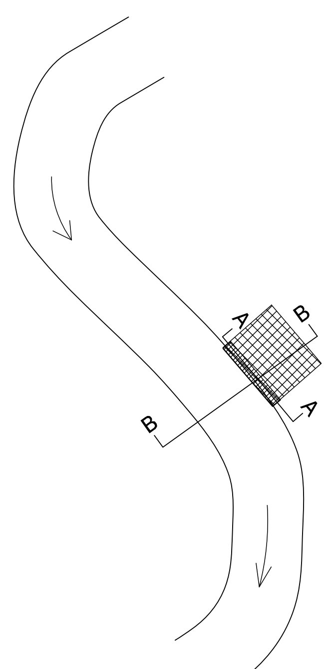


SECTION B-B

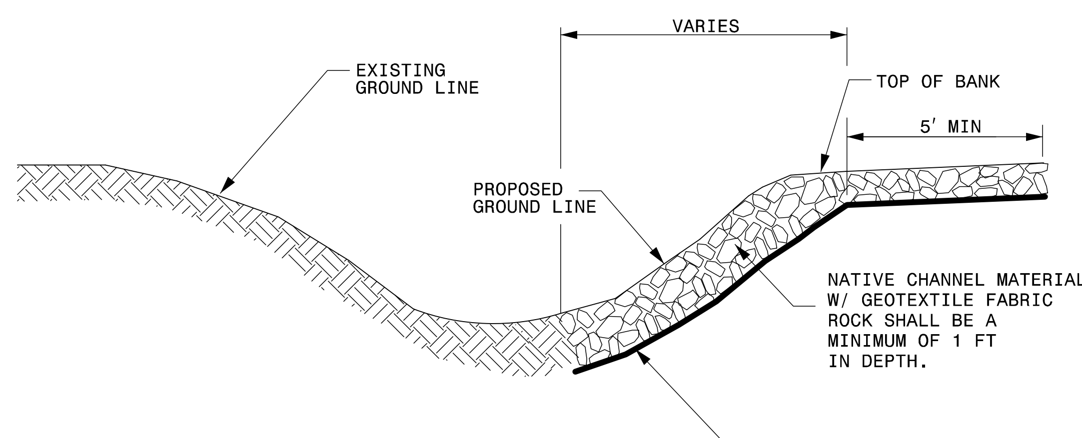
FLOODPLAIN INTERCEPTOR

SCALE: NTS

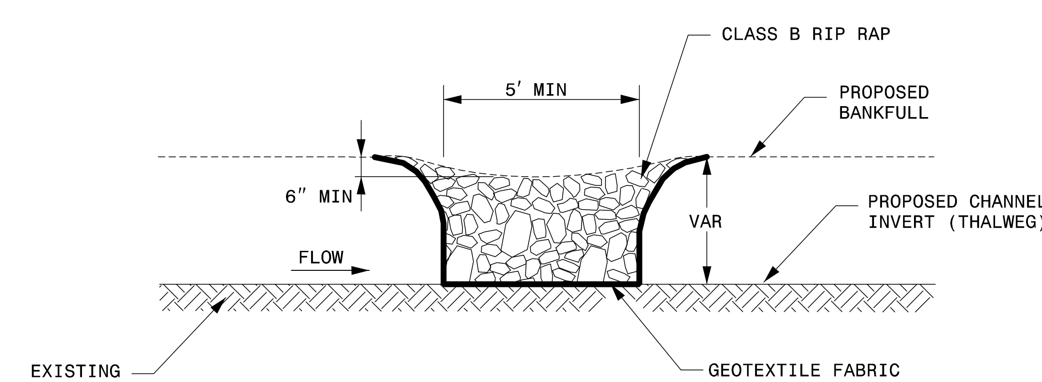
NOTE:
1. FLOODPLAIN INTERCEPTORS SHALL BE PLACED ON-SITE AT AREAS SPECIFIED IN PLANS AND/OR ONSITE BY DESIGNER.
2. NATIVE CHANNEL MATERIAL SHALL BE SIMILAR IN SIZE TO CLASS B RIP RAP. CLASS B RIP RAP MAY BE UTILIZED IF NATIVE CHANNEL MATERIAL IS UNAVAILABLE.



PLAN VIEW



SECTION B-B



SECTION A-A

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

NOT TO SCALE

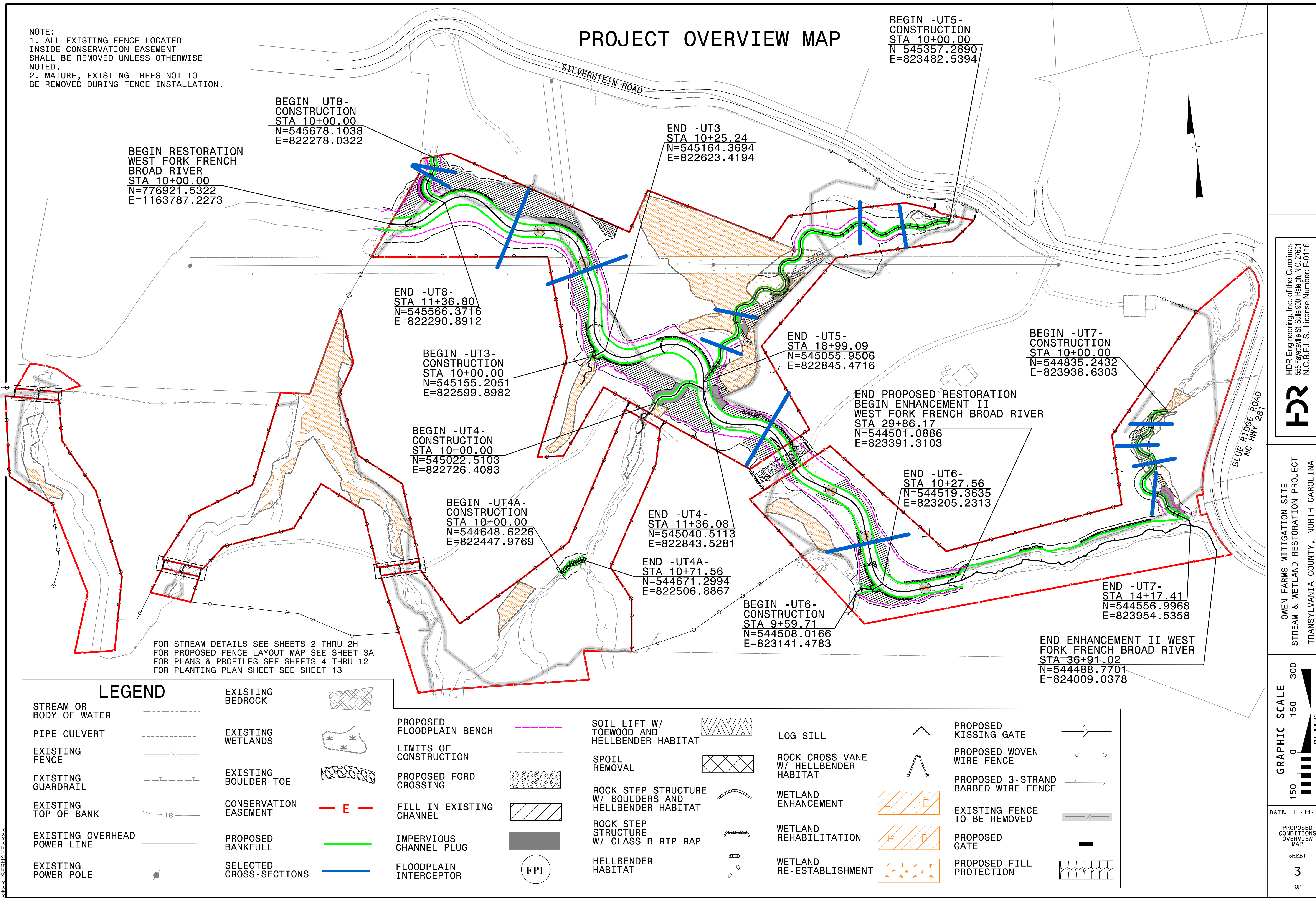
DATE: 11-14-19

DETAILS

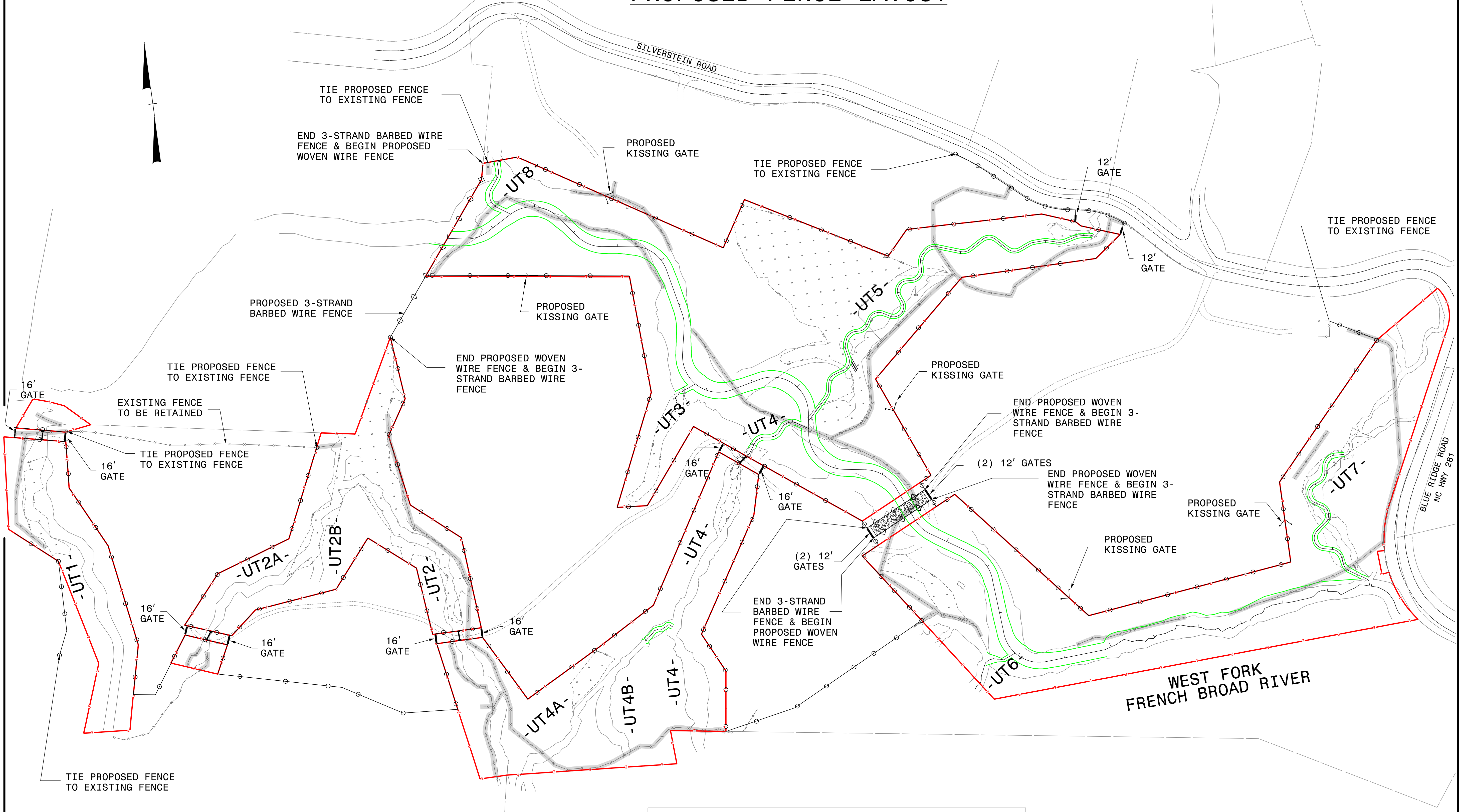
SHEET

2D

PROJECT OVERVIEW MAP



PROPOSED FENCE LAYOUT



LEGEND

CONSERVATION EASEMENT	— E —	PROPOSED WOVEN WIRE FENCE	
PROPOSED BANKFULL		PROPOSED 3-STRAND BARBED WIRE FENCE	
PROPOSED GATE		EXISTING FENCE TO BE REMOVED	
PROPOSED KISSING GATE			

FOR STREAM DETAILS SEE SHEETS 2 THRU 2E
FOR PROJECT OVERVIEW MAP SEE SHEET 3
FOR PLANS & PROFILES SEE SHEETS 4 THRU 24

NOTES:

1. FENCING WITHIN WOODED AREAS WILL BE REMOVED BY HAND.
2. MATURE, EXISTING TREES NOT TO BE REMOVED DURING FENCE INSTALLATION.
3. PROPOSED WOVEN WIRE FENCE WILL BE CONSTRUCTED ALONG CONSERVATION EASEMENT.

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OWEN FARMS MITIGATION SITE
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TRANSYLVANIA COUNTY, NORTH CAROLINA

GRAPHIC SCALE
150 0 150 300
PLANS

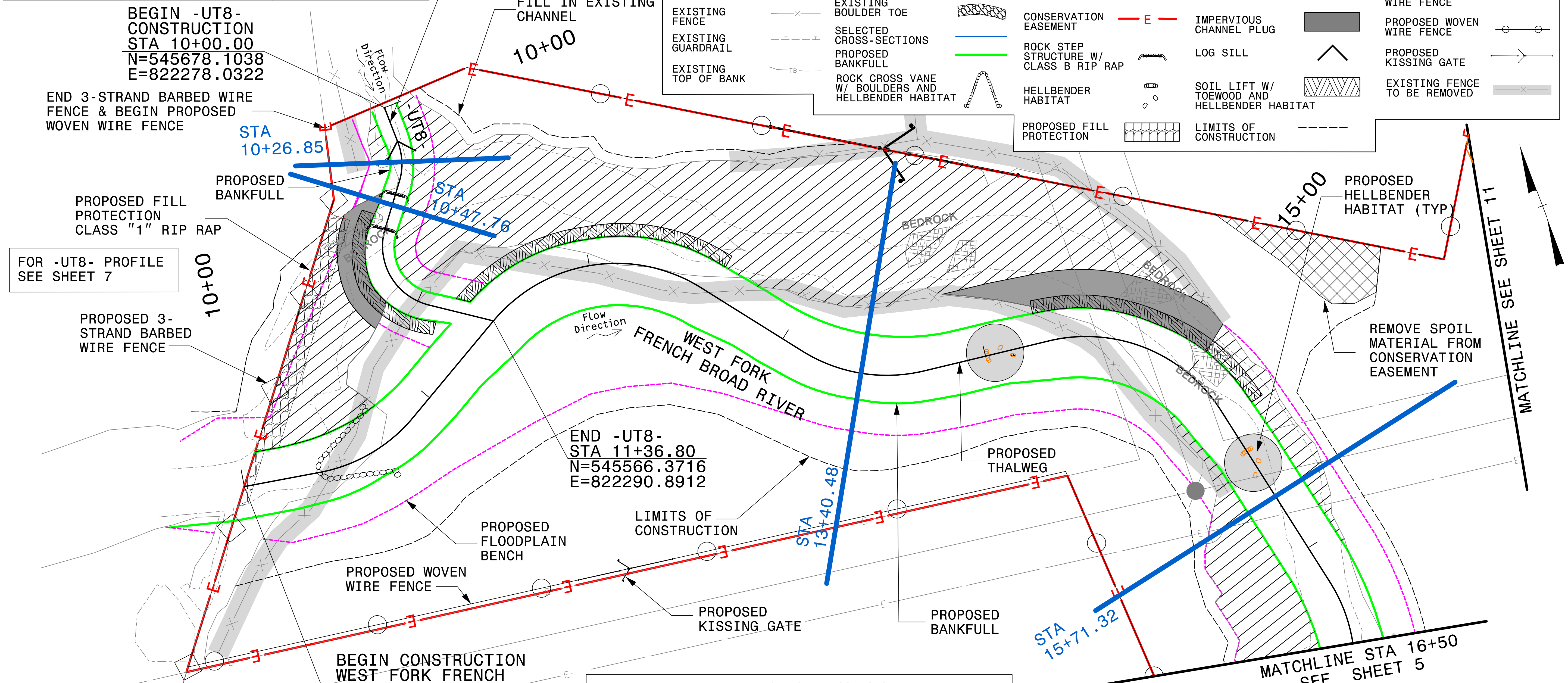
DATE: 11-14-19

PROPOSED FENCE LAYOUT

SHEET
3A

WEST FORK FRENCH BROAD RIVER STRUCTURE LOCATIONS

STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK CROSS VANE	10+36.05	545,528.3649	822,189.5203	2,694.367

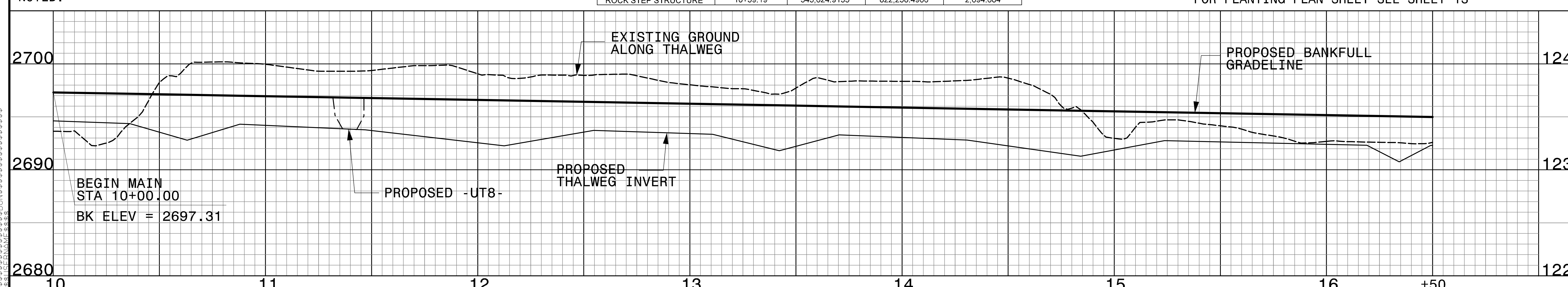


NOTE:
1. ALL EXISTING FENCE LOCATED INSIDE CONSERVATION EASEMENT SHALL BE REMOVED UNLESS OTHERWISE NOTED.

-UT8- STRUCTURE LOCATIONS

STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
LOG STEP STRUCTURE	10+17.37	545,660.7351	822,278.2477	2,696.442
ROCK STEP STRUCTURE	10+42.05	545,638.5267	822,268.9110	2,695.754
ROCK STEP STRUCTURE	10+59.19	545,624.9135	822,258.4966	2,694.684

FOR STREAM DETAILS SEE SHEETS 2 THRU 2H
FOR PROJECT OVERVIEW MAP SEE SHEET 3
FOR PROPOSED FENCE LAYOUT MAP SEE SHEET 3A
FOR PLANS & PROFILES SEE SHEETS 4 THRU 12
FOR PLANTING PLAN SHEET SEE SHEET 13



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OWEN FARMS MITIGATION SITE
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TRANSYLVANIA COUNTY, NORTH CAROLINA

WEST FORK FRENCH BROAD STA 10+00 - STA 16+50
-UT8- STA 10+00 - STA 11+36.80

GRAPHIC SCALE 50 25 0 25 PLANS

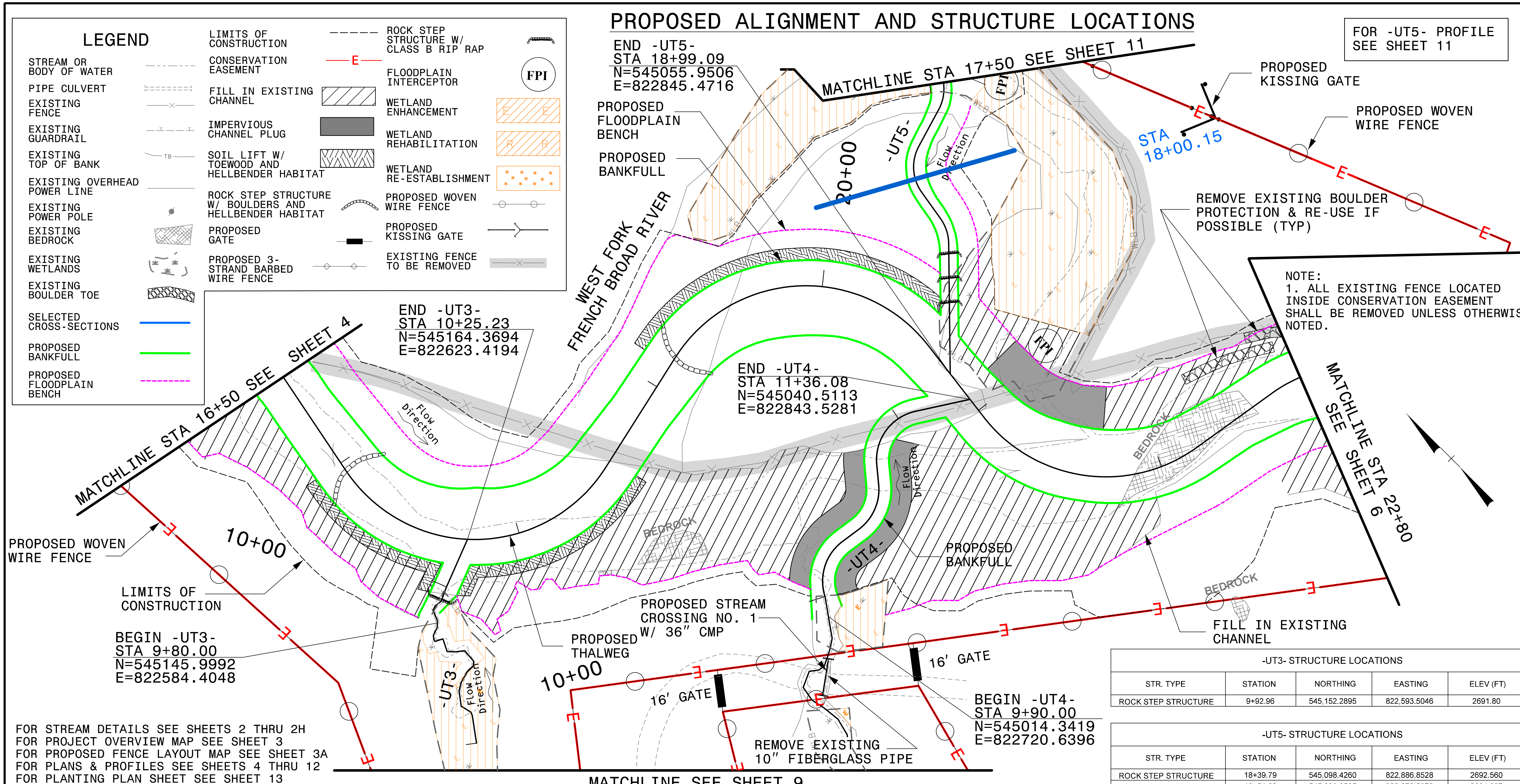
DATE: 11-14-19

PLAN & PROFILE

SHEET 4 OF

PROPOSED ALIGNMENT AND STRUCTURE LOCATIONS

FOR -UT5- PROFILE SEE SHEET 11



FOR STREAM DETAILS SEE SHEETS 2 THRU 2H
FOR PROJECT OVERVIEW MAP SEE SHEET 3
FOR PROPOSED FENCE LAYOUT MAP SEE SHEET 3A
FOR PLANS & PROFILES SEE SHEETS 4 THRU 12
FOR PLANTING PLAN SHEET SEE SHEET 13

-UT3- STRUCTURE LOCATIONS

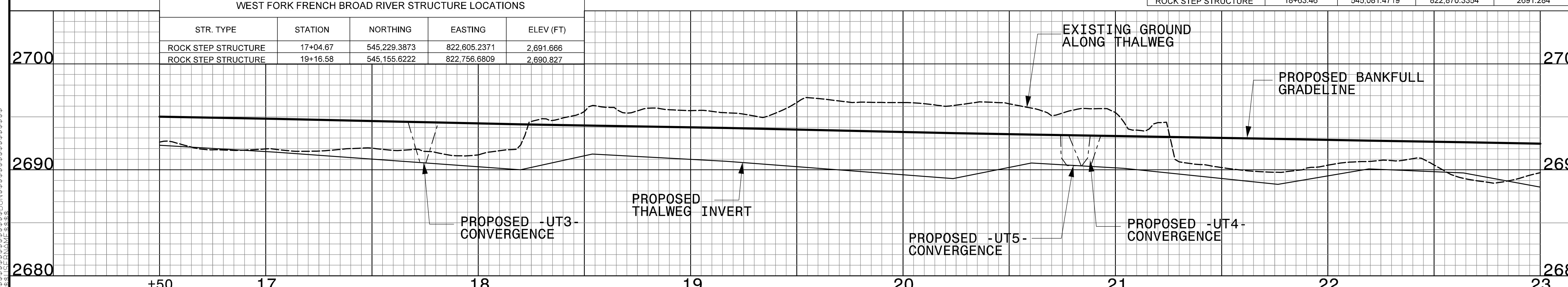
STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK STEP STRUCTURE	9+92.96	545,152.2895	822,593.5046	2691.80

-UT5- STRUCTURE LOCATIONS

STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK STEP STRUCTURE	18+39.79	545,098.4260	822,886.8528	2692.560
ROCK STEP STRUCTURE	18+51.62	545,089.9525	822,878.5976	2691.997
ROCK STEP STRUCTURE	18+63.46	545,081.4719	822,870.3354	2691.284

WEST FORK FRENCH BROAD RIVER STRUCTURE LOCATIONS

STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK STEP STRUCTURE	17+04.67	545,229.3873	822,605.2371	2,691.666
ROCK STEP STRUCTURE	19+16.58	545,155.6222	822,756.6809	2,690.827



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OWEN FARMS MITIGATION SITE
STREAM & WETLAND RESTORATION PROJECT
TRANSYLVANIA COUNTY, NORTH CAROLINA
WEST FORK FRENCH BROAD STA 16+50 - STA 22+80
-UT3- STA 10+00 - 10+25.24
-UT4- STA 10+00 - 11+36.08
-UT5- 17+50 - 18+99.09

GRAPHIC SCALE
50 25 0 25
PLANS

DATE: 11-14-19

PLAN & PROFILE

SHEET 5 OF

PROPOSED ALIGNMENT AND STRUCTURE LOCATIONS

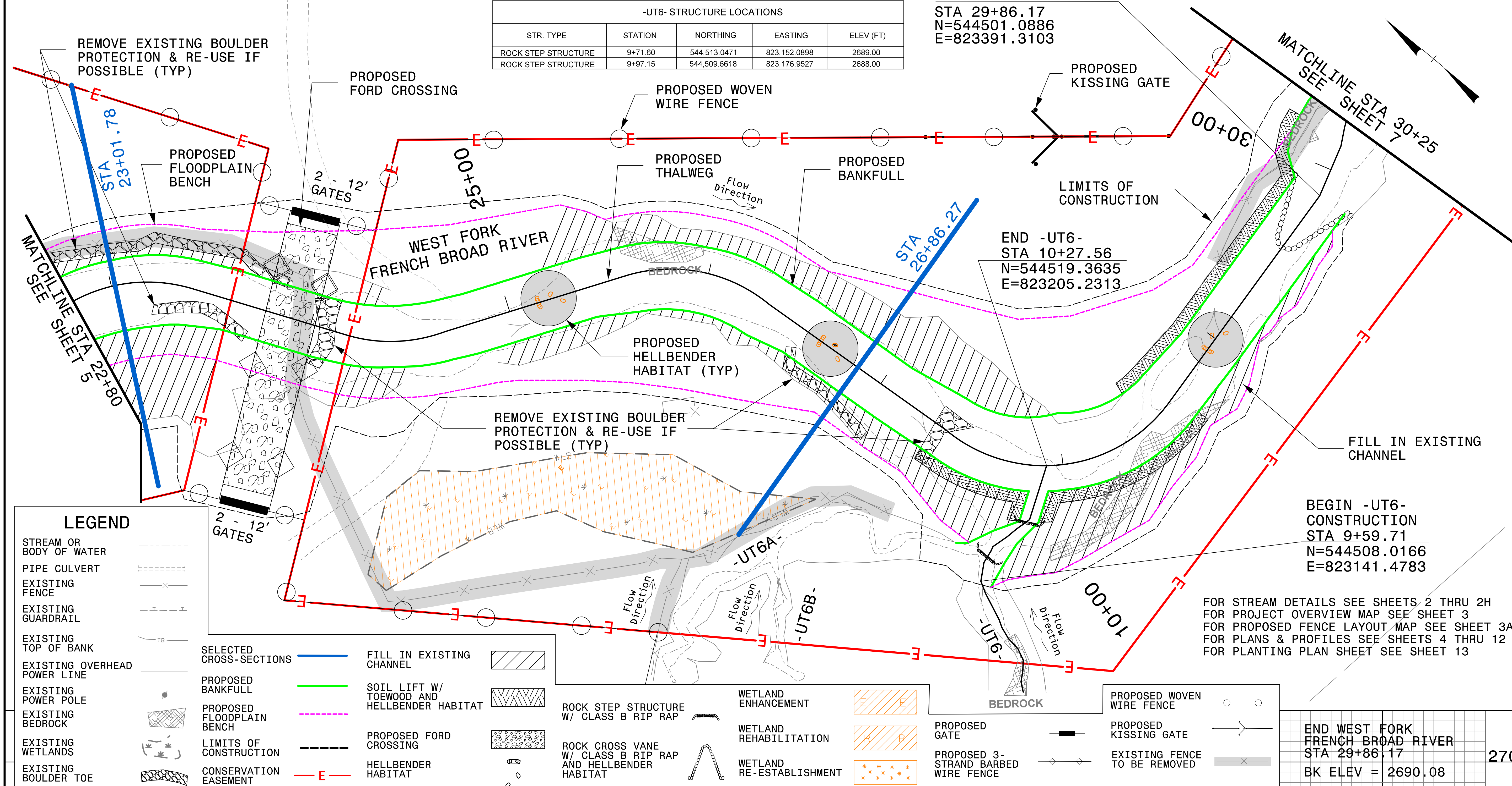
NOTE:
1. ALL EXISTING FENCE LOCATED INSIDE CONSERVATION EASEMENT SHALL BE REMOVED UNLESS OTHERWISE NOTED.

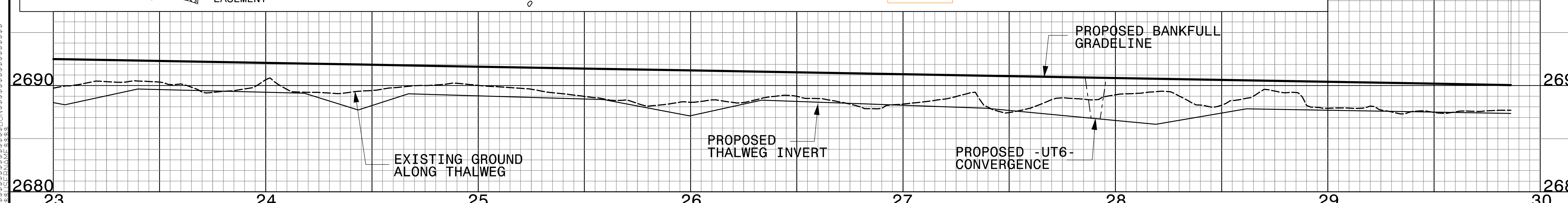
WEST FORK FRENCH BROAD RIVER STRUCTURE LOCATIONS

STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK CROSS VANE	29+55.00	544,499.1088	823,360.2023	2,687.423

-UT6- STRUCTURE LOCATIONS

STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK STEP STRUCTURE	9+71.60	544,513.0471	823,152.0898	2689.00
ROCK STEP STRUCTURE	9+97.15	544,509.6618	823,176.9527	2688.00





GRAPHIC SCALE
50 25 0 25
PLANS

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

WEST FORK FRENCH BROAD STA 23+00 - STA 30+25
-UT6- STA 9+59.71 - 10+27.56

DATE: 11-14-19

PLAN & PROFILE

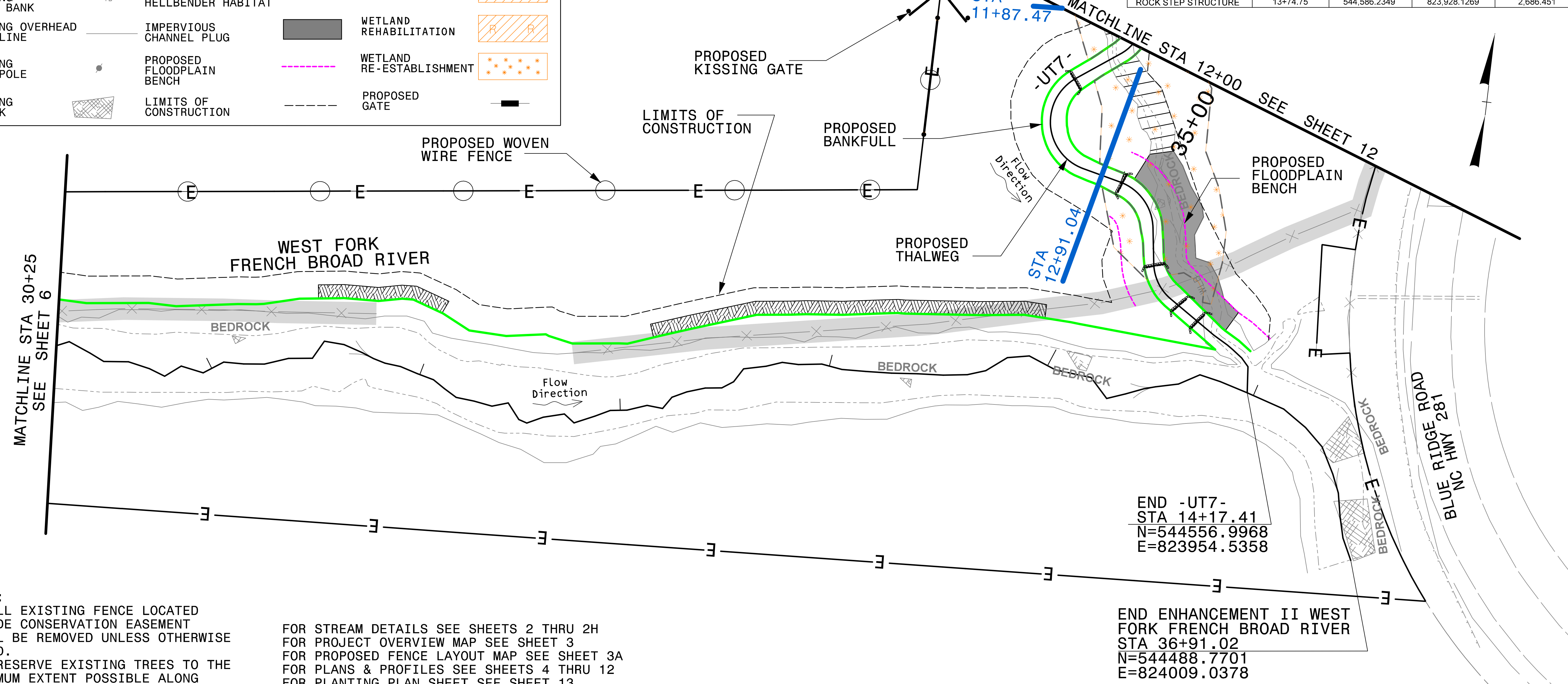
SHEET
6
OF

PROPOSED ALIGNMENT AND STRUCTURE LOCATIONS

LEGEND

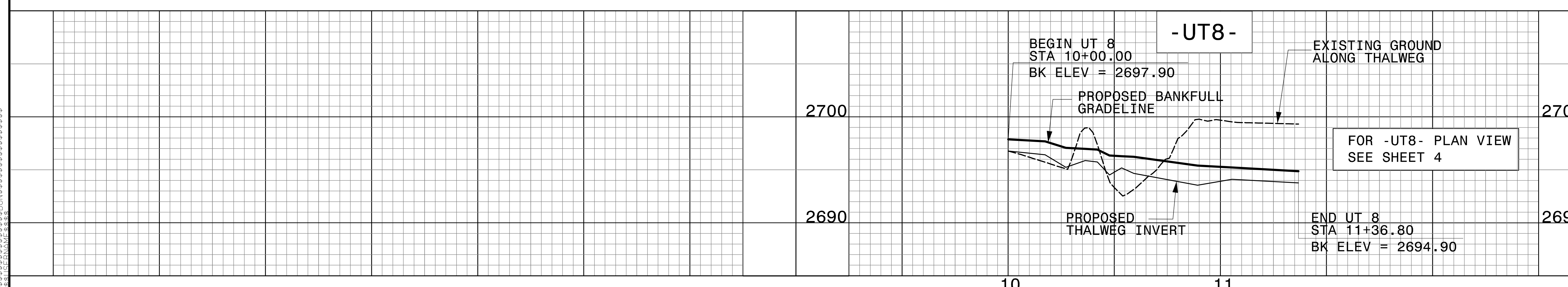
STREAM OR BODY OF WATER	EXISTING BOULDER TOE	CONSERVATION EASEMENT	PROPOSED 3-STRAND BARBED WIRE FENCE
PIPE CULVERT	SELECTED CROSS-SECTIONS	FILL IN EXISTING CHANNEL	PROPOSED WOVEN WIRE FENCE
EXISTING FENCE	PROPOSED BANKFULL	ROCK STEP STRUCTURE W/ CLASS B RIP RAP	PROPOSED KISSING GATE
EXISTING GUARDRAIL	SOIL LIFT W/ TOEWOOD AND HELLBENDER HABITAT	WETLAND ENHANCEMENT	EXISTING FENCE TO BE REMOVED
EXISTING TOP OF BANK	IMPERVIOUS CHANNEL PLUG	WETLAND REHABILITATION	
EXISTING OVERHEAD POWER LINE	PROPOSED FLOODPLAIN BENCH	WETLAND RE-ESTABLISHMENT	
EXISTING POWER POLE	LIMITS OF CONSTRUCTION	PROPOSED GATE	
EXISTING BEDROCK			

-UT7- STRUCTURE LOCATIONS				
STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK STEP STRUCTURE	12+31.91	544,686.2764	823,862.4166	2,690.142
ROCK STEP STRUCTURE	12+99.90	544,642.9599	823,887.4965	2,689.147
ROCK STEP STRUCTURE	13+42.26	544,608.8059	823,906.5238	2,688.185
ROCK STEP STRUCTURE	13+63.77	544,592.2215	823,918.9225	2,687.310
ROCK STEP STRUCTURE	13+74.75	544,586.2349	823,928.1269	2,686.451



NOTE:
1. ALL EXISTING FENCE LOCATED INSIDE CONSERVATION EASEMENT SHALL BE REMOVED UNLESS OTHERWISE NOTED.
2. PRESERVE EXISTING TREES TO THE MAXIMUM EXTENT POSSIBLE ALONG LEFT BANK GRADING/STABILIZATION.

FOR STREAM DETAILS SEE SHEETS 2 THRU 2H
FOR PROJECT OVERVIEW MAP SEE SHEET 3
FOR PROPOSED FENCE LAYOUT MAP SEE SHEET 3A
FOR PLANS & PROFILES SEE SHEETS 4 THRU 12
FOR PLANTING PLAN SHEET SEE SHEET 13



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TRANSYLVANIA COUNTY, NORTH CAROLINA

EXISTING WEST FORK FRENCH BROAD
-UT7- STA 12+00 - 14+17.41

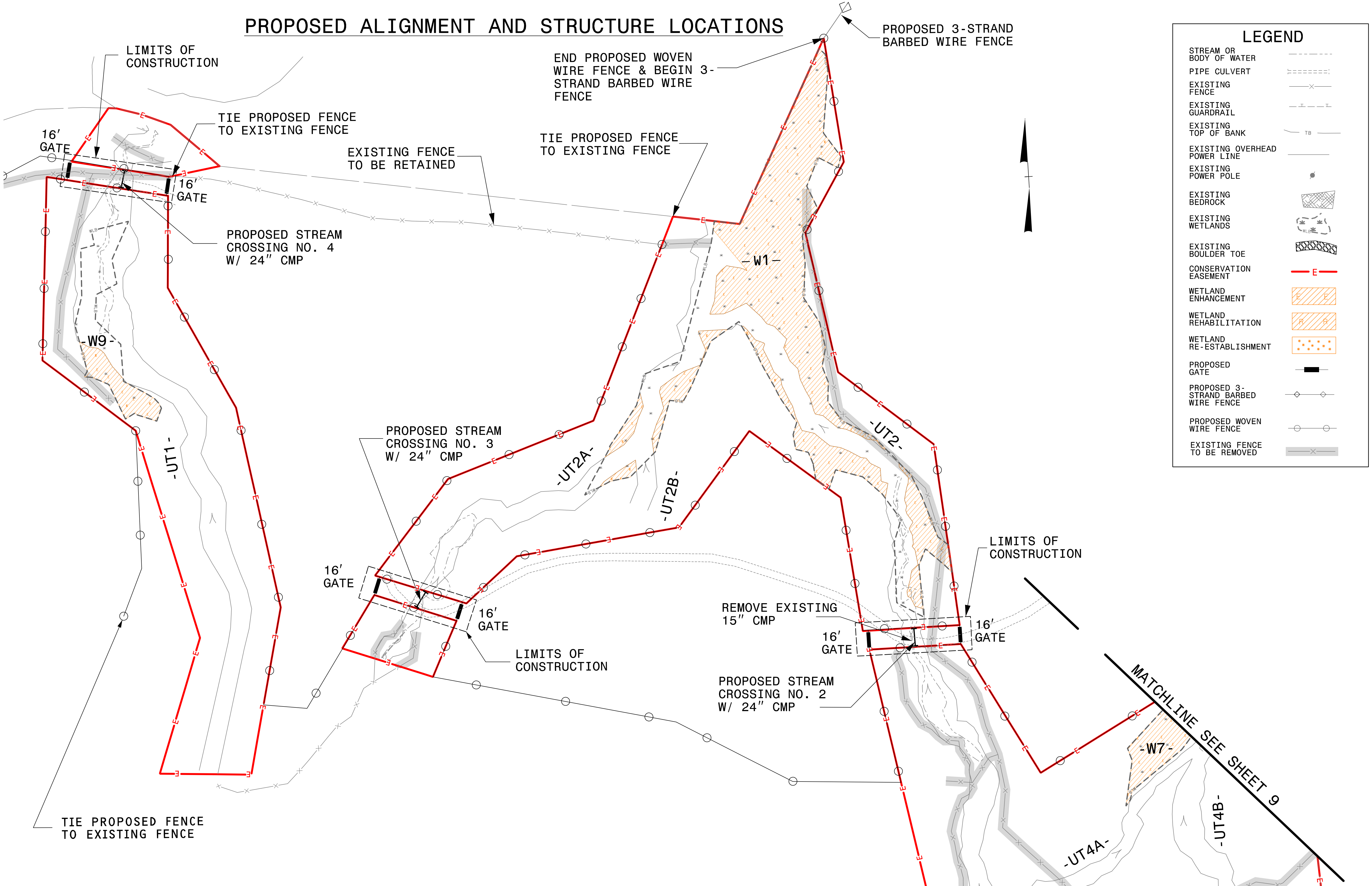
GRAPHIC SCALE
50 25 0 25
PLANS

DATE: 11-14-19

PLAN & PROFILE

SHEET 7 OF

PROPOSED ALIGNMENT AND STRUCTURE LOCATIONS



FOR STREAM DETAILS SEE SHEETS 2 THRU 2H
FOR PROJECT OVERVIEW MAP SEE SHEET 3
FOR PROPOSED FENCE LAYOUT MAP SEE SHEET 3A
FOR PLANS & PROFILES SEE SHEETS 4 THRU 12
FOR PLANTING PLAN SHEET SEE SHEET 13

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

-UT1-, -UT2-, -UT2A-
-UT2B-, -UT4A-, -UT4B-

GRAPHIC SCALE
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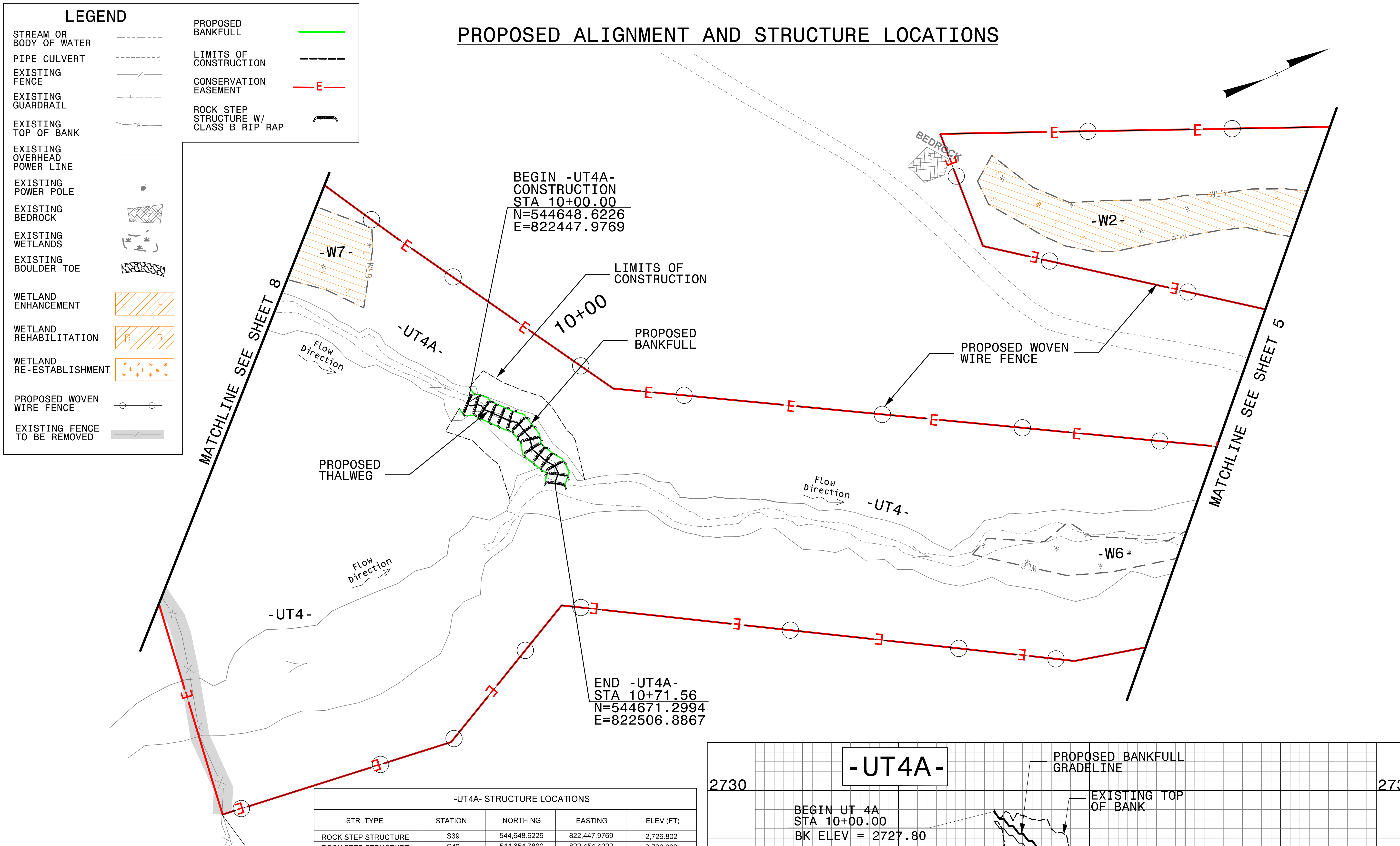
PLANS

DATE: 11-14-19

PLAN & PROFILE

PROPOSED ALIGNMENT AND STRUCTURE LOCATIONS



-UT4A- STRUCTURE LOCATIONS				
STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK STEP STRUCTURE	S39	544,648.6226	822,447.9769	2,726.802
ROCK STEP STRUCTURE	S40	544,654.7890	822,454.4022	2,726.032
ROCK STEP STRUCTURE	S41	544,657.8907	822,458.2257	2,725.262
ROCK STEP STRUCTURE	S42	544,657.8907	822,458.2257	2,724.492
ROCK STEP STRUCTURE	S43	544,661.1984	822,461.9720	2,723.722
ROCK STEP STRUCTURE	S44	544,664.4912	822,465.7251	2,722.952
ROCK STEP STRUCTURE	S45	544,667.9509	822,469.2207	2,722.182
ROCK STEP STRUCTURE	S46	544,669.1063	822,474.0854	2,721.412
ROCK STEP STRUCTURE	S47	544,670.0685	822,478.9472	2,720.642
ROCK STEP STRUCTURE	S48	544,668.7703	822,483.7757	2,719.872
ROCK STEP STRUCTURE	S49	544,670.5022	822,488.3393	2,719.102
ROCK STEP STRUCTURE	S52	544,672.5841	822,492.8852	2,718.332
ROCK STEP STRUCTURE	S53	544,675.3705	822,497.0287	2,717.562
ROCK STEP STRUCTURE	S54	544,675.3770	822,501.8009	2,716.792
ROCK STEP STRUCTURE	S55	544,672.1243	822,505.5623	2,716.022

NOTE:
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FOR STREAM DETAILS SEE SHEETS 2 THRU 2H
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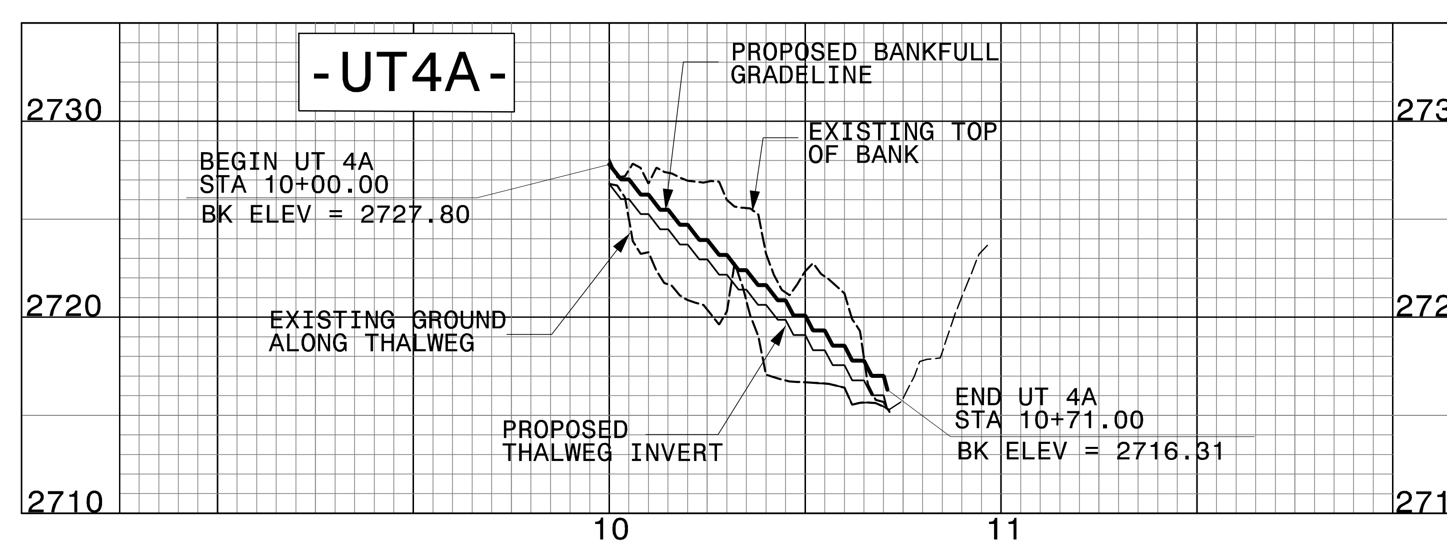
FOR PROPOSED FENCE LAYOUT MAP SEE SHEET 3A
FOR PLANS & PROFILES SEE SHEETS 4 THRU 12
FOR PLANTING PLAN SHEET SEE SHEET 13



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

-UT3-, -UT4- &
-UT4A- STA 10+00.00 - 10+71.56

GRAPHIC SCALE
50 25 0 25
PLANS

DATE: 11-14-19

PLAN & PROFILE

SHEET 9 OF

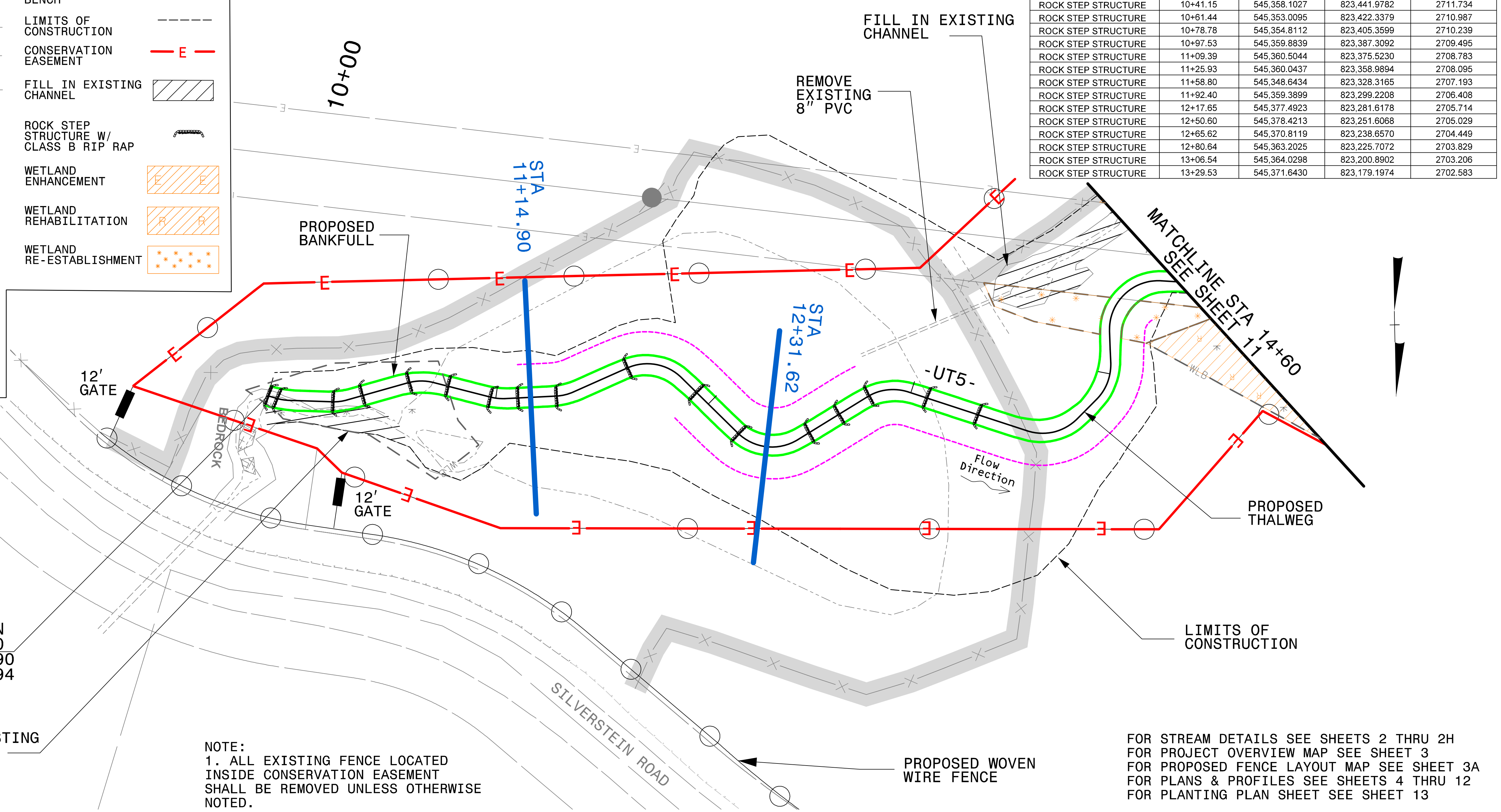
PROPOSED ALIGNMENT AND STRUCTURE LOCATIONS

LEGEND

- STREAM OR BODY OF WATER
- PIPE CULVERT
- EXISTING FENCE
- EXISTING GUARDRAIL
- EXISTING TOP OF BANK
- EXISTING OVERHEAD POWER LINE
- EXISTING POWER POLE
- EXISTING BEDROCK
- EXISTING WETLANDS
- EXISTING BOULDER TOE
- SELECTED CROSS-SECTIONS
- PROPOSED GATE
- PROPOSED WOVEN WIRE FENCE
- EXISTING FENCE TO BE REMOVED
- PROPOSED BANKFULL
- PROPOSED FLOODPLAIN BENCH
- LIMITS OF CONSTRUCTION
- CONSERVATION EASEMENT
- FILL IN EXISTING CHANNEL
- ROCK STEP STRUCTURE W/ CLASS B RIP RAP
- WETLAND ENHANCEMENT
- WETLAND REHABILITATION
- WETLAND RE-ESTABLISHMENT

-UT5- STRUCTURE LOCATIONS

STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK STEP STRUCTURE	10+04.07	545,357.2890	823,482.5394	2712.748
ROCK STEP STRUCTURE	10+27.95	545,360.4432	823,454.9042	2712.297
ROCK STEP STRUCTURE	10+41.15	545,358.1027	823,441.9782	2711.734
ROCK STEP STRUCTURE	10+61.44	545,353.0095	823,422.3379	2710.987
ROCK STEP STRUCTURE	10+78.78	545,354.8112	823,405.3599	2710.239
ROCK STEP STRUCTURE	10+97.53	545,359.8839	823,387.3092	2709.495
ROCK STEP STRUCTURE	11+09.39	545,360.5044	823,375.5230	2708.783
ROCK STEP STRUCTURE	11+25.93	545,360.0437	823,358.9894	2708.095
ROCK STEP STRUCTURE	11+58.80	545,348.6434	823,328.3165	2707.193
ROCK STEP STRUCTURE	11+92.40	545,359.3899	823,299.2208	2706.408
ROCK STEP STRUCTURE	12+17.65	545,377.4923	823,281.6178	2705.714
ROCK STEP STRUCTURE	12+50.60	545,378.4213	823,251.6068	2705.029
ROCK STEP STRUCTURE	12+65.62	545,370.8119	823,238.6570	2704.449
ROCK STEP STRUCTURE	12+80.64	545,363.2025	823,225.7072	2703.829
ROCK STEP STRUCTURE	13+06.54	545,364.0298	823,200.8902	2703.206
ROCK STEP STRUCTURE	13+29.53	545,371.6430	823,179.1974	2702.583



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FOR STREAM DETAILS SEE SHEETS 2 THRU 2H
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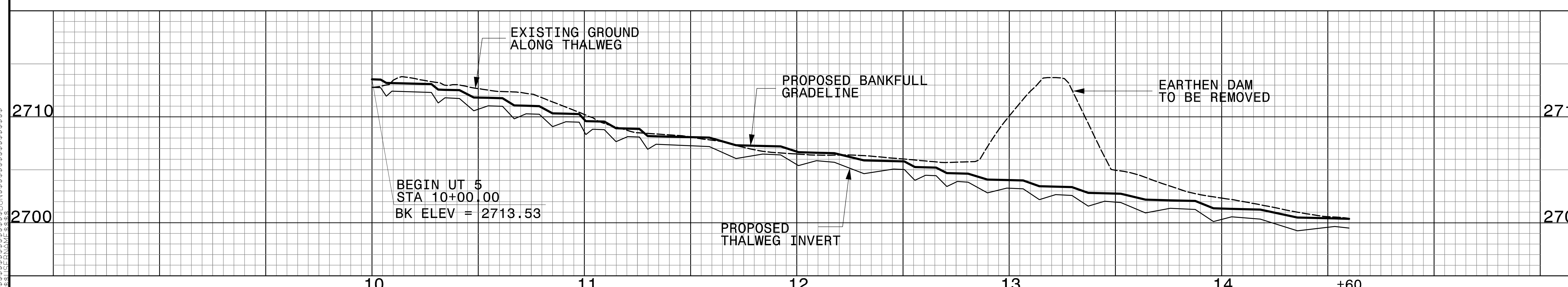
FOR PLANTING PLAN SHEET SEE SHEET 13



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OWEN FARMS MITIGATION SITE
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TRANSYLVANIA COUNTY, NORTH CAROLINA

-UT5- 10+00 - 14+60

GRAPHIC SCALE 50 25 0 25 PLANS

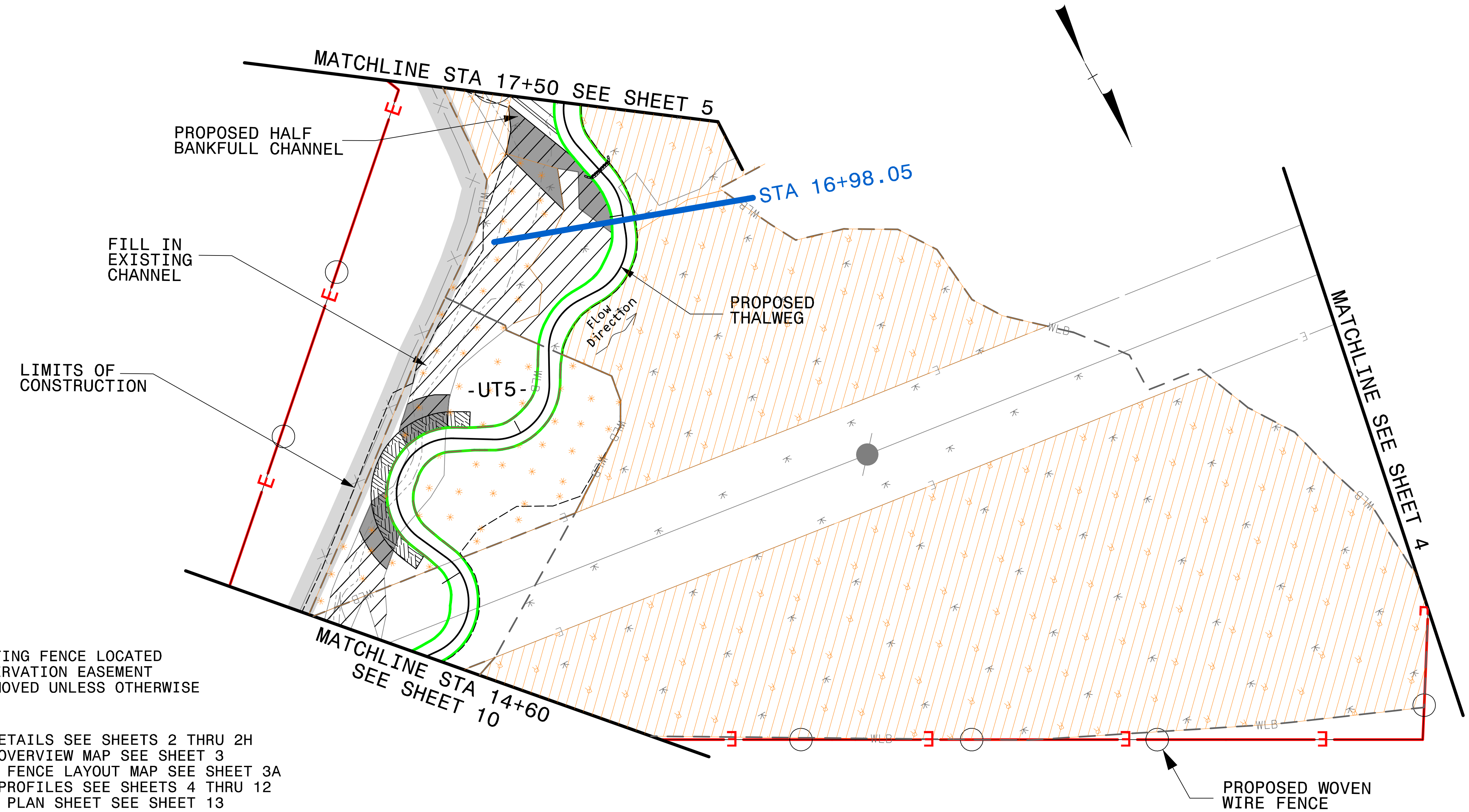
DATE: 11-14-19

PLAN & PROFILE

SHEET 10 OF

-UT5- STRUCTURE LOCATIONS				
STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
ROCK STEP STRUCTURE	17+19.22	545,187.7778	822,943.6222	2693.955

PROPOSED ALIGNMENT AND STRUCTURE LOCATIONS



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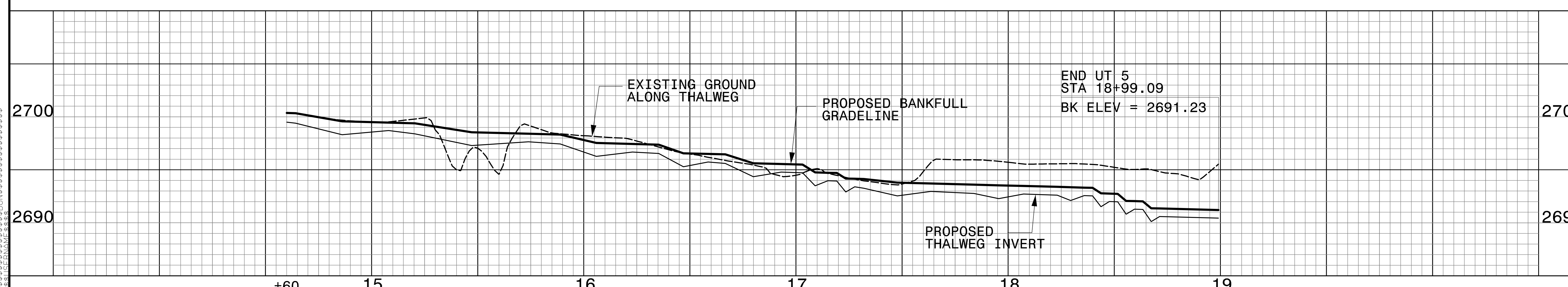
FOR PLANS & PROFILES SEE SHEETS 4 THRU 12
FOR PLANTING PLAN SHEET SEE SHEET 13

LEGEND

- STREAM OR BODY OF WATER
- PIPE CULVERT
- EXISTING FENCE
- EXISTING GUARDRAIL
- EXISTING TOP OF BANK
- EXISTING OVERHEAD POWER LINE
- EXISTING POWER POLE
- EXISTING BEDROCK
- EXISTING WETLANDS
- EXISTING BOULDER TOE
- SELECTED CROSS-SECTIONS
- PROPOSED BANKFULL
- LIMITS OF CONSTRUCTION
- CONSERVATION EASEMENT
- IMPERVIOUS CHANNEL PLUG
- FILL IN EXISTING CHANNEL
- SOIL LIFT W/ TOEWOOD
- ROCK STEP STRUCTURE W/ CLASS B RIP RAP
- FLOODPLAIN INTERCEPTOR (FPI)
- WETLAND ENHANCEMENT
- WETLAND REHABILITATION
- WETLAND RE-ESTABLISHMENT
- PROPOSED WOVEN WIRE FENCE
- EXISTING FENCE TO BE REMOVED



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

-UT5- 14+60 - 17+50

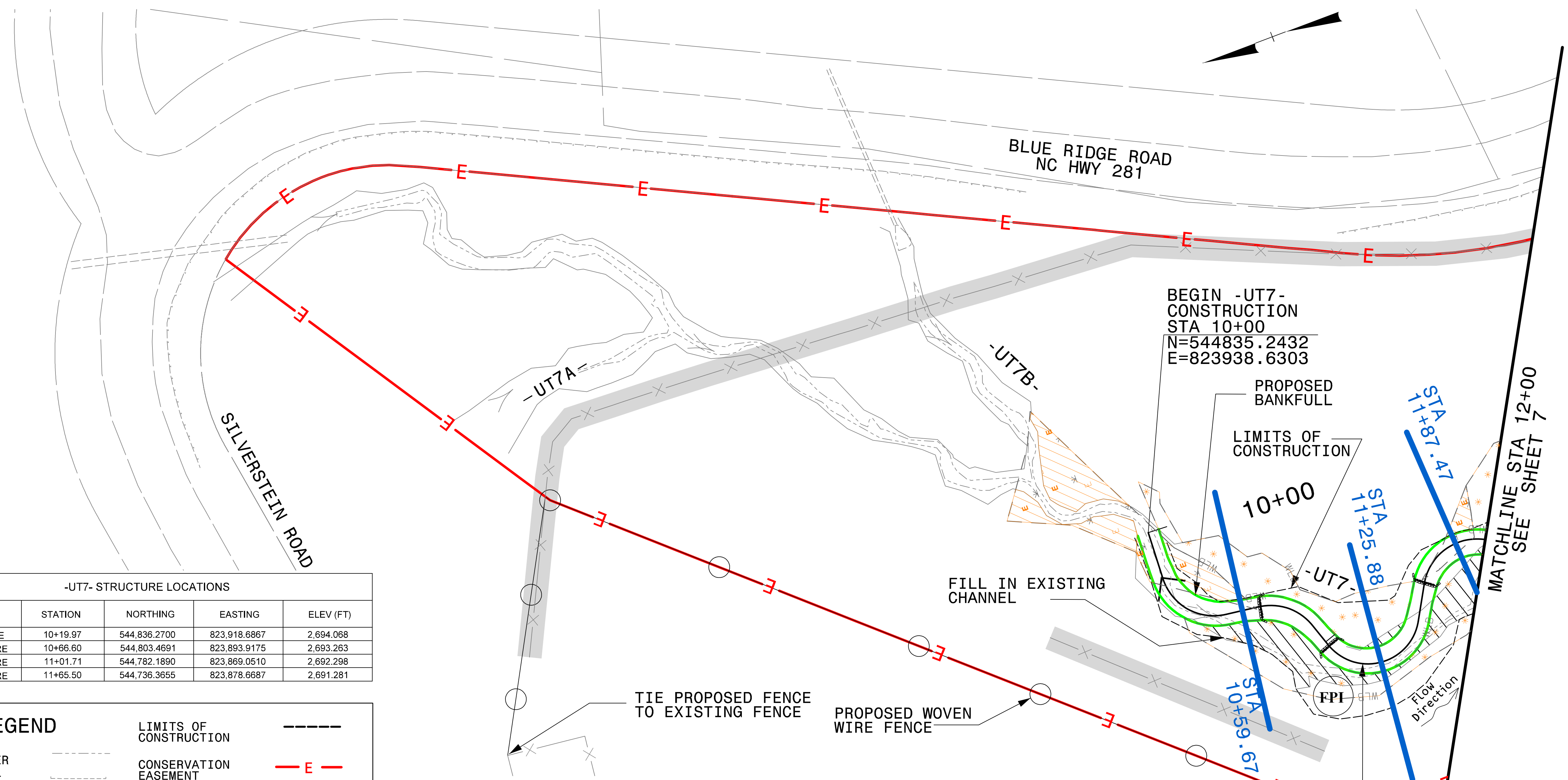
GRAPHIC SCALE
50 25 0 25
PLANS

DATE: 11-14-19

PLAN & PROFILE

SHEET
11
OF

PROPOSED ALIGNMENT AND STRUCTURE LOCATIONS



-UT7- STRUCTURE LOCATIONS				
STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT)
LOG STEP STRUCTURE	10+19.97	544,836.2700	823,918.6867	2,694.068
ROCK STEP STRUCTURE	10+66.60	544,803.4691	823,893.9175	2,693.263
ROCK STEP STRUCTURE	11+01.71	544,782.1890	823,869.0510	2,692.298
ROCK STEP STRUCTURE	11+65.50	544,736.3655	823,878.6687	2,691.281

LEGEND

- STREAM OR BODY OF WATER
- PIPE CULVERT
- EXISTING FENCE
- EXISTING GUARDRAIL
- EXISTING TOP OF BANK
- EXISTING OVERHEAD POWER LINE
- EXISTING POWER POLE
- EXISTING BEDROCK
- EXISTING WETLANDS
- EXISTING BOULDER TOE
- SELECTED CROSS-SECTIONS
- PROPOSED BANKFULL
- PROPOSED FLOODPLAIN BENCH
- LIMITS OF CONSTRUCTION
- CONSERVATION EASEMENT — E —
- FILL IN EXISTING CHANNEL
- ROCK STEP STRUCTURE W/ CLASS B RIP RAP
- LOG SILL
- FLOODPLAIN INTERCEPTOR — FPI
- WETLAND ENHANCEMENT — E
- WETLAND REHABILITATION — R
- WETLAND RE-ESTABLISHMENT
- PROPOSED WOVEN WIRE FENCE
- EXISTING FENCE TO BE REMOVED

FOR STREAM DETAILS SEE SHEETS 2 THRU 2H
FOR PROJECT OVERVIEW MAP SEE SHEET 3
FOR PROPOSED FENCE LAYOUT MAP SEE SHEET 3A
FOR PLANS & PROFILES SEE SHEETS 4 THRU 12
FOR PLANTING PLAN SHEET SEE SHEET 13

NOTE:
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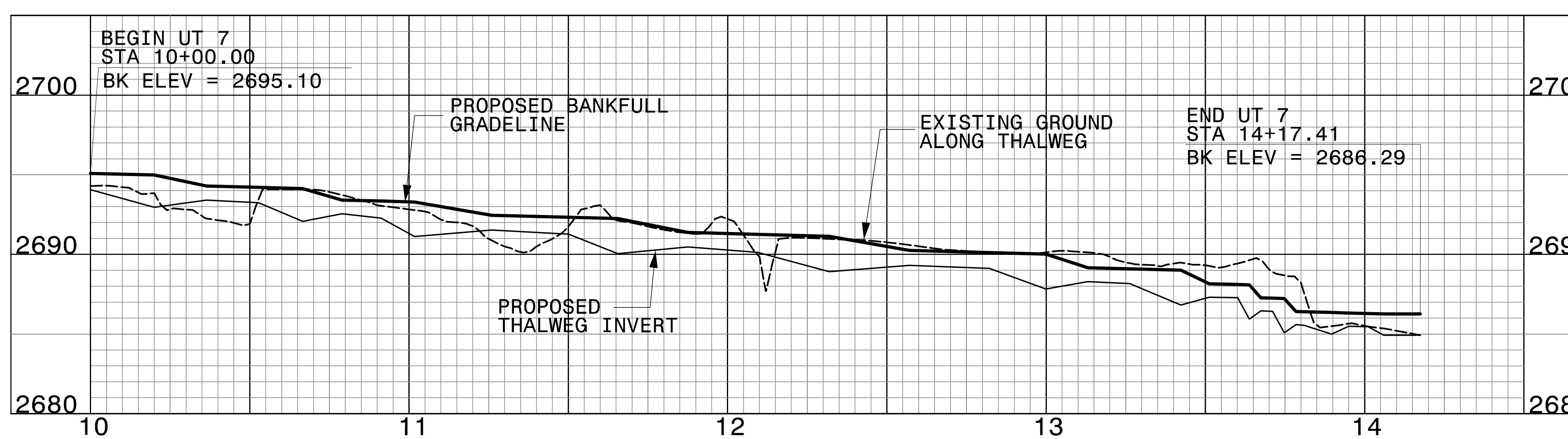

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TRANSYLVANIA COUNTY, NORTH CAROLINA
-UT7- STA 10+00 - 12+00
-UT7A-, -UT7B-

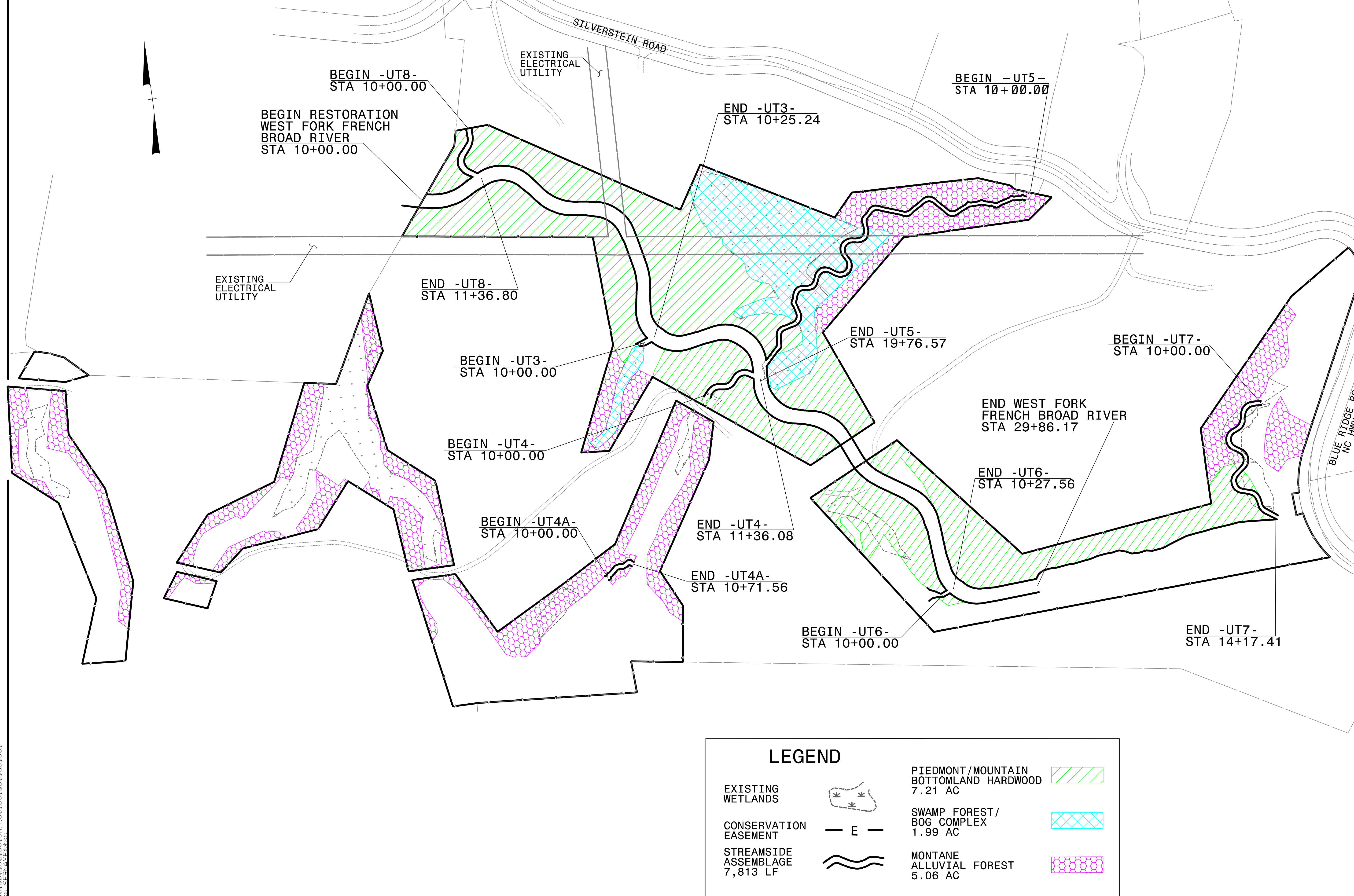
GRAPHIC SCALE
50 25 0 25
PLANS

DATE: 11-14-19

PLAN & PROFILE

SHEET
12
OF

PLANTING PLAN



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STREAM & WETLAND RESTORATION PROJECT
TRANSYLVANIA COUNTY, NORTH CAROLINA

GRAPHIC SCALE
200 100 0 100
PLANS

DATE: 07-22-19

PLANTING PLAN

SHEET
13

PROJ. REFERENCE NO.	SHEET NO.
-WFFB-	X-1

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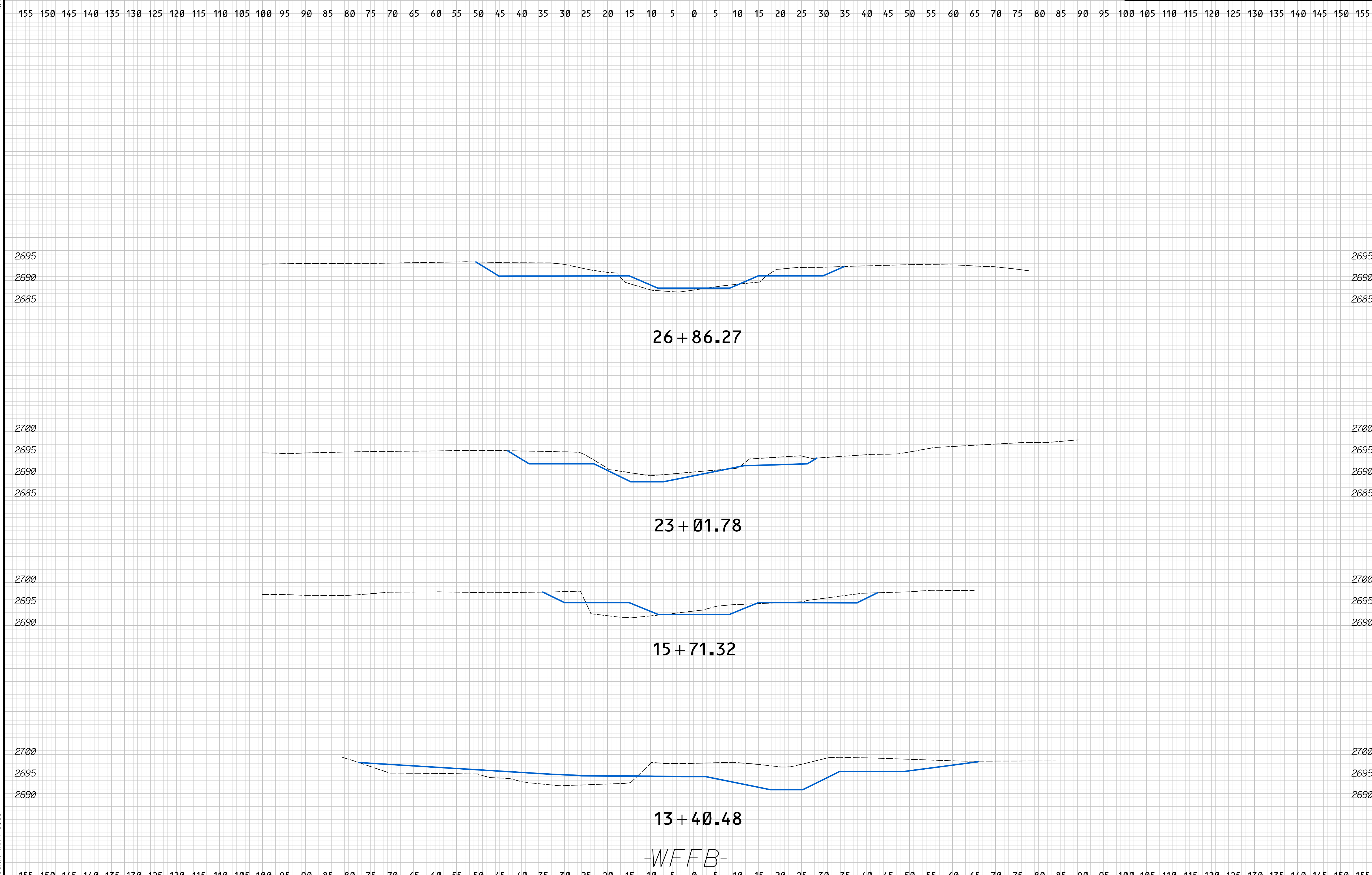

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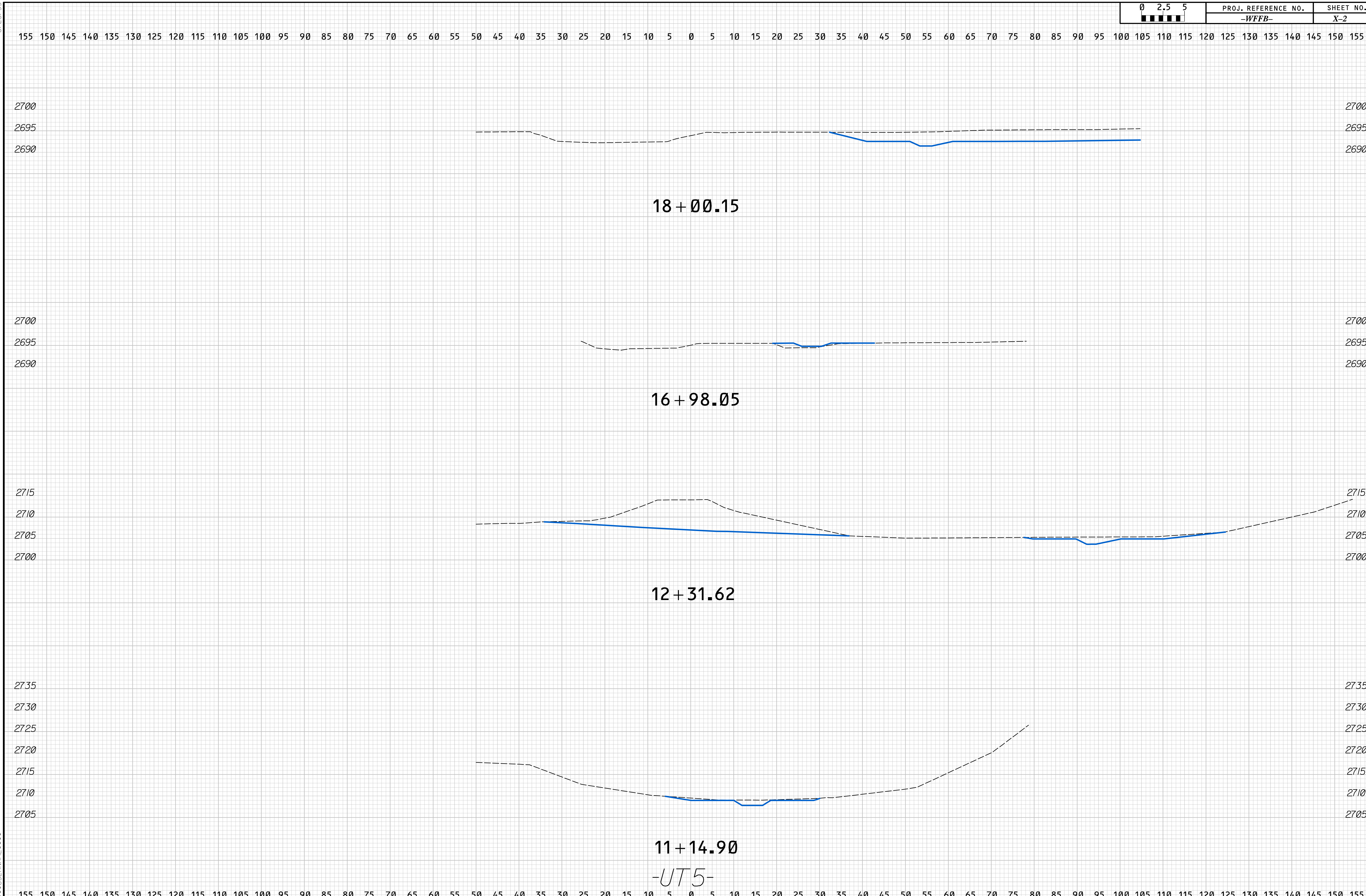
PROJ. REFERENCE NO.	SHEET NO.
-WFFB-	X-2



$$$$$$$$SYSTIME$$$$$$$$
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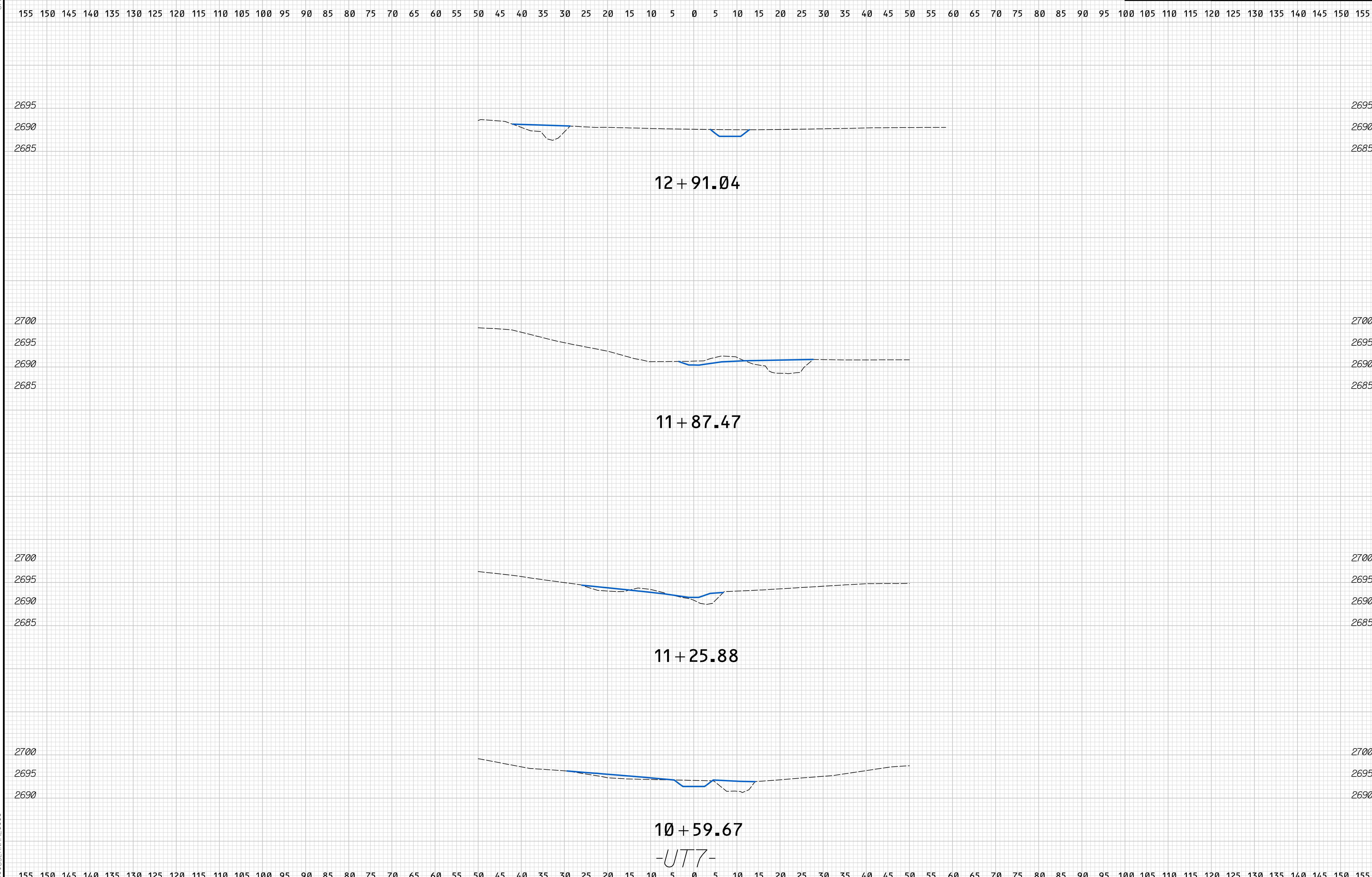
0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	-WFFB-	X-3



8/23/99
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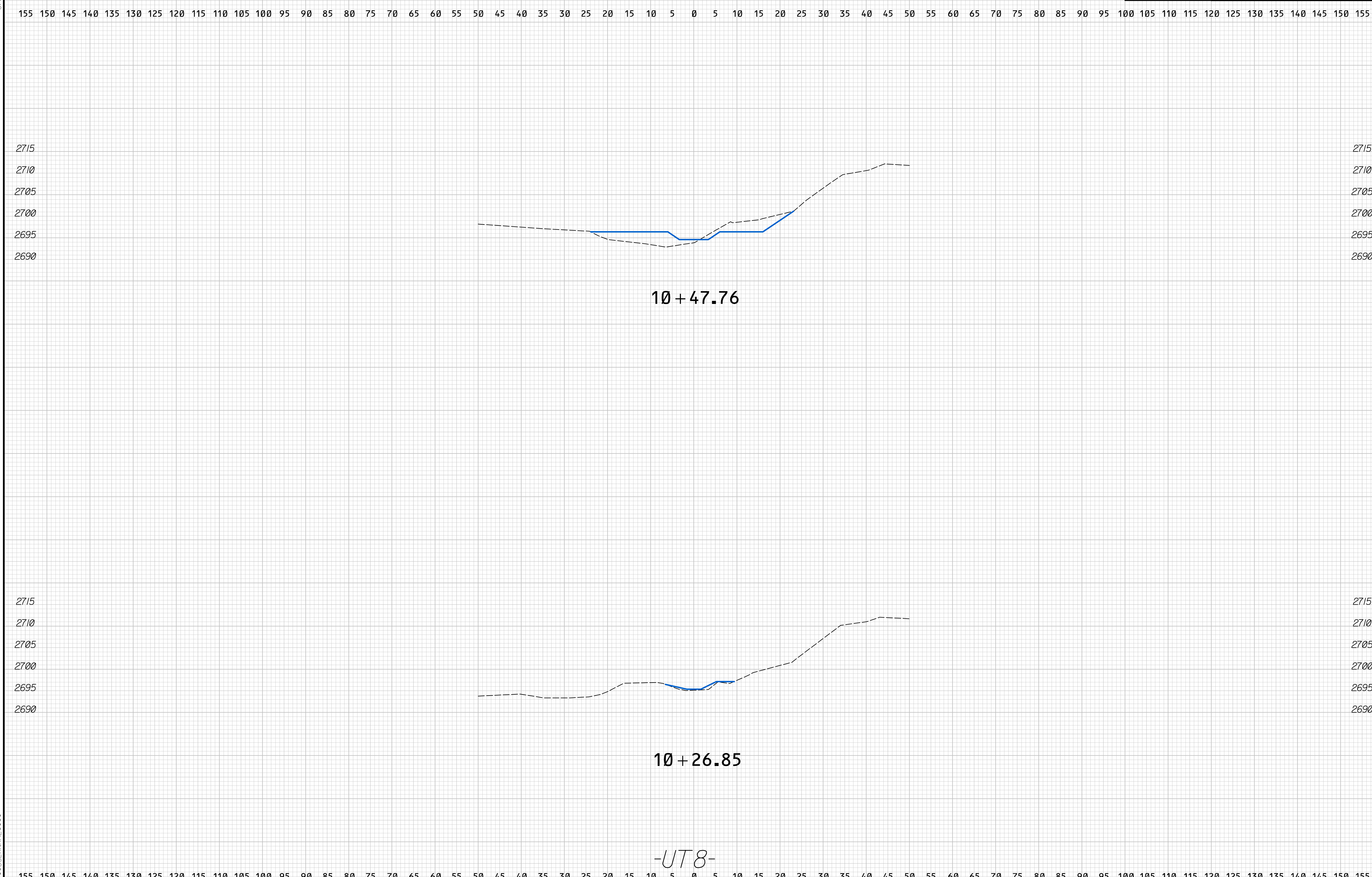
8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	-WFFB-	X-4



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Appendix H – Data and Supplementary Information

Meeting Minutes

Project:	Owen Farms Stream and Wetland Mitigation Site (DMS # 100064)
Subject:	IRT Post Contract Site Visit
Date:	Wednesday, August 01, 2018
Location:	On-Site, Transylvania County
Attendees:	Ryan Smith (HDR) Ben Furr (HDR)
	Paul Wiesner (DMS) Matthew Reid (DMS)
	Mac Haupt (DWR) Periann Russell (DMS)
	David Brown (USACE) Steve Kichefski (USACE)
	Todd Tugwell (USACE)

The IRT Post Contract Meeting for the Owen Farms Stream and Wetland Mitigation Site was held at 8:30am on Wednesday, August 1, 2018 at the project site in Transylvania County. The following represents highlights of discussions that occurred during the site visit:

1. Ben Furr gave a synopsis of the project site:
    a. Site consists of the West Fork French Broad River and multiple spring fed tributaries, and associated wetlands. HDR conducted a delineation of streams and wetlands on June 5th and 6th, 2018 and provided the IRT with updated figures depicting existing and proposed conditions (see attached figures).
    b. Cattle have access to the majority of streams and wetlands on-site. The property owner reduced the number of cattle on the property following notification that DMS had selected the Site.
    c. Wetland restoration/rehabilitation is proposed for W3 and W5. Stream restoration is proposed for West Fork French Broad River, UT 5, and UT 7. The remainder of streams and wetlands on-site are proposed for enhancement or preservation.

<u>Site Walk</u>

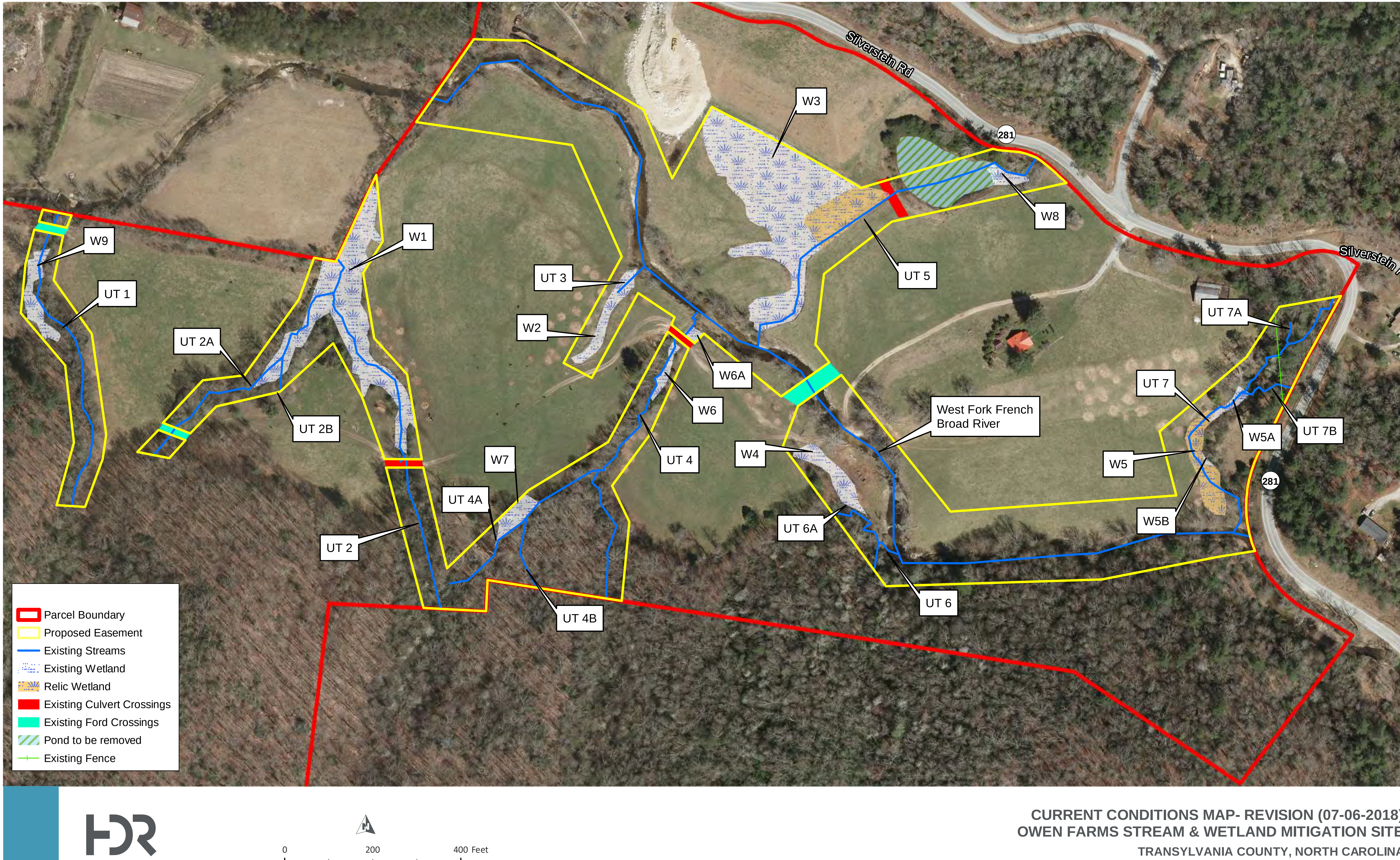
2. The IRT asked what the restoration plan for UT 5 through the pond would be. The IRT noted that they had concerns with previous stream restoration sites that had not adequately removed pond dams and re-established a restored channel. HDR noted that the current intent of the mitigation plan will be to remove the pond dam that is currently impeding flow of UT 5. If a significant sediment wedge is discovered behind the dam then it would be removed. HDR

intends to restore a new channel through the pond bed. The IRT agreed that this was the preferred method of restoration.

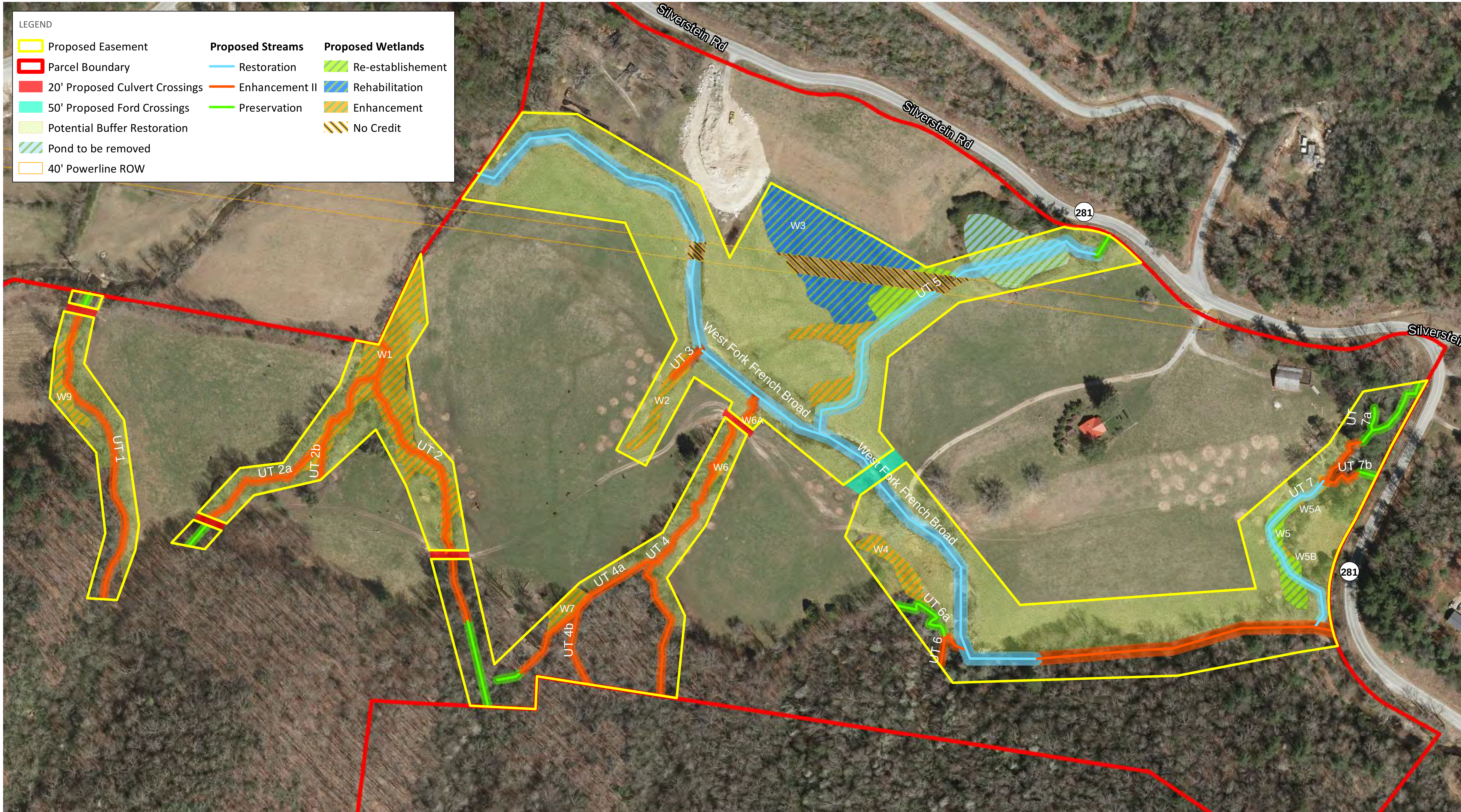
3. A discussion was held regarding the restoration of UT 5 through existing wetlands and if that would be acceptable to the IRT. The general consensus was that if restoring UT 5 through existing wetlands increases overall function of the wetlands and allows for wetland restoration within the existing channel of UT 5, then the overall concept is acceptable. Generally, it was understood that proposing the restoration of UT 5 through W3 would afford W3 greater access to floodwaters associated with UT 5 and that the existing alignment of UT 5 (i.e. the ditched section) would probably revert to a wetland based on landscape position and soils. A discussion of how to show impacts in the permit was discussed. The IRT indicated that anticipated wetland impacts would need to be identified in the permit application.
4. The IRT consensus was that a combination of rehabilitation and restoration seemed to be appropriate for W3. No credit will be allowed for the area of W3 (or stream credits on the site) within the existing power easement. The IRT mentioned that it may be possible to expand the rehabilitation/restoration of W3 along the southwest boundary of the wetland. HDR has already installed groundwater monitoring gauges in W3 and will coordinate with David Brown (USACE) during the JD site visit to confirm potential wetland rehabilitation/restoration boundaries.
5. The IRT asked what the proposed hydroperiod of W3 would be and made reference to the 2016 IRT guidance. HDR indicated that this has not been set to date but would be indicated within the mitigation plan.
6. David Brown requested that tributaries with headwaters originating outside of the easement boundary be shown extending outside of easement boundary on JD mapping.
7. UT 2 was viewed in several places as it flowed through W1 to confirm that a jurisdictional stream channel was present throughout the wetland system. The IRT consensus was that a stream channel with an Ordinary High Water Mark (OHW) was evident through W1 within the easement. Cattle access and sedimentation associated with runoff from adjacent pasture was also observed within UT 2/W1. HDR explained that beaver dams were present along UT 2 further downstream, which is affecting the UT 2/W1 system within the easement. The IRT agreed that leaving the beaver dams in place and fencing out cattle would be the best approach for this system.
8. Cattle appeared to be accessing UT 2a often, as hoof shear was evident in channel and overbank areas. A discussion was held at UT 2a regarding the significant impact cattle were having on the stream.
9. A discussion took place at UT 1 regarding the acceptable ratio for enhancement along UT 1 given that woody vegetation was already established along both sides of the channel. Todd Tugwell mentioned that the type of enhancement proposed for UT 1 may not warrant a 2.5:1 ratio. The benefits of excluding cattle from the system would include reduction in direct fecal and nutrient inputs as well as a reduction in sediment associated with runoff from the adjacent pasture. The benefits of the existing woody vegetation include steam bank stability, shading, habitat, and forage for aquatic invertebrates. There was discussion regarding studies that have shown significant water quality improvements to streams systems through removal of cattle. A discussion was held to suggest that collecting water quality samples in the existing condition of the stream system could be completed to assist in showing levels of fecal coliform and nutrients.

Also, modeling could be completed to assist in determining what historic rates of fecal and nutrients are which could assist in determining credit ratios. HDR will propose a ratio for UT 1 and other tributaries that is commensurate with the level of functional uplift provided by the proposed enhancement measures. Justification for the proposed enhancement ratio will be included in the Mitigation Plan. HDR will likely propose an average ratio for each tributary as opposed to splitting out sections that may warrant a lower ratio from areas that may warrant a higher ratio. This approach seemed to be preferred by the IRT.

10. UT 4 was viewed between the road crossings and cattle access was evident in several locations. Cattle activity along UT 4 is similar to UT 2a. UT 4a, UT 4b, and W7 were not viewed during the site visit but cattle routinely access these areas and the systems are degraded from reference condition.
11. UT 6, UT 6a, and W4 were not viewed during the site walk. Photo documentation and explanation of the existing condition of these systems will be provided in the Mitigation Plan.
12. A discussion took place regarding the method of restoration for West Fork French Broad River. The consensus appears to be that the River displays significant degradation throughout the site, with the exception of the right bank of the River in the downstream most portions. The IRT asked HDR what the restoration plan for the River would be. In response HDR noted that the restoration plan has not been started to date, however we would anticipate off-line restoration of the River in some places (i.e. new pattern) where it is needed/required based on constraints, but also using the existing pattern/location of the River as much as possible. The IRT consensus was to maximize use of the existing channel when possible. The IRT agreed that a 1:1 ratio would still be warranted given the level of functional uplift that would result from restoration of West Fork French Broad River along the existing alignment.
13. HDR explained that the level of work required to stabilize portions of the West Fork French Broad River through the enhancement section may warrant Enhancement I credit. Todd Tugwell suggested analyzing the amount of work required to repair the left bank of West Fork French Broad River through the enhancement section and, if warranted, propose justification in the Mitigation Plan for using a blended Enhancement I/Enhancement II ratio (i.e. 2:1) for that entire section.
14. The IRT consensus was that all preservation on-site would likely be credited at a 10:1 ratio.

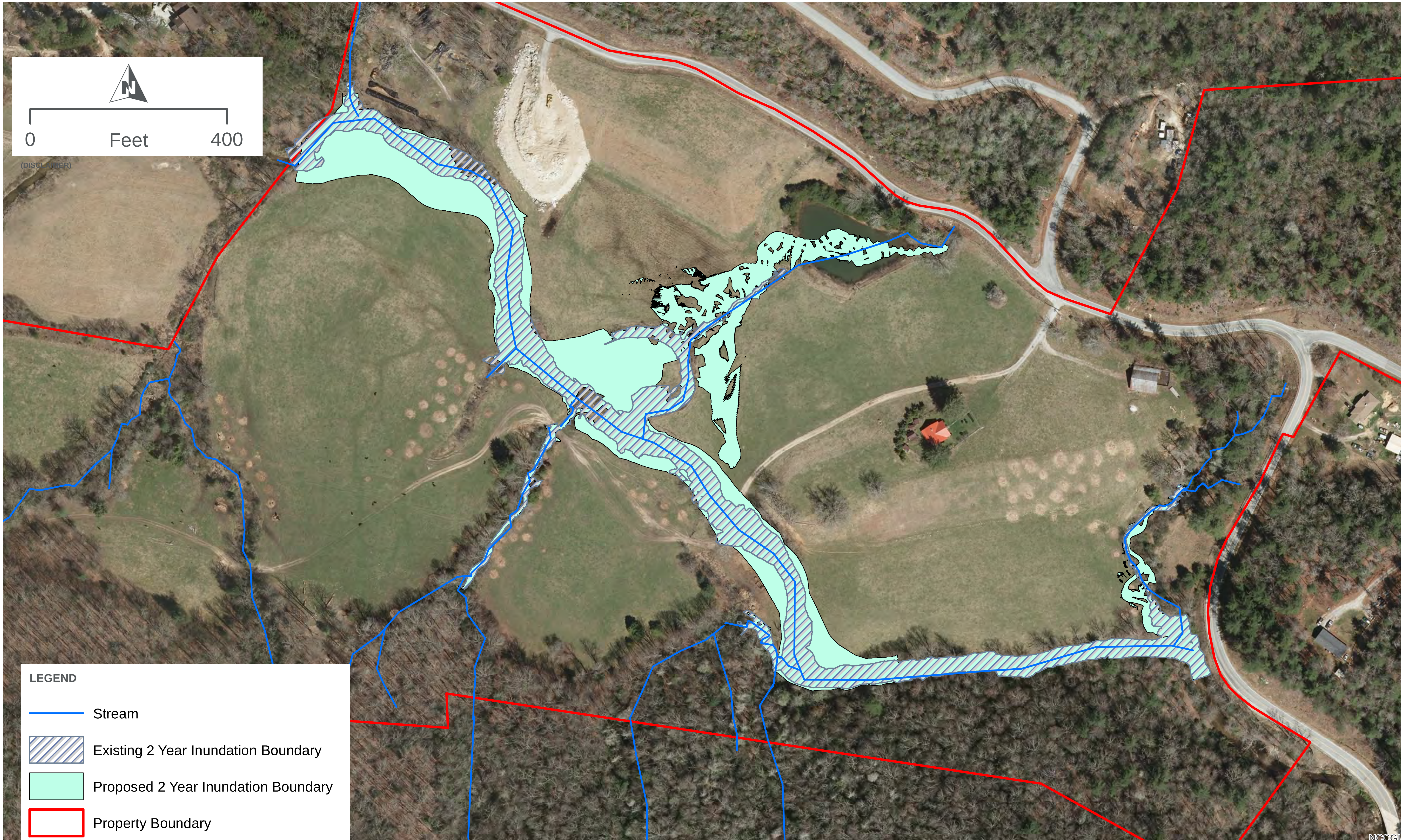


CURRENT CONDITIONS MAP- REVISION (07-06-2018)
OWEN FARMS STREAM & WETLAND MITIGATION SITE
TRANSYLVANIA COUNTY, NORTH CAROLINA
FIGURE 6



0 200 400 Feet

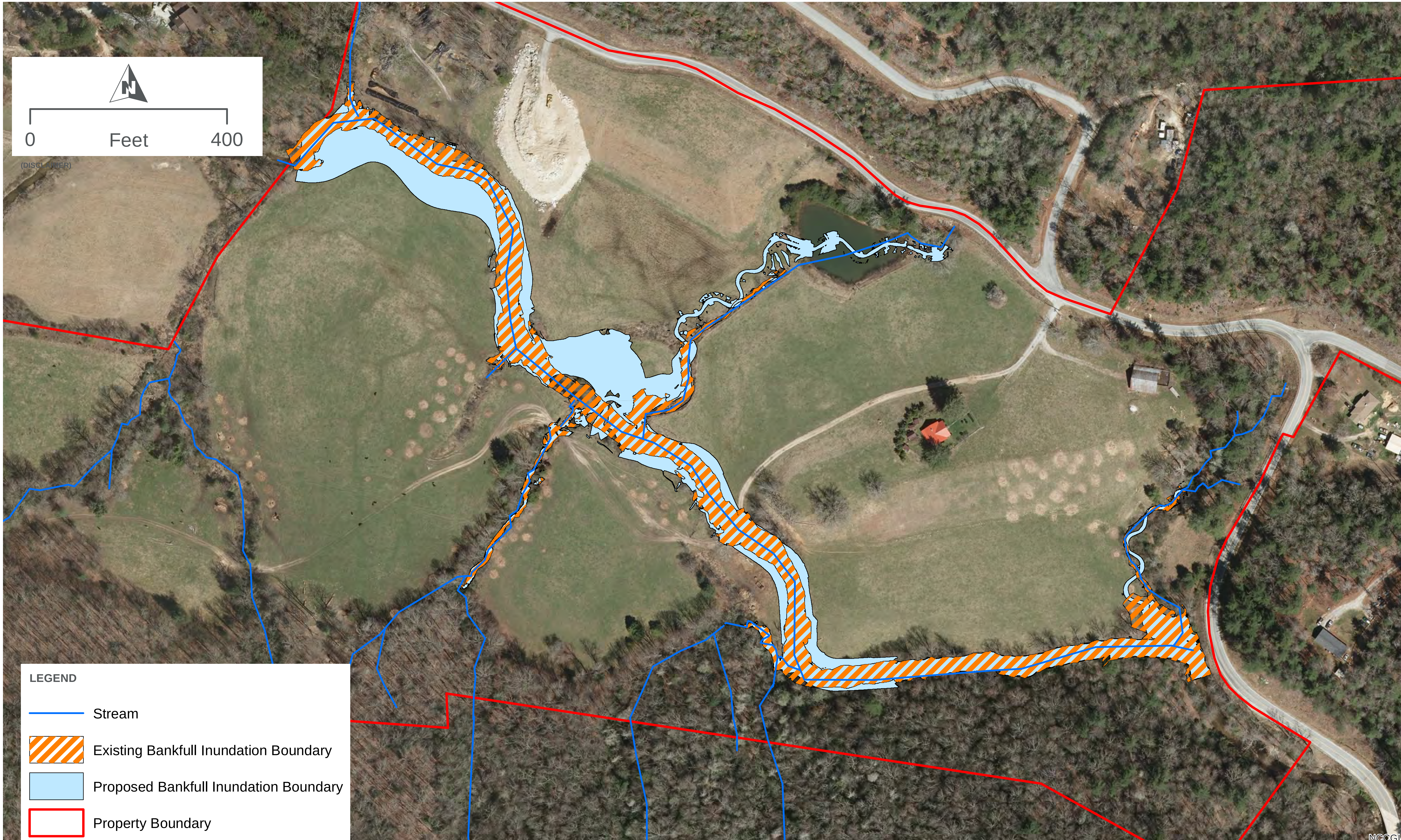
PROPOSED MITIGATION FEATURES MAP- OPTION 1- REVISION (07-06-2018)
OWEN FARMS STREAM & WETLAND MITIGATION SITE
TRANSYLVANIA COUNTY, NORTH CAROLINA
FIGURE 7A



EXISTING AND PROPOSED 2-YEAR STORM INUNDATION BOUNDARY MAP

OWEN FARMS STREAM AND WETLAND MITIGATION SITE

TRANSYLVANIA COUNTY, NC



HDR

EXISTING AND PROPOSED BANKFULL INUNDATION BOUNDARY MAP

OWEN FARMS STREAM AND WETLAND MITIGATION SITE

TRANSYLVANIA COUNTY, NC

WETS Table

WETS Station: LAKE TOXAWAY 2 SW, NC								
Requested years: 1981 - 2017								
Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	46.4	25.5	36.0	7.04	4.74	8.42	8	4.7
Feb	49.8	27.5	38.7	6.75	4.78	7.99	7	3.0
Mar	57.8	33.5	45.6	7.60	5.21	9.07	8	1.8
Apr	67.8	41.2	54.5	7.01	4.80	8.36	8	0.5
May	73.2	49.9	61.6	6.39	4.39	7.61	8	0.0
Jun	76.7	57.8	67.3	7.37	4.51	8.93	10	0.0
Jul	78.1	61.3	69.7	9.38	6.12	11.28	12	0.0
Aug	77.7	60.6	69.1	7.55	4.71	9.12	10	0.0
Sep	72.9	54.7	63.8	8.32	4.03	10.16	8	0.0
Oct	64.4	43.8	54.1	6.06	2.95	7.41	6	0.0
Nov	56.6	34.5	45.5	8.34	5.68	9.96	7	0.2
Dec	49.2	29.0	39.1	8.42	5.58	10.09	8	1.9
Annual:					78.08	97.35		
Average	64.2	43.3	53.7	-	-	-	-	-
Total	-	-	-	90.23			99	12.1

GROWING SEASON DATES

Years with missing data:	24 deg = 17	28 deg = 17	32 deg = 17
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 20	28 deg = 20	32 deg = 20
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	3/21 to 11/17: 241 days	4/7 to 10/30: 206 days	4/22 to 10/20: 181 days
70 percent *	3/15 to 11/24: 254 days	4/2 to 11/4: 216 days	4/18 to 10/24: 189 days
* Percent chance of the growing season occurring between the Beginning and Ending dates.			

STATS TABLE - total precipitation (inches)

Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1950							M1.87						1.87
1951													
1952	6.21	6.30	18.50	6.46	4.72	6.00	M0.00	16.28	2.27	1.25	9.15	5.85	82.99
1953	10.92	12.58	9.21	2.22	7.62	10.76	7.16	4.12	11.89	0.68	6.03	11.06	94.25
1954	11.69	5.75	8.40	6.76	3.01	M2.54	2.79	2.36	M0.03	1.79	5.68	11.15	61.95
1955	2.27	9.52	5.64	10.25	13.65	4.74	9.92	5.47	1.24	3.30	2.54	1.50	70.04
1956	2.07	13.68	4.91	5.89	4.45	2.97	8.77	2.99	7.20	6.05	3.59	5.85	68.42
1957	7.72	10.83	4.98	12.37	5.22	11.49	1.17	3.37	13.40	11.99			82.54
1958				M3.61	4.98	4.26	14.12	6.73	2.18	2.91	3.78	2.89	45.46

1959	5.98			6.71	12.90	3.32				13.06			41.97
1960								10.41	8.12	6.09	2.27	2.88	29.77
1961	4.70	12.38	6.71	7.64	4.51	11.63	5.04	18.62	2.75	3.11	10.36	14.55	102.00
1962	9.75	6.88	7.05	10.31	3.38	11.64	3.32	6.95	7.35	10.23	5.52	3.87	86.25
1963	4.19	2.93	11.49	7.08	4.83	6.03	9.16	3.11	5.26	0.04	11.42	3.32	68.86
1964	10.77	6.86	12.50	14.44	2.53	4.49	11.83	12.65	14.77	14.28	5.47	10.24	120.83
1965	4.51	10.76	7.90	5.15	4.67	9.99	6.05	8.04	5.05	13.32	3.62	1.19	80.25
1966	5.67	15.72	4.68	10.38	5.71	2.81	3.02	7.88	9.29	7.96	8.02	5.69	86.83
1967	5.76	3.50	6.36	3.16	4.71	13.00	11.18	12.45	6.22	7.10	5.14	13.58	92.16
1968	5.04	1.11	9.34	5.78	5.72	4.95	3.83	5.26	9.18	8.12	5.65	6.84	70.82
1969	7.57	7.31	5.21	9.61	8.25	14.75	3.61	21.61	9.87	5.70	12.40	9.21	115.10
1970	3.43	3.28	7.08	5.33	3.18	7.53	7.31	14.16	5.32	20.28	4.46	3.80	85.16
1971	5.86	8.80	6.72	2.91	6.70	4.95	11.21	8.34	8.72	8.30	8.09	11.58	92.18
1972	8.24		5.97	2.50	16.77	7.71	3.78	2.33	4.53	7.49	9.92		69.24
1973	9.21		16.83	9.43	13.63	6.04	6.87	4.95	5.28	2.16	10.72	15.57	100.69
1974	9.85	7.94	4.15	9.20	14.16	7.54	9.79	12.88	5.44	2.59	3.84	6.76	94.14
1975	7.19	11.70	13.90	1.38	16.83	8.46	16.36	5.82	19.57	12.23	10.50	8.23	132.17
1976	8.78	3.11	9.83	3.11	20.09	11.85	2.94	6.65	4.90	12.82	3.44	7.08	94.60
1977	3.67	2.73	21.56	9.04	8.84	4.03	1.32	7.51	22.54	9.88	8.41	8.10	107.63
1978	14.17	0.64	7.66	2.71	8.82	5.13	6.15	16.57	3.23	0.61	5.30	9.63	80.62
1979	10.02	9.36	21.00	12.76	7.31	5.25	13.00	11.61	17.40	3.80	18.26	2.03	131.80
1980	7.17	2.17	16.12	12.34	9.99	7.06	2.41	6.44	9.18	3.32	6.29	0.76	83.25
1981	0.57	10.27	5.82	2.27	15.96	3.48	13.26	2.43	3.49	5.78	2.03	7.31	72.67
1982	10.46	12.99	4.32	9.51	5.34	9.37	10.09		2.20	4.66	10.71	M16.69	96.34
1983	6.20	9.95	11.59	13.42	8.22	4.00	3.22	5.18	8.29	7.58	9.23	14.33	101.21
1984	5.32	10.14	8.17	9.82	9.27	5.98	11.97	7.97	0.11	6.85	5.82	2.88	84.30
1985	4.86	7.97	1.86	5.27	4.02	4.59	9.40	11.24	2.31	4.08	13.55	1.53	70.68
1986	2.76	3.05	5.36	1.50	9.01	4.57	3.09	4.41	3.99	11.36	11.56	11.19	71.85
1987	5.54	5.93	9.79	6.07	5.25	5.32	4.62	2.55	9.79	0.40	7.85	5.73	68.84
1988	7.08	3.48	3.29	6.81	1.81	4.63	7.83	4.10	3.97	4.42	9.60	2.91	59.93
1989	4.13	6.40	8.27	5.36	9.64	19.13	18.73	8.43	9.70	9.10	6.88	M5.28	111.05
1990	M7.00	11.17	11.59	3.59	8.47	0.82	7.98	9.22	4.24	10.86	3.34	11.19	89.47
1991	7.56		M7.47	11.26	9.07	8.82	15.14	8.79	3.94	1.24	8.47	9.37	91.13
1992	6.44	9.06	8.44	6.82	6.78	12.01	5.06	19.43	9.84	8.13	20.95	M8.70	121.66

1993	10.02	5.99	11.38	6.94	7.62	1.73	5.09	2.94	3.94	2.49	7.85	5.48	71.47
1994	10.36	7.19	11.08	6.39	3.01	5.79	10.11	17.75	10.52	9.74	6.63	7.03	105.60
1995												3.30	3.30
1996	16.28	5.68	7.21	5.13	5.50	9.35	9.51	12.25	15.93	2.07	9.43	11.39	109.73
1997	8.31	9.21	13.14	9.81	4.86	8.36	6.16	0.92	7.76	6.60	3.28	M5.73	84.14
1998	21.86	13.06	9.56	13.45	3.66	5.15	3.71	4.86	2.80	8.88	6.17	5.68	98.84
1999	M10.11	7.62	M4.58	7.59	3.44	6.70	6.02	3.43	6.69	M7.48	10.63	M5.32	79.61
2000	M5.70	3.39	3.68	7.39	5.17	6.22	6.63	6.31	7.47	0.04	M9.80	4.20	66.00
2001	5.22	5.03	M5.90	1.29	M5.01	7.76	6.90	4.23	7.99	4.79	4.65	4.63	63.40
2002	M6.35	2.46	10.77	5.53	5.89	M4.81	4.38	6.55	22.09	6.68	8.04	10.77	94.32
2003	7.12	8.43	8.23	8.53	14.19	14.01	16.01	13.60	18.30	3.60	16.67	8.68	137.37
2004	3.00	8.60	3.16	4.73	8.15	10.54	23.56	5.69	31.45	1.25	10.84	9.93	120.90
2005	4.56	4.67	M8.88	M5.66	3.46	M21.13	23.83	M9.14	1.65	3.36	M9.27	7.02	102.63
2006	8.79	4.99	M1.85	3.68	2.23	7.28	5.23	M8.81	M10.64	M5.25	7.92	M13.11	79.78
2007	M6.58	2.53	6.89	3.43	2.36	9.02	6.68	2.50	6.69	10.14	3.26	M5.35	65.43
2008	4.42	8.22	14.52	M5.11	3.80	1.80	6.05	11.07	3.87	4.96	3.79	9.90	77.51
2009	M4.63	5.21	9.98	7.21	M5.97	3.75	4.37	7.28	24.52	12.33	10.33	14.98	110.56
2010	11.00	5.26	6.45	5.50	M8.65	6.50	6.13	5.65	4.40	7.54	M6.89	6.42	80.39
2011	3.48	4.39	19.73	M11.28	2.06	3.16	10.71	4.23	15.43	3.21	M13.15	9.30	100.13
2012	8.32	2.17	5.88	6.16	M4.77	5.21	12.08	M0.42					45.01
2013	M6.40	6.65	5.43	13.85	6.84	19.19	26.50	9.23	4.57	3.13	8.83	18.07	128.69
2014	4.42	M5.70	4.26	8.09	7.46	6.86	7.33	6.77	6.16	8.69	6.85	6.05	78.64
2015	5.48	5.12	4.41	11.70	5.34	7.36	4.06	5.14	6.18	9.65	12.10	21.76	98.30
2016	5.47	12.15	3.51	2.51	4.67	2.34	8.19	19.36	2.07	0.71	4.37	5.25	70.60
2017	7.05	2.01	7.18	9.59	12.54	M8.67	8.17	5.22	8.09	M15.09	1.30	3.58	88.49
2018	12.86	M12.77	4.71	7.89	23.50	4.30	9.10	M11.86	M4.00				90.99
Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.													
Data missing for all days in a month or year is blank.													
Creation date: 2016-07-22													

West Fork French Broad River Discharge Calculations

West Fork French Broad Discharge Cross Section	
Drainage Area (mi ^{2})	5.50
Width	28.78
Stream Type (Rosgen)	B4
Cross-sectional Area (ft^2)	69.31
Wetted Perimeter (ft)	31.85
Hydraulic Slope (ft/ft) (S)	0.00337
Mean Depth (ft) (d)	2.41
Hydraulic Radius (ft) (R)	2.18
Bed Material (ft) (D84)	0.234
Maximum Depth (ft) (D)	2.93
Gravitation Acceleration (ft/sec ^{2}) (g)	32.2
Mannings n	0.034
Velocity (fps)	4.28
Discharge (cfs)	296.45

On-Site Analysis	
Drainage Area (mi^2)	5.5
Regional Curve Analysis	**Discharge (cfs)**
Mountain (100.64*DA^0.76)	367.7
Piedmont (89.04*DA^0.72)	303.8
Design	300.0

UT 5 Discharge Calculations

UT 5 Discharge Cross Section	
Drainage Area (mi^2)	0.07
Width	4.38
Stream Type (Rosgen)	B4
Cross-sectional Area (ft^2)	2.9
Wetted Perimeter (ft)	5.28
Hydraulic Slope (ft/ft) (S)	0.01316
Mean Depth (ft) (d)	0.66
Hydraulic Radius (ft) (R)	0.55
Bed Material (ft) (D84)	0.013
Maximum Depth (ft) (D)	0.95
Gravitation Acceleration (ft/sec^2) (g)	32.2
Mannings n	0.033
Velocity (fps)	3.48
Discharge (cfs)	10.08

On-Site Analysis	
Drainage Area (mi^2)	0.07
Regional Curve Analysis	**Discharge (cfs)**
Mountain (100.64*DA^0.76)	13.3
Piedmont (89.04*DA^0.72)	13.1
Design	10.0

UT 7 Discharge Calculations

UT 7 Discharge Cross Section	
Drainage Area (mi ^{2})	0.064
Width	4.09
Stream Type (Rosgen)	E4
Cross-sectional Area (ft^2)	2.44
Wetted Perimeter (ft)	4.69
Hydraulic Slope (ft/ft) (S)	0.045
Mean Depth (ft) (d)	0.6
Hydraulic Radius (ft) (R)	0.52
Bed Material (ft) (D84)	0.114757
Maximum Depth (ft) (D)	0.77
Gravitation Acceleration (ft/sec ^{2}) (g)	32.2
Mannings n	0.038
Velocity (fps)	5.38
Discharge (cfs)	13.12

On-Site Analysis	
Drainage Area (mi^2)	0.064
Regional Curve Analysis	**Discharge (cfs)**
Mountain (100.64*DA^0.76)	12.5
Piedmont (89.04*DA^0.72)	12.3
Design	13.0

EXISTING ENTRAINMENT CALCULATION FORM

Stream:	West Fork French Broad River	Reach:	WFFBR Upstream	
Team:	CLS, ADD, RVS	Date:	2/23/2018	

Information Input Area

36.6	D_{50}	Riffle bed material D50 (mm)			
32.1	$\hat{D}_{50}$	Bar sample D50 (mm)			
83.00	D_i	Largest particle from bar sample (mm)	0.27	(feet)	304.8 mm/foot
0.0034	S_e	Existing bankfull water surface slope (ft/ft)			
2.41	d_e	Existing bankfull mean depth (ft)			
2.18	R	Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

1.14	$D_{50}/\hat{D}_{50}$	If value is between 3-7	**Equation 1** will be used: $t^*_{ci} = 0.0834(D_{50}/\hat{D}_{50})^{-0.872}$
2.27	D_i/D_{50}	If value is between 1.3-3.0	**Equation 2** will be used: $t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$
0.0186	t^*_{ci}	Critical Dimensionless Shear Stress	**Equation used:** **2**

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

2.45	d_r	Required bankfull mean depth (ft/ft)	$d_r = \frac{t^*_{ci} g_s D_i}{S_e}$
2.41	d_e	Existing bankfull mean depth (ft)	
0.98	d_e/d_r	**Existing Stream Condition:**	**Stable**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

0.0035	S_r	Required bankfull water surface slope (ft)	$S_r = \frac{t^*_{ci} g_s D_i}{d_e}$
0.0034	S_e	Existing bankfull water surface slope (ft)	
0.98	S_e/S_r	**Existing Stream Condition:**	**Stable**

Sediment Transport Validation

0.46	Bankfull Shear Stress $t_c = gRS$ (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
35 - 86 mm	Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.44 - 1.06 lbs/sq ft	Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

EXISTING ENTRAINMENT CALCULATION FORM

Stream:	West Fork French Broad River		Reach:	WFFBR Mid-Site	
Team:	CLS, ADD, RVS		Date:	2/23/2018	

Information Input Area

36.6	D_{50}	Riffle bed material D50 (mm)			
32.1	$\hat{D}_{50}$	Bar sample D50 (mm)			
83.00	D_i	Largest particle from bar sample (mm)	0.27	(feet)	304.8 mm/foot
0.0034	S_e	Existing bankfull water surface slope (ft/ft)			
1.11	d_e	Existing bankfull mean depth (ft)			
1.08	R	Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

1.14	$D_{50}/\hat{D}_{50}$	If value is between 3-7 **Equation 1** will be used: $t^*_{ci} = 0.0834(D_{50}/\hat{D}_{50})^{-0.872}$	
2.27	D_i/D_{50}	If value is between 1.3-3.0 **Equation 2** will be used: $t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$	
0.0186	t^*_{ci}	Critical Dimensionless Shear Stress — **Equation used:**	**2**

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

2.45	d_r	Required bankfull mean depth (ft/ft)	$d_r = \frac{t^*_{ci} g_s D_i}{S_e}$
1.11	d_e	Existing bankfull mean depth (ft)	
0.45	d_e/d_r	**Existing Stream Condition:**	**Aggrading**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

0.0075	S_r	Required bankfull water surface slope (ft)	$S_r = \frac{t^*_{ci} g_s D_i}{d_e}$
0.0034	S_e	Existing bankfull water surface slope (ft)	
0.45	S_e/S_r	**Existing Stream Condition:**	**Aggrading**

Sediment Transport Validation

0.23	Bankfull Shear Stress t_c =gRS (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
17 - 51 mm	Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.44 - 1.06 lbs/sq ft	Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

EXISTING ENTRAINMENT CALCULATION FORM

Stream:	West Fork French Broad River	Reach:	WFFBR Downstream
Team:	CLS, ADD, RVS	Date:	2/23/2018

Information Input Area

36.6	D_{50}	Riffle bed material D50 (mm)			
32.1	$\hat{D}_{50}$	Bar sample D50 (mm)			
83.00	D_i	Largest particle from bar sample (mm)	0.27	(feet)	304.8 mm/foot
0.0034	S_e	Existing bankfull water surface slope (ft/ft)			
3.01	d_e	Existing bankfull mean depth (ft)			
2.73	R	Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

1.14	$D_{50}/\hat{D}_{50}$	If value is between 3-7	**Equation 1** will be used: $t^*_{ci} = 0.0834(D_{50}/\hat{D}_{50})^{-0.872}$
2.27	D_i/D_{50}	If value is between 1.3-3.0	**Equation 2** will be used: $t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$
0.0186	t^*_{ci}	Critical Dimensionless Shear Stress	**Equation used:** 2

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

2.45	d_r	Required bankfull mean depth (ft/ft)	$d_r = \frac{t^*_{ci} g_s D_i}{S_e}$
3.01	d_e	Existing bankfull mean depth (ft)	
1.23	d_e/d_r	**Existing Stream Condition:**	**Degrading**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

0.0028	S_r	Required bankfull water surface slope (ft)	$S_r = \frac{t^*_{ci} g_s D_i}{d_e}$
0.0034	S_e	Existing bankfull water surface slope (ft)	
1.23	S_e/S_r	**Existing Stream Condition:**	**Degrading**

Sediment Transport Validation

0.58	Bankfull Shear Stress t_c =gRS (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
44 - 102 mm	Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.44 - 1.06 lbs/sq ft	Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

PROPOSED CONDITIONS ENTRAINMENT CALCULATION FORM

Stream:	West Fork French Broad River	Reach:	WFFBR
Designer:	CLS, ADD, RVS	Date:	2/23/2018

Information Input Area

36.6	D_{50}	Riffle bed material D50 (mm)			
32.1	$\hat{D}_{50}$	Bar sample D50 (mm)			
83.0	D_i	Largest particle from bar sample (mm)	0.27	(feet)	304.8 mm/foot
0.0034	S_e	Proposed bankfull water surface slope (ft/ft)			
2.143	d_e	Proposed bankfull mean depth (ft)			
2.009	R	Proposed Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

1.14	$D_{50} / \hat{D}_{50}$	If value is between 3-7	**Equation 1** will be used: $t^*_{ci} = 0.0834(D_{50}/\hat{D}_{50})^{-0.872}$
2.27	D_i / D_{50}	If value is between 1.3-3.0	**Equation 2** will be used: $t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$
0.0186	t^*_{ci}	Critical Dimensionless Shear Stress	**Equation used:** 2

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

2.42	d_r	Required bankfull mean depth (ft/ft)	$d_r = \frac{t^*_{ci} g_s D_i}{S_e}$
2.14	d_e	Proposed bankfull mean depth (ft)	
0.88	d_e / d_r	**Design Stream Condition:**	**Stable**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

0.0039	S_r	Required bankfull water surface slope (ft)	$S_r = \frac{t^*_{ci} g_s D_i}{d_e}$
0.0034	S_e	Proposed bankfull water surface slope (ft)	
0.88	S_e / S_r	**Design Stream Condition:**	**Stable**

Sediment Transport Validation

0.432	Bankfull Shear Stress	t_c =gRS (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
32 - 82 mm		Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.44 - 1.06 lbs/sq ft		Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

EXISTING ENTRAINMENT CALCULATION FORM

Stream:	Owen Farms-UT5	Reach:	UT5 (Above Pond)
Team:	CLS, ADD, RVS	Date:	6/6/2018

Information Input Area

14.0	D_{50}	Riffle bed material D50 (mm)			
11.5	$\hat{D}_{50}$	Bar sample D50 (mm)			
40.00	D_i	Largest particle from bar sample (mm)	0.13	(feet)	304.8 mm/foot
0.0080	S_e	Existing bankfull water surface slope (ft/ft)			
0.52	d_e	Existing bankfull mean depth (ft)			
0.46	R	Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

1.22	$D_{50}/\hat{D}_{50}$	If value is between 3-7	**Equation 1** will be used: $t^*_{ci} = 0.0834(D_{50}/\hat{D}_{50})^{-0.872}$
2.86	D_i/D_{50}	If value is between 1.3-3.0	**Equation 2** will be used: $t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$
0.0151	t^*_{ci}	Critical Dimensionless Shear Stress	**Equation used:** 2

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

0.41	d_r	Required bankfull mean depth (ft/ft)	$d_r = \frac{t^*_{ci} g_s D_i}{S_e}$
0.52	d_e	Existing bankfull mean depth (ft)	
1.27	d_e/d_r	**Existing Stream Condition:**	**Degrading**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

0.0063	S_r	Required bankfull water surface slope (ft)	$S_r = \frac{t^*_{ci} g_s D_i}{d_e}$
0.0080	S_e	Existing bankfull water surface slope (ft)	
1.27	S_e/S_r	**Existing Stream Condition:**	**Degrading**

Sediment Transport Validation

0.23	Bankfull Shear Stress t_c =gRS (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
17 - 52 mm	Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.16 - 0.53 lbs/sq ft	Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

PROPOSED CONDITIONS ENTRAINMENT CALCULATION FORM

Stream:	Owen Farms-UT5	Reach:	UT 5
Designer:	CLS, ADD, RVS	Date:	

Information Input Area

14.0	D_{50}	Riffle bed material D50 (mm)			
11.5	$\hat{D}_{50}$	Bar sample D50 (mm)			
40.0	D_i	Largest particle from bar sample (mm)	0.13	(feet)	304.8 mm/foot
0.0057	S_e	Proposed bankfull water surface slope (ft/ft)			
0.630	d_e	Proposed bankfull mean depth (ft)			
0.566	R	Proposed Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

1.22	$D_{50} / \hat{D}_{50}$	If value is between 3-7	**Equation 1** will be used: $t^*_{ci} = 0.0834(D_{50}/\hat{D}_{50})^{-0.872}$
2.86	D_i / D_{50}	If value is between 1.3-3.0	**Equation 2** will be used: $t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$
0.0151	t^*_{ci}	Critical Dimensionless Shear Stress	**Equation used:** 2

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

0.58	d_r	Required bankfull mean depth (ft/ft)	$d_r = \frac{t^*_{ci} g_s D_i}{S_e}$
0.63	d_e	Proposed bankfull mean depth (ft)	
1.09	d_e / d_r	**Design Stream Condition:**	**Stable**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

0.0052	S_r	Required bankfull water surface slope (ft)	$S_r = \frac{t^*_{ci} g_s D_i}{d_e}$
0.0057	S_e	Proposed bankfull water surface slope (ft)	
1.09	S_e / S_r	**Design Stream Condition:**	**Stable**

Sediment Transport Validation

0.201	Bankfull Shear Stress t_c =gRS (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
15 - 47 mm	Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.16 - 0.53 lbs/sq ft	Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

EXISTING ENTRAINMENT CALCULATION FORM

Stream:	Owen Farms-UT 7	Reach:	UT7 (Upstream of Confluence w/ UT7B)
Team:	CLS, ADD, RVS	Date:	6/6/2018

Information Input Area

14.2	D_{50}	Riffle bed material D50 (mm)			
3.4	$\hat{D}_{50}$	Bar sample D50 (mm)			
42.00	D_i	Largest particle from bar sample (mm)	0.14	(feet)	304.8 mm/foot
0.0196	S_e	Existing bankfull water surface slope (ft/ft)			
0.60	d_e	Existing bankfull mean depth (ft)			
0.52	R	Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

4.17	$D_{50}/\hat{D}_{50}$	If value is between 3-7	**Equation 1** will be used: $t^*_{ci} = 0.0834(D_{50}/\hat{D}_{50})^{-0.872}$
2.96	D_i/D_{50}	If value is between 1.3-3.0	**Equation 2** will be used: $t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$
0.0240	t^*_{ci}	Critical Dimensionless Shear Stress	**Equation used:** 1

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

0.28	d_r	Required bankfull mean depth (ft/ft)	$d_r = \frac{t^*_{ci} g_s D_i}{S_e}$
0.60	d_e	Existing bankfull mean depth (ft)	
2.15	d_e/d_r	**Existing Stream Condition:**	**Degrading**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

0.0091	S_r	Required bankfull water surface slope (ft)	$S_r = \frac{t^*_{ci} g_s D_i}{d_e}$
0.0196	S_e	Existing bankfull water surface slope (ft)	
2.15	S_e/S_r	**Existing Stream Condition:**	**Degrading**

Sediment Transport Validation

0.64	Bankfull Shear Stress t_c =gRS (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
49 - 109 mm	Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.17 - 0.55 lbs/sq ft	Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

PROPOSED CONDITIONS ENTRAINMENT CALCULATION FORM

Stream:	Owen Farms-UT 7	Reach:	UT 7		
Designer:	CLS, ADD, RVS	Date:			

Information Input Area

14.2	D_{50}	Riffle bed material D50 (mm)			
42.0	D_i	Largest particle from bar sample (mm)	0.14	(feet)	304.8 mm/foot
0.0054	S_e	Proposed bankfull water surface slope (ft/ft)			
0.667	d_e	Proposed bankfull mean depth (ft)			
0.599	R	Proposed Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

	$D_{50} / D^{\wedge}_{50}$	If value is between 3-7	**Equation 1** will be used:	$t^*_{ci} = 0.0834(D_{50}/D^{\wedge}_{50})^{-0.872}$
2.96	D_i / D_{50}	If value is between 1.3-3.0	**Equation 2** will be used:	$t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$
0.0146	t^*_{ci}	Critical Dimensionless Shear Stress	**Equation used:**	2

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

0.62	d_r	Required bankfull mean depth (ft/ft)	$d_r = \frac{t^*_{ci} g_s D_i}{S_e}$
0.67	d_e	Proposed bankfull mean depth (ft)	
1.08	d_e / d_r	**Design Stream Condition:**	**Stable**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

0.0050	S_r	Required bankfull water surface slope (ft)	$S_r = \frac{t^*_{ci} g_s D_i}{d_e}$
0.0054	S_e	Proposed bankfull water surface slope (ft)	
1.08	S_e / S_r	**Design Stream Condition:**	**Stable**

Sediment Transport Validation

0.202	Bankfull Shear Stress t_c =gRS (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
15 - 47 mm	Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.17 - 0.55 lbs/sq ft	Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

EXISTING ENTRAINMENT CALCULATION FORM

Stream:	Owen Farms	Reach:	UT 8
Team:	CLS, ADD, RVS	Date:	6/6/2018

Information Input Area

71.7	D_{50}	Riffle bed material D50 (mm)			
16.8	$\hat{D}_{50}$	Bar sample D50 (mm)			
82.0	D_i	Largest particle from bar sample (mm)	0.27	(feet)	304.8 mm/foot
0.0379	S_e	Existing bankfull water surface slope (ft/ft)			
1.13	d_e	Existing bankfull mean depth (ft)			
0.69	R	Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

4.27	$D_{50}/\hat{D}_{50}$	If value is between 3-7	**Equation 1** will be used:	$t^*_{ci} = 0.0834(D_{50}/\hat{D}_{50})^{-0.872}$
1.14	D_i/D_{50}	If value is between 1.3-3.0	**Equation 2** will be used:	$t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$
0.0235	t^*_{ci}	Critical Dimensionless Shear Stress	**Equation used:**	**1**

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

0.28	d_r	Required bankfull mean depth (ft/ft)	$d_r = \frac{t^*_{ci} g_s D_i}{S_e}$
1.13	d_e	Existing bankfull mean depth (ft)	
4.10	d_e/d_r	**Existing Stream Condition:**	**Degrading**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

0.0092	S_r	Required bankfull water surface slope (ft)	$S_r = \frac{t^*_{ci} g_s D_i}{d_e}$
0.0379	S_e	Existing bankfull water surface slope (ft)	
4.10	S_e/S_r	**Existing Stream Condition:**	**Degrading**

Sediment Transport Validation

1.63	Bankfull Shear Stress $t_c = gRS$ (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
130 - 218 mm	Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.43 - 1.05 lbs/sq ft	Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

PROPOSED CONDITIONS ENTRAINMENT CALCULATION FORM

Stream:	Owen Farms	Reach:	UT 8
Designer:	CLS, ADD, RVS	Date:	

Information Input Area

71.7	D_{50}	Riffle bed material D50 (mm)			
16.8	$\hat{D}_{50}$	Bar sample D50 (mm)			
82.0	D_i	Largest particle from bar sample (mm)	0.27	(feet)	304.8 mm/foot
0.0110	S_e	Proposed bankfull water surface slope (ft/ft)			
0.923	d_e	Proposed bankfull mean depth (ft)			
0.829	R	Proposed Hydraulic Radius of Riffle Cross Section (ft)			
1.65	g_s	Submerged specific weight of sediment			

Calculation of Critical Dimensionless Shear Stress

4.27	$D_{50} / \hat{D}_{50}$	If value is between 3-7	**Equation 1** will be used: $t^*_{ci} = 0.0834(D_{50}/\hat{D}_{50})^{-0.872}$	
1.14	D_i / D_{50}	If value is between 1.3-3.0	**Equation 2** will be used: $t^*_{ci} = 0.0384(D_i/D_{50})^{-0.887}$	
0.0235	t^*_{ci}	Critical Dimensionless Shear Stress	**Equation used:**	1

Calculation of Bankfull Mean Depth Required for Entrainment of Largest Particle in Bar Sample

0.95	d_r	Required bankfull mean depth (ft/ft)	$d_r = \dfrac{t^*_{ci} g_s D_i}{S_e}$
0.92	d_e	Proposed bankfull mean depth (ft)	
0.97	d_e / d_r	**Design Stream Condition:**	**Stable**

Calculation of BKF Water Surface Slope Required for Entrainment of Largest Particle in Bar Sample

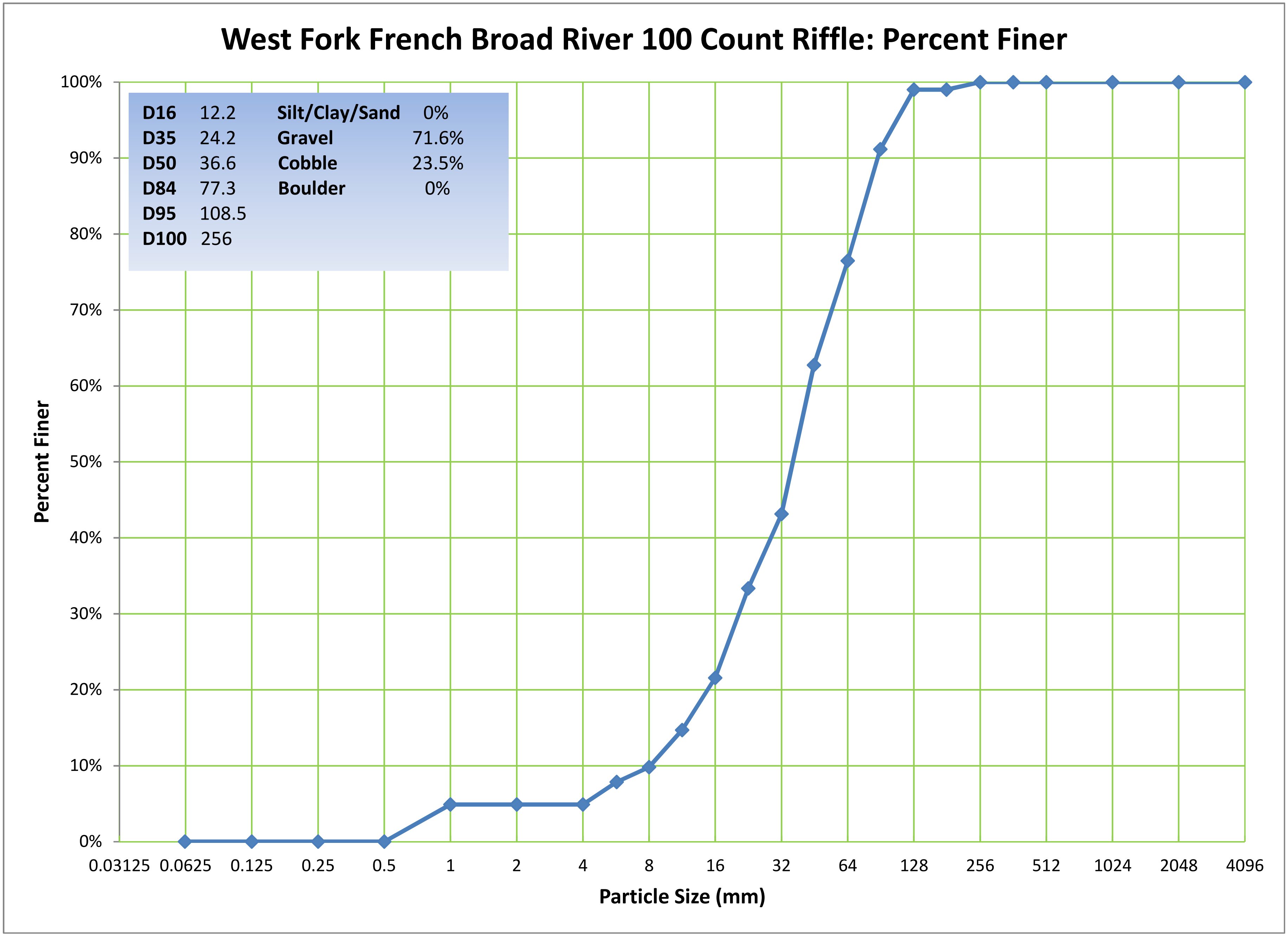
0.0113	S_r	Required bankfull water surface slope (ft)	$S_r = \dfrac{t^*_{ci} g_s D_i}{d_e}$
0.0110	S_e	Proposed bankfull water surface slope (ft)	
0.97	S_e / S_r	**Design Stream Condition:**	**Stable**

Sediment Transport Validation

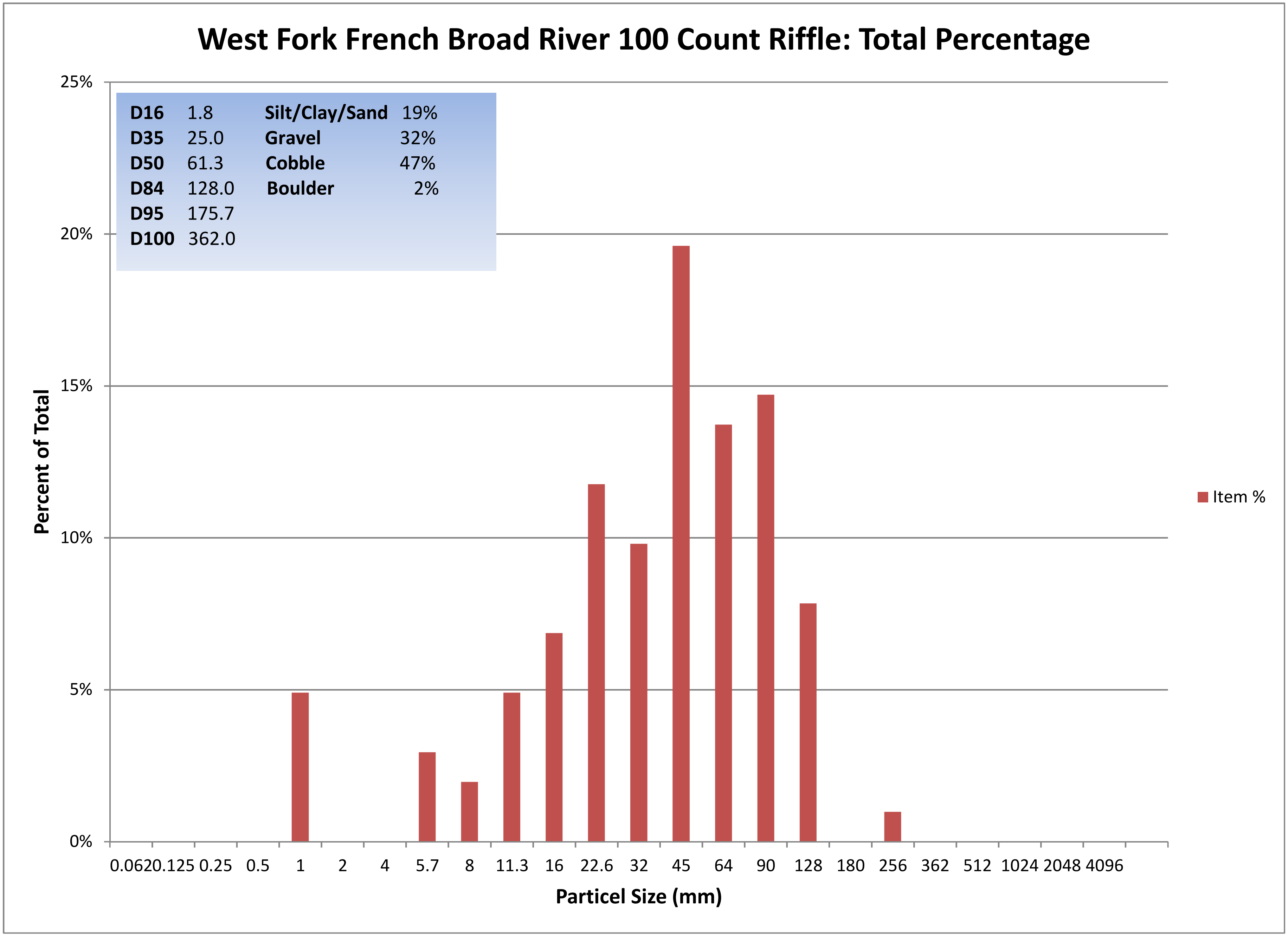
0.567	Bankfull Shear Stress $t_c = gRS$ (lb/ft2) g = Specific Weight of water = 62.4 lbs/ft^3
43 - 100 mm	Moveable particle size (mm) at bankfull shear stress (based off trend line not confidence interval) (Using Shields Diagram and Revised Shields Diagram by Rosgen, 2002)
0.43 - 1.05 lbs/sq ft	Predicted shear stress required to initiate movement of Di (mm) (based off trend line not confidence interval) (see Revised Shields Diagram, Rosgen, 2002)

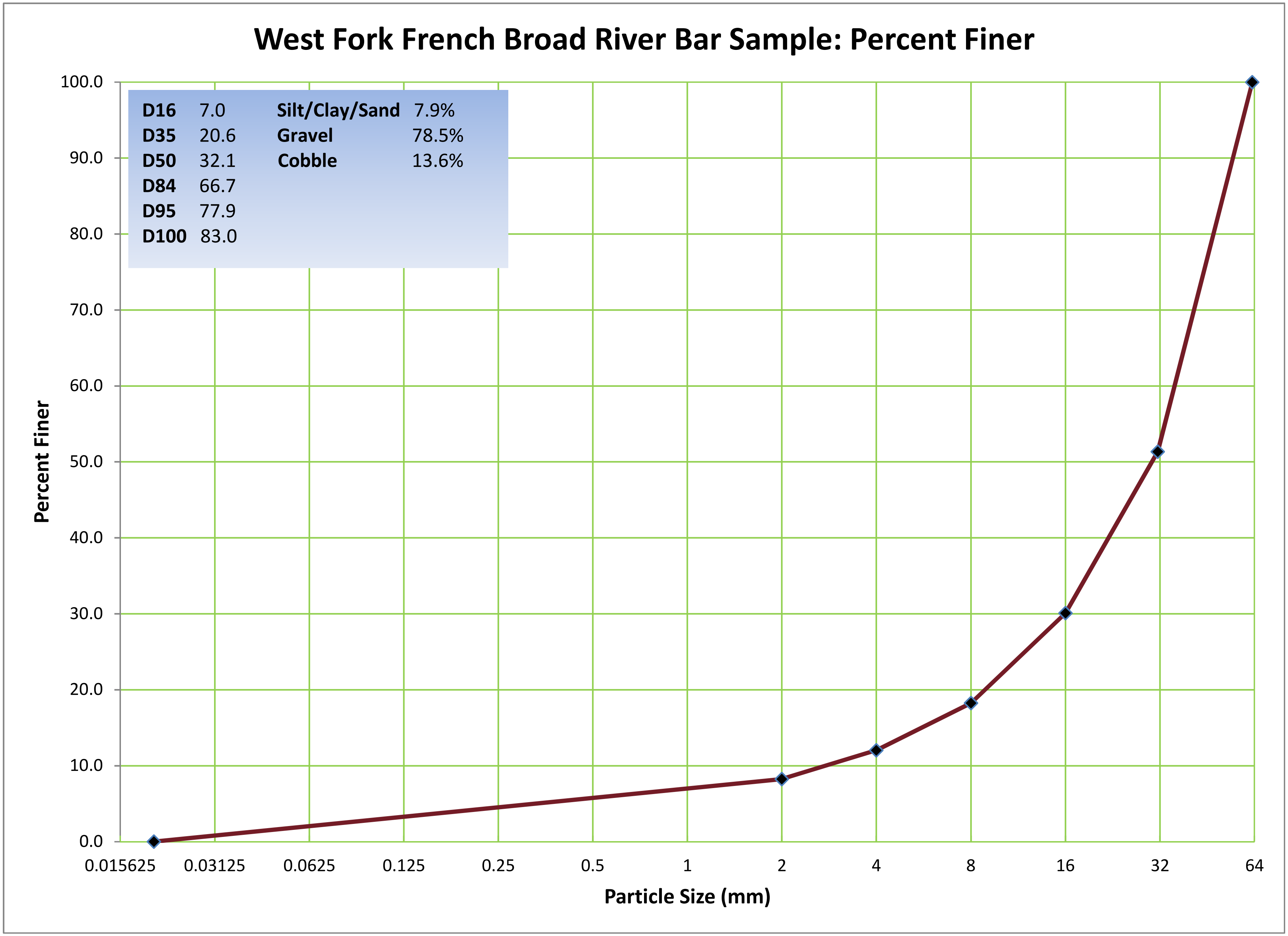
West Fork French Broad River Riffle Material

Pebble Count						
Silt/Clay		Size (mm)		Total #	Item %	Cumulative %
	Silt/Clay	0.00 -	0.062	0	0%	0%
Sand	Very Fine	0.062 -	0.125	0	0%	0%
	Fine	0.125 -	0.25	0	0%	0%
	Medium	0.25 -	0.5	0	0%	0%
	Coarse	0.5 -	1	5	5%	5%
	Very Coarse	1 -	2	0	0%	5%
Gravel	Very Fine	2 -	4	0	0%	5%
	Fine	4 -	5.7	3	3%	8%
	Fine	6 -	8	2	2%	10%
	Medium	8 -	11.3	5	5%	15%
	Medium	11 -	16	7	7%	22%
	Coarse	16 -	22.6	12	12%	33%
	Coarse	23 -	32	10	10%	43%
	Very Coarse	32 -	45	20	20%	63%
	Very Coarse	45 -	64	14	14%	76%
Cobble	Small	64 -	90	15	15%	91%
	Small	90 -	128	8	8%	99%
	Large	128 -	180	0	0%	99%
	Large	180 -	256	1	1%	100%
Boulder	Small	256 -	362	0	0%	100%
	Small	362 -	512	0	0%	100%
	Medium	512 -	1024	0	0%	100%
	Large	1024 -	2048	0	0%	100%
	Very Large	2048 -	4096	0	0%	100%
Bedrock	Bedrock					

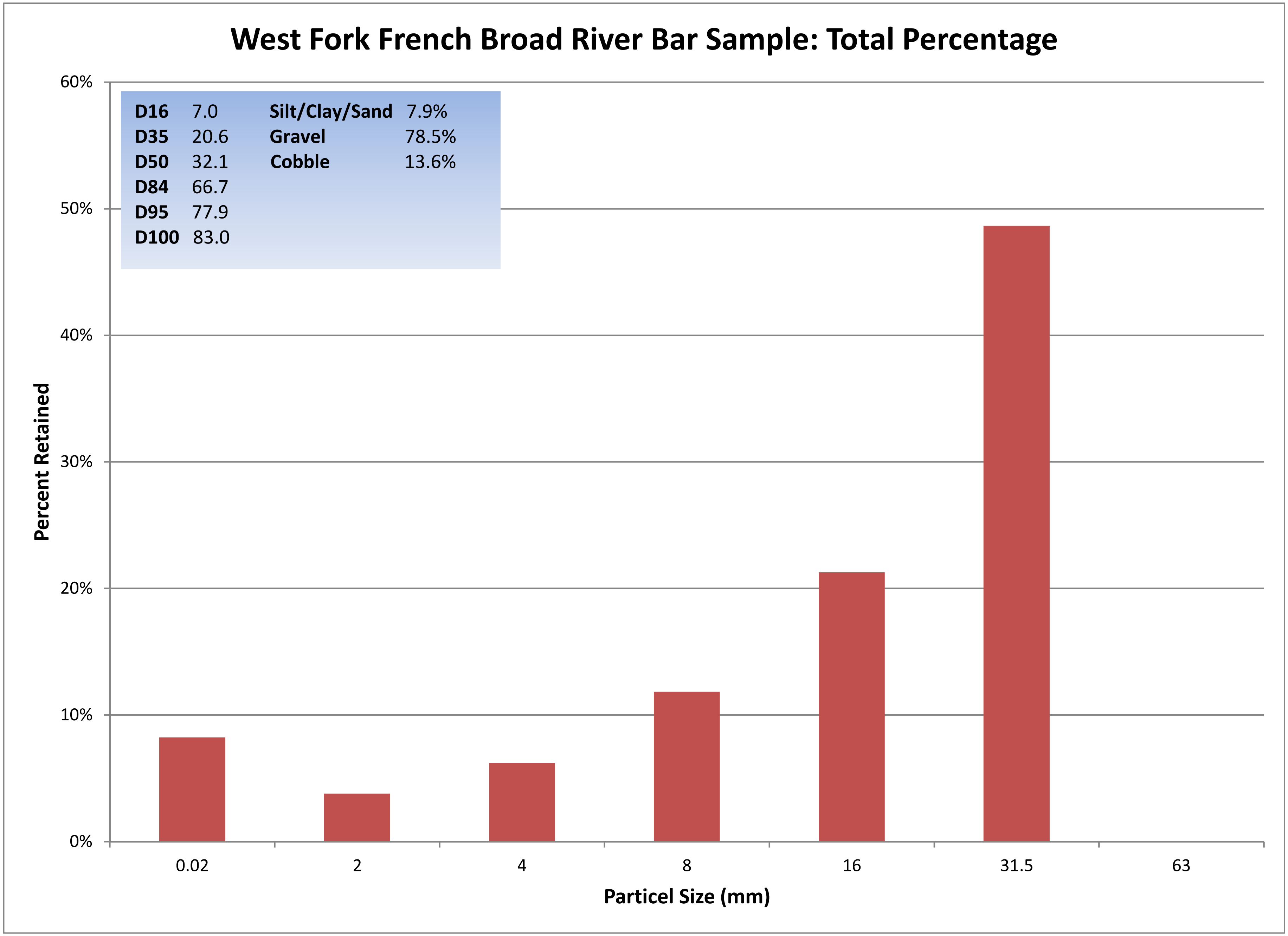


West Fork French Broad River 100 Count Riffle: Percent Finer
D16 12.2
D35 24.2
D50 36.6
D84 77.3
D95 108.5
D100 256
Silt/Clay/Sand 0%
Gravel 71.6%
Cobble 23.5%
Boulder 0%
Percent Finer
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.03125
0.0625
0.125
0.25
0.5
1
2
4
8
16
32
64
128
256
512
1024
2048
4096
Particle Size (mm)


West Fork French Broad River 100 Count Riffle: Total Percentage
D16 1.8
D35 25.0
D50 61.3
D84 128.0
D95 175.7
D100 362.0
Silt/Clay/Sand 19%
Gravel 32%
Cobble 47%
Boulder 2%
Percent of Total
25%
20%
15%
10%
5%
0%
0.062 0.125 0.25 0.5 1 2 4 5.7 8 11.3 16 22.6 32 45 64 90 128 180 256 362 512 1024 2048 4096
Particel Size (mm)
Item %

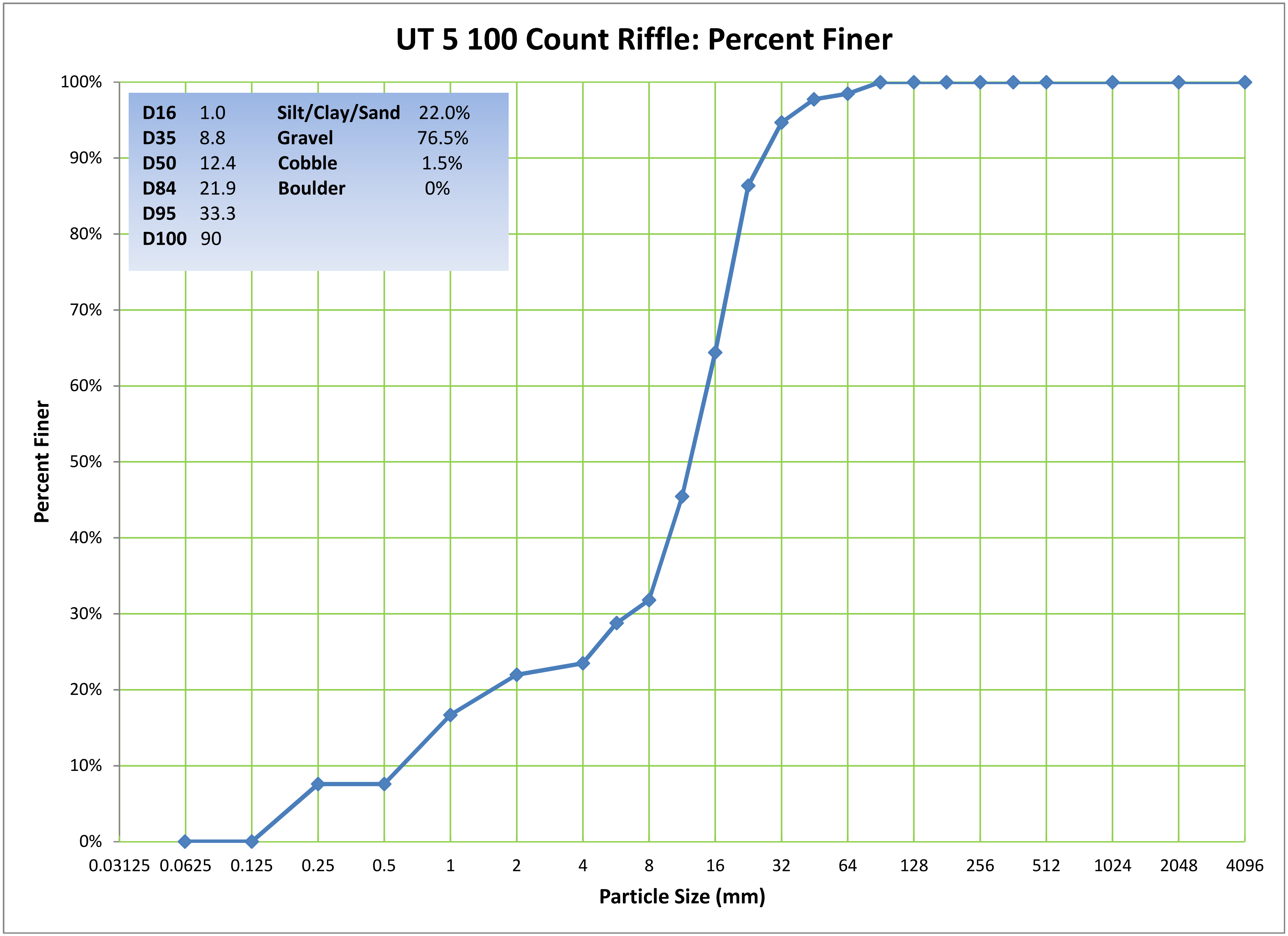


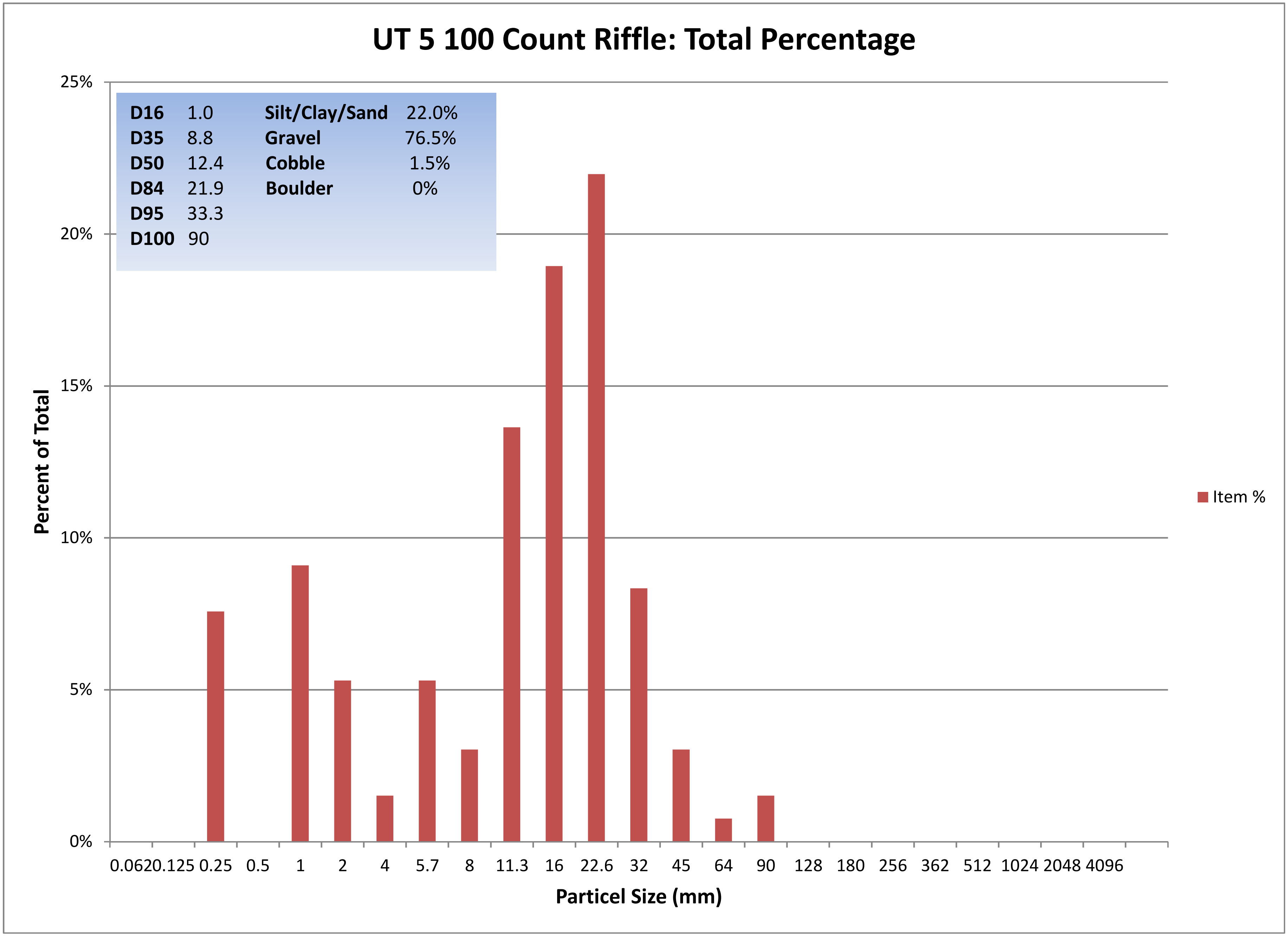
West Fork French Broad River Bar Sample: Percent Finer
D16 7.0
D35 20.6
D50 32.1
D84 66.7
D95 77.9
D100 83.0
Silt/Clay/Sand 7.9%
Gravel 78.5%
Cobble 13.6%
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Percent Finer
0.015625
0.03125
0.0625
0.125
0.25
0.5
1
2
4
8
16
32
64
Particle Size (mm)

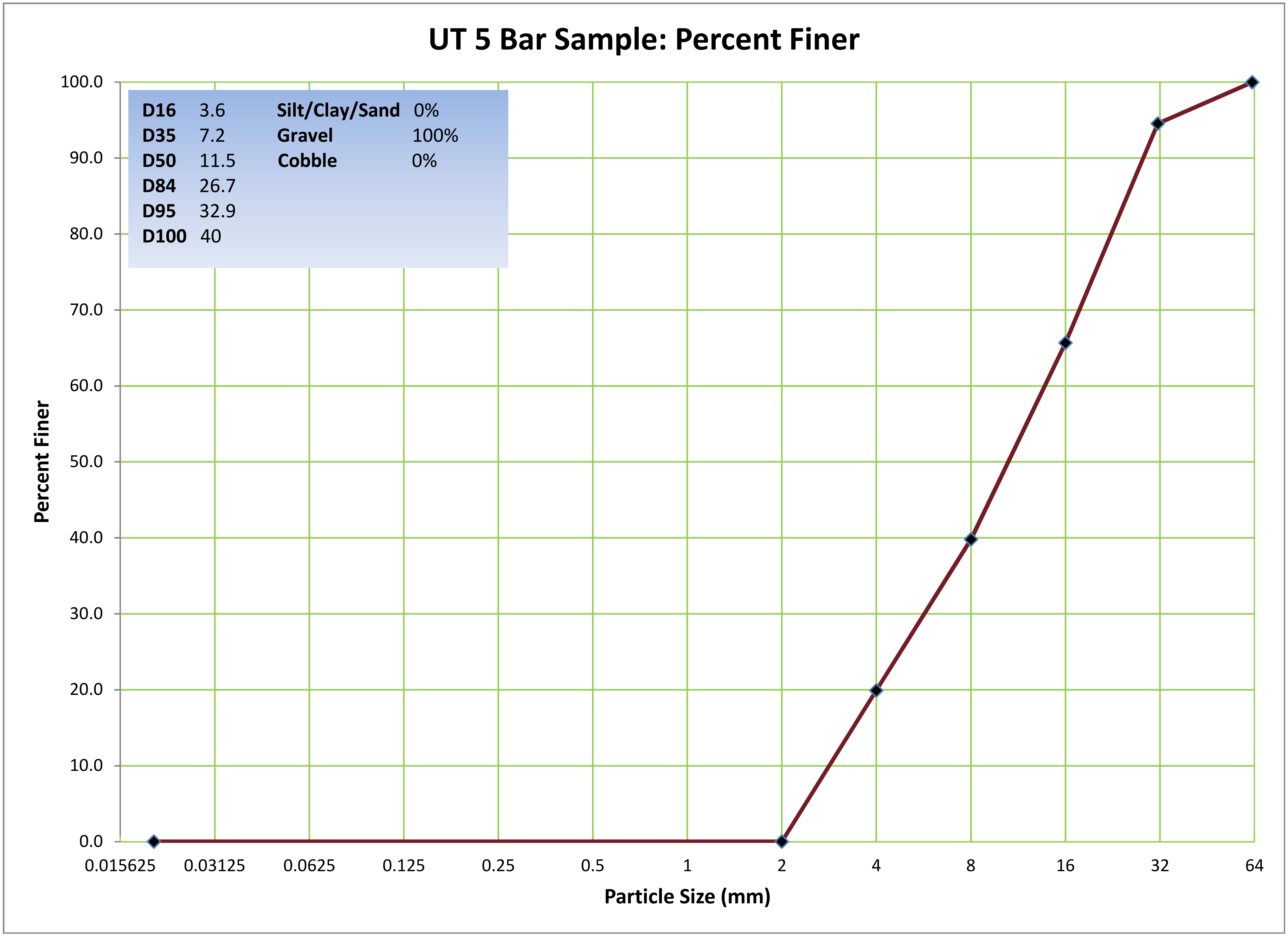

West Fork French Broad River Bar Sample: Total Percentage
D16 7.0
D35 20.6
D50 32.1
D84 66.7
D95 77.9
D100 83.0
Silt/Clay/Sand 7.9%
Gravel 78.5%
Cobble 13.6%
Percent Retained
60%
50%
40%
30%
20%
10%
0%
0.02
2
4
8
16
31.5
63
Particel Size (mm)

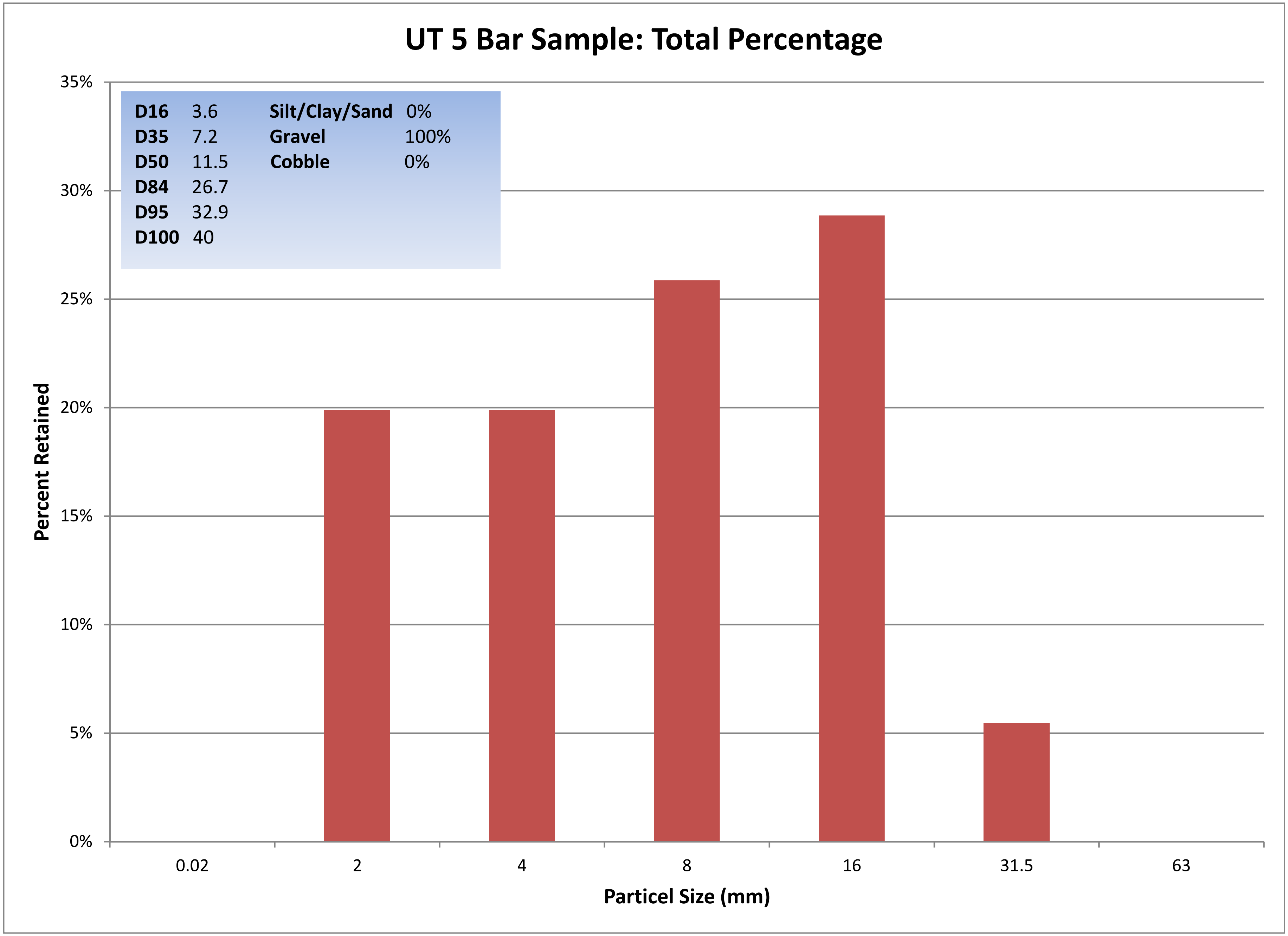
UT 5 Riffle Material

Pebble Count						
Silt/Clay		Size (mm)		Total #	Item %	Cumulative %
	Silt/Clay	0.00 -	0.062	0	0%	0%
Sand	Very Fine	0.062 -	0.125	0	0%	0%
	Fine	0.125 -	0.25	10	8%	8%
	Medium	0.25 -	0.5	0	0%	8%
	Coarse	0.5 -	1	12	9%	17%
	Very Coarse	1 -	2	7	5%	22%
Gravel	Very Fine	2 -	4	2	2%	23%
	Fine	4 -	5.7	7	5%	29%
	Fine	6 -	8	4	3%	32%
	Medium	8 -	11.3	18	14%	45%
	Medium	11 -	16	25	19%	64%
	Coarse	16 -	22.6	29	22%	86%
	Coarse	23 -	32	11	8%	95%
	Very Coarse	32 -	45	4	3%	98%
	Very Coarse	45 -	64	1	1%	98%
Cobble	Small	64 -	90	2	2%	100%
	Small	90 -	128	0	0%	100%
	Large	128 -	180	0	0%	100%
	Large	180 -	256	0	0%	100%
Boulder	Small	256 -	362	0	0%	100%
	Small	362 -	512	0	0%	100%
	Medium	512 -	1024	0	0%	100%
	Large	1024 -	2048	0	0%	100%
	Very Large	2048 -	4096	0	0%	100%
Bedrock	Bedrock					


UT 5 100 Count Riffle: Percent Finer
D16 1.0
D35 8.8
D50 12.4
D84 21.9
D95 33.3
D100 90
Silt/Clay/Sand 22.0%
Gravel 76.5%
Cobble 1.5%
Boulder 0%
Percent Finer
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.03125 0.0625 0.125 0.25 0.5 1 2 4 8 16 32 64 128 256 512 1024 2048 4096
Particle Size (mm)

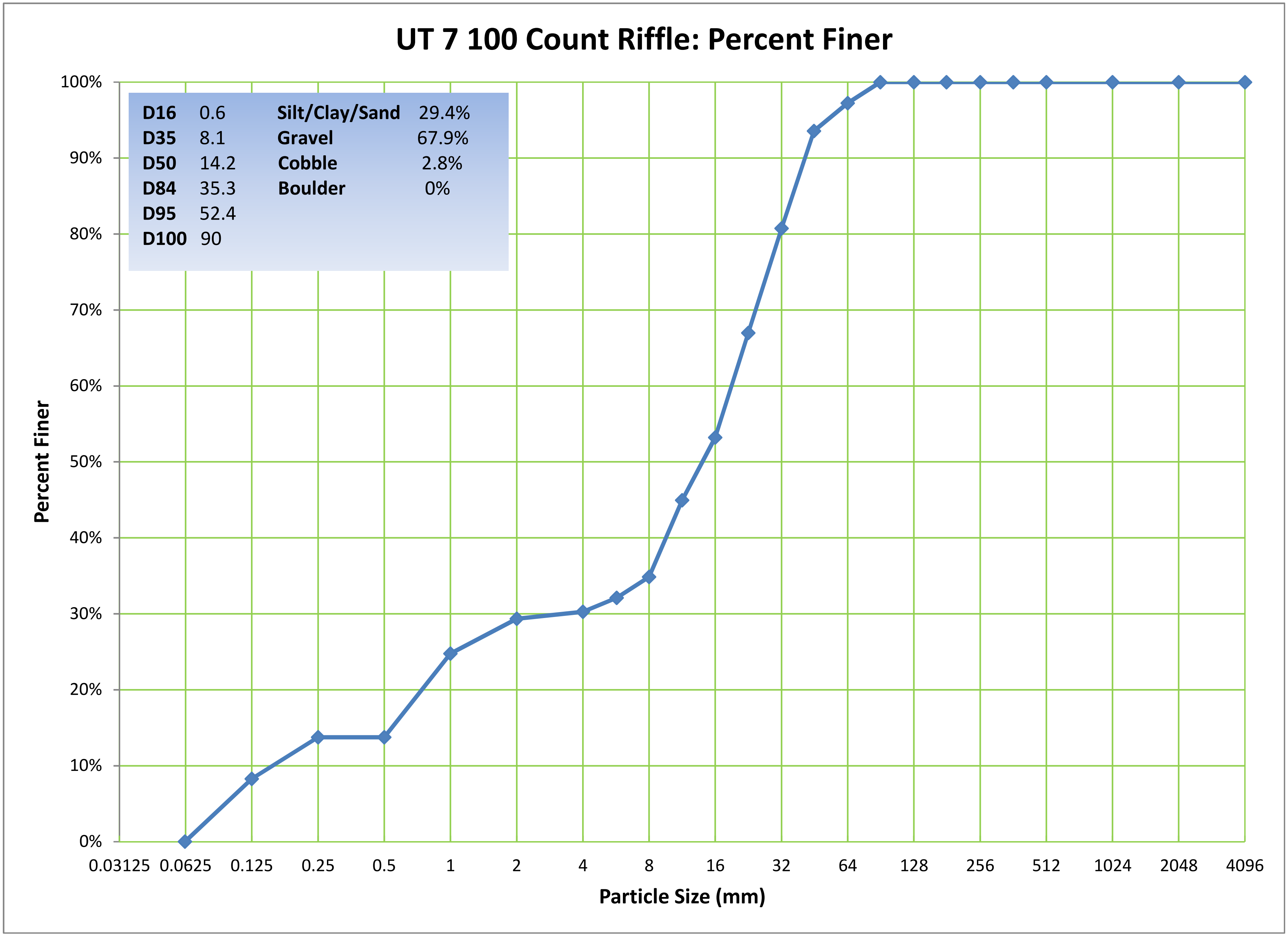

UT 5 100 Count Riffle: Total Percentage
D16 1.0
D35 8.8
D50 12.4
D84 21.9
D95 33.3
D100 90
Silt/Clay/Sand 22.0%
Gravel 76.5%
Cobble 1.5%
Boulder 0%
Percent of Total
25%
20%
15%
10%
5%
0%
0.0620.125 0.25 0.5 1 2 4 5.7 8 11.3 16 22.6 32 45 64 90 128 180 256 362 512 1024 2048 4096
Particel Size (mm)
Item %

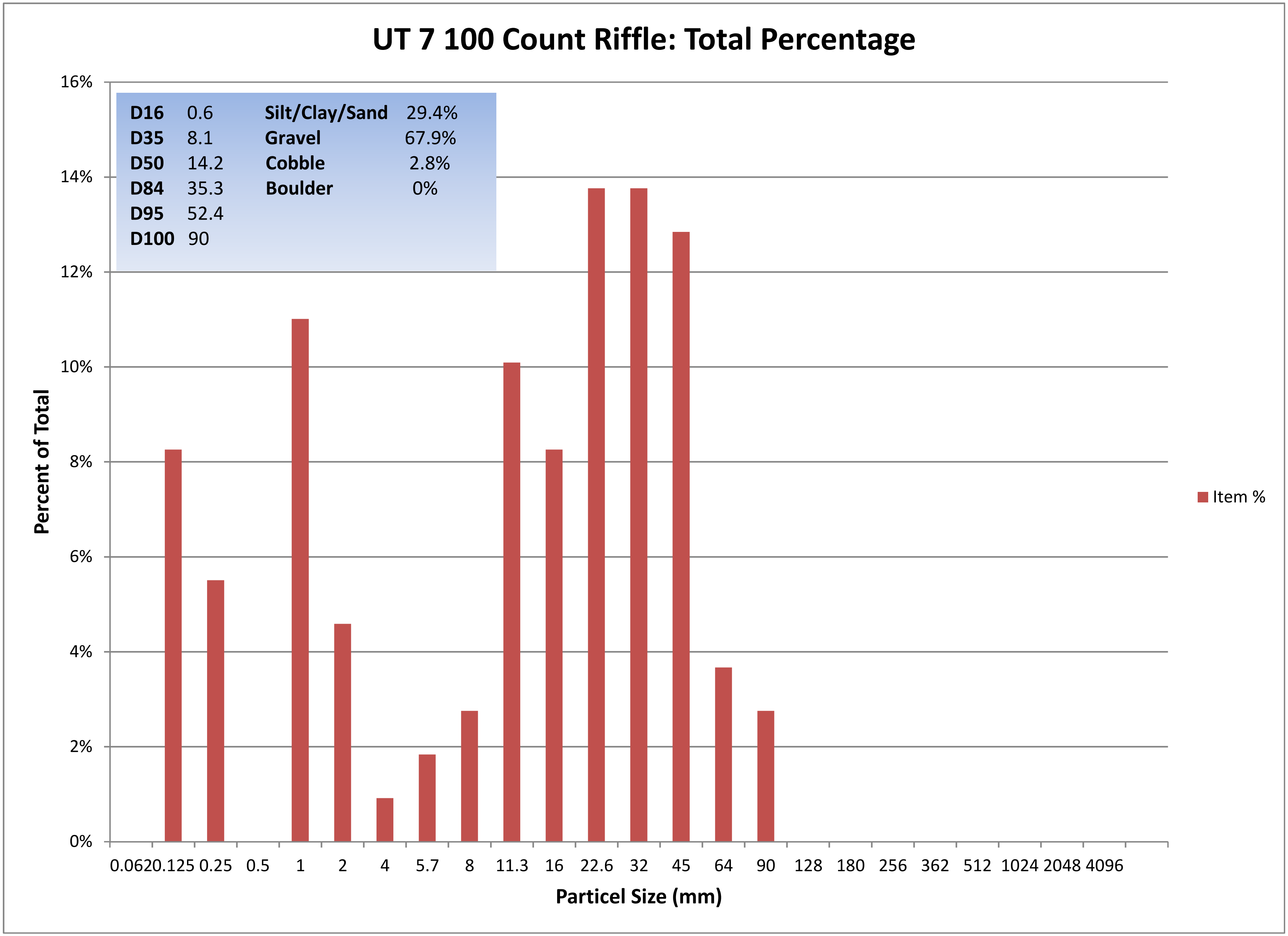

UT 5 Bar Sample: Percent Finer
D16 3.6
D35 7.2
D50 11.5
D84 26.7
D95 32.9
D100 40
Silt/Clay/Sand 0%
Gravel 100%
Cobble 0%
Percent Finer
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
0.015625
0.03125
0.0625
0.125
0.25
0.5
1
2
4
8
16
32
64
Particle Size (mm)

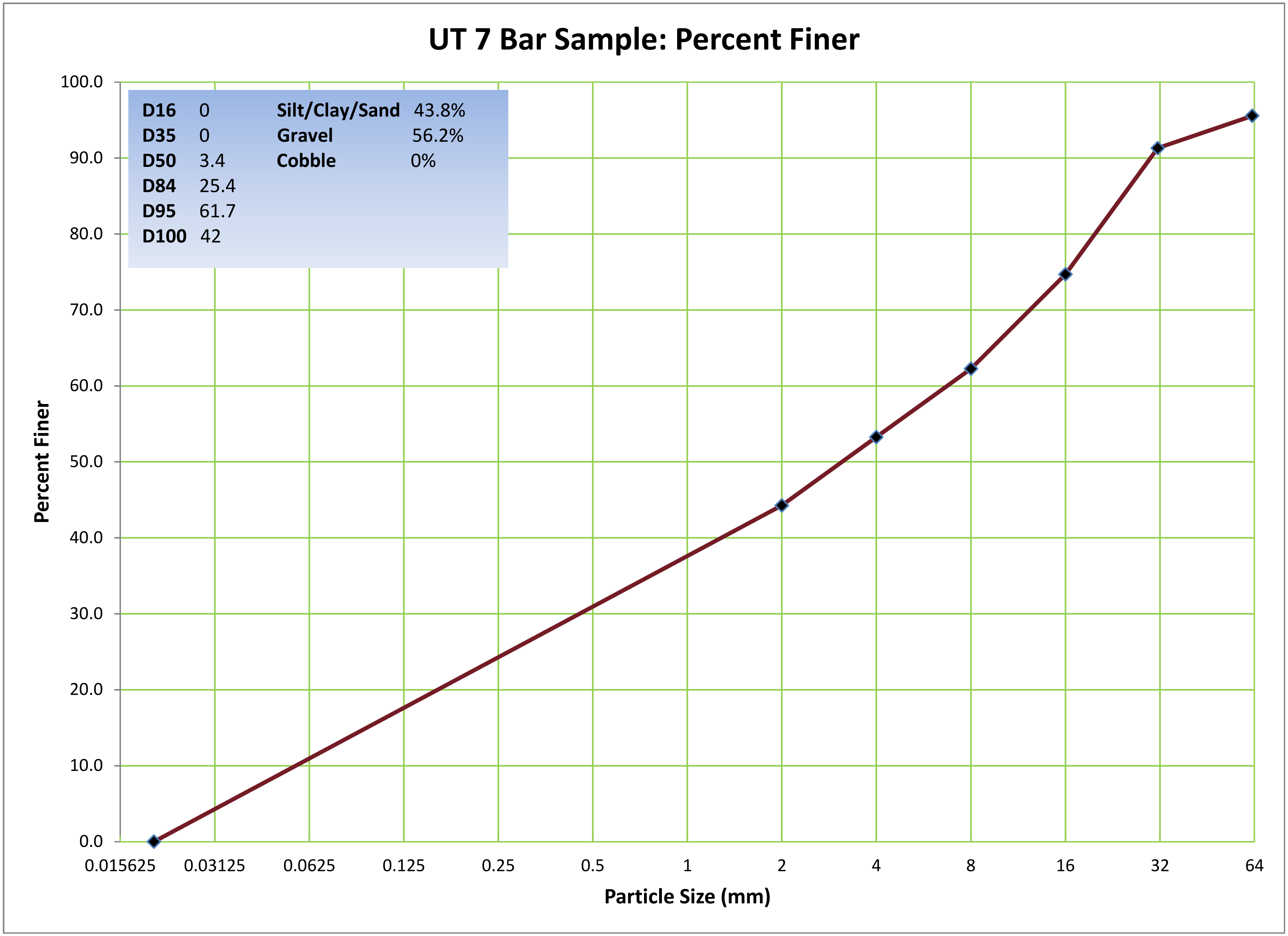

UT 5 Bar Sample: Total Percentage
D16 3.6
D35 7.2
D50 11.5
D84 26.7
D95 32.9
D100 40
Silt/Clay/Sand 0%
Gravel 100%
Cobble 0%
35%
30%
25%
20%
15%
10%
5%
0%
Percent Retained
0.02
2
4
8
16
31.5
63
Particel Size (mm)

UT 7 Riffle Material

Pebble Count						
		Size (mm)		Total #	Item %	Cumulative %
Silt/Clay	Silt/Clay	0.00 -	0.062	0	0%	0%
Sand	Very Fine	0.062 -	0.125	9	8%	8%
	Fine	0.125 -	0.25	6	6%	14%
	Medium	0.25 -	0.5	0	0%	14%
	Coarse	0.5 -	1	12	11%	25%
	Very Coarse	1 -	2	5	5%	29%
Gravel	Very Fine	2 -	4	1	1%	30%
	Fine	4 -	5.7	2	2%	32%
	Fine	6 -	8	3	3%	35%
	Medium	8 -	11.3	11	10%	45%
	Medium	11 -	16	9	8%	53%
	Coarse	16 -	22.6	15	14%	67%
	Coarse	23 -	32	15	14%	81%
	Very Coarse	32 -	45	14	13%	94%
	Very Coarse	45 -	64	4	4%	97%
Cobble	Small	64 -	90	3	3%	100%
	Small	90 -	128	0	0%	100%
	Large	128 -	180	0	0%	100%
	Large	180 -	256	0	0%	100%
Boulder	Small	256 -	362	0	0%	100%
	Small	362 -	512	0	0%	100%
	Medium	512 -	1024	0	0%	100%
	Large	1024 -	2048	0	0%	100%
	Very Large	2048 -	4096	0	0%	100%
Bedrock	Bedrock					


UT 7 100 Count Riffle: Percent Finer
D16 0.6
D35 8.1
D50 14.2
D84 35.3
D95 52.4
D100 90
Silt/Clay/Sand 29.4%
Gravel 67.9%
Cobble 2.8%
Boulder 0%
Percent Finer
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
0.03125
0.0625
0.125
0.25
0.5
1
2
4
8
16
32
64
128
256
512
1024
2048
4096
Particle Size (mm)


UT 7 100 Count Riffle: Total Percentage
D16 0.6
D35 8.1
D50 14.2
D84 35.3
D95 52.4
D100 90
Silt/Clay/Sand 29.4%
Gravel 67.9%
Cobble 2.8%
Boulder 0%
Percent of Total
16%
14%
12%
10%
8%
6%
4%
2%
0%
0.0620.125 0.25 0.5 1 2 4 5.7 8 11.3 16 22.6 32 45 64 90 128 180 256 362 512 1024 2048 4096
Particel Size (mm)
Item %



UT 7 Bar Sample: Percent Finer
D16 0
D35 0
D50 3.4
D84 25.4
D95 61.7
D100 42
Silt/Clay/Sand 43.8%
Gravel 56.2%
Cobble 0%
Percent Finer
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
0.015625
0.03125
0.0625
0.125
0.25
0.5
1
2
4
8
16
32
64
Particle Size (mm)

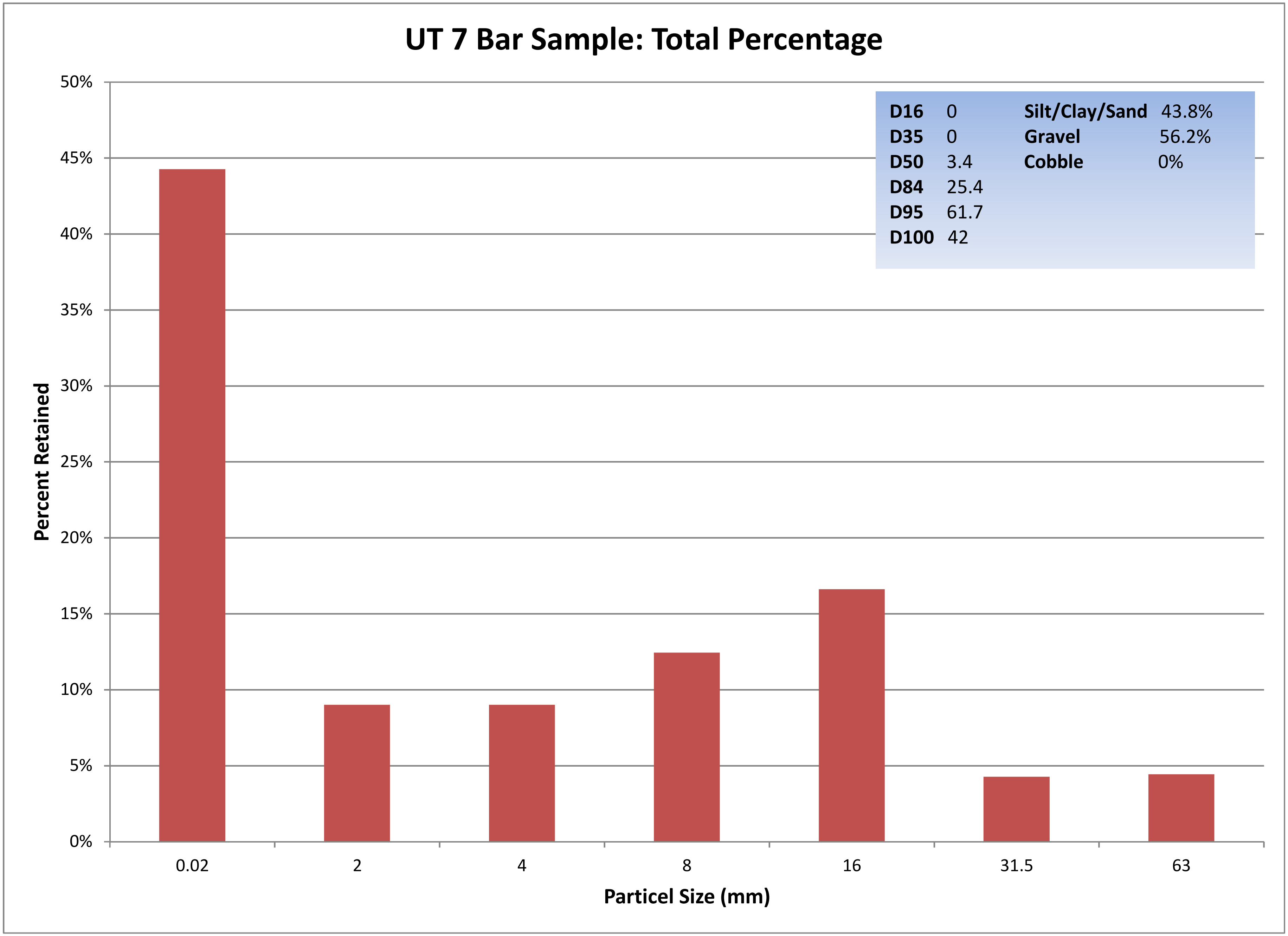

UT 7 Bar Sample: Total Percentage
D16 0
D35 0
D50 3.4
D84 25.4
D95 61.7
D100 42
Silt/Clay/Sand 43.8%
Gravel 56.2%
Cobble 0%
Percent Retained
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0.02
2
4
8
16
31.5
63
Particel Size (mm)

Table 1 - Wetland Saturation Threshold Table, Continued

Common Piedmont Soil Series		
Series Name	**Taxonomic Subgroup**	**Wetland Saturation Range**
Chewacla**	Fine-Loamy, Mixed, Active, Thermic Fluvaquentic Dystrudepts	10-12%
Wehadkee	Fine-Loamy, Mixed, Active, Nonacid, Thermic Fluvaquentic Endoaquepts	12-16-%
Iredell*	Fine, Mixed, Active, Thermic Oxyaquic Vertic Hapludalfs	6-8%
Kinkora	Fine, Mixed, Semiactive, Mesic Typic Endoaquults	10-12%
Riverview*	Fine-Loamy, Mixed, Active, Thermic Fluventic Dystrudepts	7-9%
Hatboro	Fine-Loamy, Mixed, Active, Nonacid, Mesic Fluvaquentic Endoaquepts	12-16-%
Worsham	Fine, Mixed, Active, Thermic Typic Endoaquults	10-12%
Helena*	Fine, Mixed, Semiactive, Thermic Aquic Hapludults	6-8%
Congaree*	Fine-Loamy, Mixed, Active, Nonacid, Thermic Oxyaquic Udifluvents	7-9%
Meggett	Fine, Mixed, Active, Thermic Typic Albaqualfs	10-12%
Coxville	Fine, Kaolinitic, Thermic Typic Paleaquults	10-12%
Dorian*	Fine, Mixed, Semiactive, Thermic Aquic Hapludults	6-8%
Oakboro**	Fine-Loamy, Mixed, Active, Thermic Fluvaquentic Dystrudepts	10-12%
Cordorus**	Fine-Loamy, Mixed, Active, Mesic Fluvaquentic Dystrudepts	7-9%
Common Mountain Soil Series		
Alarka	Fine-Loamy Over Sandy Or Sandy-Skeletal, Mixed, Active, Mesic Aeric Epiaquults	7-9%
Nikwasi	Coarse-Loamy Over Sandy Or Sandy-Skeletal, Mixed, Superactive, Nonacid, Mesic Cumulic Humaquepts	12-16-%
Rosman*	Coarse-Loamy, Mixed, Superactive, Mesic Fluventic Humudepts	10-12%
Toxaway	Fine-Loamy, Mixed, Superactive, Nonacid, Mesic Cumulic Humaquepts	12-16-%
Ela	Coarse-Loamy, Siliceous, Superactive, Acid, Mesic Fluvaquentic Humaquepts	12-16-%
Reddies*	Coarse-Loamy Over Sandy Or Sandy-Skeletal, Mixed, Superactive, Mesic Oxyaquic Humudepts	10-12%
Arkaqua**	Fine-Loamy, Mixed, Active, Mesic Fluvaquentic Dystrudepts	7-9%
Wesser	Sandy-Skeletal, Mixed, Mesic Humaqueptic Fluvaquents	12-16%
Biltmore*	Mixed, Mesic Typic Udipsamments	7-9%

*These soil series are non-hydric soils that may appear in close association with other soil series that are hydric.

**These soil series are all non-hydric soils that are similar taxonomically to the Chewacla soil series.

It should be noted that the presence of non-hydric series in this Table does not mean the NCIRT endorses pursuing sites with these soils series for wetland mitigation. The soils identified with asterisks are non-hydric soils. These soils often appear in association with other soils which are hydric. To determine whether the soil on site is in fact the mapped soil series, you should consult a North Carolina Licensed Soil Scientist.

Appendix I – Site Protection Instrument

2019006159
TRANSYLVANIA CO, NC FEE $34.00
STATE OF NC REAL ESTATE EXTX
$506.00
PRESENTED & RECORDED
11-21-2019 02:24:36 PM
CINDY M OWNBEY
REGISTER OF DEEDS
BY: KARIN SMITH
DEPUTY REGISTER OF DEEDS
BK: DOC 901
PG: 563-579

TG 11-21-19

Excise Tax $506
STATE OF NORTH CAROLINA

DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

TRANSYLVANIA COUNTY

SPO File Number: 88-BU
DMS Project Number: 100064

Prepared by: Office of the Attorney General
Property Control Section
Return to: NC Department of Administration
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

THIS DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS, made this 20th day of Nov., 2019, by *Troy Owen Farms, LLLP, a Georgia limited liability limited partnership*, ("**Grantor**"), whose mailing address is *227 June Bug Ln, Alapaha, GA, 31622*, to the State of North Carolina, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Division of Mitigation Services (formerly known as the Ecosystem Enhancement Program and Wetlands Restoration Program) within the Department of Environment and Natural Resources for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between *HDR Engineering, Inc. of the Carolinas* and the North Carolina Department of Environmental Quality, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environmental Quality Purchase and Services Contract Number 7532.

WHEREAS, The State of North Carolina is qualified to be the Grantee of a Conservation Easement pursuant to N.C. Gen. Stat. § 121-35; and

WHEREAS, the Department of Environment and Natural Resources and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Understanding, (MOU) duly executed by all parties on November 4, 1998. This MOU recognized that the Wetlands Restoration Program was to provide effective compensatory mitigation for authorized impacts to wetlands, streams and other aquatic resources by restoring, enhancing and preserving the wetland and riparian areas of the State; and

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the Division of Mitigation Services (formerly Ecosystem Enhancement Program) is to provide for compensatory mitigation by effective protection of the land, water and natural resources of the State by restoring, enhancing and preserving ecosystem functions; and

WHEREAS, the Department of Environment and Natural Resources, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, the North Carolina Division of Water Quality, the North Carolina Division of Coastal Management, and the National Marine Fisheries Service entered into an agreement to continue the In-Lieu Fee operations of the North Carolina Department of Natural Resources' Division of Mitigation Services (formerly Ecosystem Enhancement Program) with an effective date of 28 July, 2010, which supersedes and replaces the previously effective MOA and MOU referenced above; and

WHEREAS, the acceptance of this instrument for and on behalf of the State of North Carolina was granted to the Department of Administration by resolution as approved by the Governor and Council of State adopted at a meeting held in the City of Raleigh, North Carolina, on the 8th day of February 2000; and

WHEREAS, the Division of Mitigation Services in the Department of Environmental Quality, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in Gloucester Township, Transylvania County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately 127 acres and being conveyed to the Grantor by deed as recorded in **Document Book 81 at Page 171** of the Transylvania County Registry, North Carolina; and

WHEREAS, Grantor is willing to grant a Conservation Easement and Right of Access over the herein described areas of the Property, thereby restricting and limiting the use of the areas of the Property subject to the Conservation Easement to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept said Easement and Access Rights. The Conservation Easement shall be for the protection and benefit of the waters of ***West Fork French Broad River***.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement along with a general Right of Access.

The Conservation Easement Area consists of the following:

Being all of seven conservation easement areas containing a total of **25.19 Acres**, being the same more or less, according to a plat of survey entitled "A Conservation Easement Survey for The State of North Carolina, NCDEQ: Division of Mitigation Services, Owen Farms Mitigation Site, SPO File No. 88-BU , DMS Site ID NO. 100064", on the property of Troy Owen Farms, LLLP, dated 11/13/2019, Job# 180783-CE. This description of land was prepared from an actual survey and shown on the aforesaid plat by Kee Mapping and Surveying, PA (License # C-3039) between the dates of 08/13/18 – 09/04/2019 and under the supervision of Hampton James Lark, NC PLS (License # L-2865) and shown on a plat of survey as recorded in Plat File 19, Slides 365-367 of the Transylvania County Register of Deeds.

See attached "**Exhibit A**", Legal Description of area of the Property hereinafter referred to as the "Conservation Easement Area"

The purposes of this Conservation Easement are to maintain, restore, enhance, construct, create and preserve wetland and/or riparian resources in the Conservation Easement Area that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; to maintain permanently the Conservation Easement Area in its natural condition, consistent with these purposes; and to prevent any use of the Easement Area that will significantly impair or interfere with these purposes. To achieve these purposes, the following conditions and restrictions are set forth:

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

The Conservation Easement Area shall be restricted from any development or usage that would impair or interfere with the purposes of this Conservation Easement. Unless expressly reserved as a compatible use herein, any activity in, or use of, the Conservation Easement Area by the Grantor is prohibited as inconsistent with the purposes of this Conservation Easement. Any rights not expressly reserved hereunder by the Grantor have been acquired by the Grantee. Any rights not expressly reserved hereunder by the Grantor, including the rights to all mitigation credits, including, but not limited to, stream, wetland, and riparian buffer mitigation units, derived from each site within the area of the Conservation Easement, are conveyed to and belong to the Grantee. Without limiting the generality of the foregoing, the following specific uses are prohibited, restricted, or reserved as indicated:

A. Recreational Uses. Grantor expressly reserves the right to undeveloped recreational uses, including hiking, bird watching, hunting and fishing, and access to the Conservation Easement Area for the purposes thereof.

B. Motorized Vehicle Use. Motorized vehicle use in the Conservation Easement Area is prohibited except within a Crossing Area(s) or Road or Trail as shown on the recorded survey plat.

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including organized educational activities such as site visits and observations. Educational uses of the property shall not alter vegetation, hydrology or topography of the site.

D. **Damage to Vegetation.** Except within Crossing Area(s) as shown on the recorded survey plat and as related to the removal of non-native plants, diseased or damaged trees, or vegetation that destabilizes or renders unsafe the Conservation Easement Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Conservation Easement Area is prohibited.

E. Industrial, Residential and Commercial Uses. All industrial, residential and commercial uses are prohibited in the Conservation Easement Area.

F. Agricultural Use. All agricultural uses are prohibited within the Conservation Easement Area including any use for cropland, waste lagoons, or pastureland.

G. New Construction. There shall be no building, facility, mobile home, antenna, utility pole, tower, or other structure constructed or placed in the Conservation Easement Area.

H. **Roads and Trails.** There shall be no construction or maintenance of new roads, trails, walkways, or paving in the Conservation Easement.

All existing roads, trails and crossings within the Conservation Easement Area shall be shown on the recorded survey plat.

I. Signs. No signs shall be permitted in the Conservation Easement Area except interpretive signs describing restoration activities and the conservation values of the Conservation Easement Area, signs identifying the owner of the Property and the holder of the Conservation Easement, signs giving directions, or signs prescribing rules and regulations for the use of the Conservation Easement Area.

J. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or any other material in the Conservation Easement Area is prohibited.

K. Grading, Mineral Use, Excavation, Dredging. There shall be no grading, filling, excavation, dredging, mining, drilling, hydraulic fracturing; removal of topsoil, sand, gravel, rock, peat, minerals, or other materials.

L. Water Quality and Drainage Patterns. There shall be no diking, draining, dredging, channeling, filling, leveling, pumping, impounding or diverting, causing, allowing or permitting the diversion of surface or underground water in the Conservation Easement Area. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns is allowed. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides in the Conservation Easement Area is prohibited. In the event of an emergency interruption or shortage of all other water sources, water from within the Conservation Easement Area may temporarily be withdrawn for good cause shown as needed for the survival of livestock on the Property.

M. Subdivision and Conveyance. Grantor voluntarily agrees that no further subdivision, partitioning, or dividing of the Conservation Easement Area portion of the Property owned by the Grantor in fee simple ("fee") that is subject to this Conservation Easement is allowed. Any future transfer of the Property shall be subject to this Conservation Easement and Right of Access and to the Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Conservation Easement Area for the purposes set forth herein.

N. Development Rights. All development rights are permanently removed from the Conservation Easement Area and are non-transferrable.

O. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural features of the Conservation Easement Area or any intentional introduction of non-native plants, trees and/or animal species by Grantor is prohibited.

The Grantor may request permission to vary from the above restrictions for good cause shown, provided that any such request is not inconsistent with the purposes of this Conservation

Easement, and the Grantor obtains advance written approval from the Division of Mitigation Services, 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, receive a perpetual Right of Access to the Conservation Easement Area over the Property at reasonable times to undertake any activities on the property to restore, construct, manage, maintain, enhance, protect, and monitor the stream, wetland and any other riparian resources in the Conservation Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

B. Restoration Activities. These activities include planting of trees, shrubs and herbaceous vegetation, installation of monitoring wells, utilization of heavy equipment to grade, fill, and prepare the soil, modification of the hydrology of the site, and installation of natural and manmade materials as needed to direct in-stream, above ground, and subterraneous water flow.

C. Signs. The Grantee, its employees and agents, successors or assigns, shall be permitted to place signs and witness posts on the Property to include any or all of the following: describe the project, prohibited activities within the Conservation Easement, or identify the project boundaries and the holder of the Conservation Easement.

D. Fences. Conservation Easements are purchased to protect the investments by the State (Grantee) in natural resources. Livestock within conservations easements damages the investment and can result in reductions in natural resource value and mitigation credits which would cause financial harm to the State. Therefore, Landowners (Grantor) with livestock are required to restrict livestock access to the Conservation Easement area. Repeated failure to do so may result in the State (Grantee) repairing or installing livestock exclusion devices (fences) within the conservation area for the purpose of restricting livestock access. In such cases, the landowner (Grantor) must provide access to the State (Grantee) to make repairs.

E. Crossing Area(s). The Grantee is not responsible for maintenance of crossing area(s), however, the Grantee, its employees and agents, successors or assigns, reserve the right to repair crossing area(s), at its sole discretion and to recover the cost of such repairs from the Grantor if such repairs are needed as a result of activities of the Grantor, his successors or assigns.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

B. Inspection. The Grantee, its employees and agents, successors and assigns, have the right, with reasonable notice, to enter the Conservation Easement Area over the Property at reasonable times for the purpose of inspection to determine whether the Grantor is complying with the terms, conditions and restrictions of this Conservation Easement.

C. Acts Beyond Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury or change in the Conservation Easement Area caused by third parties, resulting from causes beyond the Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life or damage to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

E. No Waiver. Enforcement of this Easement shall be at the discretion of the Grantee and any forbearance, delay or omission by Grantee to exercise its rights hereunder in the event of any breach of any term set forth herein shall not be construed to be a waiver by Grantee.

V. MISCELLANEOUS

A. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of the Conservation Easement, and the application of such provision to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

C. Any notices shall be sent by registered or certified mail, return receipt requested to the parties at their addresses shown herein or to other addresses as either party establishes in writing upon notification to the other.

D. Grantor shall notify Grantee in writing of the name and address and any party to whom the Property or any part thereof is to be transferred at or prior to the time said transfer is made. Grantor further agrees that any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed is subject to the Conservation Easement herein created.

E. The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the State Property Office and the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property or of any request to void or modify this Conservation Easement. Such notifications and modification requests shall be addressed to:

Division of Mitigation Services Program Manager
NC State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

and

General Counsel
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

G. The parties recognize and agree that the benefits of this Conservation Easement are in gross and assignable provided, however, that the Grantee hereby covenants and agrees, that in the event it transfers or assigns this Conservation Easement, the organization receiving the interest will be a qualified holder under N.C. Gen. Stat. § 121-34 et seq. and § 170(h) of the Internal Revenue Code, and the Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue in perpetuity the conservation purposes described in this document.

VI. QUIET ENJOYMENT

Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Conservation Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes of this Conservation Easement. Without limiting the generality of the foregoing, the Grantor expressly reserves to the Grantor, and the Grantor's invitees and licensees, the right of access to the Conservation Easement Area, and the right of quiet enjoyment of the Conservation Easement Area,

TO HAVE AND TO HOLD, the said rights and easements perpetually unto the State of North Carolina for the aforesaid purposes,

AND Grantor covenants that Grantor is seized of said premises in fee and has the right to convey the permanent Conservation Easement herein granted; that the same is free from encumbrances and that Grantor will warrant and defend title to the same against the claims of all persons whomsoever.

IN TESTIMONY WHEREOF, the Grantor has hereunto set his hand and seal, the day and year first above written.

TROY OWEN FARMS, LLLP, a Georgia limited liability limited partnership

BY: Bonnie H. Owen (SEAL)
Bonnie H. Owen, General Partner

STATE OF GEORGIA
COUNTY OF Lowndes

I certify that the following person(s) personally appeared before me this day, each acknowledging to me that he or she voluntarily signed the foregoing document for the purpose stated therein and in the capacity indicated: Bonnie H. Owen

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the 20th day of November, 2019.

Mary Margaret Williams
Notary Public

My commission expires:

August 15, 2023

MARY MARGARET WILLIAMS
NOTARY PUBLIC
Exp. Aug. 15, 2023
LOWNDES COUNTY, GA

Exhibit A

A Conservation Easement for
The State of North Carolina,
NCDEQ: Division of Mitigation Services,
"Owen Farms Mitigation Site"
Property of:
Troy Owen Farms, LLLP
SPO FILE NO. 88-BU DMS SITE ID NO. 100064

The following conservation easement areas are located off of N.C. Highway 281, within the Gloucester Township, Transylvania County, North Carolina and being on portions of that property conveyed to Troy Owen Farms, LLLP through Document Book 81, Page 171 of the Transylvania County Register of Deeds, and being more particularly described as follows (all bearings are grid bearings and all distances are horizontal ground distances):

<u>Conservation Easement Area A:</u>
BEGINNING AT AN EXISTING 5/8" REBAR WITH A "PETIT" CAP (CORNER 1), said rebar being at a common corner of Document Book 81, Page 171 and Document Book 162, Page 567 of the Transylvania County Registry, and being located N 88°07'57" W a distance of 1984.02 feet from a 5/8" rebar with a "Kee" Control Point cap set in concrete (Control Point #500) having North Carolina State Plane Coordinates (2011) of Northing: 545187.39 feet and Easting: 823349.38 feet;

Thence leaving the aforesaid common line and with the conservation easement area the following (3) courses and distances:

(1) S 81°36'28" W a distance of 53.91 feet to a 5/8" rebar set with a CE cap (Corner 2);
(2) N 77°40'20" W a distance of 104.10 feet to a 5/8" rebar set with a CE cap (Corner 3);
(3) N 38°10'20" E a distance of 68.26 feet to a 5/8" rebar set with a CE cap (Corner 4), said rebar being in the center of the West Fork of the French Broad River and in a common line of Deed Book 81, Page 171 and Deed Book 489, Page 531 of the Transylvania County Registry;

Thence with the aforesaid common line, with the center of the West Fork of the French Broad River, and with the conservation easement area S 85°06'52" E a distance of 8.33 feet to an unmarked point, said point being at the common corner of Document Book 81, Page 171, Document Book 489, Page 531 and Document Book 162, Page 567 of the Transylvania County Registry;

Thence leaving the aforementioned common line, with the common line of Document Book 81, Page 171 and Document Book 162, Page 567, with the center of the West Fork of the French Broad River, and continuing with the conservation easement area the following (2) courses and distances:

(1) S 72°31'22" E a distance of 27.56 feet to an unmarked point;
(2) S 67°02'46" E a distance of 32.08 feet to an unmarked point;

Thence leaving the center of the West Fork of the French Broad River, continuing with the aforementioned common line, and continuing with the conservation easement area S 46°19'00" E a distance of 67.36 feet to the TRUE POINT OF BEGINNING;

Being all of that area of land in Conservation Easement Area A containing a total of 0.15 Acre, being the same more or less.

Conservation Easement Area B:

BEGINNING AT A 5/8" REBAR SET WITH A CE CAP (CORNER 5), said rebar being located N 88°17'41" W a distance of 2166.03 feet from a 5/8" rebar with a "Kee" Control Point cap set in concrete (Control Point #500) having North Carolina State Plane Coordinates (2011) of Northing: 545187.39 feet and Easting: 823349.38 feet;

Thence with the conservation easement area the following (10) courses and distances:

(1) S 77°40'20" E a distance of 129.10 feet to a 5/8" rebar set with a CE cap (Corner 6);
(2) S 03°43'21" W a distance of 96.71 feet to a 5/8" rebar set with a CE cap (Corner 7);
(3) S 26°09'03" E a distance of 144.88 feet to a 5/8" rebar set with a CE cap (Corner 8);
(4) S 09°06'16" E a distance of 214.97 feet to a 5/8" rebar set with a CE cap (Corner 9);
(5) S 13°27'50" W a distance of 178.49 feet to a 5/8" rebar set with a CE cap (Corner 10);
(6) N 85°52'26" W a distance of 96.11 feet to a 5/8" rebar set with a CE cap (Corner 11);
(7) N 19°59'08" E a distance of 148.70 feet to a 5/8" rebar set with a CE cap (Corner 12);
(8) N 13°43'27" W a distance of 227.92 feet to a 5/8" rebar set with a CE cap (Corner 13);
(9) N 49°27'38" W a distance of 122.75 feet to a 5/8" rebar set with a CE cap (Corner 14);
(10) N 04°49'50" E a distance of 192.81 feet to the TRUE POINT OF BEGINNING;

Being all of that area of land in Conservation Easement Area B containing a total of 1.62 Acres, being the same more or less.

Conservation Easement Area C:

BEGINNING AT AN EXISTING 5/8" REBAR WITH A "PETIT" CAP (CORNER 15), said rebar being at a common corner of Document Book 81, Page 171 and Document Book 162, Page 567 of the Transylvania County Registry, and being located N 83°12'20" W a distance of 1350.71 feet from a 5/8" rebar with a "Kee" Control Point cap set in concrete (Control Point #500) having North Carolina State Plane Coordinates (2011) of Northing: 545187.39 feet and Easting: 823349.38 feet;

Thence leaving the aforesaid common line and with the conservation easement area the following (15) courses and distances:

(1) S 05°43'22" E a distance of 131.49 feet to a 5/8" rebar set with a CE cap (Corner 16);
(2) S 31°57'12" W a distance of 84.74 feet to a 5/8" rebar set with a CE cap (Corner 17);
(3) S 09°41'19" E a distance of 150.50 feet to a 5/8" rebar set with a CE cap (Corner 18);
(4) S 49°30'53" E a distance of 125.82 feet to a 5/8" rebar set with a CE cap (Corner 19);
(5) S 04°38'09" E a distance of 191.91 feet to a 5/8" rebar set with a CE cap (Corner 20);
(6) S 89°58'34" W a distance of 101.89 feet to a 5/8" rebar set with a CE cap (Corner 21);
(7) N 05°55'02" W a distance of 142.10 feet to a 5/8" rebar set with a CE cap (Corner 22);
(8) N 50°22'01" W a distance of 118.78 feet to a 5/8" rebar set with a CE cap (Corner 23);
(9) S 39°37'12" W a distance of 125.35 feet to a 5/8" rebar set with a CE cap (Corner 24);
(10) S 83°23'33" W a distance of 173.17 feet to a 5/8" rebar set with a CE cap (Corner 25);
(11) S 50°28'39" W a distance of 73.16 feet to a 5/8" rebar set with a CE cap (Corner 26);
(12) N 69°02'29" W a distance of 99.94 feet to a 5/8" rebar set with a CE cap (Corner 27);
(13) N 40°38'05" E a distance of 126.86 feet to a 5/8" rebar set with a CE cap (Corner 28);
(14) N 71°39'00" E a distance of 164.67 feet to a 5/8" rebar set with a CE cap (Corner 29);
(15) N 24°46'23" E a distance of 230.16 feet to a 5/8" rebar set with a CE cap (Corner 30), said rebar being in the common line of Deed Book 81, Page 171 and Deed Book 162, Page 567 of the Transylvania County Registry, and also being located S 80°08'35" E a distance of 479.25 feet from an existing 5/8" rebar with a "Petit" cap at a common corner thereof;

Thence with the aforesaid common line and continuing with the conservation easement area the following (2) courses and distances:

(1) S 80°08'35" E a distance of 70.61 feet to an existing 2" iron pipe (Corner 31);
(2) N 27°50'59" E a distance of 214.07 feet to the TRUE POINT OF BEGINNING;

Being all of that area of land in Conservation Easement Area C containing a total of 2.74 Acres, being the same more or less.

Conservation Easement Area D:

BEGINNING AT A 5/8" REBAR SET WITH A CE CAP (CORNER 32), said rebar being located S 76°22'43" W a distance of 1814.91 feet from a 5/8" rebar with a "Kee" Control Point cap set in concrete (Control Point #500) having North Carolina State Plane Coordinates (2011) of Northing: 545187.39 feet and Easting: 823349.38 feet;

Thence with the conservation easement area the following (4) courses and distances:

(1) S 26°19'15" W a distance of 63.92 feet to a 5/8" rebar set with a CE cap (Corner 33);
(2) N 68°58'44" W a distance of 99.84 feet to a 5/8" rebar set with a CE cap (Corner 34);
(3) N 34°35'35" E a distance of 65.38 feet to a 5/8" rebar set with a CE cap (Corner 35);
(4) S 69°02'29" E a distance of 90.40 feet to the TRUE POINT OF BEGINNING;

Being all of that area of land in Conservation Easement Area D containing a total of 0.14 Acre, being the same more or less.

Conservation Easement Area E:

BEGINNING AT A 5/8" REBAR SET WITH A CE CAP (CORNER 36), said rebar being in the common line of Document Book 81, Page 171 and Document Book 162, Page 567 of the Transylvania County Registry, and being located S 13°20'53" W a distance of 202.82 feet from an existing axle at a common corner thereof, and also being located N 65°56'20" W a distance of 1205.80 feet from a 5/8" rebar with a "Kee" Control Point cap set in concrete (Control Point #500) having North Carolina State Plane Coordinates (2011) of Northing: 545187.39 feet and Easting: 823349.38 feet;

Thence with the conservation easement area the following (10) courses and distances:

(1) N 87°25'57" E a distance of 72.54 feet to a 5/8" rebar set with a CE cap (Corner 37);
(2) S 58°21'55" E a distance of 276.11 feet to an unmarked point in the western line of a 40 foot wide right of way easement of Haywood E.M.C.;
(3) S 58°21'55" E a distance of 46.23 feet to an unmarked point in the eastern line of the aforesaid right of way easement of Haywood E.M.C.;
(4) S 58°21'55" E a distance of 145.27 feet to a 5/8" rebar set with a CE cap (Corner 38);
(5) N 31°38'30" E a distance of 109.41 feet to a 5/8" rebar set with a CE cap (Corner 39);
(6) S 60°41'30" E a distance of 321.06 feet to a 5/8" rebar set with a CE cap (Corner 40);
(7) N 42°27'32" E a distance of 67.46 feet to a 5/8" rebar set with a CE cap (Corner 41);
(8) S 88°40'23" E a distance of 282.21 feet to a 5/8" rebar set with a CE cap (Corner 42);
(9) S 69°26'03" E a distance of 72.03 feet to a 5/8" rebar set with a CE cap (Corner 43);
(10) S 44°47'11" E a distance of 14.72 feet to a 5/8" rebar set with a CE cap (Corner 44), said rebar being at the southwest corner of Permanent Drainage Easement #2 of the N.C. Department of Transportation as described in Document Book 230, Page 63 of the Transylvania County Registry;

Thence with the southern line of the aforesaid Permanent Drainage Easement and continuing with the conservation easement area S 70°02'04" E a distance of 52.12 feet to an unmarked point at the southeast corner the aforesaid Permanent Drainage Easement;

Thence leaving the aforementioned Permanent Drainage Easement and continuing with the conservation easement area the following (13) courses and distances:

(1) S 70°02'04" E a distance of 31.21 feet to a 5/8" rebar set with a CE cap (Corner 45);
(2) S 53°04'04" W a distance of 71.26 feet to a 5/8" rebar set with a CE cap (Corner 46);
(3) N 89°33'08" W a distance of 278.12 feet to a 5/8" rebar set with a CE cap (Corner 47), said rebar being in the northern line of a 40 foot wide right of way easement of Haywood E.M.C.;
(4) S 48°07'24" W a distance of 52.48 feet to an unmarked point, said point being in the southern line of the aforesaid right of way easement of Haywood E.M.C.;
(5) S 48°07'24" W a distance of 229.16 feet to a 5/8" rebar set with a CE cap (Corner 48);
(6) S 22°05'42" E a distance of 230.74 feet to a 5/8" rebar set with a CE cap (Corner 49);
(7) S 64°10'30" W a distance of 171.53 feet to a 5/8" rebar set with a CE cap (Corner 50);

(8) N 52°53'46" W a distance of 402.18 feet to a 5/8" rebar set with a CE cap (Corner 51);
(9) S 38°02'59" W a distance of 190.52 feet to a 5/8" rebar set with a CE cap (Corner 52);
(10) N 85°28'46" W a distance of 62.84 feet to a 5/8" rebar set with a CE cap (Corner 53);
(11) N 24°24'15" E a distance of 249.31 feet to a 5/8" rebar set with a CE cap (Corner 54);
(12) N 02°51'15" W a distance of 204.04 feet to an unmarked point, said point being in the southern line of the aforementioned 40 foot wide right of way easement of Haywood E.M.C.;
(13) N 02°51'15" W a distance of 40.72 feet to a 5/8" rebar set with a CE cap (Corner 55), said rebar being in the northern line of the aforesaid right of way easement of Haywood E.M.C.;

Thence with the aforesaid northern line of the right of way easement of Haywood E.M.C. and continuing with the conservation easement area N 82°02'16" W a distance of 423.92 feet to a 5/8" rebar set with a CE cap (Corner 56), said rebar being in the common line of Document Book 81, Page 171 and Document Book 162, Page 567 of the Transylvania County Registry;

Thence with the aforesaid common line, leaving the aforementioned right of way easement of Haywood E.M.C., and continuing with the conservation easement area the following (2) courses and distances:

(1) N 37°51'42" E a distance of 232.45 feet to an existing 5/8" rebar with a "Petit" cap (Corner 57);
(2) N 13°20'53" E a distance of 33.81 feet to the TRUE POINT OF BEGINNING;

Being all of that area of land in Conservation Easement Area E containing a total of 9.53 Acres, being the same more or less.

Conservation Easement Area F:

BEGINNING AT A 5/8" REBAR SET WITH A CE CAP (CORNER 58), said rebar being in the common line of Document Book 81, Page 171 and Deed Book 97, Page 473 of the Transylvania County Registry, and being located N 81°22'28" W a distance of 1107.56 feet from an existing aluminum monument (Corner 6 of U.S.A. Tract P-188) at a common corner thereof, and also being located S 45°34'41" W a distance of 1067.22 feet from a 5/8" rebar with a "Kee" Control Point cap set in concrete (Control Point #500) having North Carolina State Plane Coordinates (2011) of Northing: 545187.39 feet and Easting: 823349.38 feet;

Thence with the aforementioned common line and with the conservation easement area the following (3) courses and distances:

(1) N 81°22'28" W a distance of 115.09 feet to an existing aluminum monument (Corner 59), said monument being at Corner 5 of U.S.A. Tract P-188;
(2) S 02°51'07" E a distance of 70.15 feet to an existing aluminum monument (Corner 60), said monument being at Corner 4 of U.S.A. Tract P-188;
(3) N 85°59'05" W a distance of 354.24 feet to an existing aluminum monument (Corner 61), said monument being at Corner 3 of U.S.A. Tract P-188;

Thence leaving the aforementioned common line and continuing with the conservation easement area the following (11) courses and distances:

(1) S 89°57'03" W a distance of 55.92 feet to a 5/8" rebar set with a CE cap (Corner 62);
(2) N 09°55'41" W a distance of 295.15 feet to a 5/8" rebar set with a CE cap (Corner 63);
(3) N 89°58'34" E a distance of 96.27 feet to a 5/8" rebar set with a CE cap (Corner 64);
(4) S 28°15'09" E a distance of 158.98 feet to a 5/8" rebar set with a CE cap (Corner 65);
(5) N 61°05'35" E a distance of 326.11 feet to a 5/8" rebar set with a CE cap (Corner 66);
(6) N 30°55'47" E a distance of 346.92 feet to a 5/8" rebar set with a CE cap (Corner 67);
(7) S 52°53'46" E a distance of 95.27 feet to a 5/8" rebar set with a CE cap (Corner 68);
(8) S 14°43'16" W a distance of 86.14 feet to a 5/8" rebar set with a CE cap (Corner 69);
(9) S 31°36'19" W a distance of 269.96 feet to a 5/8" rebar set with a CE cap (Corner 70);
(10) S 25°35'28" E a distance of 91.92 feet to a 5/8" rebar set with a CE cap (Corner 71);
(11) S 07°51'25" W a distance of 125.48 feet to the TRUE POINT OF BEGINNING;

Being all of that area of land in Conservation Easement Area F containing a total of 3.99 Acres, being the same more or less.

Conservation Easement Area G:

BEGINNING AT A 5/8" REBAR SET WITH A CE CAP (CORNER 72), said rebar being in the southern and western line of the 60 foot wide right of way of N.C. Highway 281 as described in Document Book 230, Page 63 of the Transylvania County Registry, and being located S 87°29'25" E a distance of 829.38 feet from a 5/8" rebar with a "Kee" Control Point cap set in concrete (Control Point #500) having North Carolina State Plane Coordinates (2011) of Northing: 545187.39 feet and Easting: 823349.38 feet;

Thence with the aforesaid right of way line of N.C. Highway 281 and with the conservation easement area the following (3) courses and distances:

(1) with a clockwise curve to the right, having a radius of 77.52 feet, an arc length of 88.52 feet, a chord bearing of S 06°42'13" E and a chord length of 83.78 feet to a 5/8" rebar set with a CE cap (Corner 73);
(2) S 26°00'28" W a distance of 387.69 feet to an existing bridge spike (Corner 74);
(3) with a counterclockwise curve to the left, having a radius of 231.18 feet, an arc length of 97.14 feet, a chord bearing of S 13°58'15" W and a chord length of 96.42 feet to a 5/8" rebar set with a CE cap (Corner 75), said rebar being at the northeast corner of Permanent Drainage Easement #3 of the N.C. Department of Transportation as described in Document Book 230, Page 63 of the Transylvania County Registry;

Thence with the aforesaid Permanent Drainage Easement, leaving the aforementioned right of way line of N.C. Highway 281, and continuing with the conservation easement area the following (3) courses and distances:

(1) N 88°03'58" W a distance of 14.99 feet to a 5/8" rebar set with a CE cap (Corner 76);
(2) S 03°45'00" E a distance of 48.86 feet to a 5/8" rebar set with a CE cap (Corner 77);

(3) N 80°32'34" E a distance of 15.00 feet to a 5/8" rebar set with a CE cap (Corner 78), said rebar being in the aforementioned right of way line of N.C. Highway 281;

Thence leaving the aforementioned Permanent Drainage Easement, with the aforesaid right of way line of N.C. Highway 281, and continuing with the conservation easement area with a counterclockwise curve to the left, having a radius of 231.18 feet, an arc length of 116.32 feet, a chord bearing of S 23°52'17" E and a chord length of 115.09 feet to a 5/8" rebar set with a CE cap (Corner 79);

Thence leaving the aforementioned right of way line of N.C. Highway 281 and continuing with the conservation easement area the following (8) courses and distances:

(1) S 87°10'27" W a distance of 896.43 feet to a 5/8" rebar set with a CE cap (Corner 80);
(2) N 34°48'28" W a distance of 405.08 feet to a 5/8" rebar set with a CE cap (Corner 81);
(3) N 64°10'30" E a distance of 231.14 feet to a 5/8" rebar set with a CE cap (Corner 82);
(4) S 39°58'16" E a distance of 376.04 feet to a 5/8" rebar set with a CE cap (Corner 83);
(5) N 82°58'02" E a distance of 434.43 feet to a 5/8" rebar set with a CE cap (Corner 84);
(6) N 00°07'29" W a distance of 167.98 feet to a 5/8" rebar set with a CE cap (Corner 85);
(7) N 42°15'07" E a distance of 356.94 feet to a 5/8" rebar set with a CE cap (Corner 86);
(8) N 57°17'22" E a distance of 166.46 feet to the TRUE POINT OF BEGINNING;

Being all of that area of land in Conservation Easement Area G containing a total of 7.02 Acres, being the same more or less.

Being all of seven conservation easement areas containing a total of **25.19 Acres**, being the same more or less, according to a plat of survey entitled "A Conservation Easement Survey for The State of North Carolina, NCDEQ: Division of Mitigation Services, Owen Farms Mitigation Site, SPO File No. 88-BU , DMS Site ID NO. 100064", on the property of Troy Owen Farms, LLLP, dated 11/13/2019, Job# 180783-CE. This description of land was prepared from an actual survey and shown on the aforesaid plat by Kee Mapping and Surveying, PA (License # C-3039) between the dates of 08/13/18 – 09/04/2019 and under the supervision of Hampton James Lark, NC PLS (License # L-2865) and shown on a plat of survey as recorded in Plat File 19, Slides 365-367 of the Transylvania County Register of Deeds, to which reference should be made for a more complete description.

Appendix J –Credit Release Schedule

Appendix J – Credit Release Schedule

The following credit release schedule will apply to the Owen Farms Stream and Wetland Mitigation Site as prescribed in the 2016 USACE Mitigation Update.

Credit Release Schedule and Milestones for Wetlands			
Credit Release Milestone	Release Activity	ILF/NCDMS	
		Interim Release	Total Released
1	Site Establishment	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates that interim performance standards have been met	10%	40%
4	Year 2 monitoring report demonstrates that interim performance standards have been met	10%	50%
5	Year 3 monitoring report demonstrates that interim performance standards have been met	15%	65%
6*	Year 4 monitoring report demonstrates that interim performance standards have been met	5%	70%
7	Year 5 monitoring report demonstrates that interim performance standards have been met	15%	85%
8*	Year 6 monitoring report demonstrates that interim performance standards have been met	5%	90%
9	Year 7 monitoring report demonstrates that performance standards have been met	10%	100%

* Please note that vegetation plot data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the NCIRT.

Credit Release Schedule and Milestones for Streams			
Credit Release Milestone	Release Activity	ILF/NCDMS	
		Interim Release	Total Released
1	Site Establishment	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates that interim performance standards have been met	10%	40%
4	Year 2 monitoring report demonstrates that interim performance standards have been met	10%	50%
5	Year 3 monitoring report demonstrates that interim performance standards have been met	10%	60%
6*	Year 4 monitoring report demonstrates that interim performance standards have been met	5%	65% (75%**)
7	Year 5 monitoring report demonstrates that interim performance standards have been met	10%	75% (85%**)
8*	Year 6 monitoring report demonstrates that interim performance standards have been met	5%	80% (90%**)
9	Year 7 monitoring report demonstrates that performance standards have been met	10%	90% (100%**)

*Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the NCIRT.

**10% reserve of credits to be held back until the bankfull event performance standard has been met.

Appendix K – Financial Assurance

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Pursuant to Section IV H and Appendix III of the North Carolina Department of Environmental Quality (NCDEQ) Division of Mitigation Service's (DMS) In-Lieu Fee Instrument dated July 28, 2010, the NCDEQ has provided the US Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by NCDEQ DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.