

MITIGATION PLAN
Final

December 22, 2022

CORNBREAD VALLEY MITIGATION SITE
Macon County, NC
NCDEQ Contract No. 0304-01
DMS ID No. 100175

Little Tennessee River Basin
HUC 06010202

USACE Action ID No. SAW-2020-02051
NC DWR Project No. 2020-1865
RFP Number 16-20190304 (Issued 12/20/2019)

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
5 Ravenscroft Drive, Ste 102
Asheville, NC 28801

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

REPLY TO
ATTENTION OF:

December 9, 2022

Regulatory Division

Re: NCIRT Review and USACE Approval of the NCDMS Cornbread Valley Mitigation Site / Macon County

USACE ID: SAW-2020-02051
NCDMS Project # 100175
NCDWR # 2020-1865

Paul Wiesner
North Carolina Division of Mitigation Services
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

Dear Mr. Wiesner:

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 Cornbread Valley Draft Mitigation Plan, which closed on October 15, 2022. These comments 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 USACE Mitigation 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 contact me at Kimberly.d.browning@usace.army.mil or (919) 946-5107.

Sincerely,

Kim Isenhour
Mitigation Project Manager
USACE Regulatory Division

Enclosures

Electronic Copies Furnished:
Shawn Wilkerson, Jake McLean—WEI

WILDLANDS ENGINEERING

MEMORANDUM

TO:	Paul Wiesner, NC DMS
CC:	Jacob McLean, PE, CFM
FROM:	Jacob McLean, PE, CFM
DATE:	December 22, 2022
RE:	Cornbread Valley Mitigation Site Little Tennessee River Basin 06010202 Macon County, NC DMS ID No. 100175 DEQ Contract Number 0304-01 RFP Number 16-20190304 SAW-2020-02051 Response to NCIRT Mitigation Plan Comments

This memo documents NCIRT's Draft Final Mitigation Plan review comments (*in italics*) received from Kim Isenhour's letter dated 11/22/2022, the project team's responses (in blue), and where the revisions have been included in the final Mitigation Plan.

NCWRC Andrea Leslie:

1. We are very glad to see a mitigation site in this part of the Little Tennessee basin and to know that there is another site just downstream. We think that these two sites could have a significant positive impact on Cartoogechaye Creek, which supports a diverse aquatic community, including rare and listed species. As such, it'll be very important to use excellent erosion and sediment control on the project.
Response: Agreed.

2. As noted in our response to Wildlands' scoping request, there are wild Brown Trout and Rainbow Trout in the project vicinity, and in-stream activities should be avoided during the trout moratorium of October 15 to April 15.
Response: Wildlands plans to observe the moratorium and start construction after April 15.

3. We appreciate Wildlands' efforts in developing a planting plan with a rich list of woody and herbaceous plants. Kudos to them for this!

a. We are supportive of the plans to plant smaller zones with the rapid self-seeding herbaceous plants in the 'supplemental wetland zone'. Monitoring is definitely needed to track the progress of this.

Response: The intent of planting pockets of self-seeding herbaceous plants in the wetland areas is for them to spread and create larger populations. It is unclear how successful this strategy will be and a specific monitoring approach is difficult to create/plan for. Based on the unknowns related to this new strategy, Wildlands will visually monitor these planting areas and include the observations in the annual monitoring reports. No specific success criteria will be applied to this planting zone.

b. The planting plan is geared to establish a forested wetland. We recommend allowing for flexibility via adaptive management so that pockets of different wetland types (e.g., shrub-scrub, herbaceous) can be allowed if they develop.

Response: The species list for the wetland planting zone provides for significant structural diversity and is comprised of multiple shrub and midstory species that account for 70% of the total stems. The reduced average height requirement (6' by MY7) will further allow for flexibility in the plant communities that establish. Wildlands agrees it is possible that pockets of scrub shrub wetlands will end up establishing and appreciates the flexibility given on success criteria in this zone. The text in section 6.9 has been updated to reflect this.

c. It is noted that River Cane is found offsite. We recommend incorporating this species into the planting plan.

Response: The river cane located off site lies on a steep slope just below the N Jones Creek Rd. that is densely forested. Access to this area with equipment would be difficult and destructive to the existing forest. Rivercane has been difficult to obtain commercially for planting. Based on these constraints, Wildlands does not plan to incorporate river cane into planted buffer.

4. DOT will eventually be replacing bridges on the site, as they were built in the 1960s. While they may end up using off-site detours, we suspect they will be using wider structures than cannot fit the right-of-way (ROW), which is probably not recorded anyway but just a maintenance assumption/standard width. We recommend staying back at least 10 feet either side from the ROW with the easement to accommodate later bridge replacements. This also may incentivize later bridge design work (use off-site detour and avoid mitigation, state property encroachment).

Response: The Jones Creek Road bridge was damaged and reconstructed in the last 5 years. During that time, an off-site detour was used to bring traffic in via Allison Watts Road. The right of way is recorded as 60'. Crediting buffers off the ROW are already in place at both crossings due to Duke powerline easements which could serve to augment the 60' ROW and buffer credited stream length from future potential impacts that exceed the ROW.

5. It is noted that the start of the mitigation reach UT2A is currently a perched culvert under a DOT road. The mitigation plan (MP) notes that this perch will be reduced but not eliminated. Please describe what this means – what is the current and anticipated future perch be?



Response: The pipe is a 50' long 18" CMP with a drop of 3' and no bed material. The invert of the 18" CMP is 2402.19'. The stream baseflow elevation at the time of survey was 2400.6' (a perch of 1.6'). The proposed streambed grade was 2400.8' – it was reviewed and determined that we could attempt to implement a steep riffle and rock drop at the pipe outlet into the pool planned downstream, but that aquatic connectivity remains an unlikely result of this work under the circumstances. The change will help protect the pipe from undermining any further and may provide the possibility of passage under some circumstances. This change has been made to the plans.

6. We caution Wildlands to avoid some problems seen on recently built sites with poor culvert choice/installation and structure drops:

a. It appears that the proposed culverts are corrugated metal (CMP), which is good; be sure not to substitute this material with high density polyethylene. Culverts must be buried appropriately.

Response: We continue to have landowner's pushing back on CMP which they view as having a lesser life span. If we were to propose a substitute, this would be done by request and in discussion with regulatory staff including WRC. In researching the matter, the two major shortcomings attributed to HDPE pipe seem to be lack of edge roughness for fish passage and difficulty in maintaining material in the pipe. We have found it easier to push material into HDPE pipes in order to seed them with sufficiently large material which then helps to retain other finer material. We feel that when bed material is able to be effectively maintained in HDPE that this material can be an effective choice.

Our approach to burying culverts is to lay them at the slope of the prevailing stream grade which reduces the need for excessively steep channel sections immediately upstream or downstream of crossings. Coincident with this approach, we embed the pipes and seed bed material into the culvert that is comparable to riffle and key particle sizes that are resistant to movement and form stability of the bed within the reach or in some cases slightly larger to account for additional shear in culverts during high flow.

b. Crossing 12 is at about a 5% with no outlet grade control, which is probably asking for trouble. We recommend that Wildlands at least try to promote the backwatering of that pipe with a structure.

Response: The riffle symbology was inadvertently turned off on the viewport for this crossing. Riffle grade control will be used upstream, within, and downstream of the culvert. The culvert will be embedded but not backwatered in excess of the normal riffle depth. Our experience is

that trying to backwater structures on steep grades can result in the need for excessively steep or large drops upstream or downstream or long transitions.

c. Avoid installing structures that are too high and regular. Instead of regular structures that result in planar flows over the top of them (e.g., a single log set across the channel or a large boulder resulting in a perpendicular drop), we recommend installing messy structures that allow for diversity of flow patterns and 'sneak' channels for animals with varied swimming and crawling abilities. Although the plans do not show maximum elevation changes on the typicals for structures, it appears that some of the structures will have a 1-ft drop from the structure to pool bed – we caution Wildlands in structure design and placement, as scour can result in even higher drops. We recommend considering embedding the bottom of pools with larger stone/mix (to resist scour) and adding a messier transition at the head, maybe doubling-up the logs/rocks and carrying cascade riffle transition from upstream of the structure down into the pool.
Response: We agree with these concepts and will continue to target more natural structure design and implementation. We also wish to point out that we use higher drops in higher slope systems due to reference reach data supporting this approach. Our drop structure details have been revised since the previous submittal and are either footered, and/or include splash rock, to protect structures from headcutting or undermining from pool scour.

7. Please put a note in specifications to verify during installation that some small gaps be retained between the fence bottoms (if woven wire is used) and ground to allow for wildlife scooching.
Response: Woven wire is not being proposed for this project.

USACE Kim Isenhour:

1. It will be important to have extra boundary markings in the utility crossings, perhaps "No Mow" signs, so that it's clear where the CE boundaries are compared to the utility line maintenance areas. I would also recommend extra signage on the DOT easement border to prevent encroachments if/when bridges are replaced.
Response: It is true that utility maintenance areas will not always be separated from the rest of the CE. Maintenance of Duke utility crossings is anticipated to be by helicopter but signage will be placed on posts within the CE to delineate these boundaries between utility crossings and areas that should not be maintained.

2. Please include the Internal Crossing and Utility Justification that was emailed to the Corps October 25, 2022. I agree that the smaller utility lines have the potential to be removed in the future, which would leave the easement exposed if it was external to the CE, and I understand the dilemma of not being able to enforce cattle exclusion without the backing of the CE.
Response: The referenced memo is being included within Appendix 6 of the mitigation plan.

3. Appendix 5:

a. Cherokee Nation THPO: Please confirm that the two as Protected Archeological Sites 31MA873 and 31MA877 are locations that are labeled the only areas that will be avoided during construction. Were other areas that were identified with positive shovel tests the areas that will receive shaded bare root planting? There was a lot of correspondence, so I just want to make sure that the two additional bare root planting areas are identified on Figure 10.
Response: In addition to complete avoidance of the two areas listed, the following areas are being managed uniquely based on the resource values attributed by SHPO and the project archeologist, with concurrence from THPO:

- Site 31MA872 – No grading will occur; the site will be planted with bare root planting.
- Area upslope of Site 31MA862 – No grading will occur; the site will be planted with bare root planting.

These are not identified on Figure 10 because bare root planting is standard throughout the site and so the planting is not proposed to differ from other standard planting treatments. Conversely, for site 31MA873 which intersects the easement, no planting will occur - so the area has been uniquely identified on the planting map to reflect this condition.

b. USFWS: Just to confirm that Wildlands has committed to NLEB special conditions in the 404 permit that will include no night work, no artificial lighting will be added to the action area, and trees will be removed from Oct 15 – Apr 1 outside of the bat active season for tree-roosting species. A may affect not likely to adversely affect call has been determined.
Response: Confirmed.

4. Design Sheet 2.8.1: A fiber roll BMP is planned on UT3B1. It appears that this is planned in a jurisdictional area, Wetland O. BMPs cannot be placed in jurisdictional areas. Is it possible to shift this to where the old spring box is being removed? Or perhaps note that this will just be a temporary impact until the dense vegetation establishes.
Response: As this is a vegetative and not a structural practice, the "BMP" will be constructed entirely of biodegradable materials that will be replaced over time by natural vegetation. As such, we have indicated for this impact to be considered to be temporary in the PCN. We view the use of a fiber roll as a beneficial intermediate step to the long-term goal.

5. A soils report by a licensed soil scientist would have been preferable for this site. With the amount of earth moving involved to grade to the target floodplain elevations, it would be beneficial to know if hydric soil indicators are found at 12-24". Soil profiles will be important to provide during monitoring.
Response: Soil profiles will be provided during as-built monitoring installation from borings at each groundwater gage location.

6. Section 6.7, wetlands along UT1: Typically, grading over 12" would be credited as creation at 3:1; however, since it is only about 0.1 acres that will be graded greater than 12", I accept the proposed 2:1 ratio because of the uplift from planting, livestock exclusion, and raising the streambed. Priority 1 restoration would have been preferred, with wider buffers, and would have likely eliminated some of the floodplain grading.

Response: We understand the preference for priority 1 restoration and minimization of wetland grading and will continue to strive for these conditions on future projects where and whenever possible.

7. *Figure 10:*

   a. *In addition to visually monitoring the shaded planting zones, please provide information in the monitoring report on the survival of planted understory species. A recent discussion with Wildlands indicated that on a different project, none of the understory plantings survived.*

Response: In addition to visually monitoring shaded planting zones, mortality will be evaluated with vegetation transects and discussed in annual monitoring reports. Vegetation transects will not be held to the vegetative performance standard. The note 4, below table 40 and 41, has been updated.

   b. *Please also plan to add mobile vegetation plots to the wetland enhancement area on UT1 and the reestablishment area on UT3.*

Response: Mobile vegetation plots will be added to those areas. Figure 9 and table 41 have been updated.

   c. *I'd like to see random veg plot data for UT2A and the restoration reach of Jones Creek at least once during monitoring.*

Response: Wildlands will be sure to locate mobile plots along UT2A and the restoration reaches of Jones Creek at least once during the monitoring period.

   d. *Please indicate the location of benthic monitoring on UT3A after it's conducted in MY2 or MY3.*

Response: The location will be noted.

8. *Jones Creek Reach 4: It's understood that livestock will be excluded from the bridge crossing, but will cattle be accessing the other side of N. Jones Creek Road under the bridge? I was not able to be at the site visit so I just want to confirm that the area will be adequately stabilized for livestock crossing, similar to the crossing under the road on the Wyant Lands project.*

Response: No, cattle will not have access under N. Jones Creek Road. The updated plans being provided show the fencing that will be installed upstream of the ford crossing that is proposed at the top of Reach 4.

9. *I would encourage Wildlands to follow up with the landowner regarding livestock waterline installation prior to construction so they are aware that even if watering facilities are not installed by the time construction is complete, the ford crossings cannot be used for livestock watering.*

Response: Wildlands has indicated this to landowners and will continue to revisit this requirement with them through construction.

10. It would be helpful to include a wetland grading figure that shows areas that will be graded greater than 12", and those under 12". The figures are very busy and it's difficult to determine how much grading is planned. I appreciate the explanation in the response to DMS comments.
Response: A figure showing grading depth is provided in Appendix 4.

11. Section 3.5: Did the Cherokee Nation request to be present during construction/planting?
Response: No, no request was made by the Cherokee Nation.

12. Section 6.0: Where bankfull benches are being cut, please plan to provide visual observations and/or veg transect data since vegetation establishment in these areas has proven difficult in the past.
Response: Visual observations of vegetation establishment along bankfull benches will be discussed in monitoring reports.

13. Section 6.5: Do you plan to apply a heavy herbaceous seed mix along Jones Creek Reaches 4 and 5? I'm concerned that water cresting the levies will cause floodplain scour/erosion as it re- enters Jones Creek.
Response: The area in question (where flow re-enters Jones Creek) is already subject to these high flows on a frequency far exceeding the anticipated post-project frequency and remains stable. High flow will have to pass through the 30-foot buffer before reentering Jones Creek and all non-wooded portions of the CE will be seeded with riparian seed mix.

14. Section 8.0: Detailed soil profile descriptions should be recorded within restored and created wetlands where gauges are installed. These profile descriptions should be a record of the soil horizons present, and the color, texture, and redoximorphic features present. Representative soil profiles should be gathered for the baseline monitoring report and during monitoring years 3, 5 and 7.
Response: Soil profile descriptions will be recorded during installation of gages for long-term monitoring. At years 3, 5, and 7, one representative soil profile will be provided for each wetland area on the site (3 areas) for information purposes but not as part of monitoring criteria.

15. Table 24: It would have helped expedite the review if the NCWAM scores were included in this table.
Response: This formatting request is being shared with other offices for future reference.

16. Section 6.1: The existing ditches that will remain on Jones Creek Reaches 3 and 4 should be included in this section. I understand that they're vegetated outside the easement, but what is to prevent the landowner from clearing or dipping them out? Would BMPs inside the easement be a better alternative than ditches?

a. Sheet 2.1.5: It's unclear to me whether the ditches remain open in the easement and connect to the channel, or will there be diffuse flow?

Response: Section 6.1 has been amended to include mention and photographs of existing ditches along Jones Creek Reaches 3 and 4.

17. Section 6.7.2: Were wetland gauges installed to gather pre-construction data?
Response: No gages were installed pre-construction. We understand the need/preference for gage data to be collected for most cases. Due to the anticipated timing of assessment period being from September to March (wetland crediting evaluation started late in the project based on a contract modification) we elected not to put out gages since dormant season hydrology would not be a directly relevant comparison for post-construction growing season performance evaluation. We ultimately ended up submitting the mitigation plan after the scheduled date of April 2022 due to landowner easement design considerations which delayed submittal.

18. The existing drain tiles should be shown on Figure 2.
Response: In the mitigation plan, we do discuss the presence of tile drains along reaches UT3A and UT1, but the extent (alignment) and exact outlet locations were difficult to discern in the field and thus were not mapped. Tile drain pipes observed in these two reaches were often in the form of short, dislodged sections that were laying in the channel within proximity to side ditches that were mapped and shown in Figure 2. Drains will be located and traced to their origin during construction for the purpose of removal.

DWR Erin Davis:

1. DWR requests that responses to DMS comments dated September 2, 2022, be included in the final mitigation plan appendices. There are several discussion points that could be helpful to refer back to if questions/concerns arise during IRT credit release reviews.
Response: The comment response is incorporated into the final mitigation plan within Appendix 6.

2. Page 26, Section 3.5 – DWR appreciates the thorough coordination with Duke Power. To confirm, all project utility crossings will be helicopter maintained?
Response: Per Duke, the current maintenance regime is to cut trees and limbs via helicopter.

3. Page 29, Table 27 – Why is Biology asterisked in the Functions Supported column?
Response: This was inadvertent and has been removed.

4. Page 42, Section 6.6 – Since a Priority 2 restoration approach typically limits the potential function uplift compared to Priority 1, DWR prefers it be limited to confluences and transition zones. Our recommendation for reducing the risk of hydrologic trespass is wider buffers, not a Priority 2 design.
Response: DWR and other agency preference for Priority 1 is noted and is the approach we try to pursue on all projects to the maximum extent possible.

5. Pages 43-44, Section 6.6 – In this section, the natural levy design is only mentioned along Jones Creek Reach 4, however, Reach 2 and Reach 5 are discussed in Section 3.5. Please clarify.

Response: The language used to describe Reach 4 is applicable to reaches 2 and 5 and has been copied to these sections to reflect this.

6. Page 47, Section 6.7 – While not strictly required, DWR has come to appreciate and expect a hydric soil investigation report when project wetland restoration credit is being proposed. In particular it is helpful to have a Licensed Soil Scientist evaluate drained hydric soil for reestablishment credit suitability.
Response: Due to the limited pursuit and late addition of wetland crediting on this site, Wildlands conducted hydric soil investigations in-house. Wildlands was already in the process of conducting extensive wetland evaluation as part of jurisdictional determination efforts. A map of hydric soil investigation was provided under Appendix 4.

7. Page 49, Section 6.8 – The wattle type could affect the longevity of the BMP function and potential maintenance. What type of wattle is proposed (e.g., straw vs. coir fill, fiber vs. plastic netting)? Also, please monitor for signs of erosion from any concentrated flow around the wattle.
Response: The section has been updated to specify that a biodegradable wattle is required and that the use of plastic netting is prohibited. The narrative was also updated to indicate that visual monitoring should be used to ensure proper function and remedial action should be taken if erosion is present.

8. Page 50, Section 6.9 – As part of Land Management, please provide a brief description of proposed soil restoration to address equipment/haul road compaction, low nutrients/organics, pH, etc. for planting medium suitability.
Response: A description of these activities has been added to the section.

9. Page 52, Table 40 – DWR is ok with the proposed modified vigor performance standard for wetland planting zones. Regarding table note 4, DWR requests that in addition to visual assessment of the shaded planting zones, trends on planted stem survival be reported (e.g., general survival observations, which species are establishing well, and which aren't).
Response: Wildlands will evaluate these shaded planting zones with vegetation transects and communicate trends of species survival in annual monitoring reports. The note 4 below table 40 and 41 have been updated.

10. Page 53-55, Table 41 –
a. The proposed project is comprised of more lumping than splitting of reaches based on construction activities to represent a more "holistic restoration" approach. To confirm, performance standards, monitoring and adaptive management applies to restoration and enhancement credited areas sitewide. In-stream structures and bank treatments along enhancement reaches should be assessed for stability throughout the monitoring period. Due to proposed streambed work, DWR requests an additional cross-section along Jones Creek Reach 4 and UT3A Reach 2.

Response: Additional cross-sections have been added to Jones Creek Reach 4 and UT3A Reach 2. These cross-sections on enhancement II reaches will be evaluated for stability and will be installed within riffle features. Table 41 and Figure 9 have been updated.

b. While macroinvertebrate sampling requested by the IRT isn't required to have a specific performance standard, please provide more information on the proposed sampling methodology and schedule. Please note that if sampling efforts are unsuccessful at demonstrating stream biology, credits for this reach may be at-risk.
Response: Footnote 7 of Table 41 has been revised to describe the proposed methodology.

11. There are several design sheets where existing trees are specifically called out to be saved or removed, while other trees have no callouts. Please be consistent with callouts throughout the plan. Maybe add a plan note that only trees over a certain DBH will have save/remove callouts. Also, please revisit/reevaluate areas shown both as stream bank grading and tree protection (e.g., Sheets 2.1.4, 2.1.5, 2.1.7).
Response: We have worked on providing the requested consistency. Tree saves are noted where they are close to or overlapping with grading but not in areas where no activity is proposed. Tree removals have been added, along with estimated location of trees from aerial and photo evidence as we prepare to complete tree removal in advance of the bat nesting and mating season. A note about tree marking (existing, save and remove) is being provided on the legend. The areas showing streambank grading and tree protection will be refined during the preparation of a final grading model for construction. A review to verify the intended approach (save/remove) has been made and is reflected by the updated plans.

12. Multiple ditches that flow towards the project easement and stream are to remain open to continue positive drainage. Understanding that field changes may occur due to site conditions during construction, please assess the potential need for stone placement within any ditches or stream tie-in points during this planning phase and include on final design plans as necessary.
Response: At this time, the current condition of ditches is satisfactory and any construction-phase needs will be addressed—construction specifications state that minor grading or stabilization with stone or vegetation will be conducted as directed by Wildlands for preferred flow paths.

13. Sheets 2.1.1 – 2.1.7 – Please add callouts to any areas proposed to be graded as natural levees as discussed in the plan narrative.
Response: Callouts have been added to Reaches 2, 4, & 5 to indicate the locations where this approach is proposed.

14. Sheet 2.1.5 – To confirm, the existing ditch transitions to diffused flow within the easement?
Response: The preliminary grading contours for the mainstem bank work gave a false impression that the ditch would be graded out. The intent, as indicated on the concept design figure (Figure 8), is to maintain the ditch in its current geometry and vegetated condition.

Section 6.1 has been amended to include mention and photographs of existing ditches along Jones Creek Reaches 3 and 4.

15. Sheet 2.2.1 –Section 6.6.6 mentions the construction of an outlet/headwall. If this is proposed, please show on plan sheet. DWR's preference is to fully remove existing infrastructure from the project easement. However, if any infrastructure is left or built within the easement, please clearly identify in the as-built and MY0 report, including coordination with Stewardship and changes to the standard easement agreement (e.g., maintenance activity allowance).
Response: The existing pipe will be removed to the extent possible and it is anticipated that a small rock headwall may be used if necessary to help stabilize the outlet once the pipe has been removed as close to the easement/property boundary as feasible. The remaining infrastructure has been anticipated by the plat and easement language, and also previously coordinated with NCDMS Stewardship to ensure their acceptance of the approach. A maintenance area has been designated outside of the credited reach and the final outlet/headwall configuration will be identified on the as-built.

16. Sheet 2.3.1 – Is the UT1A culvert located on the easement boundary? If so, DWR requires an offset to the start of crediting to allow for future structure maintenance. DWR's preference would be to have a setback between the project easement and the existing structure.
Response: Yes, UT1A ends at the NCDOT right-of-way (ROW). As the 45' ROW for the existing 2-lane road does not extend into the easement, any maintenance of the structure would be required to occur within the established ROW unless new ROW is obtained. If repair/replacement was required, it is anticipated that shoulder grading or a headwall could be implemented to nominally reduce the pipe length and thereby avoid impacts to the easement. Based on these conditions, Wildlands suggests that the proposed credited length remain as presented.

17. Sheet 2.4.2 – To clarify, the existing ditch is a wetland feature? Also, the narrative mentions remnant road roughening along UT2. Please show the approximate road footprint.
Response: Yes, the ditch is a jurisdictional wetland. The narrative mentions roadbed remnants but we could not find where roughening had been proposed by the narrative and do not feel that roughening is warranted. The remnant road is on the right side of UT2 Reach 1 (near station 201+80) and is grown over with large vegetation such that no activities are proposed to roughen or address the historic roadbed. As such, it is anticipated that the relevance of this historic feature is minimal for the purposes of construction activities.

18. Sheet 2.6.1 – Please include the brush pack icon to the plan legend sheet. Also, does the proposed vernal pool outlet to the stream? If so, will the outlet be vegetated or stone lined?
Response: The proposed vernal pool has been removed from the plans as the existing channel will be filled to greater than bankfull. The area will not collect water nor require an outlet.

19. Sheet 2.6.3 – What is the hatched feature on the left floodplain between Sta. 10+50 – 11+00?

Response: The hatched feature was for floodplain roughening and has been called out with a note to add extra livestaking in this area. Since it is the only instance of this practice, no symbol has been added to the legend.

20. Sheets 2.7.1 & 2.7.2 – Please add reach callouts (e.g., reach name, credit start/end station and approach). Why does the proposed thalweg icon change to arrows? Assuming the "w" line is a water line, please add it to the legend and callout it's removal from the easement.
Response: Callouts and alignment style have been revised. Location of existing and proposed waterlines are shown on figures but not on planset.

21. Sheet 2.8.1 – While not a credited stream, please add a callout and show the footprint of UT3B1 within the project easement, as well as any proposed work.
Response: A callout for the beginning of UT3B1 has been added to the plans. Apart from removal of the spring box and re-stabilization in that area and an adjacent minor headcut, no work is proposed on UT3B1.

22. Sheet 2.8.2 – Please briefly describe how riffles will be built into existing tree roots.
Response: The tree currently abuts the stream and stone will be placed against the tree to shape the riffle.

23. Sheet 2.9.1 – The narrative mentions the UT3C Reach 1 culvert is undersized and that headwall is eroding. Is replacement of this structure proposed? If so, please callout. If not, please discuss any potential adverse impacts the existing structure may have on the project reach. Also, to confirm no constructed riffles are proposed along UT3C Reach 1 or Reach 2?
Response: During IRT Site Walk, you asked whether the culvert may be undersized. Wildlands indicated it may be but that it is also outside of the project area. The mitigation plan narrative indicates that there is erosion of the culvert headwall. Replacement of the structure is not proposed; however, uncredited streambed stabilization is proposed to prevent headcutting, and stone placement against the eroded portion of the headwall is proposed – previously the note specifying this stone placement was present in design files but did not show up on the plan sheet and this has been resolved (a note has been added to Sheet 2.9.1 to indicate the intended plans to apply stone against the existing embankment adjacent to the culvert outlet). The bed and embankment stabilization proposed should adequately reduce the risk of potential impacts to the project which would be from failure and/or embankment erosion from overtopping.

24. Sheet 4.1.1 & 4.1.2 – DWR appreciates the level of detail provided for the different planting zones and the proposed species diversity, including herbaceous wetland plugs. The inclusion of potential substitutes is helpful to review at this stage.
Response: Please note that we've since completed further coordination with the nursery and have made some minor adjustments to the anticipated and substitute species and percentages. Adjustments are reflected by the mitigation plan and construction plans.

25. Sheet 7.3 – For consistency, please use either vernal pool or floodplain pool for both the legend icon and detail.

Response: We are no longer planning to utilize this practice on the project and have removed it entirely from the planset.

PREPARED BY:

Wildlands Engineering, Inc.
167-B Haywood Road
Asheville, NC 28806
Phone: (828) 774-5547

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 DMS operations and procedures for the delivery of compensatory mitigation.

Contributing Staff:

Jake McLean, PE, CFM *Project Manager*
Shawn Wilkerson, *Principal in Charge*
Emily Reinecker, PE, *Quality Assurance*
Jordan Hessler, *Wetland Delineation, Stream/Wetland Design, Permitting*
Joe Lovenshimer, *Adaptive Management, Invasive Species Management, Planting*
Jacob Wiseman, PE, CFM, *Stream/Wetland Design*
Jane Margaret Bell, *Stream Design/ Planting Plan Design*
Ian Hazelhoff, *Land Acquisition*
Jacob Cochrane, EI, *Stream Design, H+H Modeling*
Jesse Kelley, *Construction Documents*
Scott Gregory, *Mitigation Plan Development, Enhancement Design*

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1.0 Introduction

The Cornbread Valley Mitigation Site (Site) is located in Macon County approximately 6 miles southwest of the Town of Franklin (Figure 1). The project includes restoration and enhancement of project streams and wetlands. The project is located within the Cartoogechaye Creek Targeted Local Watershed Hydrologic Unit Code (HUC) 06010202020030, and this HUC has been identified as a Targeted Resource Area (TRA) for water quality, hydrology and habitat (Interactive Map ID 19736155) by the NC Department of Environmental Quality Division of Mitigation Services (DMS). The Site is located in the NC Division of Water Resources (DWR) Subbasin 04-04-01. The Site is proposed to provide stream credits in the Little Tennessee 06010202 (Little Tennessee 02) Cataloging Unit (CU), and in the Little Tennessee Extended Service Area CU's 06010203 (03) and 06010204 (04).

The project proposes to restore and enhance 9090.9 existing linear feet of cold water streams. Wetland enhancement, rehabilitation, and re-establishment is proposed to restore headwater/seepage and floodplain riparian wetlands, and a best management practice (BMP) is proposed to slow and filter runoff from upland livestock trails. The existing streams and wetland resources are presented in Figure 2. The work proposed on the Site will provide 6129.333 stream credits and 1.319 wetland credits and will be protected in perpetuity by an 18-acre conservation easement.

Table 1: Project Attribute Table Part 1

Project Information	
Project Name	Cornbread Valley Mitigation Site
County	Macon
Project Area (acres)	18
Project Coordinates (latitude and longitude)	35.101330 N, -83.455015 W
Planted Acreage (acres of woody stems planted)	13

2.0 Basin Characterization and Site Selection

The Little Tennessee 02 is dominated by forest (87%) with approximately 6% of land developed and 4% in agriculture. The developed areas include Highlands and Franklin. Multiple conservation and watershed planning documents outline water quality goals and objectives for the broader Little Tennessee River basin as summarized below:

- The Little Tennessee River Basin Restoration Priorities (RBRP) (DMS, 2018) document established a broad watershed goal of reducing sediment and nutrient sources by restoring unstable streams and degraded riparian buffers.
- The Little Tennessee Watershed Association noted in their 2011 report, "The State of the Streams in the Upper Little Tennessee Watershed," that livestock access to streams was a concern in the upper Cartoogechaye watershed, and in Jones Creek specifically. The report also noted a high incidence of blackspot, a parasitic infection often associated with organic enrichment, in fish monitored within the Cartoogechaye Creek subwatershed.
- The Little Tennessee Basinwide Water Quality Plan (DEQ, 2012) noted that Jones Creek suffers from livestock access and that livestock farming in the greater Cartoogechaye Creek watershed may be responsible for the elevated fecal coliform levels recorded upstream of the Town of Frankin's water treatment plant. The Basinwide Plan also stated that riparian buffer restoration and nutrient and erosion control measures should be prioritized and identified the prevalence of stream restoration opportunities in the Cartoogechaye Creek watershed.

- The 2015 North Carolina Wildlife Resource Commission's (NCWRC) Wildlife Action Plan (WAP) noted that instream habitats in the upper Little Tennessee River basin are degraded from erosion and sedimentation related to both development and agriculture. The plan identified the importance of fencing livestock from streams and establishing riparian buffers along streams.
- The North Carolina Natural Heritage Program identified Cartoogechaye Creek as an Aquatic Significant Natural Heritage Area of state significance beginning two miles downstream of the Site.

The Site was selected due to its ability to support local watershed objectives and goals as well as contribute to the protection of the Significant Natural Heritage Habitat downstream by excluding livestock, creating stable stream banks, restoring a forest in agriculturally maintained buffer areas, and restoring wetland habitat. These actions will reduce fecal, nutrient, and sediment inputs to project streams, and ultimately to Cartoogechaye Creek and the Little Tennessee River, as well as reconnect instream and terrestrial habitats on the Site.

3.0 Baseline and Existing Conditions

3.1 Watershed Conditions

The entire Site is currently maintained for livestock pasture and represents a large portion of the grazed lands within the Jones Creek subwatershed, which is one of two primary subwatersheds to Cartoogechaye Creek.

On March 11, 2020, all Site streams were evaluated and scored; Jones Creek, UT1, UT1A, UT2, UT2A, UT3, UT3A Reach 2, UT3B, UT3B1, and UT3C were identified as perennial within the project limits. UT3A Reach 1 was identified as intermittent. Stream forms are included in Appendix 3. Figure 2 maps the streams and wetlands on the Site. Details about the existing streams and wetland are provided in Section 3.3.

Large portions of the watershed are forested. However, on the Site, riparian buffers are typically absent, one-sided or narrow throughout all project reaches. Two exceptions are UT3B and the left bank of UT3C where wider buffers consisting of native communities are present. The typical site vegetation makeup is discussed in more detail in Section 3.2.3. Apart from lacking buffers, monocultures of tag alder (*Alnus serrulata*) are a concern along UT1, and in limited other areas where tag alders dominate streambanks. These areas may be susceptible to alder dieback under future full shade conditions. During the post-contract Site Walk, IRT recommended that stability provided by alder thickets be viewed as temporary when it is not also supported by a stable geomorphic form.

A review of historic aerials from 1954 to 2016 shows the Site streams have existed in their approximate locations over this time span. UT1 appears to have been ditched after 1954 but prior to 1964. The Site use has remained consistent as livestock pasture, although fields north of UT3 have also been used for row crops in some years. The pond dam on UT2 originated prior to 1975 – it appears to be visible in the 1975 aerial and is plainly visible in the 1984 aerial.

The Site is located within the Prentiss USGS 7.5-minute Quadrangle map as shown on Figure 4; topography and relief are typical for the region. Generally, tributary valleys onsite are steep and semi-confined to confined, and the mainstem of Jones Creek is semi-confined to unconfined. Based on site survey, Jones Creek has a valley slope of approximately 1.5-2.5%. Tributary reaches UT3B, UT3C, and the upper portions of UT3A and UT2 have typical slopes of 5-10% emerging from their headwater valleys. UT3 has a slope of approximately 4% in Reach 1. UT3 Reach 2, UT1, and the lower portions of UT3A and UT2 have slopes in the 2-4% range as they enter and flow within the Jones Creek valley.

Watershed drainage areas and land uses are depicted on Figure 3. The Jones Creek watershed is situated in an agricultural valley in Macon County with no zoning regulations and a mix of residential and agricultural land use. A substantial portion of the watershed is forested, including the Jones Creek headwaters originating on the Nantahala National Forest. The Site is one of the last remaining large farms in the upper portion of the Jones Creek watershed. Jones Creek, as a major tributary to Cartoogechaye Creek which provides public drinking water for the Town of Franklin, is protected by the Macon County Watershed Protection Ordinance which restricts certain uses, limits the amount of impervious surfaces, and restricts lot sizes within these watersheds. Furthermore, the County Comprehensive Plan does not support extension of water and sewer into low to moderate density areas such as the Jones Creek subwatershed. Based on aerial photography, land use in the valley has remained stable over recent decades and natural and regulatory constraints are likely to support low intensity land uses. Tributary streams are generally forested in their headwaters, or unforested in agriculture where they begin on the Site. Offsite streams contribute sand, gravel and cobble bedload to Jones Creek which conveys these materials based on its size and slope. Onsite streams tributaries are often a source of excessive fine sediment evident in poor pool depth maintenance and depositional areas, particularly within manipulated reaches.

Site streams are classified as WS-III waters with Trout; this designation is used to protect water supply sources in low to moderately developed watersheds and also protects Class C uses (secondary recreation, fishing and fish consumption, wildlife, aquatic life, and agriculture).

Table 2: Project Attribute Table Part 2

Project Watershed Summary Information		
Physiographic Province	Blue Ridge	
Ecoregion	Blue Ridge – Southern Crystalline Ridges and Mountains	
River Basin	Little Tennessee River	
USGS HUC (8 digit, 14 digit)	06010202, 06010202020030	
NCDWR Sub-basin	04-04-01	
Stream Thermal Regime	Cold	
Project Drainage Area (acres)	3,164 (Jones Creek), 181 (UT3)	
2016 NLCD Land Use Classification	Jones Creek Drainage	UT3 Drainage
Forested	95%	83%
Agricultural	3%	17%
Developed	2%	<1%
% Impervious	<1%	<1%

- **Notes**: Land Use Source – National Land Cover Database 2016 (NLCD 2016), Multi-Resolution Land Characteristics (MRLC) consortium, https://www.mrlc.gov/data/nlcd-2016-land-cover-conus.

3.2 Landscape Characteristics

3.2.1 Geology

Channel material ranges from fines to cobble in smaller headwater tributary reaches and fines to boulder with sand to cobble being most common in Jones Creek. No instances of bedrock were identified. With the absence of bedrock, stream downcutting has proceeded unchecked in some reaches such as UT3 Reach 1. This condition, however, reduces the potential for subsurface constraints during construction. The Site streams consist of either headwater tributaries in narrow colluvial valleys with a step-pool morphology (A-type or B-type streams), or less confined valley bottom streams such as Jones Creek. In the broader valley bottom of Jones Creek, the 10- to 25-year flood events access the wider

floodplain while bankfull and other lesser flows are contained within a bankfull channel and vegetated bench. It is noted that the wider floodplain is accessible at depths of less than two times the maximum depth and that therefore the entrenchment ratio does not represent the limited stream-floodplain interaction that exists in this landscape position. According to the NC Geologic Survey, the Site is located in the Blue Ridge Belt of the Blue Ridge physiographic province. The Blue Ridge Belt contains a combination of igneous, sedimentary, and metamorphic rocks that have been repeatedly heated and deformed through such processes as folding, faulting, and fracturing. The Site is mapped as amphibolite with intrusive and extrusive mafic rock and may include meta-sedimentary rocks. Shallow bedrock was not noted at the Site. The unit is described as primarily equigranular, massive to well foliated, interlayered, and rarely discordant. According to the Geologic Map of North Carolina (1985), the underlying geology of the proposed restoration Site is mapped as Middle-Late Proterozoic age (roughly 900 million years in age) amphibolite (ZYba).

Source: North Carolina Geological Survey (NCGS), 2016. Mineral Resources. http://deq.nc.gov/about/divisions/energy-mineral-land-resources/north-carolina-geological-survey/ncgs-maps/1985-geologic-map-of-nc, North Carolina Geological Survey (NCGS), 1985. Geologic map of North Carolina 1:500,000 scale.

3.2.2 Soils

The proposed project is mapped by the Web Soil Survey for Macon County. The predominant Site floodplain soils are described in Table 3 below and depicted in Figure 5. Nikwasi, Dellwood and Saunook loam are the three soil types mapped in areas that host wetlands on the Site. It is likely that the primary hydric soil on the Ste is Nikwasi which is present as a minor component in Dellwood and Saunook soils. While the typical profile for Nikwasi is described as a sandy or fine sandy loam, hydric soil profiles on the Site were generally loam to clay loam in consistency, consistent with Saunook.

Table 3: Project Soil Types

Soil Name	Description
Dellwood gravelly fine sandy loam	Dellwood gravelly fine sandy loam soils are found on floodplains. They are shallow with gravel and sand subsoils and are moderately well drained. Consists of 5% minor components, including Nikwasi which is rated as hydric.
Evard-Cowee complex	Evard consists of deep loamy well drained soils on slopes and interfluves. The profile consists of 5” of gravelly loam, then clay to sandy loam down to 80”. Cowee consists of shallow loamy soil with underlying bedrock, and is characterized as well drained soils occurring on mountaintop and side slope landscape positions. The profile is 5” of gravelly sandy loam overlying sandy clay loam to 80” and then bedrock. The series has 20% minor components.
Nikwasi fine sandy loam	Nikwasi fine sandy loam is found on floodplains and in depressions which flood frequently. It is very poorly drained with 10% of the mapped unit consisting of undrained Nikwasi soils. The profile consists of a sandy loam or fine sandy loam to 26” depth and then transitions to an extremely gravelly coarse sand to a depth of 80”. Nikwasi is rated as hydric.
Saunook gravelly loam	Saunook gravelly loam consists of deep loamy well drained soils on drainageways, alluvial fans and coves. The profile consists of a 10” of gravelly loam, then clay loam from 10 to 35”, and cobbly fine sandy loam below to 80”. Saunook consists of 20% minor components.
Saunook loam	Saunook loam consists of deep loamy well drained soils on drainageways, alluvial fans and coves. The profile consists of a loam surface layer and subsoils range progress from clay loam from 10” to 34” of depth and then to cobbly sandy loam below that, to 80”. Farmland of statewide importance. Consists of 20% minor components, all associated with floodplain settings, including Dellwood, Reddies, and Nikwasi – Nikwasi is rated as hydric.
Trimont gravelly loam	Trimont gravelly loam is a deep gravelly and sandy loam to 80”. It occurs on mountain side slope positions. The typical profile is 9” of gravelly loam overlying sandy clay loam to 45” and fine sandy loam to 80”. It is well drained.

Source: *Soil Survey of Macon County, North Carolina, USDA-NRCS,* https://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=NC

3.2.3 Plant Community

Along most of the project streams vegetation consists of pasture grass species, such as fescue (*Festuca* spp.), along with wetland plants, such as soft rush (*Juncus effusus*) and cattails (*Typha spp*.), in wetter areas. Where present in the broader concave valley bottom floodplains, woody vegetation is often a narrow strip of tag alders (*Alnus serrulata*), or a single row of mixed-hardwood forest species, including sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), eastern red cedar (*Juniperus virginiana*), willow (*Salix* spp.), black walnut (*Juglans nigra*), and American hornbeam (*Carpinus caroliniana*). River cane (*Arundinaria gigantaea*) was also observed just off the Site along Jones Creek on higher ground above the floodplain. In the steeper headwater drainages, where woody species are present, and in areas with slightly more intact buffers (Jones Creek Reaches 1a, 1b, and 3; UT3B; UT3C right bank), mixed-hardwood forest species include yellow buckeye (*Aesculus flava*), American basswood (*Tilia* americana), black cherry (*Prunus serotina*), red maple (*Acer rubrum*), tulip tree (*Liriodendron tulipifera*), flowering dogwood (*Cornus florida*), and black walnut (*Juglans nigra*). Ecological community assessment of the Site suggests Rich Cove Forest (Montane Intermediate Subtype) and Montane Alluvial Forest (Small Stream Subtype) types are present, albeit fragmented and impacted, onsite.

Invasive species are present throughout the project area; these species include multiflora rose (*Rosa multiflora*), Chinese privet (*Ligustrum sinense*), Callery pear (*Pyrus calleryana*) and Japanese honeysuckle (*Lonicera japonica*). Invasive species are particularly dense along UT1, the lower portion of UT2, UT2A, and are prevalent along portions of UT3.

3.3 Project Resources

3.3.1 Existing Streams

All project streams except UT3A Reach 1 scored as perennial. Geomorphic surveys were conducted on Site streams to characterize their existing condition. Existing streams and cross section locations are illustrated in Figure 2. NCDWR stream assessment forms are in Appendix 3. Cross sections and geomorphic data are provided in Appendix 4.

<u>Jones Creek – Reach 1a/1b</u>

Jones Creek flows onto the Site from the south and is a cobble-gravel stream with occasional boulders. It is semi-confined with a hybrid of step-pool and meander planform morphology. Jones Creek at the upstream easement limits has a wooded buffer and is relatively stable for a short length (Reach 1a) before entering an unstable reach (Reach 2). Below Reach 2, Jones Creek returns to a relative stable reach with deep-rooted vegetation on both banks (Reach 1b). Buffer widths are narrow, and livestock have access to the creek.

Table 4: Jones Creek Reach 1a/1b Attribute Table

Reach Summary Information	
Parameters	**Jones Creek Reach 1a/1b**
Length of Reach (Linear Feet)	43, 297
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined
Drainage area (acres)	2,723 – 2,732
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Medium
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	19.3
Bank Height Ratio (ft/ft)	1.0
Gradient (ft/ft)	0.022 – 0.029
Reachwide d50 (mm)	57
Stream Classification (Existing and Proposed)	Hybrid B4/C4 existing and proposed
Evolutionary Trend	VI – Quasi Equilibrium
FEMA Zone Classification	X


Jones Creek above Allison Watts Rd

Jones Creek – Reach 2

Jones Creek Reach 2 is a cobble-gravel stream with occasional boulders that is located between Reaches 1a and 1b. It is less confined than Reaches 1a and 1b owing to a low left bank where water can escape the channel and flow to the Allison Watts Road embankment before reentering the stream. This loss of confinement has resulted in a lower slope within this reach, and aggradation of bedload within the channel and on point bars. The combination of high shear and erosion in unvegetated outside meanders and bedload deposition on point bars and mid-channel bars has resulted in a highly sinuous planform that is unstable. Reach 2 lacks a woody buffer on one or both banks and has lost trees due to planform instability. It is likely that prior manipulation of the stream and valley, namely stream relocation along with construction of high berms along the channel top of bank to prevent flooding in fields, has resulted in flow conveyance discontinuity (loss of and/or excessive stream power) and has led to the sediment aggradation and severe meandering response in this reach. Unvegetated banks are subject to erosion and lateral migration from extreme flood events, or repetitive moderate events, as the channel adjusts. Based on visual observation, bank height ratios are in typically in excess of 1.0 but less than 1.5, except where bed aggradation is most prominent and has resulted in bank height ratios less than 1.0.

Table 5: Jones Creek Reach 2 Attribute Table

Reach Summary Information	
Parameters	**Jones Creek Reach 2**
Length of Reach (Linear Feet)	487
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined
Drainage area (acres)	2,726
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	24.1
Bank Height Ratio (ft/ft)	0.7-1.4
Gradient (ft/ft)	0.016
Reachwide d50 (mm)	57
Stream Classification (Existing and Proposed)	C4 existing, hybrid B4/C4 proposed
Evolutionary Trend	V – Aggradation and Widening
FEMA Zone Classification	X



Jones Creek Reach 2



Existing powerline over Jones Creek Reach 2 (to be removed)

<u>Jones Creek Reach 3</u>

Jones Creek Reach 3 starts downstream of Allison Watts Road and flows through livestock pastures with relative stability maintained by deep-rooted vegetation on both banks. In some cases, bankfull benches are present. Through much of the reach, the left bank lacks benching and in segments exhibits minor bank erosion. The buffer widths are narrow and there is currently livestock access to the creek. Multflora rose is present throughout the reach and is locally dense two discrete. There is minor toe erosion on the right bank in the downstream portion of the reach just upstream of the confluence with UT2A. The stream approach to the bridge along N. Jones Creek Road was repaired by NCDOT due to recent damage to the right bridge face and abutment.



Jones Creek Reach 3 existing ford crossing

Table 6: Jones Creek Reach 3 Attribute Table

Reach Summary Information	
Parameters	**Jones Creek Reach 3**
Length of Reach (Linear Feet)	879
Valley confinement (Confined, moderately confined, unconfined)	Unconfined

Reach Summary Information	
Parameters	**Jones Creek Reach 3**
Drainage area (acres)	2897
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Medium
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	17.5
Bank Height Ratio (ft/ft)	0.9
Gradient (ft/ft)	0.019
Reachwide d50 (mm)	67
Stream Classification (Existing and Proposed)	Hybrid B3/C3 existing and proposed
Evolutionary Trend	VI – Quasi Equilibrium
FEMA Zone Classification	X



Jones Creek Reach 3
looking upstream at eroding left bank

Jones Creek Reach 4

Jones Creek Reach 4 begins downstream of N. Jones Creek Road. Livestock use the bridge opening for access to the upstream pasture and an existing riffle below the bridge is used as a ford to move livestock to the feeding area near the barn. The buffer widths are narrow or non-existent; lower in the reach the left bank buffer is a mix of non-native invasives species and alders. Reach 4 is confined on the right bank by a tall bank and berm in the upper portion. The lower portion of Reach 4 is adversely affected by the backwater from the aggradational area at the beginning of Reach 5 in the lower portion which has caused aggradation and a long section of backwater in the lower reach.

Table 7: Jones Creek Reach 4 Attribute Table

Reach Summary Information	
Parameters	**Jones Creek Reach 4**
Length of Reach (Linear Feet)	717
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	3,154
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Medium
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	21.6
Bank Height Ratio (ft/ft)	0.9
Gradient (ft/ft)	0.0126
Reachwide d50 (mm)	77
Stream Classification (Existing and Proposed)	Hybrid B3/C3 existing and proposed



Jones Creek Reach 4



Jones Creek Reach 4

Reach Summary Information	
Parameters	**Jones Creek Reach 4**
Evolutionary Trend	VI – Quasi Equilibrium with V – Aggradation and Widening just above Reach 5
FEMA Zone Classification	X

Jones Creek Reach 5

Jones Creek Reach 5 begins as the creek takes a sweeping left curve before making two 90-degree right bends against the Jones Creek Road embankment. Historic road and tributary alignments on old USGS topographic quandrangle maps indicate this area has been changed over time and this manipulation is the likely cause of the loss of valley confinement at the left curve. As a result of the loss of confinement, the lower portion of Reach 4 and beginning of Reach 5 are severely aggrading and resulting in backwater in the lower portion of Reach 4. Downstream in the 90-degree bends, erosion is moderate to severe. Below these bends, only the right bank is within the project Site. It has a narrow strip of trees adjacent to the pasture. Runoff from heavy use areas near the barn in this reach follow concentrated flow paths to the creek. The lack of adequate left stream buffer allows for unfiltered runoff, nutrients and bacteria to flow directly into the creek. At the bottom of the reach, Jones Creek and the right bank continue on the project parcel and are in stable condition with a narrow buffer on the right bank and continued livestock access.

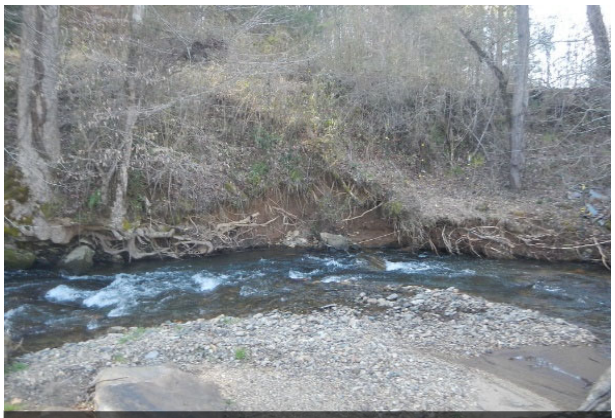




Backwater extends upstream from start of Reach 5 as a result of severe aggradation; arrow shows perspective of photo above

Table 8: Jones Creek Reach 5 Attribute Table

Reach Summary Information	
Parameters	**Jones Creek Reach 5**
Length of Reach (Linear Feet)	484
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	3,164
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Medium
NCDWR Water Quality Classification	WS-III; Tr



Valley wall erosion near road on Jones Creek Reach 5

Reach Summary Information	
Parameters	**Jones Creek Reach 5**
Width to Depth Ratio (ft/ft)	23.1
Bank Height Ratio (ft/ft)	1.0
Gradient (ft/ft)	0.0180
Reachwide d50 (mm)	77
Stream Classification (Existing and Proposed)	C3 existing, hybrid B3/C3 proposed
Evolutionary Trend	V – Aggradation and Widening
FEMA Zone Classification	X

UT1

UT1 begins at the southern Site property boundary at a piped outlet delivering flow from a small drainage area. UT1 was ditched in the 1960's based on review of aerial photography. The right bank of UT1 is intersected by at least four ditches that drain wet areas within the right floodplain. Vegetation along the upper portion of the reach has been maintained to the water's edge and remains sparse, while the lower half has been allowed to establish a narrow, but dense row of alders. This difference in vegetation results in a difference in bedform with the shaded area exhibiting a coarser riffle substrate (consisting of sand and gravel) with less grass growing within the wetted perimeter. Sidecast materials from historic ditching are present along the right bank throughout the reach. This material is densely covered with multifora rose. UT1A enters from the right mid-reach. Livestock have access to the creek throughout reach. Some minor bank erosion is present and both the left and right banks are taller than bankfull, confining flow within the historically ditched channel. The exiting culvert on UT1 is undersized.



UT1 upper portion of reach



Undersized culvert crossing UT1

Table 9: UT1 Attribute Table

Reach Summary Information	
Parameters	**UT1**
Length of Reach (Linear Feet)	1,076
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined
Drainage area (acres)	66
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	11.5
Bank Height Ratio (ft/ft)	2.6
Gradient (ft/ft)	0.0210
Reachwide d50 (mm)	1 to 18
Stream Classification (Existing and Proposed)	Existing G4 to Proposed C4b
Evolutionary Trend	II – Channelized
FEMA Zone Classification	X

UT1A

UT1A starts from the outlet of a 24-inch CMP culvert underneath Jones Creek Road and is bisected by an undersized and perched culvert crossing before draining into UT1. The upstream half of the stream reach is smothered in small gravel and fines originating from the road above, lacking in bedform and intermittently flowing subsurface until downstream of the crossing. The channel below the crossing is bordered by a dense thicket of tag alders, and also incised. The channel profile along this lower section is initially steep with active headcuts before stabilizing into a regular succession of short riffles and pools. Sidecast materials from historic ditching are present along the right bank throughout the reach.

Table 10: UT1A Attribute Table

Reach Summary Information	
Parameters	**UT1A**
Length of Reach (Linear Feet)	178
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined
Drainage area (acres)	3
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	7.9
Bank Height Ratio (ft/ft)	3.2
Gradient (ft/ft)	0.0905
Subpavement d50 (mm)	1.0
Stream Classification (Existing and Proposed)	Existing B5a/B4a to Proposed B4a
Evolutionary Trend	II/III – Channelized/Degradation
FEMA Zone Classification	X



UT1A dense alders with high bank height ratio



Headcutting of UT1A near confluence of UT1

UT2 Reach 1

The stream origin for UT2 Reach 1 begins upstream of a drained pond at a spring head. The right bank is wooded with no livestock access and contains remnants of an abandoned roadbed; prior manipulation of the channel for water diversion is evident from sidecast material located in the left floodplain. Below the source, the stream has tall streambanks with woody vegetation but also exhibits alternating erosion.

Water from the adjacent spring box at the top of UT2 Reach 1 serves adjacent agricultural and residential needs. The spring box area has been left out of the easement area and existing waterlines do not run within the proposed easement.

Table 11: UT2 Reach 1 Attribute Table

Reach Summary Information	
Parameters	**UT2 Reach 1**
Length of Reach (Linear Feet)	150
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined
Drainage area (acres)	13
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	18.1
Bank Height Ratio (ft/ft)	1.7
Gradient (ft/ft)	0.0313
Reachwide d50 (mm)	14
Stream Classification (Existing and Proposed)	B4 existing and proposed
Evolutionary Trend	III – IV Degradation/Widening
FEMA Zone Classification	X



UT2 Reach 1 bank erosion and water piping in creek bed

UT2 Reach 2

UT2 Reach 2 begins at an eroded inlet to a small, drained pond—the earthen pond dam has failed and is actively eroding, threatening to headcut through the old pond bed and mobilize the stored sediment downstream. A large volume of sediment has been eroded from the dam embankment. Below the breach, there is a second minor headcut. At the top of the reach both banks are wooded with trees having grown on the dam. The buffer narrows in the middle section of the reach and ceases in the lower section of the reach. Bank erosion is prevalent for about 150 LF downstream of the bed, after which the bed stabilizes and becomes depositional. At this point, the buffers end, and both banks are in pasture. The reach has discontinuous fencing that is not excluding livestock. Where present, fencing is immediately abutting the stream leaving no buffer.

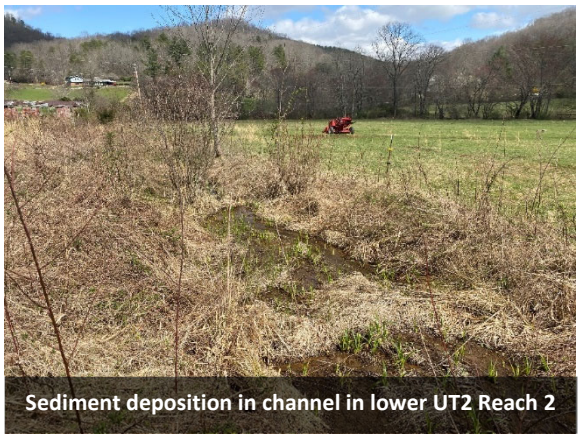
The slope at and below the dam is approximately 16% grade, transitioning to a more moderate grade of approximately 8%, and then entering the wider floodprone area of Jones Creek where the slope is approximately 2.5%. Erosion from the dam embankment is supplying excessive fine sediment to the historically ditched middle and lower reaches which are heavily silted. There is a culverted crossing mid-reach and the lower portion of the reach adjacent to the road is overgrown with multiflora rose, privet and honeysuckle. The project reach is intersected by two overhead electric lines in the lower half of the reach.

Table 12: UT2 Reach 2 Attribute Table

Reach Summary Information	
Parameters	**UT2 Reach 2**
Length of Reach (Linear Feet)	849
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	22
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	8.0
Bank Height Ratio (ft/ft)	1.0
Gradient (ft/ft)	0.0395
Reachwide d50 (mm)	14
Stream Classification (Existing and Proposed)	B4, existing and proposed (varies near bottom of reach)
Evolutionary Trend	Varies from II/III – Channelized/Degradation to V – Aggradation and Widening
FEMA Zone Classification	X



Old pond bed at start of UT2 Reach 2



Sediment deposition in channel in lower UT2 Reach 2

UT2A

UT2A is fed from a small pond located offsite upstream of Jones Creek Road. The stream flows into the Site via an existing road culvert. The perched culvert condition is severe, exceeding 24" in height from the channel bed. The channel has been ditched along the roadside of Jones Creek and N Jones Creek Roads at the toe of the road embankment. Trash and household debris are present throughout the reach. The reach has areas of bank erosion as shown in the photo below and is overwide with embedded riffles and silted-in pools within the upstream half of the reach. Roadside gravel and fines appear to be entering the reach along the portion of channel bordering N. Jones Creek Road. At its confluence with Jones Creek Reach 3, UT2A is obstructed by a combination of concrete rubble and boulders from recent repair or reconstruction of the N. Jones Creek Road bridge abutment.



UT2A looking upstream near top of reach

Table 13: UT2A Attribute Table

Reach Summary Information	
Parameters	**UT2A**
Length of Reach (Linear Feet)	499
Valley confinement (Confined, moderately confined, unconfined)	Confined
Drainage area (acres)	14
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	6.9
Bank Height Ratio (ft/ft)	2.0
Gradient (ft/ft)	0.0420
Reachwide d50 (mm)	3.8
Stream Classification (Existing and Proposed)	G4 existing/B3a proposed
Evolutionary Trend	III – IV Degradation/Widening
FEMA Zone Classification	X



UT2A toe erosion

UT3 Reach 1

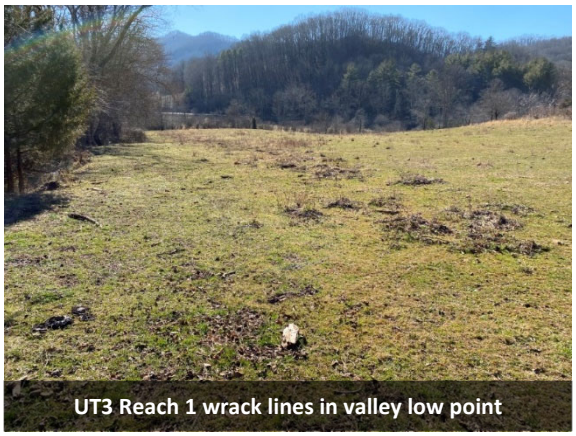
UT3 Reach 1 is accessible to livestock. UT3C and UT3B enter on the left side of UT3 Reach 1. UT3 Reach 1 is incised and lateral bank erosion is present upstream of an existing culvert crossing. Downstream of the culvert, bank height ratios exceed 3 and this segment of the reach has not widened in most locations due to the presence of large trees on either bank. The majority of the trees are undermined and there is a high risk of bank failures and sediment load contribution. In most of this segment of the reach, only a narrow row of trees forms the buffer and there is pasture beyond on both banks. There is a noticeable crenulation in the valley to the right of the existing stream location where the stream could be effectively relocated and raised to its original base level. Prior overflow into this valley crenulation is evident from leaf litter wracklines located in the low point of the right floodplain as a result of overtopping of the existing reconstructed culvert crossing further upstream.



Upper part of UT3 Reach 1 looking downstream at valley low point

Table 14: UT3 Reach 1 Attribute Table

Reach Summary Information	
Parameters	**UT3 Reach 1**
Length of Reach (Linear Feet)	662
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined
Drainage area (acres)	156
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	7.0
Bank Height Ratio (ft/ft)	3.1
Gradient (ft/ft)	0.0384
Reachwide d50 (mm)	24
Stream Classification (Existing and Proposed)	G4 existing, B4 to B4a proposed
Evolutionary Trend	IV – Degradation and Widening
FEMA Zone Classification	X



UT3 Reach 1 wrack lines in valley low point

UT3 Reach 2

UT3 Reach 2 enters a flatter portion of the valley. The stream channel is less incised than in Reach 1 (BHRs are approximately 2.0) but a few, small active headcuts were observed. A narrow row of woody vegetation is present along the tops of both banks for about half of the reach, but overall the banks are eroding from a lack of woody vegetation and trampling impacts by livestock. Lateral erosion is affecting over half of the reach. Multiflora rose is common and locally dense.

Table 15: UT3 Reach 2 Attribute Table

Reach Summary Information	
Parameters	**UT3 Reach 2**
Length of Reach (Linear Feet)	239
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined
Drainage area (acres)	158
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Medium
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	13.0
Bank Height Ratio (ft/ft)	1.7
Gradient (ft/ft)	0.0272
Reachwide d50 (mm)	24



UT3 Reach 2 below UT3B confluence

Reach Summary Information	
Parameters	**UT3 Reach 2**
Stream Classification (Existing and Proposed)	Incised C4b existing to C4b proposed
Evolutionary Trend	IV – Degradation and Widening
FEMA Zone Classification	X

UT3 Reach 3

UT3 Reach 3 begins as a narrow, incised channel with bank height ratios of 1.5. UT3 Reach 3 takes on considerable flow and stress from the frequent overtopping of Jones Creek at the aggraded Reach 4/5 reach break – flows overtopping the bank flow across the field and enter UT3 Reach 3. The banks are lined with alders which have prevented widening in most locations thus far. Beyond the alders, there is minimal to no additional buffer. Toe erosion is prevalent throughout the upper half of Reach 3. Ditches connecting to locations along both banks appear to drain existing floodplain wetland areas. An old crossing was observed midreach.

Table 16: UT3 Reach 3 Attribute Table

Reach Summary Information	
Parameters	**UT3 Reach 3**
Length of Reach (Linear Feet)	374
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	174
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	5.2
Bank Height Ratio (ft/ft)	1.5
Gradient (ft/ft)	0.0177
Reachwide d50 (mm)	29
Stream Classification (Existing and Proposed)	Incised E4 existing to C4 proposed
Evolutionary Trend	IV – Degradation and Widening
FEMA Zone Classification	X



UT3 Reach 3 immediately below UT3A Reach 1

UT3 Reach 4

UT3 Reach 4 is wider with less erosion than the upstream reaches of UT3. A manmade levy has been built up along the left bank within the lower portion of the reach. The left bank is bordered by pasture with intermittent alders and the right bank buffer is narrow but with larger trees. Livestock have access to the creek.

Table 17: UT3 Reach 4 Attribute Table

Reach Summary Information	
Parameters	**UT3 Reach 4**
Length of Reach (Linear Feet)	213
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	181
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Medium
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	13.3
Bank Height Ratio (ft/ft)	1.5
Gradient (ft/ft)	0.0182
Reachwide d50 (mm)	29
Stream Classification (Existing and Proposed)	Manipulated C4 existing to C4 proposed
Evolutionary Trend	VI Quasi equilibrium
FEMA Zone Classification	X


UT3 Reach 4

UT3A Reach 1

UT3A Reach 1 is a modified, headwater drainage that originates from an intermittent stream in a small patch of alders, surrounded by pasture. Below the intermittent section, the stream has been modified by cattle trampling and removal of all woody vegetation such that it lacks the channel definition to classify as a stream and is therefore considered a linear jurisdictional wetland under present conditions before reemerging in Reach 2 as a perennial stream. It is likely that the landform and hydrology of the wetland portion previously supported a small channel, but due to historic alteration and cattle access now presents as a linear wetland. Broken drain tiles found within the reach, and an overly steep tie-in slope at the bottom of the hill just upstream of Reach 2 are evidence of prior manipulation and suggest the stream is piped below grade. The reach was observed during wet and dry weather and stream flow was present, albeit spread over a broad, low area, during all observations.

From a geomorphic perspective, the reach is braided by potential historic impacts, as well as the more recent and ongoing livestock impacts, rather than natural processes. The lack of channel definition results in poor in-stream habitat, devoid of bedform. Baseflow is spread through multiple paths consisting of mud and silty substrate. No buffer is present, aside from the patch of alders at the origin. The downstream limits of the reach terminate at the existing wood line down valley where an unnaturally steep drop-down terminates and a perennial channel begins. Due to the extent of manipulation and impact to this channel it was not classified using Rosgen's system.

Table 18: UT3A Reach 1 Attribute Table

Reach Summary Information	
Parameters	**UT3A Reach 1**
Length of Reach (Linear Feet)	273
Valley confinement (Confined, moderately confined, unconfined)	Unconfined (manipulated)
Drainage area (acres)	11
Perennial, Intermittent, Ephemeral	Intermittent
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	N/A
Bank Height Ratio (ft/ft)	N/A
Gradient (ft/ft)	0.1076
Reachwide d50 (mm)	Silt
Stream Classification (Existing and Proposed)	Not classified existing to B4/5 proposed
Evolutionary Trend	V – Aggradation and Widening
FEMA Zone Classification	X



UT3A Reach 1

UT3A Reach 2

UT3A Reach 2 is perennial. There is no fencing around the reach and there is surface erosion from livestock trails at the head of the reach and on the left valley wall.

In the upper half of the reach, there is vertical and lateral channel instability. Multiple active headcuts are present—bank height ratios vary, but typically range between two to three or greater. The channel is overly sinuous in areas and is eroding into the valley wall. Evidence of prior manipulation coupled with livestock access and poor buffer quality all contribute to this instability.

As the reach exits the wooded area, intermittent trees line the banks, consisting of primarily alders that are present both on the banks and within the channel. As the channel enters the pasture, the reach corridor has floodplain wetlands on either side of the creek. The stream is no longer incised and is instead aggrading from a combination of upstream sediment supply and livestock access, resulting in an overly-wide and grass-choked streambed. Sidecast material is situated along the top of right bank along the downstream half of the reach.



Headcutting in UT3A Reach 2

Table 19: UT3A Reach 2 Attribute Table

Reach Summary Information	
Parameters	**UT3A Reach 2**
Length of Reach (Linear Feet)	530
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined
Drainage area (acres)	13
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	20.7
Bank Height Ratio (ft/ft)	5.8
Gradient (ft/ft)	0.0383
Reachwide d50 (mm)	0.5
Stream Classification (Existing and Proposed)	B5a existing to B4a and B4 proposed (with coarsening likely)
Evolutionary Trend	IV – Degradation and Widening (upper) to Aggradation and Widening (lower)
FEMA Zone Classification	X



Wallowed and overly-wide section of UT3A Reach 2

UT3B

UT3B is a small headwater drainage that originates from a seep partly fed by an upland linear wetland. UT3B flows through a moderately confined, wooded valley floor that is at a lower level than the adjacent pastures. Overall, the upper half of the reach is predominantly stable. In the lower half of the reach where the valley bottom broadens and the channel is less confined, the channel becomes incised and more sinuous. A few active headcuts were observed and portions of the reach flow subsurface under tree roots. Outer meanders are eroding into the valley wall in a few areas. Three small wetland areas were delineated in the lower valley that generally occupy the entire bottom width of the riparian corridor and on either side of the stream. All of UT3B is accessible by livestock.



UT3B has been ditched against the left valley wall and will be returned to its original channel (looking upstream)

Table 20: UT3B Attribute Table

Reach Summary Information	
Parameters	**UT3B**
Length of Reach (Linear Feet)	566
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined
Drainage area (acres)	7
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	High
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	16.2
Bank Height Ratio (ft/ft)	2.8
Gradient (ft/ft)	0.0708
Reachwide d50 (mm)	8.9
Stream Classification (Existing and Proposed)	F4b existing to B4 proposed with B4a in upstream portion existing and proposed
Evolutionary Trend	IV – Degradation and Widening to VI – Quasi Equilibrium
FEMA Zone Classification	X



UT3B meanders into the right valley wall in the lower part of the reach

UT3B1

UT3B1 is a short, steep headwater drainage that begins at a spring box within the Site and flows into UT3B. Above the spring box, there are steep diches with multiple knickpoints and there is evidence of surface erosion as well as impacts from livestock access, but the reach is predominantly stable. Like UT3B, UT3B1 flows through a wooded valley floor that is at a lower level than the adjacent pastures and hydrology is fed by an upland wetland area.

Table 21: UT3B1 Attribute Table

Reach Summary Information	
Parameters	**UT3B1**
Length of Reach (Linear Feet)	77
Valley confinement (Confined, moderately confined, unconfined)	Confined
Drainage area (acres)	1.0
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	High
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	23.8



UT3B1 looking downstream

Reach Summary Information	
Parameters	**UT3B1**
Bank Height Ratio (ft/ft)	1.0
Gradient (ft/ft)	0.0997
Reachwide d50 (mm)	N/A
Stream Classification (Existing and Proposed)	B4a existing and proposed
Evolutionary Trend	VI – Quasi-equilibrium
FEMA Zone Classification	X

UT3C Reach 1

UT3C Reach 1 is a steep step-pool channel that flows onto the Site through a metal culvert under a gravel driveway. The headwall of the culvert is eroding. The first segment of the reach flows through a powerline easement before entering a short, wooded section. The powerline easement is also used by livestock for crossing the stream. In this area, the channel flows between two small existing wetlands. In the wooded section, dredge spoils are present. Below the utility and wetlands, the stream has been pushed against the left valley wall and is overly wide with mid-channel and lateral bar formation, and light to moderate bank erosion. Stream banks along the left bank are tall and steep but are heavily wooded from a forested buffer. The right floodplain consists predominantly of pasture with intermittent trees along the bank. Livestock have access to the stream throughout the reach.

Table 22: UT3C Reach 1 Attribute Table

Reach Summary Information	
Parameters	**UT3C Reach 1**
Length of Reach (Linear Feet)	310
Valley confinement (Confined, moderately confined, unconfined)	Confined
Drainage area (acres)	53
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Medium
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	10.6
Bank Height Ratio (ft/ft)	1.7
Gradient (ft/ft)	0.0794
Reachwide d50 (mm)	24
Stream Classification (Existing and Proposed)	Incised B4a existing to B4a proposed
Evolutionary Trend	V – Aggradation and Widening
FEMA Zone Classification	X



The top of UT3C Reach 1 has a poorly maintained headwall, headcutting, and a mowed wetland area (looking upstream)



The UT3C Reach 1 channel is relocated against the hillslope and is overly-wide (looking upstream)

UT3C Reach 2

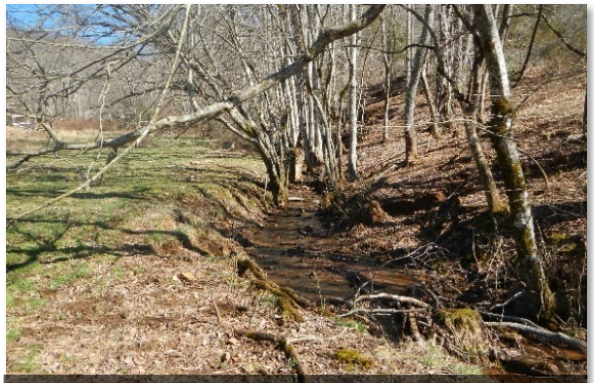
UT3 Reach 2 begins at a headcut. Below the headcut, the stream becomes aligned tight against the left valley wall and loses its floodplain bench connection. Further downstream, the reach is confined within an incised channel that has bank height ratios ranging between 1.7 and 3, and entrenchment at or below 1.4. Livestock have access to UT3C Reach 2 throughout its length. Bank erosion and valley wall erosion are present in this lower reach and there is limited buffer width.

Table 23: UT3C Reach 2 Attribute Table

Reach Summary Information	
Parameters	**UT3C Reach 2**
Length of Reach (Linear Feet)	264
Valley confinement (Confined, moderately confined, unconfined)	Confined
Drainage area (acres)	54
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	WS-III; Tr
Width to Depth Ratio (ft/ft)	28.8
Bank Height Ratio (ft/ft)	3.7
Gradient (ft/ft)	0.0754
Reachwide d50 (mm)	24
Stream Classification (Existing and Proposed)	Incised B4a existing to B4a proposed
Evolutionary Trend	IV – Degradation and Widening
FEMA Zone Classification	X



UT3C Reach 2 starts at a headcut that has been temporarily arrested by trees, where the channel is tight against the left valley wall



UT3C Reach 2 eroding into the valley wall

3.3.2 Existing Wetlands

Wildlands delineated potential wetland and waters of the United States within and immediately adjacent to the proposed project easement using the USACE Routine On-Site Determination method presented in the 1987 Corps of Engineers delineation manual and the subsequent Regional Supplement for the Eastern Mountain and Piedmont Region. The Preliminary Jurisdictional Determination (PJD) was approved on October 28, 2021. See Appendix 2 for the PJD package, which includes the USACE Wetland Determination Data Sheets. Existing wetland data is summarized in Table 24.

A total of 30 existing jurisdictional wetland features (Wetlands A-DD) were documented within the assessment area (Figure 2). Onsite wetland features exhibit indicators of wetland hydrology, hydrophytic vegetation, and hydric soils. Indicators of wetland hydrology include surface water, high water table, saturation, geomorphic position, and water-stained leaves. Dominant hydrophytic vegetation species within wetlands include common juncus (*Juncus effusus*), jewelweed (*Impatiens capensis*), Japanese stilt grass (*Microstegium vimineum*), alder (*Alnus serrulata*), shallow sedge (*Carex lurida*), New York ironweed (*Vernonia noveboracensis*), and red maple (*Acer rubrum*). Soils within onsite wetlands exhibit one of the following hydric soil indicators: depleted matrix, redox dark surface, or loamy gleyed matrix.

Existing wetlands were evaluated using the North Carolina Wetland Assessment Method (NCWAM). The rapid assessment method evaluates field conditions relative to reference condition to generate function ratings for specific wetland types. Using the NCWAM dichotomous key and best professional judgement, existing wetlands were classified based on the reference wetland type if the area was not disturbed. Onsite wetlands were classified as headwater forests, bottomland hardwood forest, and seeps. Overall NCWAM ratings range from low to high. Most onsite wetlands scored as low or medium functioning systems when compared to reference conditions as a result of impairments to one or two of the three primary functions (hydrology, water quality, and habitat). Water quality and habitat functions generally received low scores due to livestock grazing, lack of native vegetative communities, and poor connectivity to other natural areas. Wetlands that scored as high functioning include Wetlands F, G, O, P, Y, Z, AA, and BB. NCWAM field assessment forms and the rating calculator outputs are included in Appendix 3.

Table 24: Project Attribute Table Part 4

Wetland	Size of Wetland (acres)	Wetland Type	Mapped Soil Series	Drainage Class	Soil Hydric Status	Source of Hydrology
A	0.155	Headwater	Saunook gravelly loam	Well drained	No	Groundwater
B	0.314	Bottomland	Nikwasi fine sandy loam/ Evard-Cowee complex	Very poorly drained/ Well drained	Yes/No	Groundwater
C	0.040		Saunook loam	Well drained	No	Groundwater
D	0.006		Saunook loam	Well drained	No	Groundwater
E	0.003		Saunook loam	Well drained	No	Groundwater
F	0.028	Headwater	Saunook loam	Well drained	No	Groundwater
G	0.033		Saunook loam	Well drained	No	Groundwater
H	0.058		Saunook loam	Well drained	No	Groundwater
I	0.017		Saunook loam	Well drained	No	Groundwater
J	0.030	Headwater	Saunook loam	Well drained	No	Groundwater
K	0.138	Seep	Nikwasi fine sandy loam	Very poorly drained	Yes	Groundwater
L	0.002		Dellwood gravelly fine sandy loam	Moderately well drained	No	Groundwater
M	0.052	Bottomland	Dellwood gravelly fine sandy loam	Moderately well drained	No	Groundwater/ Overbank
N	0.600		Nikwasi fine sandy loam/ Dellwood gravelly fine sandy loam	Very poorly drained/ Moderately well drained	Yes/No	Groundwater/ Overbank
O	0.070	Headwater	Saunook loam/ Evard-Cowee complex	Well drained/ Well drained	No/No	Groundwater
P	0.012		Evard-Cowee complex	Well drained	No	Groundwater
Q	0.027	Bottomland	Nikwasi fine sandy loam	Very poorly drained	Yes	Groundwater/ Overbank
R	0.015	Headwater	Saunook loam	Well drained	No	Groundwater

Wetland	Size of Wetland (acres)	Wetland Type	Mapped Soil Series	Drainage Class	Soil Hydric Status	Source of Hydrology
S	0.229	Bottomland	Dellwood gravelly fine sandy loam	Moderately well drained	No	Groundwater/ Overbank
T	0.044		Dellwood gravelly fine sandy loam/Nikwasi fine sandy loam	Moderately well drained /Very poorly drained	No/Yes	Groundwater
U	0.214	Seep	Dellwood gravelly fine sandy loam/ Nikwasi fine sandy loam	Moderately well drained/ Very poorly drained	No/Yes	Groundwater
V	0.346	Bottomland	Dellwood gravelly fine sandy loam	Moderately well drained	No	Overbank/ Groundwater
W	0.117		Dellwood gravelly fine sandy loam	Moderately well drained	No	Groundwater
X	0.279		Dellwood gravelly fine sandy loam	Moderately well drained	No	Groundwater/ Overbank
Y	0.005	Seep	Saunook loam	Well drained	No	Groundwater
Z	0.007	Seep	Saunook loam	Well drained	No	Groundwater
AA	0.033	Headwater	Saunook loam	Well drained	No	Overbank/ Groundwater
BB	0.006		Saunook loam	Well drained	No	Groundwater
CC	0.009	Seep	Dellwood gravelly fine sandy loam	Moderately well drained	No	Groundwater
DD	0.010		Dellwood gravelly fine sandy loam/Saunook loam	Moderately well drained	No	Groundwater

3.4 Overall Functional Uplift Potential

The primary stressors on the Site are direct livestock access, lack of a riparian buffer, channel incision, stream bank erosion and existing culverts which fragment habitats. These stressors led to low NCSAM scores the following reaches: Jones Creek Reach 2, UT1, UT1A, UT2 Reach 1, UT2 Reach 2, UT2A, UT3 Reach 1, UT3 Reach 3, UT3A Reach 1, UT3A Reach 2, UT3C Reach 2. Without intervention, the streams will continue to erode their beds and banks until a new floodplain is formed at a lower elevation, contributing excess sediment to the sensitive downstream waters. Livestock will continue to trample streams and wetlands, overgraze the floodplain, and contribute bacteria and nutrients to downstream waters, and prevent the growth of stabilizing vegetation. Ultimately, functional uplift for this Site is linked to stabilizing sediment sources, improvement in and maintenance of hydrologic connectivity between streams, wetlands and floodplains, and restoration of riparian habitats. Additionally, establishing a riparian buffer and correcting undersized and perched culvert crossings will protect and enhance this connectivity. Functional uplift for the Site will be achieved through the following:

- Reconnecting incised streams to floodplains, flood relief benches, and wetlands through restoration and berm removal to improve hydrologic connection.
- Stabilizing bank erosion and associated pollutants.
- Correcting habitat fragmentation through improved culvert crossings and removal of a breached impoundment.

- Installing a BMP at the top of UT3B to treat upslope pasture runoff.
- Planting riparian buffers to shade and help stabilize streams, promote woody debris in system and to enhance wetland vegetation communities.
- Fencing out livestock.
- Protecting the Site with a conservation easement.

These project components are described in Section 5 in terms of goals, objectives, and outcomes for the project and in greater detail in Section 6 as the project mitigation plan.

3.5 Site Constraints to Functional Uplift

The following potential Site constraints have been identified and will be addressed as part of this project.

There are cultural resource areas located in and adjacent to the project site. Two of the identified areas will be completely avoided by all project activities and other areas outside of the original project limits will be avoided for grading activities and limited to bare root planting only. The Cherokee Nation has requested that work halt if any culturally significant finds are made during construction. Overall these present limited constraints to uplift unless additional finds during construction lead to modifications to the final design implementation. Section 4.5 discusses cultural resource coordination in greater detail.

Along UT1 and the lower portion of UT2 where streams are located in the valley bottom of the historic floodplain of Jones Creek and also flow through adjacent wetlands and relic wetland areas, two issues are present. First, the adjacent areas in low lying fields are important to farming operations and would be rendered useless if wetness regimes were increased significantly over existing levels. Secondly, the stream-wetland complexes proposed must meet the stream and valley grading requirements to maintain a consistent stream slope and sediment transport regime. Stream gradient is dictated in part by the level where UT1 enters the Site. For these reasons, Priority 1.5 restoration was elected for these streams. The streambed will be raised and the floodplain will be lowered. In many cases, rehabilitation wetlands have hydric soils at the existing ground surface but must be graded down 12-24” in order to blend to target floodplain elevations.

On Jones Creek Reaches 2 & 5, aggregational areas are discussed in the stream design implementation approach. These areas result from historic valley modifications that caused sudden losses in stream transport competency and capacity. It is not possible to re-shape the entire valley to address this issue; therefore, a natural stream levy design has been developed to grade limited segments of the valley to mimic reference reach channel dimensions and B-type channel confinement in order to facilitate the desired hydraulic and sediment transport continuity along the length of the valley. These features will be approximately two feet tall and after revegetation and will not require maintenance.

Multiple farm and utility crossings are necessary to maintain farming operations and existing utilities. Due to the complexity of coordinating crossings, easement widths and locations had to be adjusted from the original plan. The overall number of crossings was reduced between the IRT Site Walk and final design, along with an overall reduction of approximately 40 feet in the total length of internal and external easement breaks.

The property owners currently rotate livestock and horse grazing throughout pastures on the Site. Three fords, two existing culverts and multiple informal crossings facilitate current access throughout the Site. Landowners will require crossings of the conservation easement to be able to maintain grazing rotation and access to fields bound by NCDOT roads. Efforts were made to minimize the number of stream crossings to those necessary for the landowners to maintain their farming operations in a sustainable manner. Crossings have been carefully sited, and in some cases relocated from their originally proposed

location to enhance the long-term stability of the crossings and minimize impacts to existing resources. All crossings have been designed to be appropriate for aquatic organism passage and sediment transport continuity. On the mainstem Jones Creek, ford crossings were selected to achieve these ends. Tributary crossings will be constructed with culverts.

Each crossing is proposed to be fenced with high tensile wire fence and gated for livestock exclusion. Crossings have been designed in coordination with the restored stream bed profile to allow for aquatic organism passage. The crossings are summarized and numbered below in Table 25 and depicted on Figure 8. More crossing and crossing fencing details are located in the planset (Appendix 11, Sheets 5.1-5.8 and Sheet 7.10).

Livestock currently have access to all streams on the project. After restoration, the landowner may remove livestock from all or a part of the property. Wildlands will provide 5-strand barbed wire fencing along the perimeter of the easement of any sections of the property where livestock will be present. The landowner will be required to install fencing if livestock are returned to the property in the future. More fencing details are located in the planset (Appendix 11, Sheets 4.2.1-4.2.4 and Sheet 7.10).

Several powerlines cross the property and creeks. Upon review with Duke Power, multiple modifications to the original powerline relocation plan were required. Wildlands worked with Duke Power and the owner to reduce Duke's easement from 50-feet to 30-feet where their utility easement crosses the proposed conservation easement. Duke crossings will be seeded with riparian or wetland seed mix and planted with a dense grid of ninebark and elderberry to provide shading of streams and to help discourage weeds. Utility corridors are maintained with helicopter trimming and therefore no ground access is anticipated to be required for utility maintenance.

Two external easement breaks are present at existing roads, and twelve internal easement breaks are proposed to maintain landowner and livestock access to pastures, as well as to accommodate utility easements.

Table 25: Summary of Site Easement Crossings and Breaks

No.	Width (ft)	Location	Internal or External	Crossing Type
1	46	UT1	Internal	Internal Crossing - Culvert
2	30	Jones Creek above Reach 1a (non-credited reach)	Internal	Utility Corridor
3	Varying Width (4' – 34')	Jones Creek Reach 1b near Allison Watts Rd	Internal	Utility Corridor
4	60	Between Jones Creek Reach 1b and Reach 3 at Allison Watts Rd	External	NCDOT Allison Watts Road ROW
5	35	Jones Creek Reach 3 near Allison Watts Rd	Internal	Internal Crossing - Ford
6	40	UT2	Internal	Internal Crossing - Culvert
7	30	UT2 near N Jones Creek Rd	Internal	Utility Corridor
8	60	Between Jones Creek Reach 3 and Reach 4 at N Jones Creek Rd	External	NCDOT North Jones Creek Road ROW
9	Varying Width (61' – 109')	Above Jones Creek Reach 4	Internal	Internal Crossing – Ford

No.	Width (ft)	Location	Internal or External	Crossing Type
10	40	UT3 Reach 3	Internal	Internal Crossing - Culvert
11	40	UT3 Reach 2	Internal	Internal Crossing - Culvert
12	36	UT3C Reach 2	Internal	Internal Crossing - Culvert
13	30	Above UT3C Reach 1	Internal	Utility Corridor
14	Varying Width (41' – 63')	Above UT3 Reach 1	Internal	Internal Crossing - Culvert

The easement boundaries around all streams proposed for mitigation credit provide the required 30-foot minimum riparian buffer for Mountain streams. The easement area will be marked per requirements outlined in RFP 16-20190304.

The entire easement area can be accessed for construction, monitoring, and long-term stewardship via North Jones Creek Road and Allison Watts Road.

4.0 Regulatory Considerations

Table 26, below, is a summary of regulatory considerations for the Site. These considerations are expanded upon in Sections 4.1-4.3.

Table 26: Regulatory Considerations Attribute Table

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	No	PCN[1]
Water of the United States - Section 401	Yes	No	PCN[1]
Endangered Species Act	Yes	Yes	Appendix 5
Historic Preservation Act	Yes	Yes	Appendix 5
Coastal Zone Management Act	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

1. PJD was approved on 8/16/21. PCN to be provided to IRT with Final Mitigation Plan.

4.1 Biological and Cultural Resources

A Categorical Exclusion for the Site was approved on November 24, 2021. This document included investigation into the presence of threatened and endangered species onsite protected under the Endangered Species Act of 1973, any historical resources protected under the National Historic Preservation Act of 1966, and places of religious importance to American Indians, Eskimos, and Native Hawaiinas protected under the American Indian Religious Freedom Act.

Per the Categorical Exclusion research and response by US Fish and Wildlife Service, the project will have no effect on the Appalachian elktoe (*Alasmidonta raveneliana*), gray bat (*Myotis grisescens*), littlewing pearlymussel (*Pegias fabula*), rock gnome lichen (*Gymnoderma lineare*), and spotfin chub (*Erimonax monachus*). The project may affect but is not likely to adversely affect the following species: Indiana bat (*Myotis sodalist*), Bog turtle (*Clemmys muhlenbergii*), mountain sweet pitcher-plant (*Sarracenia rubra*

ssp. Jonesii), small whorled pogonia (*Isotria medeoloides*), swamp pink (*Helonias bullata*), Virginia spiraea (*Spiraea virginiana*), and the Northern long-eared bat (*Myotis septentrionalis*) (NLEB).

Wildlands conducted a botanical pedestrian survey on January 26, 2021 and May 27, 2021, where suitable habitat was identified for the Small whorled pogonia, Swamp pink, Virginia spiraea, and the Mountain sweet pitcher-plant. No individual species were identified within the project areas for these species. With the exception of the Small whorled pogonia, these botanical results are valid through May 27, 2023. Given the shorter survey validity window for the Small whorled pogonia (1 year), an additional botanical survey was warranted prior to construction start date. Results from the additional field survey conducted on June 28, 2022 confirmed suitable habitat is present for the Small whorled pogonia with no individual species present within the project area.

As part of the Categorical Exclusion Section 7 consultation process, FHWA submitted NLEB 4(d) streamlined consultation forms to USFWS for additional review and concurrence. The USFWS responded that they concurred that the proposed project occurred at a location where any incidental take that may result from associated activities with this project is exempt under the 4(d) rule. However, on March 23, 2022, the USFWS issued a proposal to reclassify the NLEB from a threatened to an endangered status. In anticipation of the proposed reclassification, which if finalized, would remove the current 4(d) rule for the NLEB, Wildlands submitted a letter to USFWS on May 13, 2022 to re-initiate NLEB consultation for this project.

USFWS concurred with a "may affect, not likely to adversely affect" determination for the NLEB based on Wildlands commitment to the following conservation measures:

- Trees will be removed from October 15th – April 1st outside of the bat active season for tree-roosting species
- no artificial lighting will be added to the action area
- no night work will occur

The conclusion for cultural resources per the Categorical Exclusion research and response by the State Historic Preservation Office is that there are no historic resources that will be affected by this project.

Two archeological sites were identified for protection, and the Cherokee Nation has requested that these areas be maintained free of disturbance from planting. One of these sites is not located within the proposed easement. For the other site, the total acreage to be left unplanted and undisturbed is less than 0.01 acres and has been designated on the plans to remain unplanted. All other archeological sites within the proposed project area were identified as dispersed low-density or isolated artifact finds that lack research potential and were recommended as not eligible for NRHP. Avoidance recommendations were concurred with by state and Tribal entities. In addition, the Cherokee Nation requested that changes in scope or APE be brought to the attention of the Nation, that project activities halt if items of cultural significance are discovered during construction, and that other pertinent Tribal and Historic Preservation Offices be contacted with regards to the project so that they may review their databases or records (which has been performed and is documented in the appendix). Wildlands is documenting the avoidance activities, scope change, and halt work requests into the project plans as special notes on Sheet 0.3 (Appendix 11).

The signed Categorical Exclusion checklist and summary are provided in Appendix 5. A complete copy of the Categorical Exclusion document, including additional information and regulatory communications, is available upon request.

4.2 FEMA Floodplain Compliance and Hydrologic Trespass

The Site is represented on the Macon County Flood Map 3700656200J with an effective date of May 4, 2009. None of the project streams are mapped with FEMA-regulated floodplains. The project will be designed to avoid hydrologic trespass on adjacent properties.

4.3 401/404

Some wetlands within the floodplain adjacent to the existing streams will be partially impacted during realignment of the stream channel. Several wetland areas and relic hydric areas will be enhanced or restored as part of this project. Wetlands on the Site that are within the conservation easement and outside of the limits of disturbance will be flagged with safety fence during construction to prevent unintended impacts. This will be denoted in the final construction plans. The Pre-Construction Notification (PCN), including this data, will be submitted to the NCIRT with the Final Mitigation Plan.

5.0 Mitigation Site Goals and Objectives

The project will improve stream and wetland functions through exclusion of livestock, conversion of pastures into riparian buffer, enhancing instream and wetland habitat connectivity and diversity, and by restoring stream, wetland, and floodplain connections throughout the Site.

Project goals are desired project outcomes and are verifiable through measurement and/or visual assessment. Objectives are activities that will result in the accomplishment of goals. The project will be monitored after construction to evaluate performance as described in Section 7 of this report. The project goals and related objectives are described in Table 27.

Table 27: Mitigation Goals and Objectives

Goal	Objective	Expected Outcomes	Functions Supported
Exclude livestock from stream channels and wetland resources.	Install livestock fencing as needed to exclude livestock from stream channels, wetlands, and riparian areas, or remove livestock from adjacent fields.	Reduce direct fecal coliform and nutrient inputs to the Site streams. Eliminate hoof shear on the stream bed and banks, which will reduce stream bank erosion and fine sediments in the stream channel. Eliminate livestock trampling of existing wetlands and grazing in riparian buffers.	Geomorphology, Physicochemical, Biology
Restore and supplement native floodplain vegetation.	Convert active livestock pasture to forested riparian buffers along all Site streams, which will slow and treat sediment, nutrient, and fecal coliform laden runoff from adjacent pastures before entering streams. Protect and enhance existing forested riparian buffers and wetlands. Treat invasive species.	Reduce sediment inputs from pasture runoff. Reduce floodplain velocities and increase retention of flood flows on the floodplain in headwater stream systems, decreasing direct runoff and increasing storage and nutrient cycling within the watershed. Increase shading of stream channels, which will increase dissolved oxygen concentrations. Provide a source of LWD and organic material to Site streams for continued habitat. Support all stream and wetland functions.	Hydrology, Hydraulic, Geomorphology, Physicochemical, Biology

Goal	Objective	Expected Outcomes	Functions Supported
Improve the stability of stream channels.	Reconstruct stream channels slated for restoration with stable dimensions and appropriate depth relative to the existing floodplain. Add bank revetments and instream structures to protect restored/ enhanced streams.	Reduce sediment inputs from bank erosion. Increase floodplain engagement where appropriate, decreasing runoff and instream stresses while increasing infiltration. Promote sediment transport in areas where aggradation is occurring. Decrease erosion along dam and pipe outlets. Diversify available habitats.	Hydraulic, Geomorphology, Physicochemical, Biology
Diffuse concentrated agricultural runoff.	Install a stormwater BMP in an area of concentrated agricultural runoff to diffuse and provide vegetated upland infiltration for runoff before it enters the stream channel or wetlands.	Reduce agricultural and sediment inputs to the project, which will reduce likelihood of accumulated fines and excessive algal blooms from nutrients.	Physicochemical, Biology
Improve instream habitat.	Install habitat features such as constructed steps, cover logs, and brush toes on restored reaches. Add woody materials/ LWD to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians. Promote aquatic species migration and recolonization from refugia, leading to colonization and increase in biodiversity over time. Add complexity including LWD to the streams.	Geomorphology, Physicochemical, Biology
Restore wetland hydrology, soils, and plant communities	Restore and enhance riparian wetlands by enhancing stream-wetland interaction, plugging and filling existing agricultural ditches, removing berm material over relic hydric soils, remove piping/drain tile, and planting native wetland species.	Improve terrestrial habitat	Hydrology, Physiochemical, Biology
Permanently protect the project Site from harmful uses.	Establish a conservation easement on the Site. Exclude livestock from Site streams and wetlands, remove impoundments and rebuild embedded culverts, and remove pastures from the riparian buffer.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands. Support all stream and wetland functions.	Hydrology, Hydraulic, Geomorphic, Physicochemical, Biology

6.0 Design Approach and Mitigation Work Plan

Sections 6.1-6.6 will discuss design approach for streams; 6.7 will discuss design approach for wetlands; 6.8 will discuss BMP implementation; and 6.9 will discuss vegetation plan.

6.1 Stream Design Approach Overview

The design approach for this Site was developed to meet the goals and objectives described in Section 5 which were formulated based on the potential for uplift described in Section 3.4. The design is also intended to provide the expected outcomes in Section 5, though these are not tied to performance criteria.

The project streams proposed for restoration on the Site will be reconnected floodplains and wetlands, and will be reconstructed with stable dimension, pattern, and profile that will transport the water and sediment delivered to the system. To address aggradation in Reaches 2 and 4/5 of Jones Creek, channel sinuosity will be reduced, and aggraded sediment will be removed to steepen the profile, and the restored channel dimension has been sized to transport coarse sediment being delivered by the watershed. An unstable pond dam will be removed on UT2, streams will be removed from roadside location or from valley walls and into their valley low point, where possible. The riparian buffer, existing wetlands and proposed wetland restoration areas will be planted with native tree species. Instream structures will be constructed in the channels to help maintain stable channel morphology and improve and diversify aquatic habitat. The entire project area will be protected in perpetuity by a conservation easement. There are existing vegetated ditch outlets that enter Jones Creek along Reaches 3 and 4 shown in the photos to the right that are proposed to remain.





Existing vegetated ditch outlets – Jones Creek

The design approach for this Site utilizes a combination of analog and analytical approaches for stream restoration, and also relies on empirical data and prior experiences and observations. Reference reaches were identified to serve as the basis for design parameters. Channels were sized based on design discharge hydrologic analysis which uses a combination of empirical and analytical data as described within this report. Designs were then verified and/or modified based on sediment transport analysis. These design approaches have been used on many successful Mountain and Piedmont restoration projects and are appropriate for the goals and objectives for this Site.

Table 28: Stream Stressors and Mitigation Approach

Project Reach	Primary Stressors/Impairments	Approach	Mitigation Activities[1]
Jones Creek R1a	Livestock access, narrow buffers	EII	Easement has been extended upstream of credited area to exclude livestock from streams.
Jones Creek R1b	Livestock access, narrow buffers	EII	Left bank grading at top of reach.
Jones Creek R2	Livestock access, lateral instability, lack of buffer on right and left floodplain, incision	R	Restore dimension, pattern, and profile, remove utility crossing.

Project Reach	Primary Stressors/Impairments	Approach	Mitigation Activities[1]
Jones Creek R3	Livestock access, narrow buffers, intermittent left bank erosion, partially unstable crossing, invasive species	EII	Ford crossing replacement, left bank grading, treatment of right bank toe erosion.
Jones Creek R4	Severe erosion and livestock trampling, poor buffer quality, narrow buffers, severe erosion along right bank, berm at right top of bank, unstable crossing, invasive species, aggradation	EII	Ford crossing replacement, address erosion through bank grading and removal of aggraded bed material.
Jones Creek R5	Livestock access, absent or narrow buffers, severe aggradation, 90-degree bend in creek, valley wall erosion, invasive species	R	Restore dimension, pattern, and profile.
UT1	Livestock access, poorly defined channel, incised channel, minor erosion, lack of buffer, undersized culvert, invasive species	R	Physical removal of invasives, construct stream and wetland complex, crossing replacement, removal of aggraded bed material, and bank grading.
UT1A	Livestock access, low w/d ratio and incised channel, channel toe erosion, lack of buffer, undersized and perched culvert, invasive species	R	Restore dimension and step-pool morphology, remove crossing.
UT2 R1	Livestock access, left bank erosion and narrow left bank buffer, remnant pond berm	EII	Streambank grading left bank, planting left bank only. Supplemental planting throughout majority of reach.
UT2 R2	Livestock access, remnant pond with failed dam, channel erosion, undersized culvert, aggradation of fines in channel, invasive species	R	Restore dimension and step-pool morphology, construct stream and wetland complex, replace crossing. Supplemental planting limited to a portion of the right bank.
UT2A	Livestock access, stream located against road embankment, bank and bed erosion, incision, narrow buffers	R	Restore dimension and step-pool morphology. Raise bed and improve connectivity at upstream culvert.
UT3 R1	Livestock access, narrow or no buffers, active erosion from vertical incision and widening	R	Restore dimension and step-pool morphology. Supplemental planting throughout entirety of reach. Supplemental planting limited to one portion of the left bank.
UT3 R2	Livestock access impacts, narrow buffer right bank no buffer left bank, widespread bank erosion	EII	Restore bankfull bench along left bank, repair intermittent bank erosion on right bank. Supplemental planting throughout entirety of reach.
UT3 R3	Livestock access, buffers narrow and invasives prevalent, bed incision and bank erosion, flood impacts from mainstem	R	Physical removal of invasives, construct stream and wetland restoration complex.
UT3 R4	Livestock access, no or narrow left buffer, prominent berm along left top of bank	EII	Grade out berm along left bank.
UT3A R1	Livestock access has trampled channel definition, invasive species	R	Restore dimension and step-pool morphology.
UT3A R2	(upper) Multiple headcuts, bed and bank erosion, deposition within channel, livestock access throughout	EII	(upper) Grade banks and bed and install structures, (lower) Restore stream and wetland complex. Supplemental planting

Project Reach	Primary Stressors/Impairments	Approach	Mitigation Activities[1]
			limited to a small region at beginning of reach.
UT3B/UT3 B1	Ditches deliver concentrated runoff to stream, livestock access, bank erosion	EII	Remove spring box, implement BMP to stabilize runoff upstream of headwaters, complete minor pattern adjustments and bed and bank grading.
UT3C R1	Livestock access, narrow or no buffers, headcutting, erosion of culvert headwall	EII	Stabilize profile with structures, construct a narrow baseflow channel with structures, stabilize eroding right bank. Supplemental planting limited to portions of the left bank.
UT3C R2	Livestock access, no buffer right bank, narrow or no buffer portions of left bank, erosion into valley wall left bank, bed instability/headcutting	R	Relocate stream away from steep valley wall, restore dimension and step-pool morphology. Supplemental planting limited to portions of the left bank.

[1] Conservation easement, livestock exclusion, planting, and invasive species treatment to be implemented along all reaches. Where only supplemental planting is proposed, this is noted.

6.2 Reference Streams

Reference streams provide geomorphic parameters of a stable system, which can be used to inform design of stable channels of similar stream types in similar landscapes and watersheds. Eleven reference reaches were used to support the design. Selected reference reach data from publications that include stream sites located in the nearby Joyce Kilmer-Slickrock Wilderness and eastern Tennessee were also used. These reference reaches were chosen because of their similarities to the Site streams including drainage area, valley slope, channel slope, and bed material, and used to formulate design parameters related to channel dimension and/or profile.

The reference reaches are all located within the Blue Ridge physiographic province or the eastern Blue Ridge foothills of North Carolina which is located along the border of the Mountain and Piedmont provinces. Reference reaches located in the North Carolina foothills, such as Ironwood Tributary and UT to South Fork Fishing Creek, warranted inclusion for this project since they are steep, high gradient systems functioning more like step-pool channels despite being characterized by a finer channel substrate (coarse to very coarse sand) than project streams on the Site. Descriptions and geomorphic parameters for reference reaches are summarized in Appendix 4; Figure 6 illustrates the geographic locations of these reference reaches. The reference reaches to be used for the specific streams are shown in Table 29.

Table 29: Stream Reference Data Used in Development of Design Parameters

Reference Reach	Stream Type	Landscape Position	Chosen For	Used For	Used on streams
Meadow Fork	E4	Larger drainage area, moderately confined valley bottom, low slope	Similar landscape position, contributing drainage area and land use, slope, and channel substrate	Q, Dimension, Profile	Jones Creek Reaches 2, 3, 4 and 5
Choga Creek	C4	Larger drainage area, moderately confined valley bottom, low slope	Similar landscape position, drainage area, and valley slope ranges	Dimension	Jones Creek Reaches 2, 3, 4 and 5

Reference Reach	Stream Type	Landscape Position	Chosen For	Used For	Used on streams
Upper Jones Creek	C4	Larger drainage area, moderately confined valley bottom, low slope	Similar landscape position (located upstream from project), contributing drainage area and land use, slope	Dimension	Jones Creek Reaches 2, 3, 4 and 5
Pilot Mountain Tributary	B4	Confined valley, relatively steep valley slope	Stable, steep riffle/pool succession and diverse bedform features. Similar drainage area and slope.	Q, Dimension, Profile	UT1, UT3 Reaches 1, 2, and 3
UT to Austin Branch US	A4/B4a	Headwater, steep slope, step-pool system, confined valley	Landscape position, contributing drainage area and land use, habitat structures, slope	Dimension, Profile	UT3C Reaches 1 and 2
UT to Austin Branch DS	A4/B4a	Headwater, moderate to steep slope, step-pool system, confined valley	Landscape position, contributing drainage area and land use, habitat structures, slope	Q, Dimension, Profile	UT1, UT2A
Timber Tributary (mid-reach)	B4	Headwater, moderate slope, alluvial valley	Gravel bed with examples of varied habitat structures (woody debris, rock riffles, and meander pools)	Q, Dimension, Profile	UT2 Reach 2, UT3A Reach 2
UT to Gap Branch	B4/B4a	Headwater, steep slope, confined valley with alluvial bottom.	Gravel bed with examples of boulder/cobble step structures. Similar landscape position and valley slope ranges	Q, Dimension, Profile	UT3A Reach 1, UT3B,
Ironwood Tributary	A5a+	Headwater, steep slope, step-pool system, confined valley	Channel dimensions, landscape position, habitat structures, slope	Q, Dimension, Profile	UT3A Reach 1, UT3B, UT1A
UT to South Fork Fishing Creek	B5a	Headwater, steep slope, step-pool system, confined valley	Channel dimensions, landscape position, habitat structures, slope	Q, Dimension, Profile	UT3A Reach 1, UT3B, UT1A
Shew Tributary A	B5a	Headwater, steep slope, confined valley	Channel dimensions, landscape position, habitat structures, slope	Q, Dimension, Profile	UT3A Reach 1, UT3B, UT1A

6.3 Design Discharge Analysis

Multiple methods were used to develop bankfull discharge estimates for each of the project restoration and enhancement reaches including:

- published regional curve data,
  - Tennessee Blue Ridge (Jennings, 2017),
  - NC Mountain (Harman et al., 2000), and
  - NC Piedmont/Mountain or 'Alan Walker' curve (Walker, unpublished),
- a regional flood frequency analysis using U.S. Geological Survey (USGS) gage sites,
- a site-specific reference reach curve,
- existing bankfull indicators using Manning's equation, and
- data from previous successful design projects.

The resulting values were compared, and best professional judgment was used to determine a specific design discharge for each reach scheduled for restoration. Results of each method and the final design discharges are shown in Table 30 and illustrated in Figure 7.

Table 30: Summary of Design Bankfull Discharge Analysis

Discharge Estimate Method		Jones Creek Reach 2	Jones Creek Reach 5	UT1	UT1A	UT2 Reach 1	UT2 Reach 2	UT2A
DA (acres)		2,726	3,164	66	3	13	22	14
DA (sq. mi.)		4.26	4.94	0.10	0.004	0.02	0.03	0.02
TN Blue Ridge Curve (cfs)		282	316	15	1	4	6	5
NC Mountain Curve (cfs)		303	340	17	2	5	7	6
Alan Walker Curve (cfs)		174	195	9	1	3	4	3
Site Specific Reference Reach Curve (cfs)		226	248	22	3	8	10	9
Regional Flood Frequency Analysis (cfs)	1.2-year event	226	252	15	1	4	6	4
	1.5-year event	315	350	22	2	7	9	7
Bankfull Q from Manning's Eq. from XS survey (cfs)		292	309	16	2	5	8	21
Final Design Q		**275**	**300**	**17**	**6**	**5**	**5**	**6**

Discharge Estimate Method		UT3 Reach 1	UT3 Reach 3	UT3A Reach 1	UT3A Reach 2	UT3B	UT3C Reach 1	UT3C Reach 2
DA (acres)		156	174	11	13	7	53	54
DA (sq. mi.)		0.24	0.27	0.02	0.02	0.01	0.08	0.08
TN Blue Ridge Curve (cfs)		30	33	4	4	3	13	13
NC Mountain Curve (cfs)		34	37	5	5	3	14	14
Alan Walker Curve (cfs)		18	20	3	3	1	8	8
Site Specific Reference Reach Curve (cfs)		37	40	8	8	5	19	19
Regional Flood Frequency Analysis (cfs)	1.2-year event	27	30	4	4	3	13	13
	1.5-year event	39	43	7	7	4	19	19
Bankfull Q from Manning's Eq. from XS survey (cfs)		53	57	-	4	2	14	15
Final Design Q		**34**	**38**	**6**	**6**	**4**	**13**	**13**

Note: Cross section data was not collected on UT3A Reach 1 due to a lack of discernable channel dimension from livestock trampling impacts.

6.4 Design Channel Morphological Parameters

Reference reach data and designer experience were used to develop design morphologic parameters for each of the restoration reaches. Key morphological parameters are summarized in Tables 31-37. Complete design morphological parameters are included in Appendix 4.

Table 31: Summary of Design Morphologic Parameters for Jones Creek

Parameter	Existing Parameters		Reference Parameters			Proposed Parameters	
	Jones Creek Reach 2	Jones Creek Reach 5	Meadow Fork	Upper Jones Creek	Choga Creek	Jones Creek Reach 2	Jones Creek Reach 5
Contributing Drainage Area (acres)	2,726	3,164	2,816	2,605	2,970	2,726	3,164
Channel/Reach Classification	C4	C3	E4	B4/C4	B3/C3	B4/C4	B3/C3
Design Discharge Width (ft)	38.3	35.1	21.4	29.6	31	30.0	30.7
Design Discharge Depth (ft)	1.6	1.5	2.1	1.7	1.7	1.6	1.7
Design Discharge Area (ft^2)	60.9	53.5	44.0	50	54	48.4	51.4
Design Discharge Velocity (ft/s)	4.8	5.8	5.1	6.1	6.4	5.7	5.8
Design Discharge (cfs)	292	309	224	305	346	275	300
Channel Slope (ft/ft)	0.016	0.018	0.010	0.018	0.018	0.0160 – 0.0220	0.0160 - .0170
Sinuosity	1.22	1.28	-	1.12	1.16	1.08	1.06
Width/Depth Ratio	24.1	23.1	10.2	17.5	18.1	18.6	18.3
Bank Height Ratio	0.7-1.4	1.0	1.1	1.0	1.0	1.0-1.1	1.0-1.1
Entrenchment Ratio	8.0	>4.0	>2.2	>7.4	6.3	>1.5	>1.5
d50 (mm)	57	77	31	-	-	-	-

Table 32: Summary of Design Morphologic Parameters for UT1A

Parameter	Existing Parameters	Reference Parameters			Proposed Parameters
	UT1A	Ironwood Tributary	UT to S Fork Fishing Creek	Shrew Tributary A	UT1A
Contributing Drainage Area (acres)	3	19	13	13	3
Channel/Reach Classification	B5a/B4a	A5a+	B5a	B5a	B4a
Design Discharge Width (ft)	1.9	5	4.1	3.6	4.0
Design Discharge Depth (ft)	0.2	0.6	0.4	0.3	0.3
Design Discharge Area (ft^2)	0.4	2.7	1.8	1.1	1.4
Design Discharge Velocity (ft/s)	3.6	4.9	4.1	3.3	4.5
Design Discharge (cfs)	2	13	8	4	6
Channel Slope (ft/ft)	0.0905	0.1139	0.0815	0.0634	0.0430 – 0.1080
Sinuosity	1.05	1.19	-	1.1	1.05
Width/Depth Ratio	7.9	9.1	9.3	12.1	11.6
Bank Height Ratio	3.2	1.3	1	1	1.0-1.1
Entrenchment Ratio	2.3	2.1	1.7	2.1	1.4-2.4
d50 (mm)	1.0 (subpavement)	0.91	1.2	2	-

Table 33: Summary of Design Morphologic Parameters for UT3A Reach 1 and UT3B

Parameter	Existing Parameters		Reference Parameters				Proposed Parameters	
	UT3A Reach 1	UT3B	UT to Gap Branch	Ironwood Tributary	UT to South Fork Fishing Creek	Shew Tributary A	UT3A Reach 1	UT3B
Contributing Drainage Area (acres)	11	7	26	19	13	13	11	7
Channel/Reach Classification	Not classified	F4b	B4a/A4	A5a+	B5a	B5a	B4/5	B4/B4a
Design Discharge Width (ft)	-	3.3	6.2	5	4.1	3.6	4.0	4.0
Design Discharge Depth (ft)	-	0.2	0.6	0.6	0.4	0.3	0.3	0.3
Design Discharge Area (ft^2)	-	0.7	3.8	2.7	1.8	1.1	1.4	1.4
Design Discharge Velocity (ft/s)	-	3.0	5	4.9	4.1	3.3	4.4	2.7
Design Discharge (cfs)	-	2	19	13	8	4	6	4
Channel Slope (ft/ft)	0.1076	0.0708	0.068	0.1139	0.0815	0.0634	0.0950 – 0.1300	0.0330 – 0.0620
Sinuosity	1.02	1.13	-	1.19	-	1.1	1.10	1.05
Width/Depth Ratio	-	16.2	10.1	9.1	9.3	12.1	11.6	11.6
Bank Height Ratio	-	2.8	1	1.3	1	1	1.0-1.1	1.0-1.1
Entrenchment Ratio	-	1.2	3.4	2.1	1.7	2.1	1.4-2.4	1.4-2.4
d50 (mm)	Silt	8.9	19	0.91	1.2	2	-	-

Note: Cross section data was not collected on UT3A Reach 1 due to a lack of discernable channel dimension from livestock trampling impacts.

Table 34: Summary of Design Morphologic Parameters for UT2 Reach 2 and UT3A Reach 2

Parameter	Existing Parameters		Reference Parameters	Proposed Parameters	
	UT2 Reach 2	UT3A Reach 2	Timber Tributary	UT2 Reach 2	UT3A Reach 2
Contributing Drainage Area (acres)	22	13	26	22	13
Channel/Reach Classification	B4	B5a	B4	B4	B4
Design Discharge Width (ft)	4.3	5.3	8.9	5.0	4.0
Design Discharge Depth (ft)	0.5	0.5	0.5	0.4	0.3
Design Discharge Area (ft^2)	2.3	1.4	4.6	1.8	1.4
Design Discharge Velocity (ft/s)	3.5	2.6	3.7	2.8	4.4
Design Discharge (cfs)	8.1	4	17	5	4

Parameter	Existing Parameters		Reference Parameters	Proposed Parameters	
	UT2 Reach 2	UT3A Reach 2	Timber Tributary	UT2 Reach 2	UT3A Reach 2
Channel Slope (ft/ft)	0.0395	0.0383	0.0334	0.0190 - 0.0370	0.0230 – 0.0460
Sinuosity	1.03	1.08	1.12	1.11	1.10
Width/Depth Ratio	8.0	20.7	17	14.3	11.6
Bank Height Ratio	1.0	5.8	1	1.0-1.1	1.0-1.1
Entrenchment Ratio	2.1	1.4	1.5	>1.4	1.4-2.4
d50 (mm)	14	0.5	6.5	-	-

Table 35: Summary of Design Morphologic Parameters for UT1

Parameter	Existing Parameters	Reference Parameters		Proposed Parameters
	UT1	UT to Austin Branch DS	Pilot Mountain Tributary	UT1
Contributing Drainage Area (acres)	66	76.8	173	66
Channel/Reach Classification	G4	A4/B4a	B4	C4b
Design Discharge Width (ft)	7.4	6.2	8.6	8.6
Design Discharge Depth (ft)	0.6	0.7	0.7	0.6
Design Discharge Area (ft^2)	4.7	4.4	6.0	4.9
Design Discharge Velocity (ft/s)	3.4	6.2	5.3	3.4
Design Discharge (cfs)	16	27	32	17
Channel Slope (ft/ft)	0.021	0.040	0.04	0.020 – 0.0280
Sinuosity	1.01	1.2	1.05	1.13
Width/Depth Ratio	11.5	8.8	12.5	15.0
Bank Height Ratio	2.6	1.0	1.0	1.0-1.1
Entrenchment Ratio	1.4	4.3	1.5	>2.2
d50 (mm)	1 to 18	59.0	20.1	-

Table 36: Summary of Design Morphologic Parameters for UT2A

Parameter	Existing Parameters	Reference Parameters	Proposed Parameters
	UT2A	UT to Austin Branch DS	UT2A
Contributing Drainage Area (acres)	14	76.8	14
Channel/Reach Classification	G4	A4/B4a	B3a
Design Discharge Width (ft)	5.2	6.2	5.1
Design Discharge Depth (ft)	0.8	0.7	0.4
Design Discharge Area (ft^2)	3.9	4.4	2.0

Parameter	Existing Parameters	Reference Parameters	Proposed Parameters
	UT2A	UT to Austin Branch DS	UT2A
Design Discharge Velocity (ft/s)	5.2	6.2	3.1
Design Discharge (cfs)	21	27	6
Channel Slope (ft/ft)	0.042	0.040	0.0340 - 0.0460
Sinuosity	1.04	1.2	1.00
Width/Depth Ratio	6.9	8.8	13.1
Bank Height Ratio	2.0	1.0	1.0-1.1
Entrenchment Ratio	1.4	4.3	1.4 – 2.4
d50 (mm)	3.8	59.0	-

Table 37: Summary of Design Morphologic Parameters for UT3 Reaches 1 and 3

Parameter	Existing Parameters		Reference Parameters	Proposed Parameters	
	UT3 Reach 1	UT3 Reach 3	Pilot Mountain Tributary	UT3 Reach 1	UT3 Reach 3
Contributing Drainage Area (acres)	156	174	173	156	174
Channel/Reach Classification	G4	incised E4	B4	B4/B4a	C4
Design Discharge Width (ft)	8.1	7.8	8.6	11.6	13.0
Design Discharge Depth (ft)	1.2	1.5	0.7	0.7	0.8
Design Discharge Area (ft^2)	9.3	11.5	6.0	7.6	10.1
Design Discharge Velocity (ft/s)	5.7	4.9	5.3	4.5	3.8
Design Discharge (cfs)	53.4	56.5	32.0	34	38
Channel Slope (ft/ft)	0.0384	0.0171	0.0400	0.0270 - 0.0410	0.0190
Sinuosity	1.07	1.10	1.05	1.09	1.12
Width/Depth Ratio	7.0	5.2	12.5	17.6	16.7
Bank Height Ratio	3.1	1.5	1.0	1.0-1.1	1.0-1.1
Entrenchment Ratio	1.2	5.4	1.5	>1.8	>1.8
d50 (mm)	24	29	20.1	-	-

Table 38: Summary of Design Morphologic Parameters for UT3C Reach 2

Parameter	Existing Parameters	Reference Parameters	Proposed Parameters
	UT3C Reach 2	UT to Austin Branch US	UT3C Reach 2
Contributing Drainage Area (acres)	54	76.8	54

Parameter	Existing Parameters	Reference Parameters	Proposed Parameters
	UT3C Reach 2	UT to Austin Branch US	UT3C Reach 2
Channel/Reach Classification	incised B4a	A4/B4a	B4a
Design Discharge Width (ft)	10.6	6.7	6.2
Design Discharge Depth (ft)	0.6	0.5	0.5
Design Discharge Area (ft^2)	3.9	3.6	2.9
Design Discharge Velocity (ft/s)	4.0	7.3	4.5
Design Discharge (cfs)	15	26	13
Channel Slope (ft/ft)	0.0754	0.1	0.0370 - 0.0760
Sinuosity	1.04	1.0	1.03
Width/Depth Ratio	28.8	12.8	13.4
Bank Height Ratio	3.7	1.0	1.0-1.1
Entrenchment Ratio	1.2	2.6	1.4-2.4
d50 (mm)	24	59.0	-

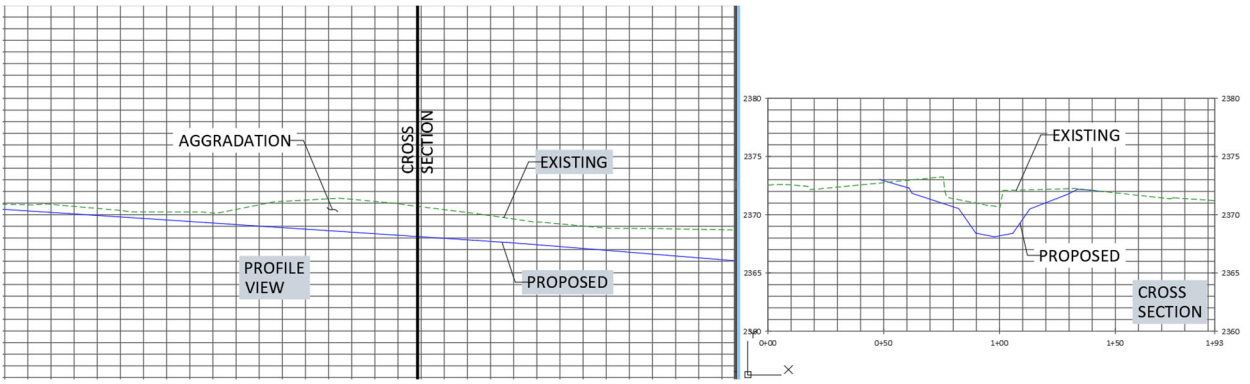
6.5 Sediment Transport Analysis

A qualitative assessment of fine and coarse sediment supply and sources in the project watershed was performed based on visual inspection and review of historic aerial photos. Much of the headwaters are forested and lies within the Nantahala National Forest. The upper three miles of Jones Creek lie within this protected area. Within the first mile upstream of the project, several hay fields and one field with livestock are evident from aerial photography. While several bank erosion areas were visible within this reach in the period between 1998-2013, all of the visibly eroding areas appear progressively more stable over the last 10 years in aerial photographs. Most visibly eroding areas having been allowed to grow up with stabilizing vegetation and appear to be on a more stable trajectory. Overall, the watershed assessment indicates that the watershed is stable with no reason to believe that land use will change markedly in the foreseeable future. Occasional logging and low-density residential development are not a concern for the stability of the proposed project.

The most critical sediment transport considerations on the project are (1) removal of onsite sources of fine sediment in tributary reaches, and (2) enhancement of sediment transport continuity in the mainstem of Jones Creek.

Current in-stream and upland sources of onsite sediment result in fine sediment deposition along UT2, UT3A, and in some other localized tributary areas. Removal of the sediment sources include pond dam erosion on UT2 and bank erosion on UT3A.

Reaches 2 and 5 of Jones Creek are aggrading due to loss of slope and appropriate cross-sectional area. In two primary locations along these reaches, Jones Creek accesses the broader floodplain at flow rates of 1/3 to 1/2 of the design bankfull discharge. In Reach 5, this condition, exacerbated by a hard bend in the river, results in a reduced sediment competency that moves only a 1” particle size in lieu of the design target of 6” during a channel-filling event. In other words, for Reach 5, the channel can only move the D50, as estimated from subpavement sampling of existing conditions, but cannot move larger particles under full channel flow conditions. The figure below shows the resulting aggradation of the channel bed load and the corresponding overly-shallow existing channel.



Flow accessing the broader floodplain does not rejoin the channel for several hundred feet owing to the shape of the floodplain and existing preferred flow paths. The result is that in these locations channel flow is no longer sufficient to transport large bedload particles and deposition occurs, either increasing flood frequency and creating a self-perpetuating issue (as in Reach 5) or inducing lateral bank erosion as a geomorphic response (as in Reach 2). To counteract this, the design of Jones Creek includes the construction of natural rises, or levies, on the floodplain that is lower in order to help target semi-confinement of bankfull flows and other frequent flows. Maintaining these flows within the channel and near-channel floodprone area will result in improved sediment transport continuity and capacity. Historic channel and valley manipulation have altered the floodplain shape to a degree that the proposed natural levy features are the only viable option to adequately confine a greater percentage of flows to prevent the loss of sediment transport in the future. In all other reaches, the purpose of improving continuity for sediment transport is to reduce localized deposition within the main channel of fine substrate coming from offsite or remaining in the system. Continuity within the channel will force deposition to occur on the overbanks where velocities are lower due to bank roughness.

A third important consideration to sediment transport analysis was to design reaches with stable bed form and grade control features. Sediment transport competency was evaluated for flows between bankfull and the 100-year flood events to evaluate riffle and grade control target gradations and material sizes. Sediment competence analysis results are shown in Table 39 and include competency calculations for the Q25 (4% annual chance return interval). Competency analyses show that most particle sizes within the existing sediment gradation are mobile under bankfull flows and larger, indicating that the reaches will be able to transport the sediment supplied to them by the watersheds. The degree of mobility suggested by the sediment competence analysis is consistent with literature on particle size mobility in mountain streams; Leopold and Rosgen (1991) showed that the D84 was consistently moved by discharges less than bankfull in these systems. To ensure that streams remain vertically stable, low mobility grade control features consistent with reference reach features of similar character and function will be established at intervals which allow for the mobility of riffle and cascading riffle material without compromising stream stability. The sizing of these key particle materials is based on hydraulic and sediment transport modeling as well as visual observation of low mobility particles in the field based on moss growth and other visual cues of long-term stability.

Table 39: Results of Competence Analysis

	Jones Creek Reach 2	Jones Creek Reach 5	UT3 Reach 1	UT3 Reach 3	UT3A Reach 1 /Reach 2	UT3C Reach 2
Abkf (sq ft)	48.4	51.4	7.6	10.1	1.4	2.9

Wbkf (ft)	30.0	30.7	11.6	13.0	4.0	6.2
Dbkf (ft)	1.6	1.7	0.7	0.8	0.3	0.5
Schan (ft/ft)	0.0160 –0.0220	0.0160 - .0170	0.0270 - 0.0410	0.019	0.0950 – 0.1300/0. 0230 – 0.0460	0.0370 - 0.0760
Bankfull Velocity (fps)	5.7	5.8	4.5	3.8	4.4/4.4	4.5
Bankfull Shear Stress, t (lb/sq ft)	2.1	1.8	1.7	0.5	2.3/0.7	1.9
Movable particle size (mm) [1]	158	146	132	36	189/55	149
Q25 Shear Stress, t (lb/sq ft)	2.6	4.1	2.8	1.1	4.0/1.5	3.2
Q25 Movable particle size (mm)[1]	211	339	228	90	326/118	355
Largest particle from bar sample (mm)	38	63	85	63	NA/63	54
Largest particle from pebble ct (mm)	362	362	256	256	NA/22.6	256
D95 reachwide (mm)			137	143	NA/75.6	90
Design riffle mix D95 (mm)	400	400	200-300	200-300	200-400/150-250	200-300
Design riffle mix D95 (in)	16	16	8-12	8-12	8-16/6-10	8-12

[1]Moveable particle size based on Shields Curve (NRCS, 2007)

Table 39 (continued): Results of Competence Analysis

	UT1	UT1A	UT2 Reach 2	UT2A
Abkf (sq ft)	4.9	1.4	1.8	2.0
Wbkf (ft)	8.6	4.0	5.0	5.1
Dbkf (ft)	0.6	0.3	0.4	0.4
Schan (ft/ft)	0.020 – 0.0280	0.0430 –0.1080	0.0190 -0.0370	0.0340 - 0.0460
Bankfull Velocity (fps)	3.4	4.5	2.8	3.1
Bankfull Shear Stress, t (lb/sq ft)	0.4	2.2	0.6-1.1	1.4
Movable particle size (mm) [1]	30	178	45-86	108
Q25 Shear Stress, t (lb/sq ft)	0.9	2.3	0.8-3.1	5.2
Q25 Movable particle size (mm)[1]	73	184	61-250	439
Largest particle from bar sample (mm)	42	80	62	63
Largest particle from pebble ct (mm)	180	N/A	90	128
D95 reachwide (mm)	110	N/A	51	32
Design riffle mix D95 (mm)	50-100	150-250	150-250	200-300
Design riffle mix D95 (in)	2-4	6-10	6-10	8-12

[1]Moveable particle size based on Shields Curve (NRCS, 2007)

6.6 Stream Design Implementation

Wildlands' approach to improving the streams on the Site includes restoration and enhancement II. A Priority 1 floodplain restoration approach was used on most reaches with a Priority 2 or 1.5 (hybrid) approach necessary in certain confluence and transition zones, as well as along UT1 and the lower portion of UT2 to reduce hydrologic trespass in adjacent fields and to establish sediment transport continuity. In addition, multiple uncredited stream segments located upstream of Jones Creek Reach 1a, downstream of Jones Creek Reach 5, upstream of UT3C, and along UT3B1 have been added into the conservation easement to allow for permanent restriction of livestock from the stream.

Restoration, enhancement II, and uncredited reaches include all of the mainstem of Jones Creek through participating landowner parcels. In addition, efforts extend to the Jones Creek tributaries UT1, UT1A,

UT2, UT2A, UT3, UT3A, UT3B, UT3B1, and UT3C, representing a holistic, watershed-scale restoration. Livestock will be excluded from the entire conservation easement as part of the project, and the landowner will install livestock watering systems post-construction as part of the project implementation. Livestock exclusion may be accomplished by removal of livestock from the property or by implementing the fencing plan detailed in the planset (Appendix 11, Sheets 4.2.1-4.2.4). Fencing along the boundary of the conservation easement will consist of 5-strand barb wire while fencing within internal easement crossings will consist of 5-strand high tensile wire (Appendix 11, Sheet 7.10). High tensile wire is favored for internal easement crossings to reduce fence maintenance needs due to debris jams or other flood event damage.

Below are descriptions of the designs for the restoration and enhancement II reaches. Enhancement II reaches will generally include planting with native tree and shrub species, permanent protection in a conservation easement to exclude livestock, bank repairs, and other reach-specific elements as described below.

6.6.1 Jones Creek Reach 1a & 1b

Jones Creek Reaches 1a and 1b bracket Reach 2 and are enhancement II reaches. Above Reach 1a, a narrow conservation easement has been established on the mainstem of Jones Creek and a tributary up to the limits of the parcel boundary in order to ensure long-term exclusion of livestock from the adjacent fields.

Reaches 1a and 1b will be permanently protected in a conservation easement, planted with native tree and shrub species, and will exclude livestock.

6.6.2 Jones Creek Reach 2

Jones Creek Reach 2 is designed as a B4/C4 hybrid stream type with a high width-depth ratio of over 18. This ratio was partly achieved by utilizing relatively flat bank slopes along the reach. The laid-back banks should encourage vegetation establishment along the bank and reduce the potential for bank toe failures while woody vegetation is establishing. The flatter banks also provide areas for the deposition of mobile substrate along the edges of the channel during high flow events.

The riffle bottom width for this reach was selected based on existing cross-sections that exhibited base flow centered in the channel and depositional features along the banks. The proposed alignment of the stream moves away from existing sharp meanders where outside of bend erosion is high. In-stream structures and bank revetment will be utilized to construct outside meander bends for additional shear mitigation. Slope through the reach will primarily be dropped over constructed riffles. Floodplain grading will include the establishment of a natural high point near the limits of the easement where the floodplain intersects an area that is lower than the prevailing floodplain grade. The natural levy will be a gentle vegetated feature that helps to maintain sediment transport continuity by increasing competency in the main channel during high flows.

The stream connects to reach 1b where the bank vegetation is established and mature, with grading tie-outs to preserve many of the larger trees along the existing banks.

6.6.3 Jones Creek Reach 3

Jones Creek Reach 3 is an enhancement II reach and will be permanently protected in a conservation easement, planted with native tree and shrub species, and will incorporate livestock exclusion. Adjacent to the proposed ford crossing, banks and bed will be stabilized. Along the left bank between the ford and the lower end of the reach, the bank will be laid back to improve the function of the channel under high flows and address toe and bank erosion. This increase to width-depth and entrenchment ratio mimic more stable channel and floodplain bench segments along the corridor. Minor toe scour between 115+50 – 116+00 will be addressed with toe stabilization and bioengineering. NCDOT has done prior

work in the vicinity of the bridge to address historic North Jones Creek Road bridge scour issues and the projects does not propose modifications to NCDOT improvements.

6.6.4 Jones Creek Reach 4

Jones Creek Reach 4 is an enhancement II reach and will be permanently protected in a conservation easement, planted with native tree and shrub species, and will incorporate livestock exclusion. Eroding banks in the existing ford will be stabilized and the ford cross will be relocated to in the straight-away below the North Jones Creek Road bridge. Downstream of 120+86, both banks and the channel will be graded to restore stable stream dimension and complement the activities proposed in Reach 5 including reestablishing a sloping bedform in the currently aggraded section of the reach. Floodplain grading will include the establishment of a natural high point near the limits of the easement where the floodplain intersects an area that is lower than the prevailing floodplain grade. The natural levy will be a gentle vegetated feature that helps to maintain sediment transport continuity by increasing competency in the main channel during high flows. Water cresting these rises in Reach 4 or 5 will flow down-valley and reenter Jones Creek. The proposed natural floodplain levies will not result in ponding water on the floodplain or a lack of an outlet for receding floodwater.

6.6.5 Jones Creek Reach 5

The primary design objective of Jones Creek Reach 5 is to address the lack of channel confinement, particularly in the vicinity of 125+00, which has led to aggradation at the head of the reach and extends into Reach 4. Secondarily, the proposed realignment increases the slope, removes a hard left turn where water escapes the main channel contributing to aggradation, and relocates the stream away from the eroding terrace slope that is part of the road embankment along N. Jones Creek Road. The adjustments to the slope and cross-sectional area of the channel will improve sediment transport to support a self-maintaining channel. The stream is designed as a B4/C4 hybrid stream type with a high width-to-depth ratio and a C-type entrenchment ratio. In-stream structures, gently sloped banks and toe protection will be used to maintain low shear and high stability in outside meander bends. Most of the stream slope will be dropped over in-stream riffle structures. Floodplain grading will include the establishment of a natural high point near the limits of the easement where the floodplain intersects an area that is lower than the prevailing floodplain grade. The natural levy will be a gentle vegetated feature that helps to maintain sediment transport continuity by increasing competency in the main channel during high flows.

Below Reach 5, the property boundary runs with the stream centerline. The right floodplain is included within the conservation easement and will be planted with a 30-foot buffer and fenced to exclude livestock, with no direct credit.

6.6.6 UT1

The proposed UT1 restoration alignment begins at the outlet of a PVC pipe. The existing pipe will be removed from within the conservation easement to the extent practicable. No access on the adjacent property has been obtained so a small headwall or similar outlet will be constructed. Stream restoration will begin where the pipe currently outlets.

UT1 is designed as a C4b-type stream. It has a slope just over 2% and has been designed with a meandering pattern that will traverse existing and proposed wetland areas. A width-depth ratio of 15 is proposed with gently sloped 3.5:1 banks. This is a low sediment supply reach, and the narrow channel bottom and long-term bank roughness will be sufficient to move the limited sediment supply entering the reach. The channel shape will facilitate deposition of any excess sediment along the banks and floodplain of UT1. The floodplain grading of the stream and valley will remove a berm from the floodplain and define a natural valley shape. Removal of the berm will include physical removal and disposal of non-native invasive species infestations along the reach. In-stream structures will be used to create deeper pools and variability within the profile. Bank structures will be used for additional

variability in habitat along the reach. Some alders and willows, currently growing in dense stands along the existing channel, will be transplanted.

6.6.7 UT1A

UT1A is designed as a steep Ba-type stream with step-pools, rock slides, and cascades. The design discharge of the stream is 6 cfs, such that typical riffle dimensions were designed to be as small as practically constructable. The stream begins below an existing culvert that emerges from under Jones Creek Road. The stream alignment moves offline from the existing alignment as the existing profile becomes more incised. Rock drops, rock sills, rock slides, log sills, and cascades will be used to drop elevation and form the step-pool system. The stream bankfull profile is positioned to provide a narrow, sloped bench on each side of the stream.

6.6.8 UT2 Reach 1

UT2 Reach 1 begins downstream of an existing spring box and flows to UT2 Reach 2. The reach is designed using the enhancement II approach with the primary goals of improving streambank stability and bedform diversity along the existing channel alignment. Point bars will be graded on the inside of the meander bends using the UT2 Reach 2 typical sections as a guide. The outside pool bends will be protected using brush packs composed of vegetative material sourced onsite. A riffle-pool sequence and log sills will be installed to provide grade control. Clearing of existing vegetation will be limited to the left floodplain to protect the existing stand of trees along the right floodplain.

6.6.9 UT2 Reach 2

UT2 Reach 2 is designed as a B-type stream that primarily consists of reshaping the valley through the earthen dam, and downstream in the leveled agricultural field to achieve the desired concave valley shape with greater confinement in the steeper reach near the dam, and partial confinement in the lower part of UT2 Reach 2. The reach begins with a steep and confined channel at the failed earthen dam. Step-pools were designed to provide grade control and energy dissipation for the steep upstream section of the reach. To account for the narrow valley through this section of the reach, a 2-foot wide bankfull bench will be built on both sides of the channel and then transition to a 2:1 slope to tie to the existing floodplain grades. Below this steep segment of the reach, the slope flattens and the alignment is through an agricultural field to the right of the existing ditched channel. This reach is Priority 1.5 restoration that reshapes and lowers historically flattened portions of the valley with a natural concave shape and raises the channel where possible, particularly through the wetland dominated section of the reach. Rock sill and brush toe structures are designed to provide grade control and improved in-stream habitat for this section of the reach. Midway along the reach, the stream passes through a proposed culvert crossing to allow livestock to cross the stream without entering the channel. The culvert will be embedded to allow for improved aquatic organism passage. The stream has been routed through existing and reestablishment wetlands with less confinement and more of a Priority 1 approach before stepping back down to transition to the confluence with Jones Creek Reach 3.

6.6.10 UT2A

The proposed alignment of UT2A moves the stream away from its existing alignment in a maintained ditch at the toe of the roadway embankment along N. Jones Creek Road. Proposed grading along the stream defines a small valley until the stream reaches the floodplain of Jones Creek Reach 3. The stream begins at the culvert that exits under Jones Creek. A perched culvert condition will be reduced but not eliminated by the proposed work. From there, the stream flows into the conservation easement and proceeds downslope with a step-pool morphology. The stream was designed as a B-type stream and will utilize rock drops, rock sills, and log drops along the profile.

6.6.11 UT3 Reach 1

UT3 Reach 1 is designed as a B-type stream channel and the stream is being relocated to the valley low point to facilitate a Priority 1 restoration. Trees on the high (left) side of the existing stream channel will generally remain while trees in the channel and on the low side of the existing stream may be removed as necessary in order to properly backfill the existing channel and shape the valley. An existing crossing will be removed and a new crossing constructed to facilitate aquatic passage. In-stream structures (rock drops, rock sills, and log sills) will be used to create pools and variability within the profile. Bank structures (brush toe and cover logs) will be used for additional variability in habitat along the reach.

6.6.12 UT3 Reach 2

UT3 Reach 2 begins below a proposed stream crossing. The enhancement level approach to Reach 2 will restore bankfull benching along one or both sides of the stream throughout the reach. The existing bedform in the reach is good and expected to improve naturally once upstream onsite sediment sources are removed. The benching will recreate a floodprone width in the typical range of a B-type stream channel. Alder transplants along the reach will be trimmed and replanted where possible.

6.6.13 UT3 Reach 3

UT3 Reach 3 is designed as a C-type channel with wetland complex interaction. The channel slope is 1.9%. For much of the reach, the bankfull elevation is within 6 inches of existing ground. A crossing facilitates rotational grazing and has been located in the primary dry area within the reach. Brush will be incorporated into outside meanders as shown on the plans. Structures will provide a variety of instream habitat conditions, with drop heights designed to facilitate aquatic passage for species using UT3 Reach 3 as a refugia from the main stream channel.

6.6.14 UT3 Reach 4

UT3 Reach 4 consists of the lower 200’ of UT3. The reach has a 2- to 3-foot tall berm on the left bank which will be graded out to form a gently sloping bankfull bench as an enhancement approach.

6.6.15 UT3A Reach 1

UT3A Reach 1 was designed as a B4 type channel with a 9.5% slope, step-pool grade control, and low sinuosity. The reach was identified as an intermittent stream at its inception point, with little to no defined bed and bank form downstream of the stream classification, leading to the classification of much of the lower reach as a jurisdictional wetland. Likely, this area has drainage tiles buried below grade, as broken tiles have been found on the surface around the location of the stream. Restoration will begin where the stream first surfaces and will define a low flow channel with stable dimensions, pattern, and profile and proper natural confinement to facilitate B-type channel morphologic processes. Steps will be built with a combination of chunky riffles and log drops. Establishment of woody vegetation along the stream banks and floodplain will create long-term channel confinement and stability. A large headcut, formed where intermittent flow transitions to perennial flow at the confluence with an additional spring and wetland seep, will be graded and hardened with log drops to create stable stream slope conditions.

6.6.16 UT3A Reach 2

A comprehensive enhancement II approach was taken for UT3A Reach 2. Channel bank sloping is proposed in locations with steep and eroding banks. Slight channel realignment is proposed in areas where shear stresses can be reduced. Toe structures will be used to narrow the channel at overly wide spots. The stream channel will be taken offline in the lower half of Reach 2 where the stream enters the valley bottom and the slope is lower. The current baseflow channel is overly wide, appears to frequently spread out on to the floodplain and drop fine sediment in the baseflow channel. The realignment section moves the channel to the right and removes an existing berm. The old channel sections will be backfilled, and the left bank of the new channel will be raised slightly to prevent high flows from

scouring the old channel. A Priority 1 profile is designed. Raising the channel will promote a higher groundwater elevation and support the wetland enhancement and re-establishment that is proposed along the end of UT3A. The reach will be planted with woody trees and shrubs to provide long-term stability and ecological uplift.

6.6.17 UT3B

Enhancement activities for UT3B will be comprised of livestock exclusion, removal of an existing spring box, the addition of a BMP, in-stream grade control structures, minor stream bank grading, and channel realignment/relocation through its original, historic channel. The realignment section puts the channel back in the natural valley bottom and through a wetland. Once diverted into the historic channel, the stream will be allowed to reform its channel geometry naturally, however an approximately 12" layer of muck will be removed, and a riffle will support the re-establishment of the new channel. All work in this area shall be handwork. Large tree roots exist in this area, making grading undesirable, but will provide long-term channel stability. The old channel will be backfilled and plugged. On the lower half of UT3B, banks will be spot graded to achieve 3:1 slopes. Riffles will be built or supplemented for the remainder of the reach. Woody material is being incorporated into bank reconstruction.

6.6.18 UT3B1

UT3B1 is not a proposed credited stream but will be stabilized and protected within the proposed conservation easement and protected by a proposed BMP.

6.6.19 UT3C Reach 1

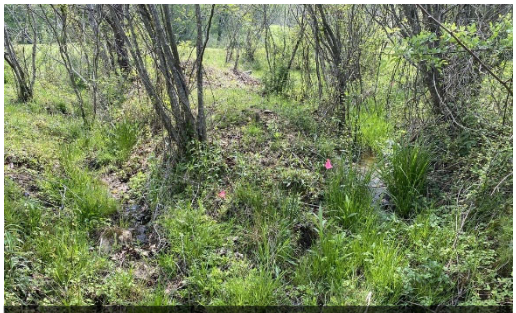
UT3C Reach 1 begins at the end of a utility crossing internal easement break. An undersized culvert conveys flows into a wide wetland area lacking defined bed and banks. Enhancement II protocols will be used along this reach to address lack of sufficient vegetation, bank erosion areas, and overly wide sections. Proposed spot treatments include bank grading, installation of a toe structures to deflect flows away from outer bends and narrow the channel dimension, and planting of woody trees and shrubs to insure long-term channel stability.

6.6.20 UT3C Reach 2

UT3C Reach 2 is a restoration reach designed to match the B4a channel type. A step-pool design will comprise chunky riffle and log structures as drops. The restoration approach shifts the existing channel to the right, away from the valley wall. The new alignment takes the stream into the field to the right of the channel and then meanders back across the existing channel and into the field on the left side of the existing channel. This alignment seems to follow the natural valley inflections, although the valley form has been highly altered through agriculture and the original valley bottom is hard to determine. The new channel connects across the valley to the new location of UT3. The channel realignment will maintain the existing stream invert to prevent wetting up the surrounding fields outside of the easement boundary.

6.7 Wetland Design

The proposed design includes the re-establishment of 0.566-acres, rehabilitation of 0.629-acres, the enhancement of 0.206-acres of historically altered wetlands. It also includes 0.693-acres of wetland creation along UT1. All wetland areas will be restored as riparian wetland through the bottomland floodplain of Jones Creek, UT1, UT2, and UT3. Wildlands evaluated ditching, piping/drain tile, agriculture, and other anthropogenic effects, as well as the potential for hydric soil development in the proposed wetland areas.



Area proposed for wetland re-establishment along UT3 Reach 3

Wetland re-establishment at 1:1 is proposed in areas along UT2 and UT3 with hydric soils near the ground surface, in hydrologic alterations that can be addressed and livestock and planting impacts that can be remedied. In areas with the same existing conditions along UT1, stream and valley restoration grading involve an average of 15" of soil removal except in spoil pile berm areas where the depth is greater; therefore, creation at 3:1 is proposed along this reach. Wetland rehabilitation at 1.5:1 is proposed along UT3A/UT3 Reach 2 and UT3 Reach 3 based on the raising of the stream profile, treatment of invasive species in wetland areas, removal of livestock and planting of these areas. All existing and proposed credited wetlands, except the small enhancement wetland C at the outlet of UT3B which is heavily impacted by livestock, are herbaceous and will be converted to forested. In enhancement areas, these activities are the basis for proposed enhancement crediting at 2:1.

UT1 – Wetlands

The proposed wetland creation and wetland enhancement areas in the floodplain of UT1, labeled Wetland A in Figure 8, have been previously ditched, piped/drain tiled, and covered with side-cast material from stream modifications. The stream-wetland corridor along UT1 is herbaceous and overgrown with multi-flora rose. UT1 will be moved from its ditched position on the fringe of the wetlands and routed within existing and historic wetland areas while being raised 1' to create stream-wetland hydrologic interaction at the channel base flow level. Some valley grading is required to accommodate UT1 within this highly altered portion of the larger Jones Creek floodplain as reflected by the crediting type and ratios proposed. Livestock will be fenced out of UT1 and the corridor. The corridor will be planted based reference wetland and riparian vegetation community species composition. Physical and chemical treatment of multi-flora rose and other invasives will be conducted during and post-construction.

UT2- Wetlands

Wildlands is proposing wetland re-establishment and wetland rehabilitation in the floodplain of the downstream extents of UT2, which is herbaceous with multi-flora rose and privet infestations. UT2 is being routed within existing and historic wetland areas and raised 1' to create stream-wetland hydrologic interaction at the channel base flow level. Livestock will be fenced out and the existing powerline maintenance area has been reduced. The corridor will be managed to reestablish a forested wetland based on reference community type.

UT3 and UT3A - Wetlands

The proposed wetland re-establishment and wetland rehabilitation areas in the floodplains of UT3 and UT3A, collectively named Wetland C on Figure 8, have been previously ditched perpendicular to the stream with the streams ditched and straightened. Upstream of the proposed crossing, the ditched

UT3A is being raised and realigned to support wetland activities on the left and right side of the stream. The same invasive species and livestock conditions are present as other proposed wetland crediting areas and the same approach to treat and revegetate the area while excluding livestock will be implemented. Downstream of the crossing, UT3 Reach 3 is being raised and realigned, and ditches along the right floodplain are being plugged in conjunction with minor grading to enhance and reestablish a large sloping wetland from the right terrace. Hydric soils exist in the stream-adjacent positions where wetland reestablishment is proposed. Except in bermed areas along perpendicular ditches, all grading is less than 12" in this area. The grading that is proposed is to best accommodate the stream-wetland complex and maximize incorporation of right terrace hill slope wetlands into the project.

6.7.1 *Hydric Soils Investigation*

A preliminary hydric soils investigation was conducted in January of 2022 to determine the extent and depth of hydric soil indicators outside of jurisdictional wetlands. The results of the investigations were used to indicate wetland re-establishment potential and depth of potential overburden material from the manipulation of Site soils for agricultural purposes. Areas containing hydric soils but lacking a wetland hydrologic regime were likely functional wetlands prior to agricultural ditching and piping/drain tiles to alter hydrology. A total of 52 hand augured soil borings were performed as part of the hydric soil investigations (Appendix 4). Soil borings were classified as non-hydric or hydric soils. At boring locations, the depth below the existing land surface to appropriate hydric soil indicators was noted. Hydric soil investigation along with Site observations were used to guide proposed wetland and design.

6.7.2 *Wetland Hydrology*

Growing season dates were defined as April 14th to October 23rd (192 days) by the Franklin, North Carolina WETS table for 50% probability of soil temperatures greater than 28 degrees Fahrenheit. However, Wildlands will use soil temperature probe data and bud burst observations to determine the growing season during MY1. The growing season will not begin before March 1st and not end after November 30th.

Based on Table 1 in the Wilmington District Stream and Wetland Compensatory Mitigation Update dated October 24, 2016, there should be a minimum wetland saturation period of 12% of the defined growing season (23 days) for adequate wetland hydrology in Nikwasi soils. Dellwood and Saunook soil series wetland saturation periods are undefined.

6.8 Agricultural BMPs

An agricultural stormwater BMP is proposed to filter upland runoff on the Site, associated with streams UT3B and UT3B1. There is no long term maintenance anticipated with this BMP although the BMP should be visually monitored in the first year or two after implementation to ensure that it is effectively dispersing concentrated flows. Any sign of erosion should be addressed by remedial action.



Trampled areas and areas of sparse vegetation will be prepared and seeded, wattles will be placed on contour to slow runoff



Minor erosion and headcutting where flow is channelizing on the landscape will be treated

Runoff from the upland cattle trails will be slowed by a series of biodegradable wattles placed on contour to promote deposition of fines – no plastic netting will be allowed. In addition, the area will be prepared and seeded to establish a dense ground cover and livestaking of understory species will be applied to the uphill side of wattles. Where available, onsite brush will be used to further roughen the hillslope flow path.

As a secondary effort, the existing channelized flow paths, UT3B1 and the top of UT3B will be regraded, matted and planted with livestakes where erosion is occurring. In steep gradient areas upstream of the jurisdictional channel, brush and livestaking will be applied as a velocity-reduction measure.

6.9 Vegetation, Planting Plan, and Land Management

Restoration plans have sought a more sustainable long-term solution that creates geomorphic stability complimented by a greater diversity of woody plant species. Ecological community assessment of the Site suggests Rich Cove Forest (Montane Intermediate Subtype) and Montane Alluvial Forest (Small Stream Subtype) types are present onsite. These community classifications were used as a guide during the planting plan development for this project, however many of the desired species are not commercially available in the quantities needed for this scale of project. Stream bank and riparian planting zones along Jones Creek, UT1 Lower, UT2A, and UT3 will comprise species found in the Montane Alluvial Forest (Small Stream Subtype). UT3A, UT3B, UT3C, UT1 Upper, and UT1A will be planted with a community of species modeled after the Rich Cove Forest (Montane Intermediate Subtype) community. Given the conditions onsite and the high-proportion of preservation and enhancement reaches, the species chosen include early-, mid-, and late-successional species. Due to plant stock and seed costs and lack of availability, some characteristic herbaceous species will not be planted or will be planted in very low quantity, but they are expected to likely colonize the Site in the future given their early-successional nature and prolific presence onsite and in the surrounding area.

These species include jewel weed, joe pye weed, New York ironweed, cardinal flower, blue eyed grass, etc.

For rapid self-seeding plants, small establishment zones will be planted with plug and/or tubling stock within the wetland areas. While planting plugs across a large wetland site is often cost-prohibitive, establishing a small area of plants that will seed into the larger area is a feasible solution. There will be fifteen 40' x 40' establishment zones (called Supplemental Wetland Zone on the plans), and the plugs shall be planted 2 ft on center in clusters of 4-6 individuals of the same species within the Wetland Supplemental Planting Zone. Species chosen for the planting plan are listed on Sheets 4.1-4.7 of the Preliminary Plans located in Appendix 11.

The Open Planting Zone (called Riparian Buffer Planting Zones 1 and 2 on the plans) and the Wetland Planting Zone will be planted with bare root seedlings and will be quantitatively monitored for growth success. Streambank Planting Zones 1 and 2, as shown on plans, will be planted with live stakes and the channel toe will be planted with multiple herbaceous species plugs and/or tublings. The Shaded Planting Zone (called Riparian Buffer Supplemental Planting Zone on plans) shall be planted with bare root or tubling shrubs and subcanopy tree species and plugs given that overstory canopy already exists. This zone will only receive visual monitoring. Permanent herbaceous seed will be spread on streambanks, wetland and riparian buffer areas, and any additional disturbed areas within the project easement.

The Wetland Planting Zone covers the areas proposed for wetland reestablishment and wetland rehabilitation. The planting scheme provides for potential for both forested and scrub shrub wetlands to establish on the Site given the structural diversity in the species list. The one area proposed for wetland enhancement will be planted according to the Riparian Buffer Supplemental Planting Zone species because the existing wetland has forest canopy but lacks sufficient understory vegetation. The Wetland Supplemental Planting Zone scheme will be applied to 15 40' x 40' pockets throughout the wetland reestablishment and wetland rehabilitation areas.

Several invasive plant species are found on the Site including multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), Callery pear (*Pyrus calleryana*), and Chinese privet (*Ligustrum sinense*). A large portion of the existing invasive species along restoration and enhancement reaches will be treated by mechanical removal during construction. Tall fescue (*Festuca arundinacea*) will be treated prior to planting in all non-graded areas within the conservation easement. The extent of invasive species coverage will be monitored, mapped, and controlled as necessary throughout the required monitoring period. Please refer to Appendix 7 for the post construction invasive species plan. Additional monitoring and maintenance issues regarding vegetation are in Sections 8 and 9 and Appendix 9.

Poor soil properties, where they occur on the Site, will be addressed prior to planting. All haul roads and other high traffic areas within the conservation easement will ripped to address soil compaction. Topsoil will also be stockpiled and reapplied in graded areas. Additionally, soil amendments meant to address issues related to soil pH, nutrient availability, and soil biology will be broadcasted based on soil test results and professional judgement. These activities should allow for more successful plant establishment throughout the conservation easement although continued adaptive management activities may be necessary in some areas.

6.10 Project Risk and Uncertainties

The active livestock operation at the Site is possibly the biggest risk to the project and the conservation easement integrity. However, the landowners live in the immediate area and are active on the property. They will be able to repair damaged fences and/or remove stray livestock from the easement quickly, lowering the risk. A fencing plan is provided with the design plans in Appendix 11.

Changes to watershed land use upstream of the project reaches is a possibility in the valley. Currently, Wildlands is not aware of any planned changes in the area. The smaller tributaries entering the project are the most susceptible to localized land use changes such as small timber sales or additional residential construction. These streams include UT1A, UT2A, and UT3C which enter the project area from small wooded and residential properties. Other tributaries including UT1, UT2, UT3, UT3A and UT3B originate from within the project parcels and have no known plans for changes in land use. Jones Creek originates from off property and could be affected by land use changes within the immediate upstream valley; however, a large percentage of the upstream watershed is located within Nantahala National Forest where any land use changes will be governed by US Forest Service best management practices.

There is a low risk of hydraulic trespass onto adjacent properties due to the relatively steep profiles of the streams at the Site and the activities proposed to resize channels where aggradation has occurred which will reduce flooding. Where fields are prone to wetness, areas have been historically tied into the main channel with ditches or subsurface drains. Accommodations have been made to remove all subsurface drains from the easement. Many of the ditches were able to be eliminated based on the easement acquired and activities proposed. However, in some cases, these ditches which are non-erosive and vegetated will be required to remain to maintain existing field conditions. No maintenance of these ditches within the easement boundary is proposed.

Overhead utility easements and DOT rights of way cross the Site in both external and internal conservation easement breaks throughout the project. Maintenance within these easements is likely to occur periodically including mowing and tree trimming. To reduce the potential for conservation easement encroachments, Wildlands will mark the easement perimeter with signage. Wildlands will follow the Maintenance Plan (Appendix 9) to address any encroachments.

All stream and wetland projects have some risk for beaver colonization. There is no onsite evidence of current or past beaver activity in the project limits. If beaver move into the project areas, Wildlands will follow the Maintenance Plan (Appendix 9) to address the issue.

7.0 Performance Standards

The stream and wetland performance standards for the project will follow approved performance standards presented in the DMS Mitigation Plan Template (Version 2.3, June 2017), the Annual Monitoring Template (June 2017), and the Wilmington District Stream and Wetland Compensatory Mitigation Update issued October 2016 by the USACE and NCIRT. Annual monitoring and routine site visits will be conducted by a qualified scientist to assess the condition of the finished project. Specific performance standards that apply to this project are those described in the 2016 Compensatory Mitigation Update including Vegetation (Section V, B, Items 1 through 3), Stream Channel Stability and Stream Hydrology Performance Standards (Section VI, B, Items 1 through 7), and Wetland Performance Standards (Section IX, A through C, and E). Performance standards are summaries in Table 40.

Table 40: Summary of Performance Standards

Parameter	Monitoring Feature	Performance Standard
STREAM SPECIFIC PERFOMANCE STANDARDS[1, 2]		
Dimension	Cross-Section Survey	BHR <1.2; ER >2.2 for C/E channels; 2.2>ER>1.2 for A/B channels
Substrate, Pattern and Profile	Visual Assessment	Should indicate stream stability; Coarser material in riffles; finer particles in pools
Hydrology	Pressure Transducer	• Four bankfull events during the 7-year period; in separate years

Parameter	Monitoring Feature	Performance Standard
		• 30 days of consecutive flow on restored intermittent streams
WETLAND SPECIFIC PERFORMANCE STANDARDS		
Hydrology	Pressure Transducer	Free groundwater surface within 12 inches of the ground surface for a minimum of 12% (23 consecutive days) of the growing season for Macon County under normal precipitation conditions. Soil temperature will be recorded with probes and correlated to bud burst observations to determine the growing season based on USACE guidance.
SITE PERFOMANCE STANDARDS[3,4]		
Vegetation	Vegetation Plots	MY3 success criteria: 320 planted stems per acre, MY5 success criteria: 260 planted stems per acre, average of 6 feet in height in each plot in Open Planting Zone or 4 feet in height in Wetland Planting Zone as identified in Figure 10 MY7 success criteria: 210 planted stems per acre, average of 8 feet in height in each plot in Open Planting Zone or 6 feet in height in Wetland Planting Zone as identified in Figure 10.
Photo Documentation	• Cross-Section Photos • Stream Photo Points • Vegetation Plot Photos • Wetland Gage Photos • Upstream and downstream photos of internal and external crossings	Should illustrate vegetative and morphological stability. Grade control structures and banks should be stable; persistent mid-channel bars with vertical or channel incision should be absent.
Visual Assessment	CCPV	Signs of encroachment, instability, invasive species

1: BHR = bank height ratio, ER = entrenchment ratio
2: The tributaries are designed to gradually drop to the base level of the main streams at their confluence, so bankfull dimensions exceeding targets would not be considered a trend towards instability in this landscape position where it can be demonstrated that the streambed profile is steeper than the bankfull or prevailing floodplain grade of the main stream.3: Remedial action would not be taken if channel changes indicate a movement toward stability.
4: Vegetation performance will be monitored in the Open Planting Zone, which includes Riparian Buffer Planting Zones 1 and 2 as termed on the plans, and the Wetland Planting Zone. The Shaded Planting Zone, comprising the Supplemental Riparian Buffer Planting Zone as shown on the plans, will be evaluated through visual assessment and vegetation transects will be conducted to evaluate planted species survival. Vegetation transects in shaded planting zones will not be held to vegetative performance standards.

8.0 Monitoring Plan

Project monitoring components are listed in more detail in Table 41. Approximate locations of the proposed vegetation plots and cross section locations are illustrated in Figure 9.

Table 41: Monitoring Components

Parameter	Monitoring Feature	Quantity/Length by Reach											Frequency	Notes
		Jones Creek R1A	Jones Creek R2	Jones Creek R1B	Jones Creek R3	Jones Creek R4	Jones Creek R5	UT1	UT1A	UT2 R1	UT2 R2	UT2A		
Dimension	Riffle Cross-sections	N/A	1	N/A	N/A	1	1	1	1	N/A	1	1	Year 1, 2, 3, 5, and 7	1
	Pool Cross-sections	N/A	0	N/A	N/A	N/A	0	1	0	N/A	1	0		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Stream Hydrology	Crest Gage (CG) and/or Transducer (SG)	1 CG						1 CG	N/A	1 CG		N/A	Semi-Annual	3
Wetland Hydrology	Groundwater Gage (GWG)	5 GWGs											Semi-Annual	--
Vegetation	Permanent/ Mobile Vegetation Plots	13 Total (7 Permanent, 6 Mobile)											Year 1, 2, 3, 5, and 7	4
Visual Assessment		Y											Semi-Annual	--
Exotic and nuisance vegetation		Y											Semi-Annual	5
Project Boundary		Y											Semi-Annual	6
Reference Photos	Photographs	23											Annual	--

Parameter	Monitoring Feature	Quantity/Length by Reach									Frequency	Notes
		UT3A Reach 1[7]	UT3A Reach 2	UT3B	UT3C Reach 1	UT3C Reach 2	UT3 Reach 1	UT3 Reach 2	UT3 Reach 3	UT3 Reach 4		
Dimension	Riffle Cross-sections	1	1	N/A	N/A	1	2	N/A	1	N/A	Year 1, 2, 3, 5, and 7	1
	Pool Cross-sections	0	N/A	N/A	N/A	0	1	N/A	0	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Stream Hydrology	Crest Gage (CG) and/or Transducer (SG)	1 SG	N/A	N/A	N/A		1 CG				Semi-Annual	3
Wetland Hydrology	Groundwater Gage (GWG)	5 GWGs[8]									Semi-Annual	--
Vegetation	Permanent/ Mobile Vegetation Plots	13 Total (7 Permanent, 6 Mobile)									Year 1, 2, 3, 5, and 7	4
Visual Assessment		Y									Semi-Annual	--
Exotic and nuisance vegetation		Y									Semi-Annual	5
Project Boundary		Y									Semi-Annual	6
Reference Photos	Photographs	18									Annual	--
Macro-invertebrates	Reach	1									Year 2 or 3	7

1. Cross-sections will be permanently marked with rebar to establish location. Surveys will include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.

2. Substrate, pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile will be collected during as-built baseline monitoring survey only, unless observations indicate widespread lack of vertical stability (greater than 10% of reach is affected) and profile survey is warranted in additional years to monitor adjustments or survey repair work.

3. Pressure transducers will be used to measure bankfull events and stream flow. Crest gages (CG) refer to bankfull events, stream gages (SG) refer to stream flow documentation. Transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers will be set to record stage once every 2 -4 hours based on the reported data. The transducer will be inspected and downloaded semi-annually.

4. Both mobile and permanent vegetation plots will be utilized to evaluate the vegetation performance for the open areas planted. 2% of the open planted acreage will be monitored with permanent plots and mobile plots. Permanent vegetation and mobile vegetation monitoring plot assessments will follow the 2016 NC IRT Wilmington District Stream and Wetland Compensatory Mitigation update to document number of planted stems and species using a circular or 100 m2 square/rectangular plot. The Shaded Planting Zone will be visually assessed, and vegetation transects will be conducted to evaluate planted species survival. Number indicates total number of plots for the entire Site but does not include the number of transects.
5. Locations of exotic and nuisance vegetation will be mapped.

6. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

7. To evaluate recolonization of UT3A, as requested by USACE, monitoring for macroinvertebrates is proposed for year 2 or 3, with no specific standards or thresholds being required except to report findings. Monitoring will follow the sampling procedure for wadeable streams outlined in the DWR Standard Operating Procedures for the Collection and Analysis of Benthic Macroinvertebrates but will only report quantity and taxonomic order of macroinvertebrates found. If no macroinvertebrates are found during the first monitoring event, follow-up sampling will be performed in either year 5 or 6 to reevaluate whether the reach is supporting macroinvertebrates.
8. Soil profile descriptions will be recorded at each gage during groundwater gage installation recording the color, texture and redoximorphic features present. In years 3, 5, and 7, one representative soil profile will be collected in each of the three wetland areas (associated with UT1, UT2 & UT3) for the site for informational purposes and reference.

9.0 Long-Term Management Plan

The Site will be transferred to the North Carolina Department of Environmental Quality (NCDEQ) Stewardship Program. 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 as needed to identify boundary markings as needed. Any livestock or associated fencing or permanent crossings will be the responsibility the owner of the underlying fee to maintain.

The Site Protection Instrument can be found in Appendix 8.

Table 42: Long-term Management Plan

Long-Term Management Activity	Long-Term Manager Responsibility	Landowner Responsibility
Signage will be installed and maintained along the Site boundary to denote the area protected by the recorded conservation easement.	The long-term steward will be responsible for inspecting the Site boundary during periodic inspections (every one to three years) and for maintaining or replacing signage to ensure that the conservation easement area is clearly marked.	The landowner shall report damaged or missing signs to the long-term manager, as well as contact the long-term manager if a boundary needs to be marked, or clarification is needed regarding a boundary location. If land use changes in future and fencing is required to protect the easement, the landowner is responsible for installing appropriate approved fencing.
The Site will be protected in its entirety and managed under the terms outlined in the recorded conservation easement.	The long-term manager will be responsible for conducting periodic inspections (every one to three years) and for undertaking actions that are reasonably calculated to swiftly correct the conditions constituting a breach. The USACE, and their authorized agents, shall have the right to enter and inspect the Site and to take actions necessary to verify compliance with the conservation easement.	The landowner shall contact the long-term manager if clarification is needed regarding the restrictions associated with the recorded conservation easement.

10.0 Adaptive Management Plan

Upon completion of Site construction, Wildlands will implement the post-construction monitoring defined in Sections 8 and 9. Project maintenance will be performed during the monitoring years to address minor issues as necessary (Appendix 9). If during annual monitoring it is determined the Site's

ability to achieve Site performance standards are jeopardized in any other way, Wildlands and DMS will notify the members of the IRT and work with the IRT to develop contingency plans and remedial actions.

11.0 Determination of Credits

Mitigation credits presented in Table 43 are projections based upon the proposed design.

The credit ratios proposed for the Site have been developed in consultation with the Interagency Review Team (IRT) as summarized in the IRT contracting meeting minutes dated February 2, 2021. This correspondence is included in Appendix 6.

1. The requested stream restoration credit ratio is 1:1 for mitigation activities that include reconstruction of the channels to a stable form and connection of the channels to the adjacent floodplain or bankfull bench features to establish stream-type appropriate entrenchment ratios.
2. Enhancement II is 2.5:1 throughout the Site, although the treatment varies some from reach to reach. Detailed description of enhancement II treatments by reach were provided in Section 6.
3. Wetland re-establishment is proposed at 1:1, wetland rehabilitation is proposed at 1.5:1, wetland creation is proposed at 3:1, and wetland enhancement is proposed at 2:1. Wetland enhancement is proposed in areas with heavy livestock impacts. Many of the Site's wetlands found in wooded stream corridors are not proposed for enhancement due to their high NCWAM scores.
4. No credit is sought for the BMP or for uncredited reaches that have been included within the conservation easement to facilitate livestock exclusion and limited or full buffer width planting, as applicable.

Buffers proposed throughout the Site meet the minimum required 30-foot standard width for Mountain streams. The credit release schedule is provided in Appendix 12.

Table 43: Project Asset Table

Project Components							
Project Segment	**Mitigation Plan Ft/Ac[1]**	**As-Built Ft/Ac**	**Mitigation Category**	**Restoration Level**	**Priority Level**	**Mitigation Ratio (X:1)**	**Credits**
Stream							
Jones Creek Reach 1a	42.855	-	Cold	EII	N/A	2.5	17.142
Jones Creek Reach 2	376.479	-	Cold	R	P1	1	376.479
Jones Creek Reach 1b	272.459	-	Cold	EII	N/A	2.5	108.984
Jones Creek Reach 3	793.418	-	Cold	EII	N/A	2.5	317.367
Jones Creek Reach 4	631.333	-	Cold	EII	N/A	2.5	252.533
Jones Creek Reach 5	421.865	-	Cold	R	P1	1	421.865
UT1	1054.139	-	Cold	R	P1/P2	1	1054.139
UT1A	161.276	-	Cold	R	P1	1	161.276
UT2 Reach 1	150.298	-	Cold	EII	N/A	2.5	60.119
UT2 Reach 2	797.913	-	Cold	R	P1/P2	1	797.913
UT2A	346.353	-	Cold	R	P1	1	346.353
UT3 Reach 1	639.406	-	Cold	R	P1	1	639.406
UT3 Reach 2	198.177	-	Cold	EII	N/A	2.5	79.271
UT3 Reach 3	340.964	-	Cold	R	P1/P2	1	340.964
UT3 Reach 4	215.532	-	Cold	EII	N/A	2.5	86.213
UT3A Reach 1	275.305	-	Cold	R	P1	1	275.305
UT3A Reach 2	482.387	-	Cold	EII	N/A	2.5	192.955
UT3B	584.575	-	Cold	EII	N/A	2.5	233.830
UT3C Reach 1	243.399	-	Cold	EII	N/A	2.5	97.360
UT3C Reach 2	269.859	-	Cold	R	P1	1	269.859
Total Stream LF	**8297.992**	**-**					
Wetland							
Wetland A	0.693	-	RR	C	Creation	3	0.231
Wetland A	0.168	-	RR	E	Enhancement	2	0.084
Wetland B	0.060	-	RR	REE	Re-Establishment	1	0.060
Wetland B	0.152	-	RR	RH	Rehabilitation	1.5	0.101
Wetland C	0.506	-	RR	REE	Re-Establishment	1	0.506
Wetland C	0.477	-	RR	RH	Rehabilitation	1.5	0.318
Wetland C	0.038	-	RR	E	Enhancement	2	0.019
Total Wetland Acreage	**2.094**	**-**					

Notes: 1. Internal crossing lengths have been removed from restoration footage.

Table 43 (continued): Project Asset Table

Project Credits						
Restoration Level	**Stream**			**Riparian**	**Non-Rip**	**Coastal**
	Warm	**Cool**	**Cold**	**Wetland**	**Wetland**	**Marsh**
Restoration	0.000	0.000	4683.559	0.000	0.000	0.000
Re-Establishment				0.566	0.000	0.000
Rehabilitation				0.419	0.000	0.000
Enhancement				0.103	0.000	0.000
Enhancement I	0.000	0.000	0.000			
Enhancement II	0.000	0.000	1445.774			
Creation				0.231	0.000	0.000
Preservation	0.000	0.000	0.000	0.000	0.000	
Totals	0.000	0.000	**6129.333**	**1.319**	0.000	0.000

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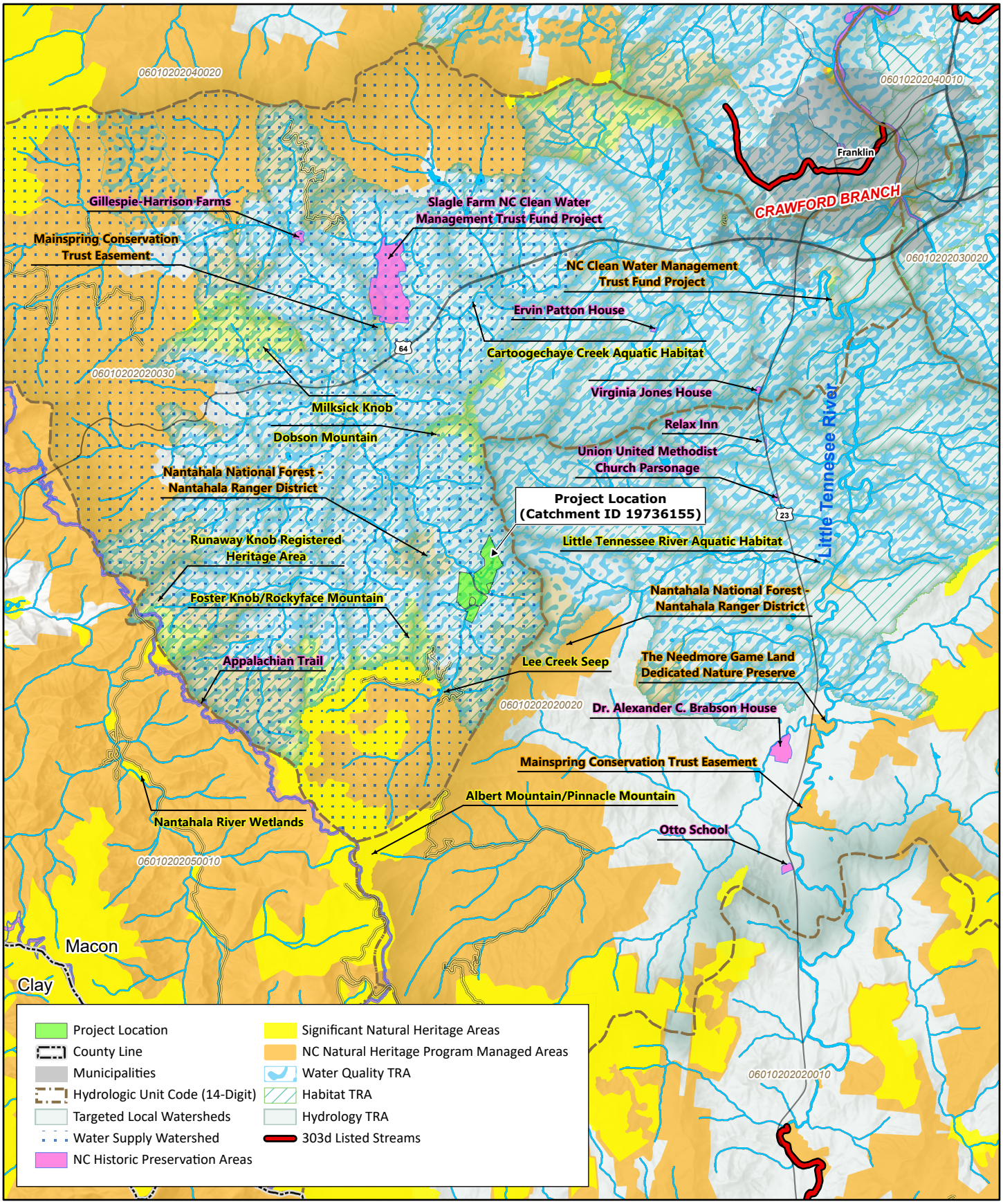
FIGURES



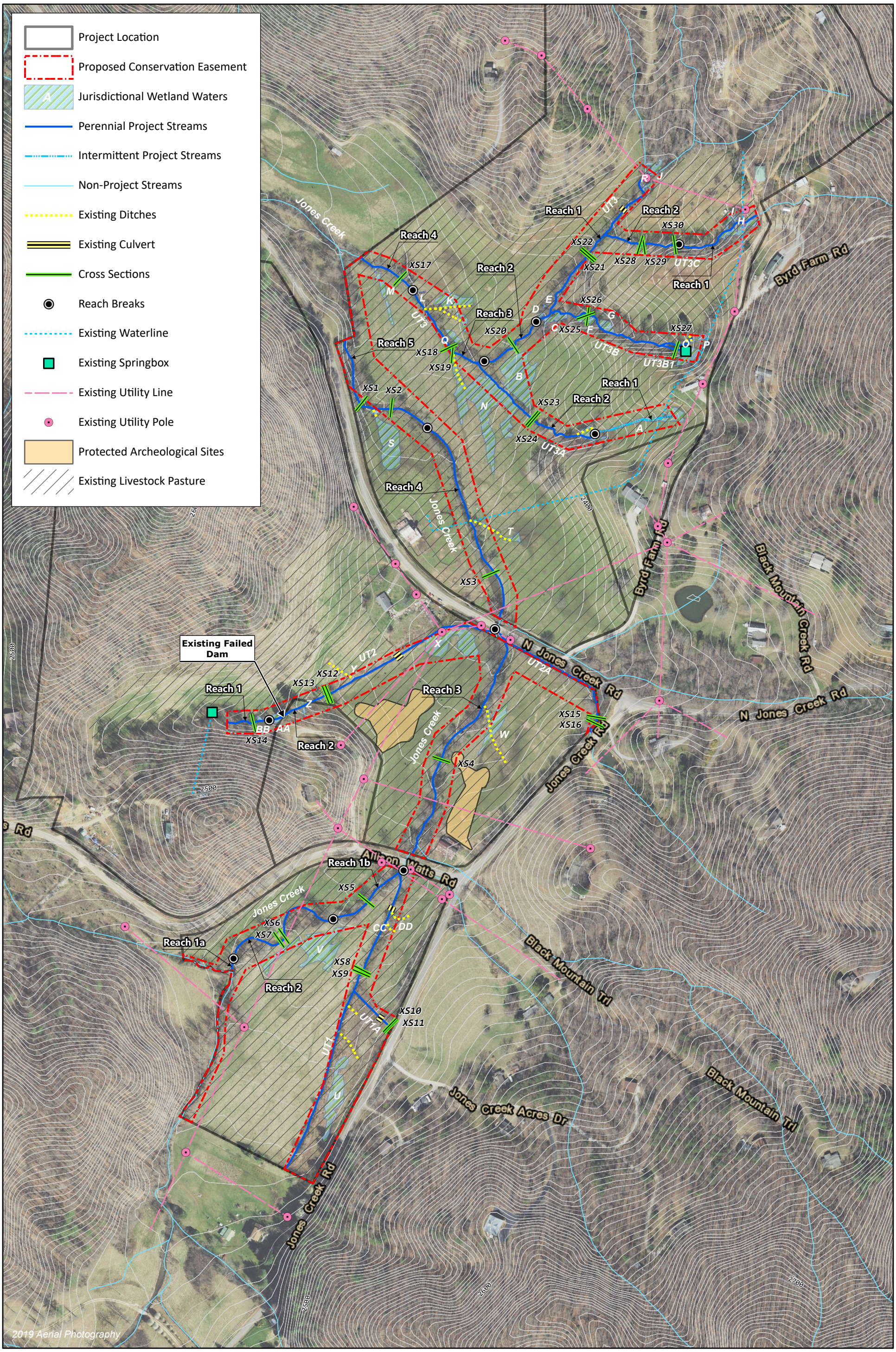
WILDLANDS ENGINEERING

0 0.75 1.5 Miles

N

Figure 1 Vicinity Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

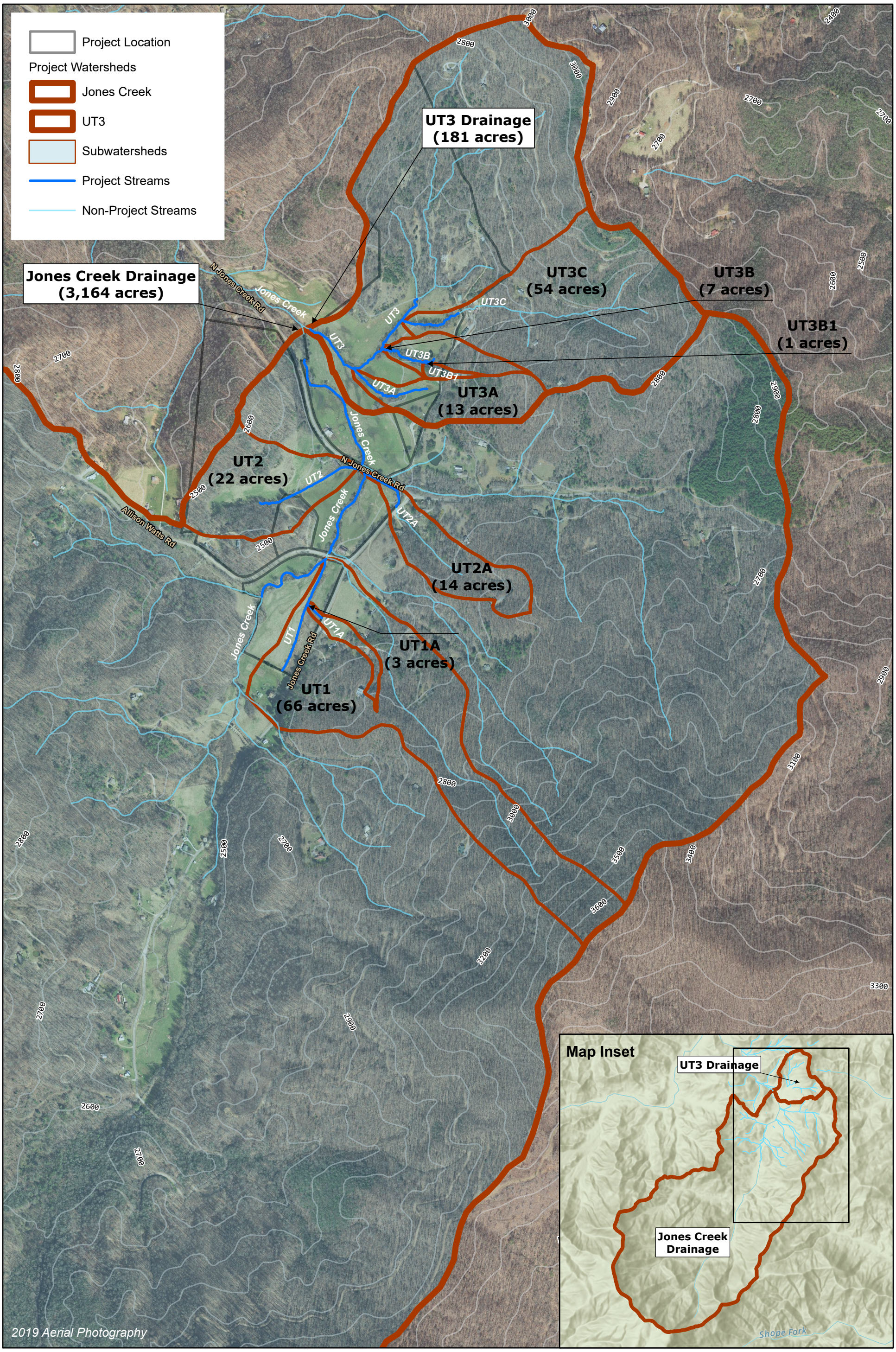
Macon County, NC



WILDLANDS ENGINEERING

Figure 2 Site Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202

Macon County, NC



WILDLANDS ENGINEERING

Figure 3 Watershed Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

Macon County, NC

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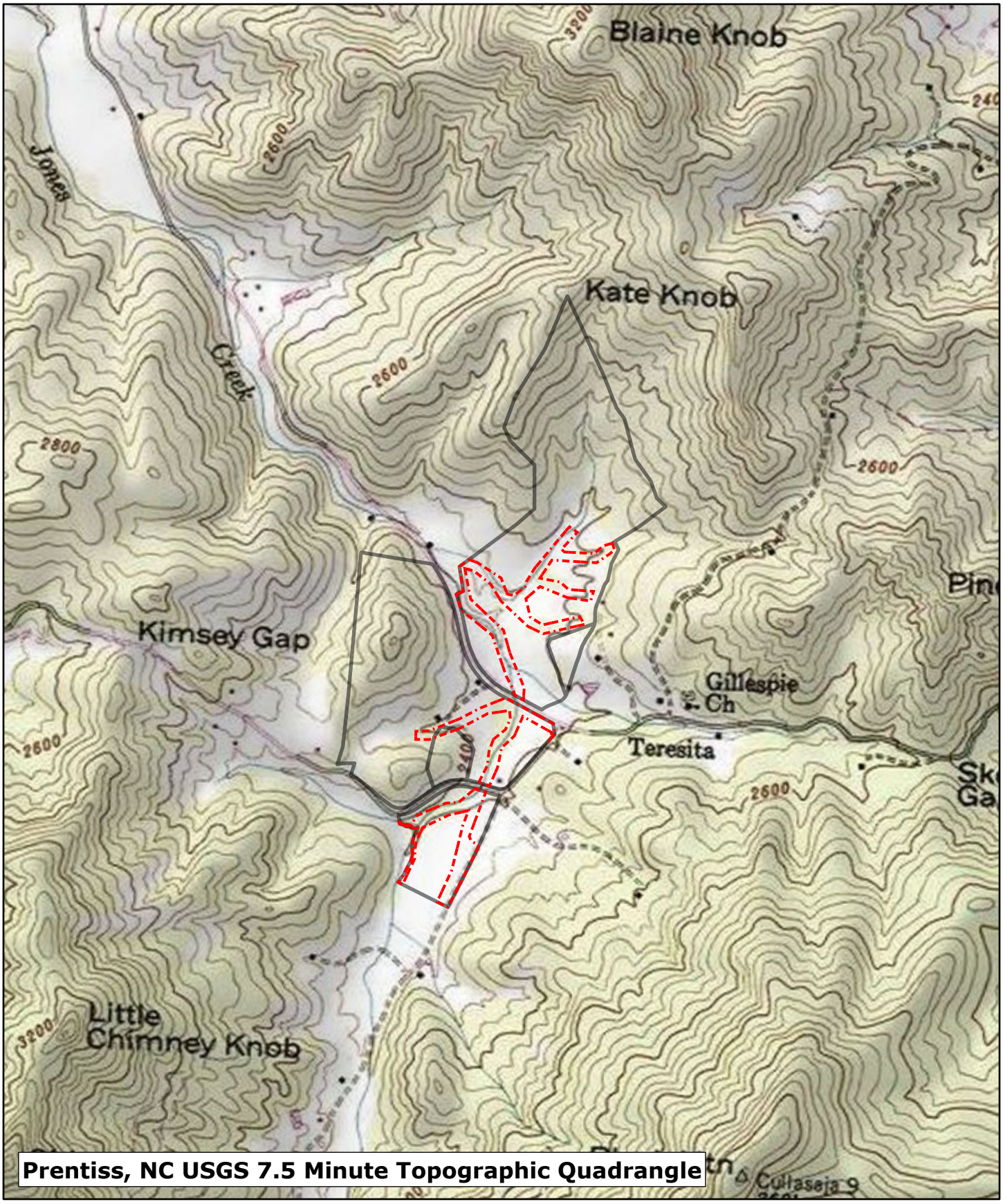

WILDLANDS ENGINEERING

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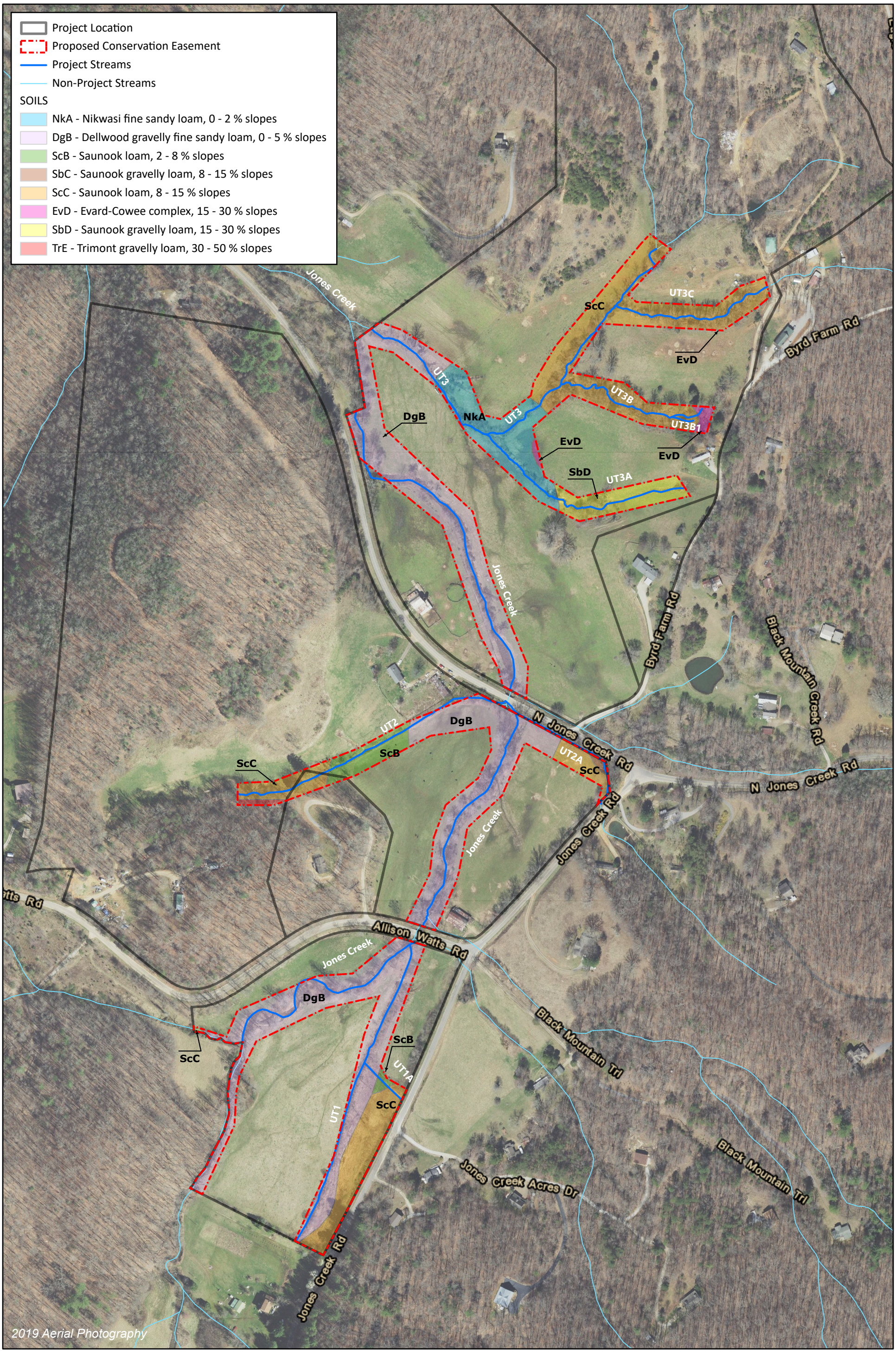
Figure 4 USGS Topo Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

Macon County, NC



WILDLANDS ENGINEERING

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Figure 5 Soils Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

Macon County, NC

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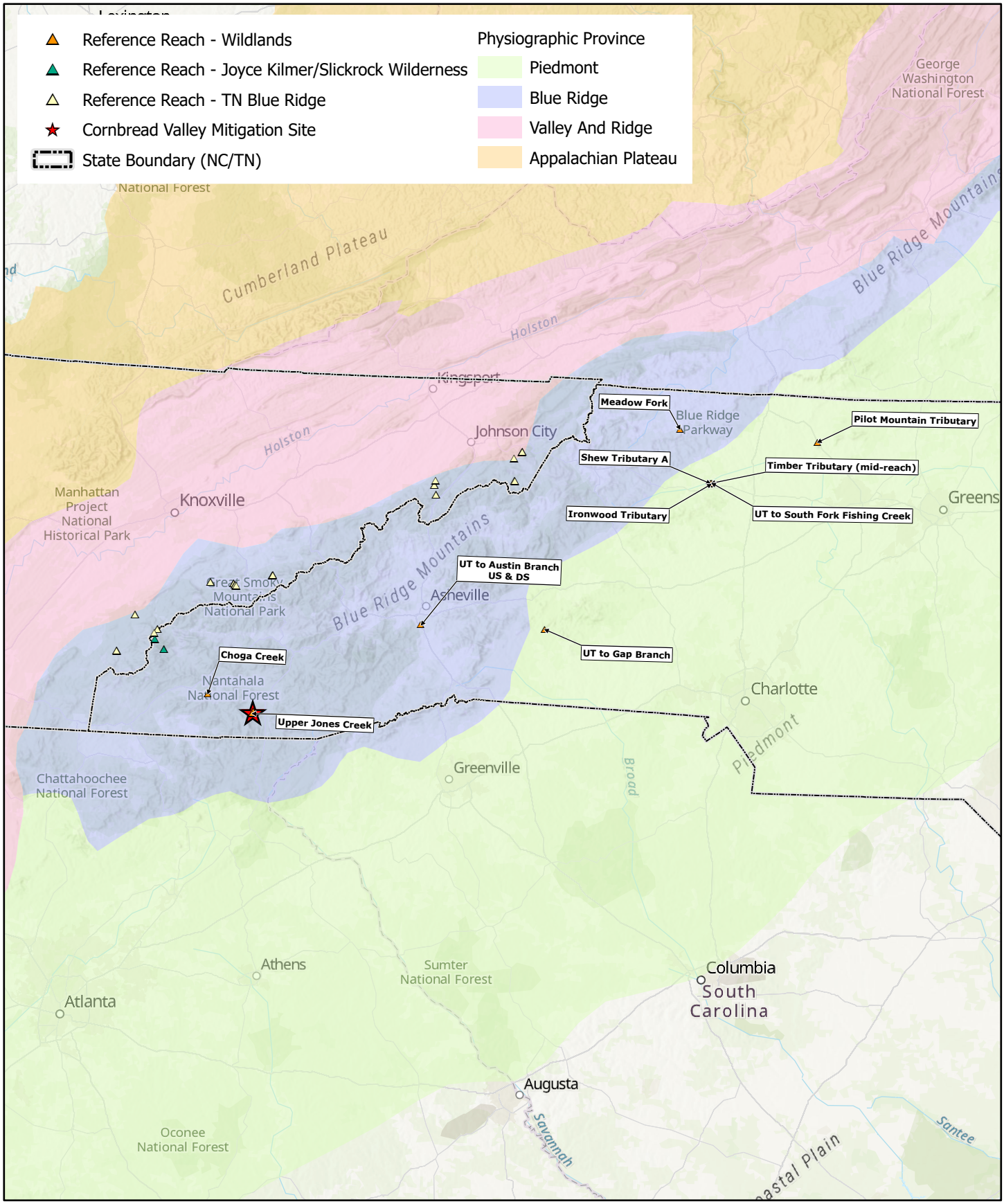

WILDLANDS ENGINEERING

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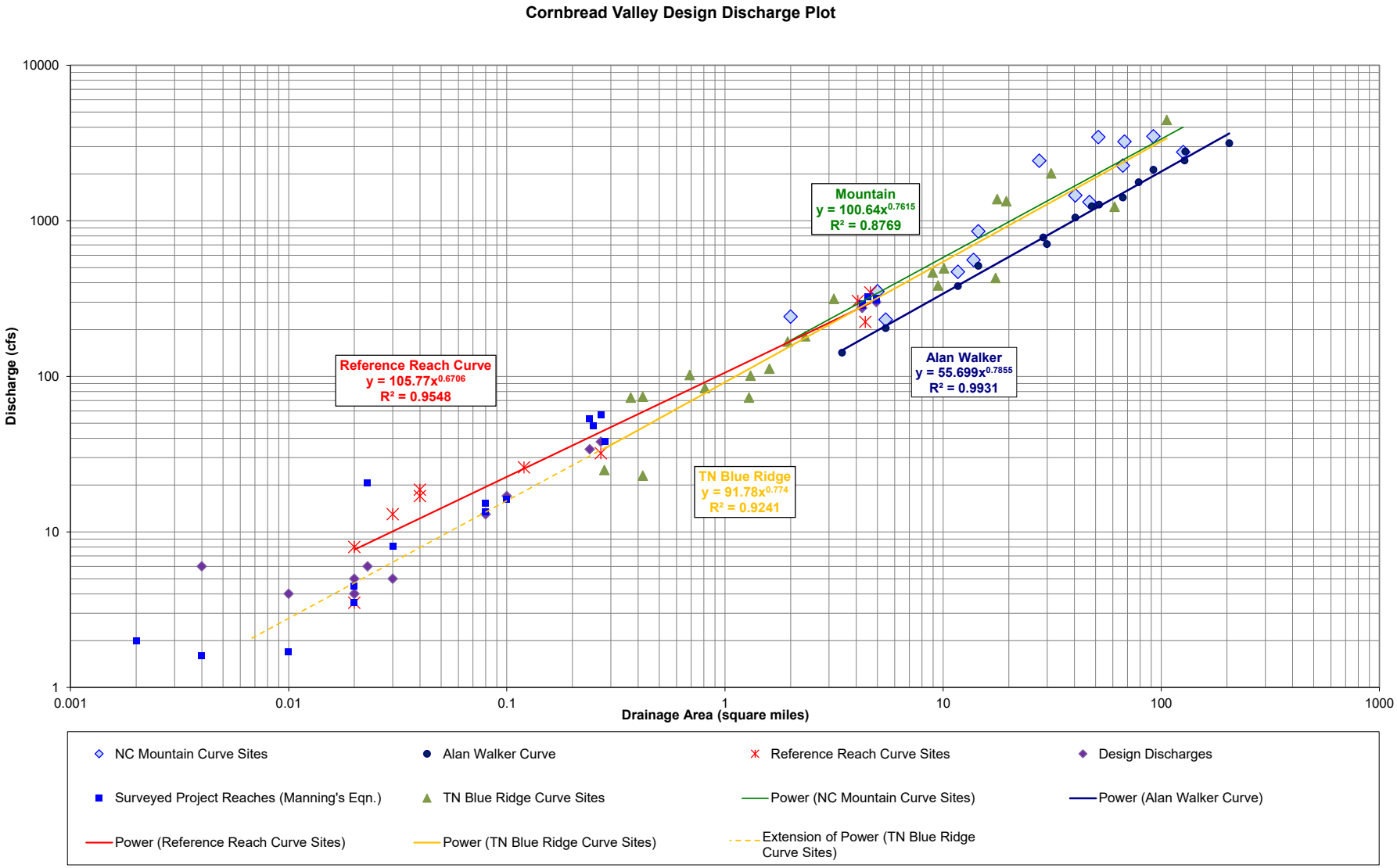
Figure 6 Reference Reach Vicinity Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202

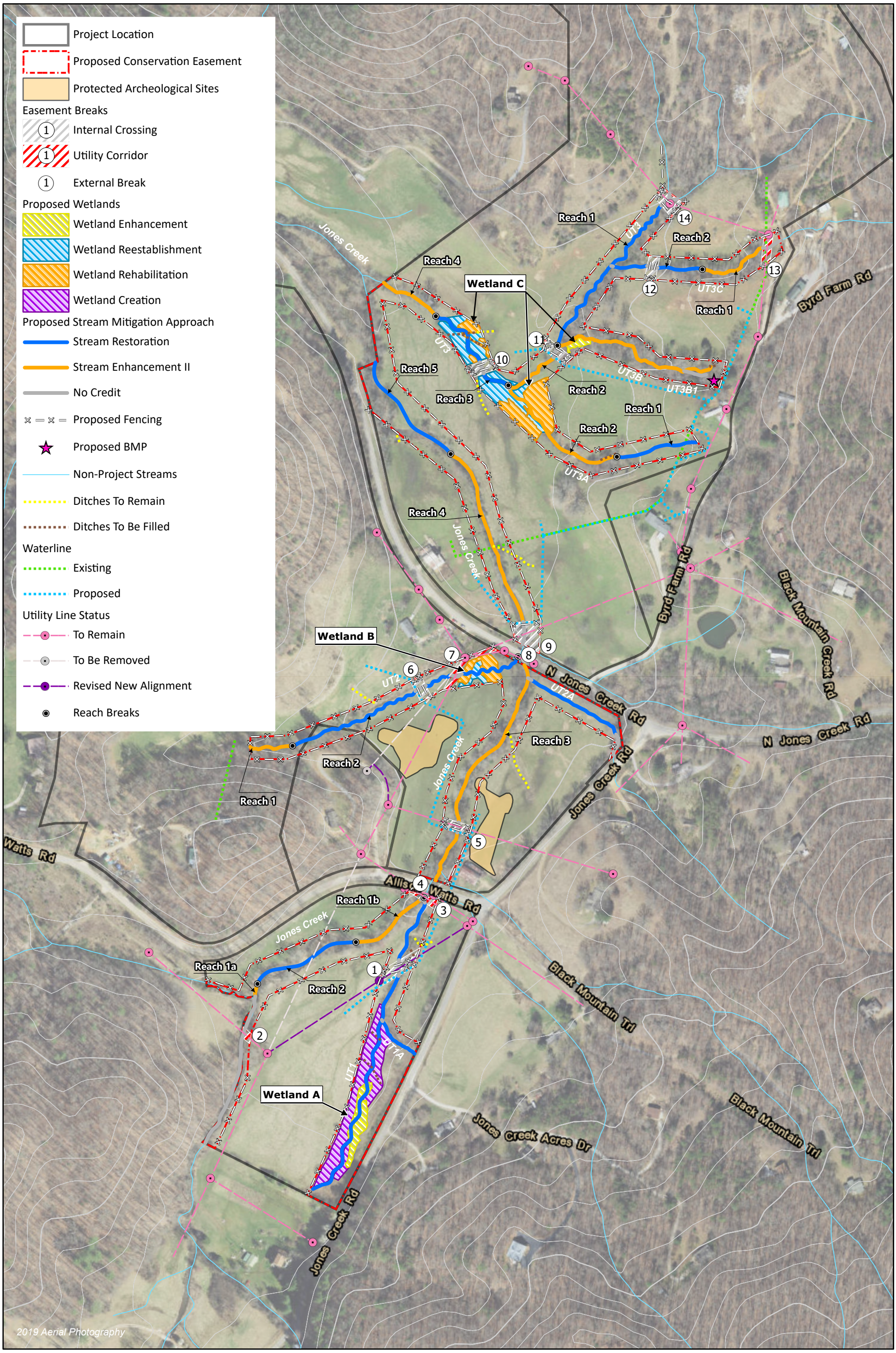
Macon County, NC



WILDLANDS ENGINEERING

Figure 7. Design Discharge Analysis
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

Macon County, NC



WILDLANDS ENGINEERING

Figure 8 Concept Design Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202

Macon County, NC

Project Location
Proposed Conservation Easement
Easement Breaks
1 Internal Crossing
1 Utility Corridor
1 External Break
Protected Archeological Sites
Proposed Wetland Mitigation Approach
Wetland Enhancement
Wetland Reestablishment
Wetland Rehabilitation
Wetland Creation
Proposed Stream Mitigation Approach
Stream Restoration
Stream Enhancement II
No Credit
Proposed Fencing
Proposed BMP
Non-Project Streams
Ditches To Remain
Ditches To Be Filled
Utility Line Status
To Remain
To Be Removed
Revised New Alignment
Reach Breaks
Monitoring Components
Mobile Vegetation Plot (6 Total)
Permanent Vegetation Plot (7 Total)
Proposed Stream Gage (1 total)
Proposed Groundwater Gage (5 Total)
Proposed Crest Gage (4 total)
Proposed Photo Point (41 total)
Proposed Cross-section (16 total)

Reach 1
Reach 2
Reach 3
Reach 4
Reach 5
Reach 1b
Reach 1a
UT3
UT3A
UT3B
UT3B1
UT3C
UT2
UT2A
UT1
Jones Creek
Jones Creek Rd
N Jones Creek Rd
Byrd Farm Rd
Black Mountain Trl
Jones Creek Acres Dr
Allison Watts Rd
N Jones
1
2
3
4
5
6
7
8
9
10
11
12
13
14

2019 Aerial Photography

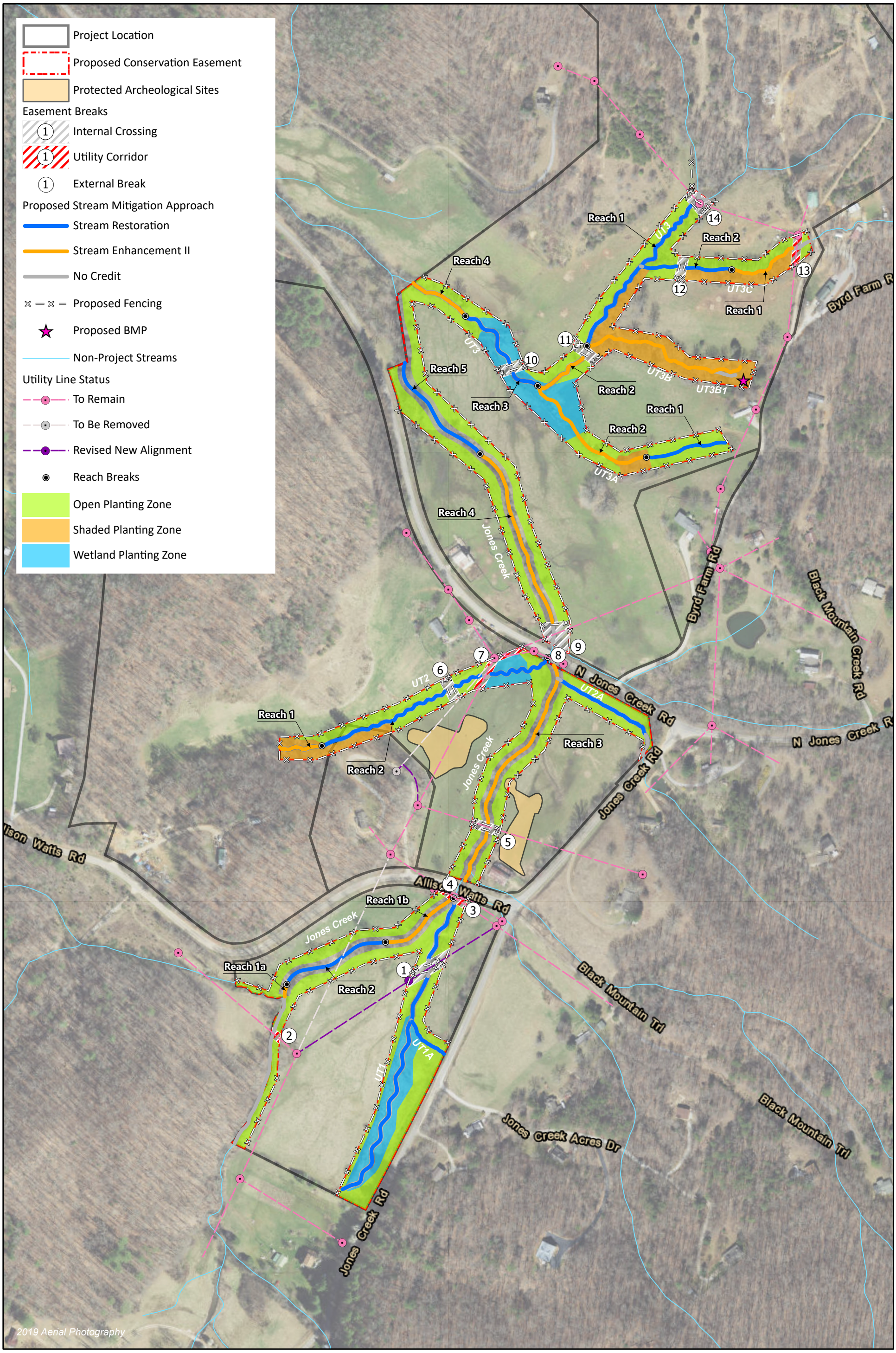
WILDLANDS ENGINEERING

0 300 600 Feet

N

Figure 9 Monitoring Components Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202

Macon County, NC



WILDLANDS ENGINEERING

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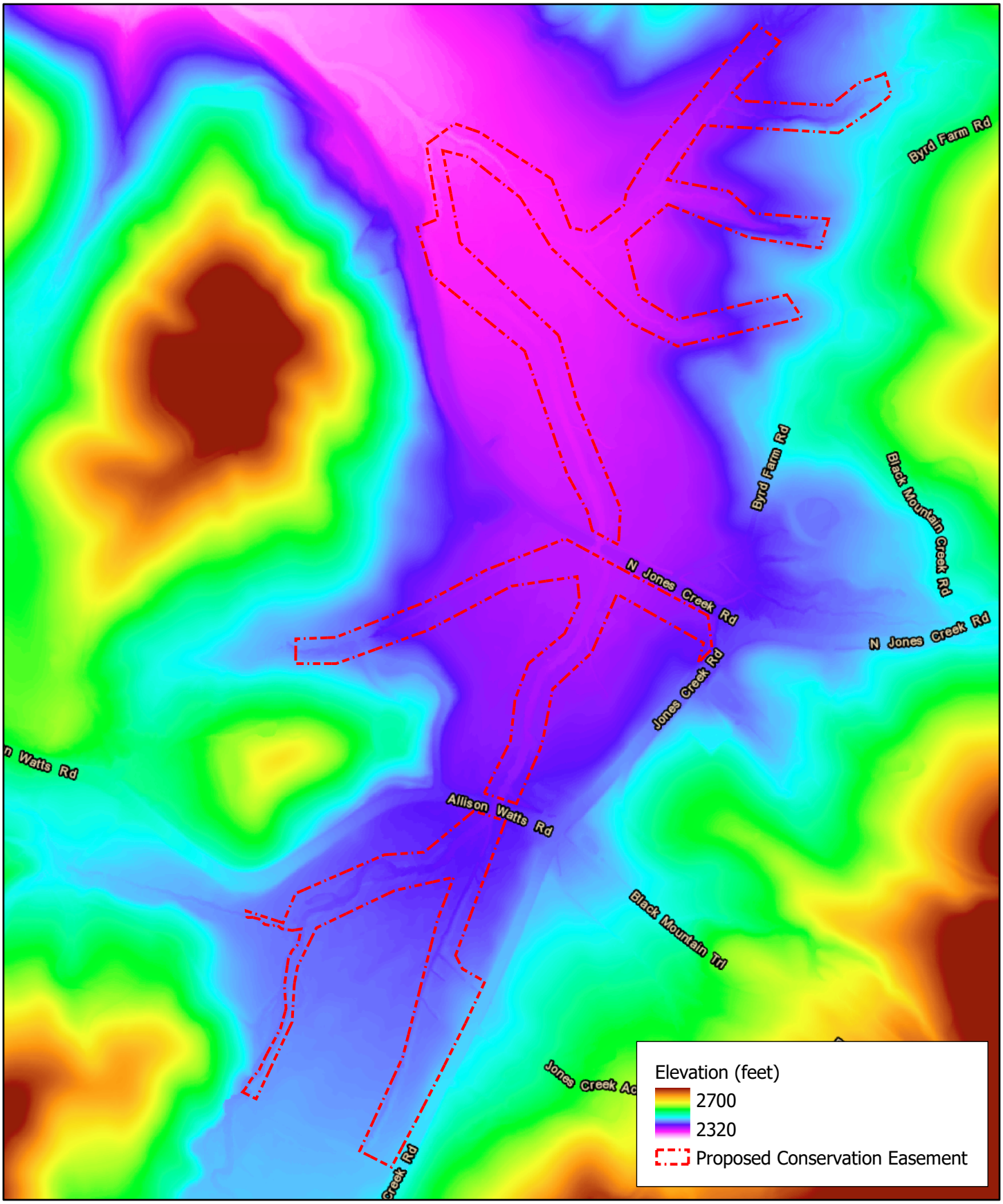
Figure 10 Planting Zone Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202

Macon County, NC



WILDLANDS ENGINEERING

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Figure 11 LiDAR Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

Macon County, NC

APPENDIX 1 – Historic Aerial Photos


INQUIRY #: 5996243.5
YEAR: 2016
= 500'
N
EDR



INQUIRY #: 5996243.5

YEAR: 2012

= 500'

N

EDR


INQUIRY #: 5996243.5
YEAR: 2009
= 500'
N
EDR


INQUIRY #: 5996243.5
YEAR: 2006
= 500'
N
EDR



INQUIRY #: 5996243.5

YEAR: 1998

= 750'

N

EDR



INQUIRY #: 5996243.5

YEAR: 1994

= 500'

N

EDR


INQUIRY #: 5996243.5
YEAR: 1984
= 500'
N
EDR



INQUIRY #: 5996243.5

YEAR: 1975

= 500'

N

EDR



INQUIRY #: 5996243.5

YEAR: 1954

= 500'

N

EDR

APPENDIX 2 – Preliminary Jurisdictional Determination

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action ID: **SAW-2020-02051** County: **Macon** U.S.G.S. Quad: **Prentiss**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Applicant: **Wildlands Engineering, Inc. / Attn.: Jordan Hessler**
Address: **167-B Haywood Road**
Asheville, NC 28806
Telephone Number: **828-551-8582**
Email: **jhessler@wildlandseng.com**

Size (acres): **45.5 acre portion of lager tract** Nearest Town: **Franklin**
Nearest Waterway: **UTs Jones Creek and Jones Creek** Coordinates: **35.10362, -83.45358**
River Basin/HUC: **Upper Little Tennessee (06010202)**

Location description: **The project site is located on a tract of land (PINs 6562-71-5245 and 6562-72-5090) at 1765 North Jones Creek Road and 69 Allison Watts Road in Franklin City, Macon 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 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 project area 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. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to

CWA 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 in Morehead City, NC, at (252) 808-2808 to determine their requirements.

Placement of dredged or fill material within waters of the US, including 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 by the Corps during a site inspection on September 10, 2021, and are as approximately depicted on the attached Delineation Map, Figures 3.0 – 3.4, submitted by Wildlands Engineering, Inc.

E. Attention USDA Program Participants

The delineation included herein has been conducted to identify the location and extent of the aquatic resource boundaries and/or the jurisdictional status of aquatic resources for purposes of the Clean Water Act for the particular site identified in this request. This delineation and/or jurisdictional determination may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should discuss the applicability of a certified wetland determination with the local USDA service center, prior to starting work.

F. Appeals Information for Approved Jurisdiction Determinations (as indicated in Section B. above)

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: Mr. Philip A. Shannin
Administrative Appeal Review Officer
60 Forsyth Street SW, Floor M9
Atlanta, Georgia 30303-8803
OR
philip.a.shannin@usace.army.mil

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 jurisdictional determination).

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: **October 28, 2021**

Expiration Date: N/A preliminary jurisdictional determination

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 https://regulatory.ops.usace.army.mil/customer-service-survey/

Copy Furnished (by email):
None

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: **Wildlands Engineering, Inc. / Attn.: Jordan Hessler**	File Number: **SAW-2020-02051**	Date: **October 28, 2021**

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 division 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** **69 Darlington Avenue** **Wilmington, North Carolina 28403** **828-271-7980, ext. 4232** **david.w.brown@usace.army.mil.**	If you only have questions regarding the appeal process you may also contact: **Mr. Philip Shannin, 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) 562-5136** **Email: philip.a.shannin@usace.army.mil**
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. Phillip Shannin, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801
Phone: (404) 562-5136

PRELIMINARY JURISDICTIONAL DETERMINATION (JD) FORM
U.S. Army Corps of Engineers

BACKGROUND INFORMATION

A. **REPORT COMPLETION DATE FOR PRELIMINARY JD:** October 28, 2021

B. **NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:**
Wildlands Engineering, Inc. / Attn.: Jordan Hessler
167-B Haywood Road
Asheville, NC 28806

C. **DISTRICT OFFICE, FILE NAME, AND NUMBER:**
CESAW-RG-A, SAW-2020-02051, NCDMS Cornbread Valley Mitigation Site

D. **PROJECT LOCATION(S) AND BACKGROUND INFORMATION:**
The project site is located on a tract of land (PINs 6562-71-5245 and 6562-72-5090) at 1765 North Jones Creek Road and 69 Allison Watts Road in Franklin City, Macon County, North Carolina.

State: **NC** County/parish/borough: **Macon** City: **Franklin**
Center coordinates of site (lat/long in degree decimal format): **35.10362, -83.45358**
Universal Transverse Mercator: **N/A**
Name of nearest waterbody: **UTs Jones Creek and Jones Creek**

E. **REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):**
☒ Office (Desk) Determination. Date: **October 28, 2021**
☒ Field Determination. Date(s): **September 10, 2021**

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	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resources in review area (acreage and linear feet, if applicable	Type of aquatic resources (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
Jones Creek	35.103136	-83.455442	2,788 LF	Non-wetland waters	Section 404
UT1	35.099947	-83.45593	1,086 LF	Non-wetland waters	Section 404
UT1A	35.100066	-83.455664	173 LF	Non-wetland waters	Section 404
UT1B – Intermittent	35.100035	-83.455852	55 LF	Non-wetland waters	Section 404
UT1C – Intermittent	35.099752	-83.455919	88 LF	Non-wetland waters	Section 404
UT2	35.103109	-83.456032	1,012 LF	Non-wetland waters	Section 404
UT2A	35.103235	-83.45373	500 LF	Non-wetland waters	Section 404
UT3	35.10683	-83.454349	1,554 LF	Non-wetland waters	Section 404
UT3A – Intermittent	35.105557	-83.453026	75 LF	Non-wetland waters	Section 404
UT3A	35.105688	-83.454228	480 LF	Non-wetland waters	Section 404
UT3B	35.106383	-83.45241	18 LF	Non-wetland waters	Section 404

UT3B	35.106433	-83.453222	539 LF	Non-wetland waters	Section 404
UT3B1	35.106293	-83.452603	77 LF	Non-wetland waters	Section 404
UT3C	35.107313	-83.452519	585 LF	Non-wetland waters	Section 404
UT3D – Intermittent	35.106556	-83.455321	47 LF	Non-wetland waters	Section 404
UT3E – Intermittent	35.107943	-83.45299	61 LF	Non-wetland waters	Section 404
UT4	35.100383	-83.457508	174 LF	Non-wetland waters	Section 404
UT5	35.101461	-83.454977	192 LF	Non-wetland waters	Section 404
UT6	35.103564	-83.454031	243 LF	Non-wetland waters	Section 404

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resources in review area (acreage and linear feet, if applicable	Type of aquatic resources (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
Wetland A	35.105586	-83.452981	0.155 AC	Wetland waters	Section 404
Wetland B	35.105969	-83.45431	0.314 AC	Wetland waters	Section 404
Wetland C	35.106531	-83.453929	0.040 AC	Wetland waters	Section 404
Wetland D	35.106548	-83.454101	0.006 AC	Wetland waters	Section 404
Wetland E	35.106634	-83.454056	0.003 AC	Wetland waters	Section 404
Wetland F	35.106526	-83.453584	0.028 AC	Wetland waters	Section 404
Wetland G	35.106477	-83.453355	0.033 AC	Wetland waters	Section 404
Wetland H	35.107422	-83.45191	0.058 AC	Wetland waters	Section 404
Wetland I	35.107498	-83.452007	0.017 AC	Wetland waters	Section 404
Wetland J	35.107972	-83.45289	0.030 AC	Wetland waters	Section 404
Wetland K	35.106605	-83.45507	0.138 AC	Wetland waters	Section 404
Wetland L	35.106712	-83.455475	0.002 AC	Wetland waters	Section 404
Wetland M	35.106687	-83.455877	0.052 AC	Wetland waters	Section 404
Wetland N	35.105684	-83.454692	0.600 AC	Wetland waters	Section 404
Wetland O	35.106231	-83.452418	0.070 AC	Wetland waters	Section 404
Wetland P	35.106404	-83.452285	0.012 AC	Wetland waters	Section 404
Wetland Q	35.106318	-83.455065	0.027 AC	Wetland waters	Section 404
Wetland R	35.107784	-83.452956	0.015 AC	Wetland waters	Section 404
Wetland S	35.105301	-83.455744	0.229 AC	Wetland waters	Section 404
Wetland T	35.104518	-83.454429	0.044 AC	Wetland waters	Section 404
Wetland U	35.099246	-83.456017	0.214 AC	Wetland waters	Section 404
Wetland V	35.100585	-83.456352	0.346 AC	Wetland waters	Section 404
Wetland W	35.102749	-83.454412	0.117 AC	Wetland waters	Section 404
Wetland X	35.103486	-83.454932	0.279 AC	Wetland waters	Section 404
Wetland Y	35.103143	-83.456073	0.005 AC	Wetland waters	Section 404
Wetland Z	35.102791	-83.456559	0.007 AC	Wetland waters	Section 404
Wetland AA	35.102712	-83.456887	0.033 AC	Wetland waters	Section 404

Wetland BB	35.102699	-83.457062	0.006 AC	Wetland waters	Section 404
Wetland CC	35.100829	-83.455485	0.009 AC	Wetland waters	Section 404
Wetland DD	35.100914	-83.455407	0.010 AC	Wetland waters	Section 404

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: **Wildlands Engineering, Inc.**
☒ Data sheets prepared/submitted by or on behalf of preliminary JD requester. **Wildlands 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: **Prentiss**
☒ Natural Resources Conservation Service (NRCS) Soil Survey.

Citation: **Macon 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. 3700 6562 00J, effective date May 4, 2009**

☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)

☒ Photographs: ☒ Aerial (Name & Date): **Google Earth Pro – Nov. 2017, Oct. 2015, Mar. 2013, Jun. 2008, Aug. 2005, Apr. 1998 and Apr. 1994**

☒ Other (Name & Date): **SAW Regulatory Viewers – USGS Hydrography Dataset and LIDAR DEM, Hillshade and Slope**

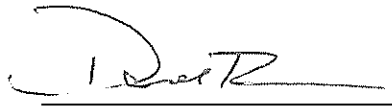
☐ Previous determination(s). File no. and date of response letter:

☐ 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).***

The streams on the property are UTs Jones Creek and Jones Creek. 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 streams are depicted as solid blue lines on the USGS 7.5 minute quadrangle map Prentiss and the most current Natural Resource Conservation Service Soil Survey for Macon County. The UTs Jones Creek flow into Jones Creek, which flows into Cartoogechaye Creek, and then into the Little Tennessee River, a traditional navigable river.

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.



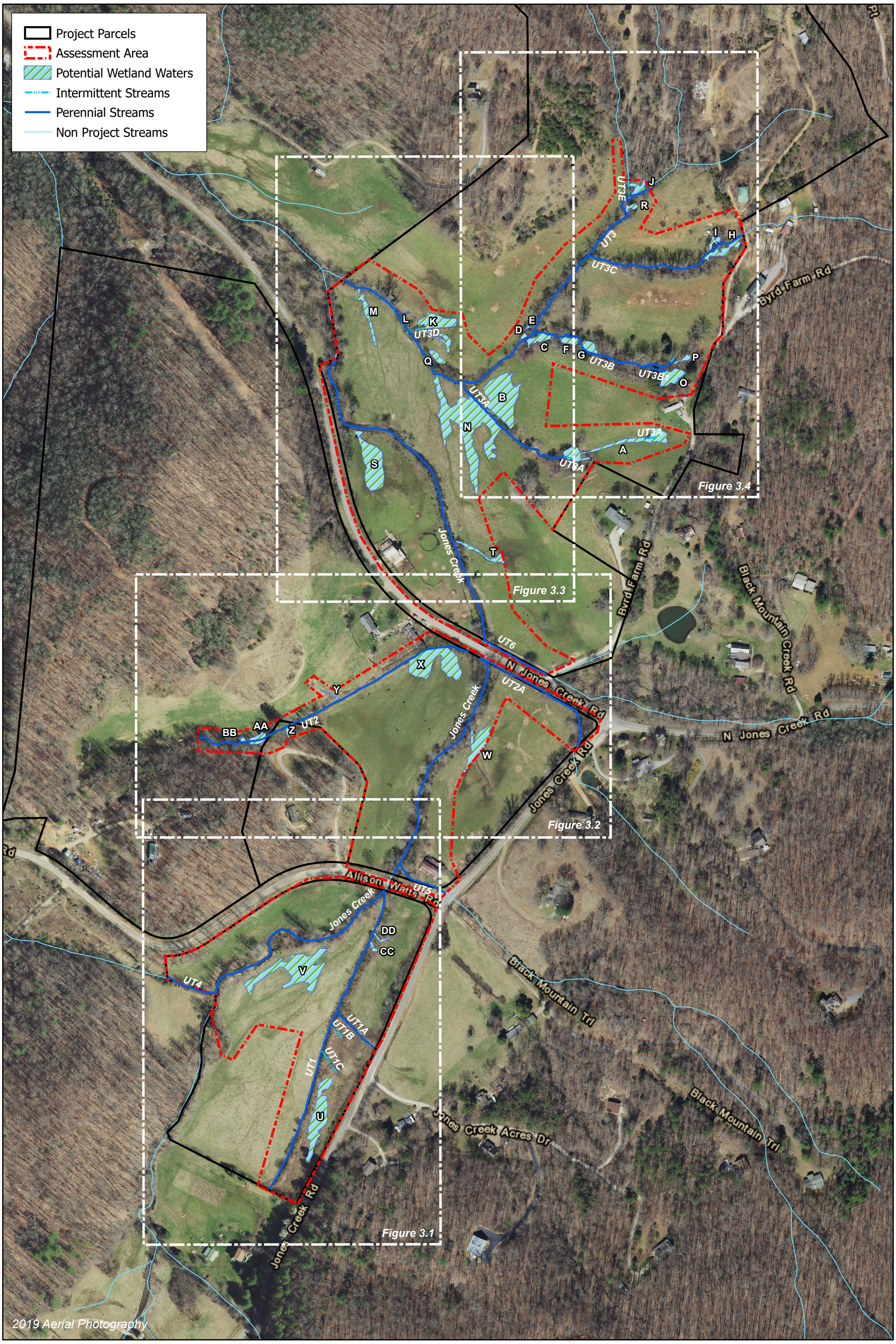
David Brown, October 28, 2021
Signature and date of Regulatory staff member completing preliminary JD

In File with submitted JD Request
Wildlands Engineering, Inc.
(signed and dated request preliminary JD per agent authorization)

Please sign this Preliminary JD Form. Keep a signed copy for your record and return a signed form 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.



WILDLANDS ENGINEERING

0 300 600 Feet

N

Figure 3.0 Delineation Map (Overview)
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

Macon County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 3.1 Delineation Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin (03050101)

Macon County, NC



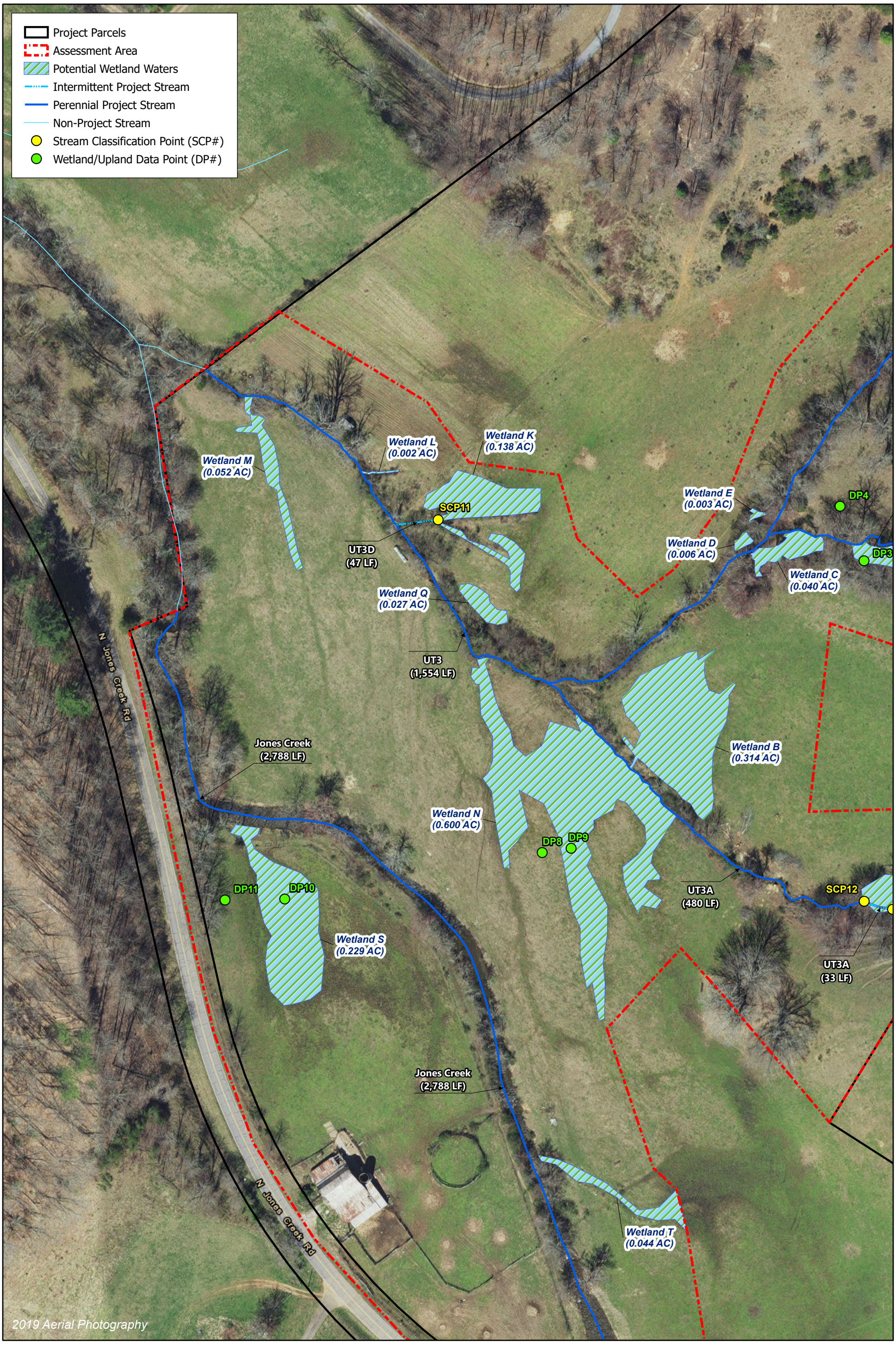
WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 3.2 Delineation Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

Macon County, NC



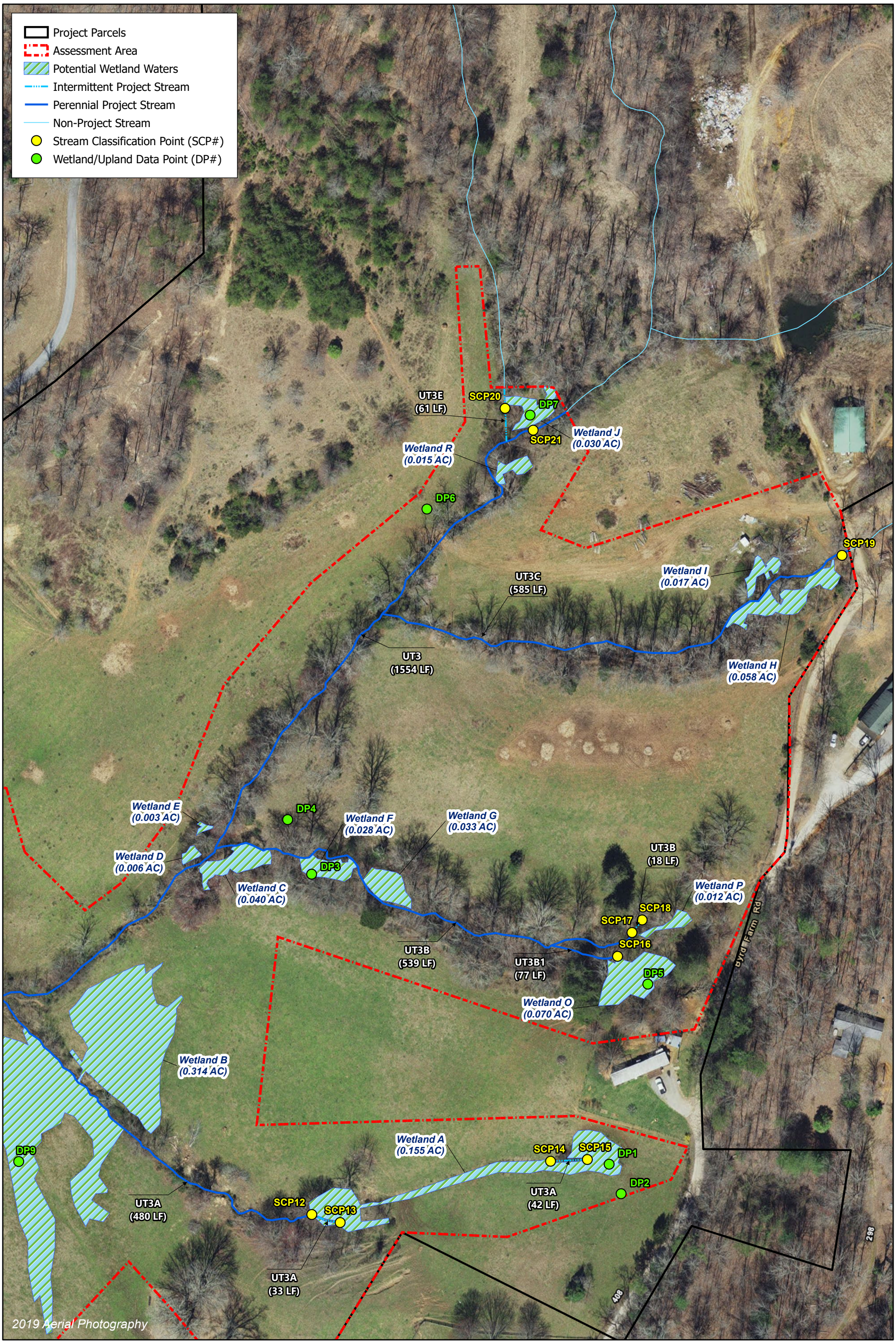
WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 3.3 Delineation Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

Macon County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 3.4 Delineation Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin (06010202)

Macon County, NC

APPENDIX 3 – DWR, NCSAM, and NCWAM Identification Forms

NC DWQ Stream Identification Form Version 4.11 Stream Classification Point 1 (SCP1)

Date: 3/24/2021	**Project/Site:** Cornbread	**Latitude:** 35.100339
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.457180
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 45.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** Jones Creek *e.g. Quad Name:*

A. Geomorphology (Subtotal = 26)	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 = 10)				
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 = 9.5)				
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 (10+), damselfly (2+), caddisfly (10+)

Sketch:

Stream Classification Point 2 (SCP2)

SCP2

NC DWQ Stream Identification Form Version 4.11

Date: 3/24/2021	Project/Site: Carbmead	Latitude: 35.100455
Evaluator: M. Caddell	County: Macon	Longitude: -83.457770
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 44.5	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other non project stream to JonesCreek R1a e.g. Quad Name:

A. Geomorphology (Subtotal = 24.5)	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

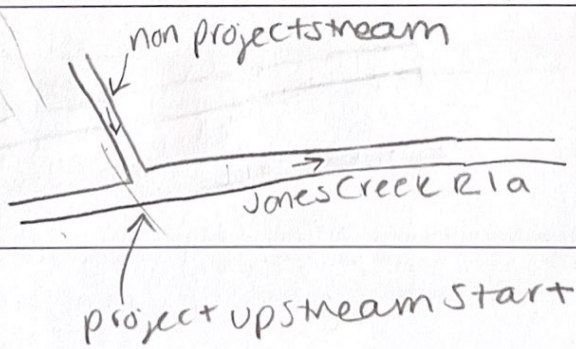
B. Hydrology (Subtotal = 10.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9.5)				
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 (3+), dragonfly, damselfly

Sketch:



NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 3 (SCP3)

Date: 3/24/2021	**Project/Site:** Cornbread	**Latitude:** 35.098557
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.456530
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 30.75	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* UT1

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 = 10)				
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)	

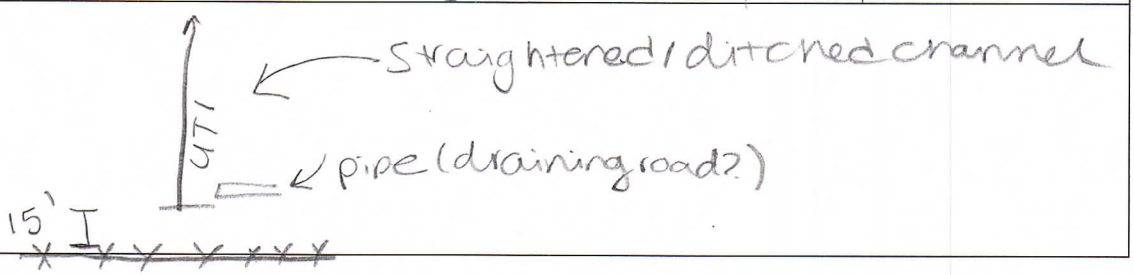
C. Biology (Subtotal = 10.75)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	(3)
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	0.5	(1)	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	(FACW = 0.75; OBL = 1.5 Other = 0)			

juncus/carex sp.

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: mayfly (2+), caddisfly (2+), dragonfly (2+), salamander (2+)

Sketch:



Stream Classification Point 4 (SCP4)

NC DWQ Stream Identification Form Version 4.11

Date: 3/24/2021	Project/Site: Cornbread	Latitude: 35.099657
Evaluator: M. Caddell	County: Macon	Longitude: -83.455818
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 26.25	Stream Determination (circle one) Ephemeral (Intermittent) Perennial	Other e.g. Quad Name: ditched stream #1 (to UT1)

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

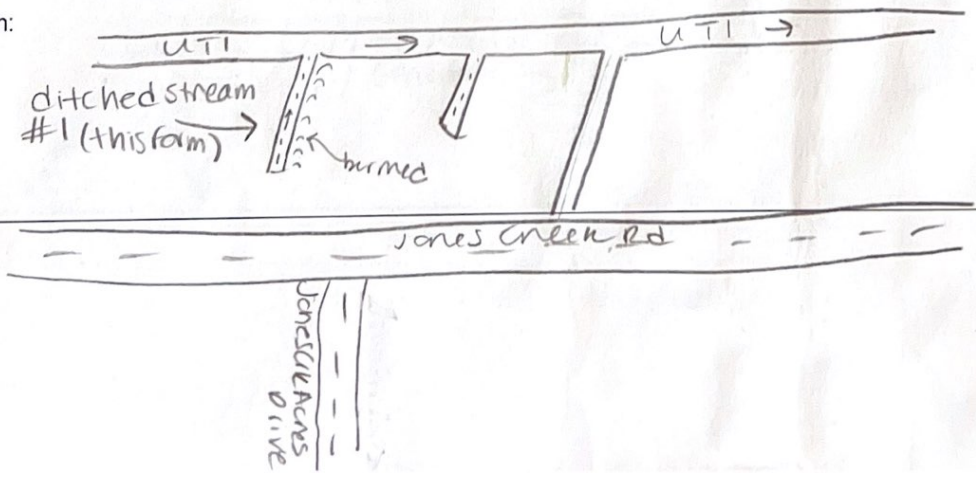
B. Hydrology (Subtotal = 9)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 9.75)				
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: dragonflies (3), midges (2T), salamanders (5T)

Sketch:



NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 5 (SCP5)

Date: 3/24/2021	**Project/Site:** Cornbread	**Latitude:** 35.099989
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.455~~779~~
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 25.25	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:* ditched stream #2 (to UT1)

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

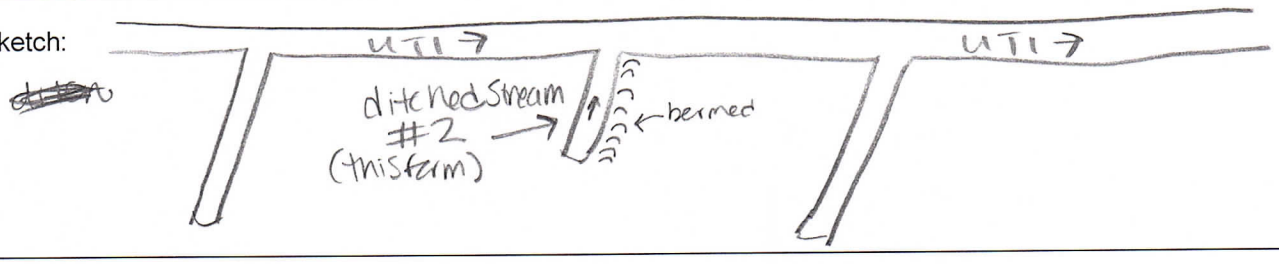
B. Hydrology (Subtotal = 8)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 8.75)				
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 sedge			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: mayfly, dragonfly, mullusk, salamander

Sketch:



Stream Classification Point 6 (SCP6)

NC DWQ Stream Identification Form Version 4.11

Date: 3/24/2021	Project/Site: Cornbread	Latitude: 35.099895
Evaluator: M. Caddell	County: Macon	Longitude: -83.455409
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 34	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other *e.g. Quad Name:* UT1A

A. Geomorphology (Subtotal = 14.5)	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

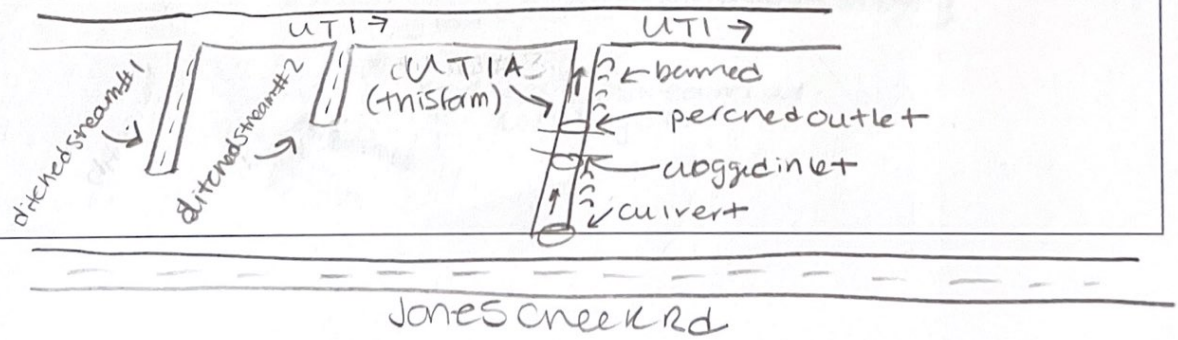
B. Hydrology (Subtotal = 10.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 9)				
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: dragonfly (2+), mayfly (2+), salamander

Sketch:



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Stream Classification Point 7 (SCP7)

Date: 3/24/2021	**Project/Site:** Cornbread	**Latitude:** 35.101478
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.455095
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 36.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* non project stream to Jones Creek KR3

A. Geomorphology (Subtotal = 18.5)	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

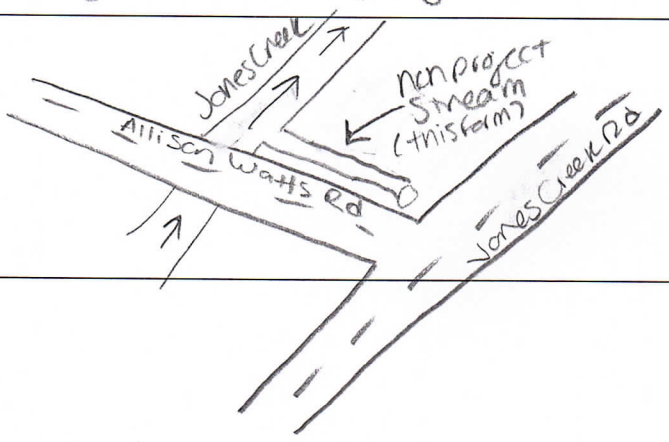
B. Hydrology (Subtotal = 9)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 9)				
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 (2+), mayfly, snail (2)

Sketch:



NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 8 (SCP8)

Date: 3/24/2021	**Project/Site:** Cornbread	**Latitude:** 35.102697
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.457560
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 33	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* UT2

A. Geomorphology (Subtotal = 14)	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

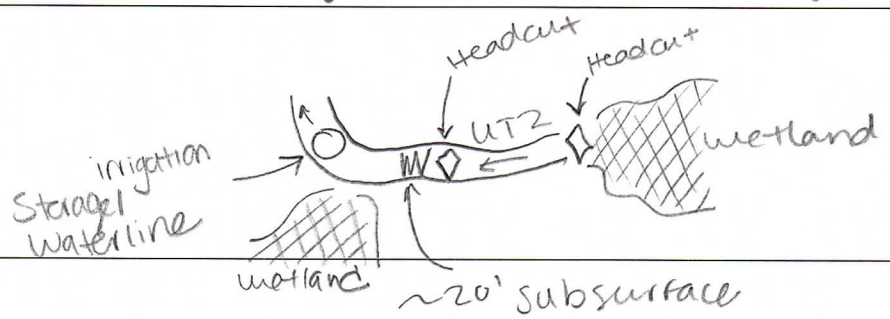
B. Hydrology (Subtotal = 9.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 9.5)				
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: salamander, Mayfly, Snail, caddisfly, hellgamite

Sketch:



NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 9 (SCP9)

Date: 4/29/21	**Project/Site:** Cornbread	**Latitude:** 35.102779
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.453295
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 33	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* UT2A

5 6 3

A. Geomorphology (Subtotal = 14)	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

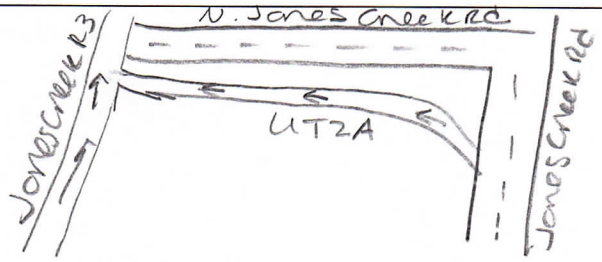
B. Hydrology (Subtotal = 10)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 9)				
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: damselfly, snail (2+), salamander

Sketch:



NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 10 (SCP10)

Date: 3/24/2021	**Project/Site:** Canbread	**Latitude:** 35.103658
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.457770
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 37.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** non project stream to Jones Crk R4 *e.g. Quad Name:*

A. Geomorphology (Subtotal = 20)	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)				
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:

Sketch:

Stream Classification Point 11 (SCP11)

NC DWQ Stream Identification Form Version 4.11

Date: 4/29/2021	Project/Site: Cornbread	Latitude: 35.106560
Evaluator: M. Cabbell	County: Macon	Longitude: -83.455229
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 23.5	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other ditchedstream#3 e.g. Quad Name: (to UT3)

A. Geomorphology (Subtotal = 7)	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

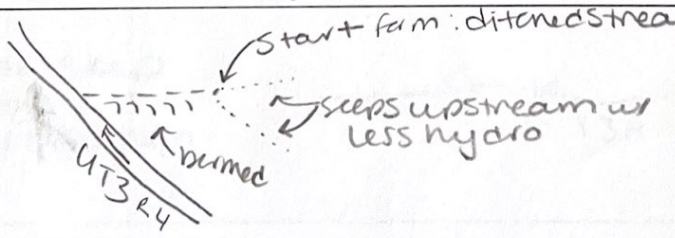
B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

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: Snails (3+), caddisfly, salamander(2)

Sketch:



Stream Classification Point 12 (SCP12)

NC DWQ Stream Identification Form Version 4.11

Date: 4/29/2021	Project/Site: Cornbread	Latitude: 35.1054571
Evaluator: M. Caddell	County: Macon	Longitude: -83,4535851
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 34.5	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other UT3A *e.g. Quad Name:* continued

A. Geomorphology (Subtotal = 14.5)	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 = 11.5)				
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)	

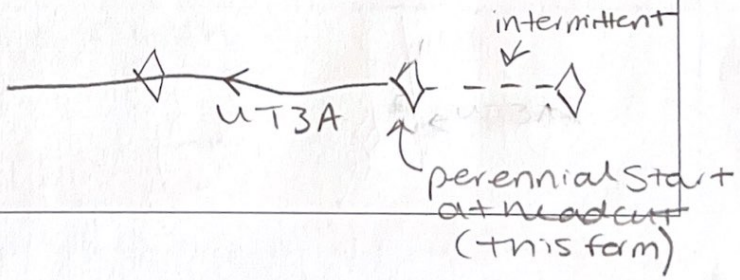
C. Biology (Subtotal = 8.5)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	(2)	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	(0.5)	1	1.5
24. Amphibians	0	(0.5)	1	1.5
25. Algae	0	(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: Salamander, caddisfly (3), crayfish, dragonfly, mayfly

Sketch:

Start below seep
meets intermittent
section and geomorph
is strange



NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 13 (SCP13)

Date: 4/29/2021	**Project/Site:** Cornbread	**Latitude:** 35.1054363
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.4534791
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 28	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:* UT3A continued

A. Geomorphology (Subtotal = 9.5)	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

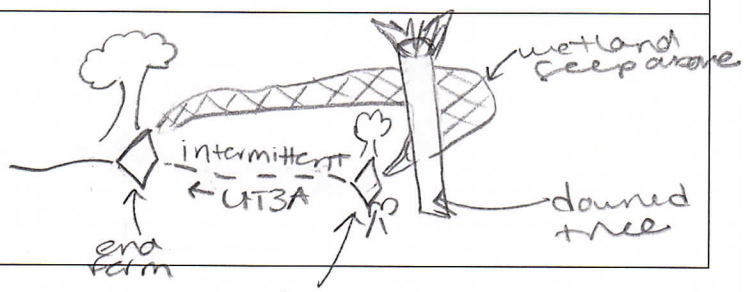
B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 10)				
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: Salamander (3+), dragonfly (2), caddisfly, aquatic worms

Sketch:
- Stronger valley down in bowl where jurisdictional stream starts again



Start at small headcut in between two maple trees

NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 14 (SCP14)

Date: 4/29/21	**Project/Site:** Cornbread	**Latitude:** 35.1056533
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.4527002
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 16.75	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** UT3A upper *e.g. Quad Name:*

A. Geomorphology (Subtotal = 3)	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)	

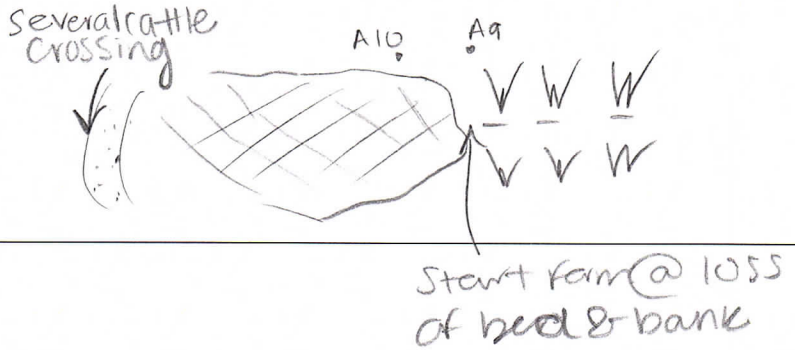
C. Biology (Subtotal = 6.25)				
18. Fibrous roots in streambed	3	2	1	(0)
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	(3)
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	(0.5)	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	(FACW = 0.75; OBL = 1.5 Other = 0 Juncus/sedge)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: dragonfly (10+), damselfly (2+), midge (2), frog

Sketch:

- wetland plants, 1055cf geomorphology due to no woody veg present and cattle trampling



NC DWQ Stream Identification Form Version 4.11 Stream Classification Point 15 (SCP15)

Date: 4/29/2021	**Project/Site:** Cornbread	**Latitude:** 35.107850
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.453021
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 23	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** UT3A upper *e.g. Quad Name:*

A. Geomorphology (Subtotal = 9)	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

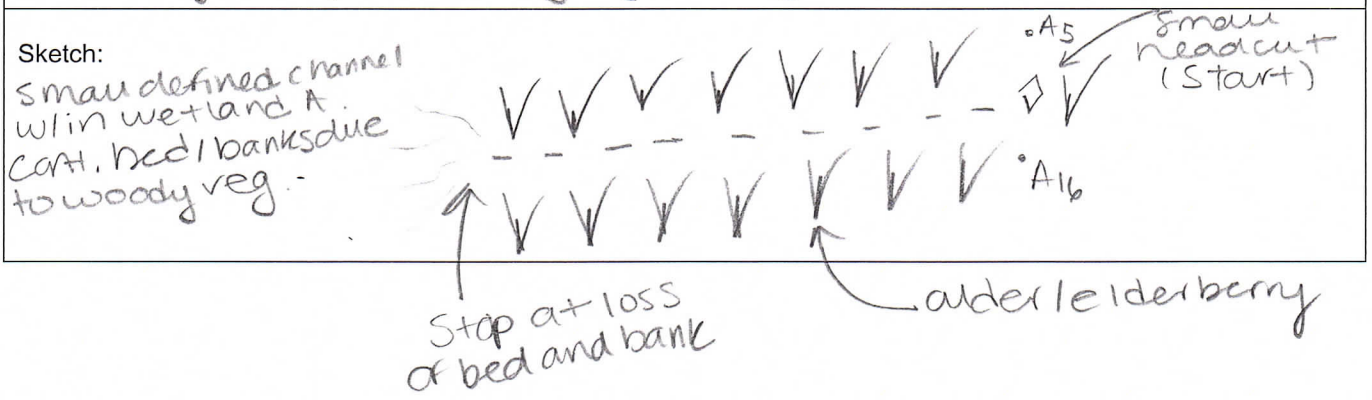
B. Hydrology (Subtotal = 9.5)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	1	(2)	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 4.5)				
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: dragonfly (6+), mayfly, midge

Sketch:



NC DWQ Stream Identification Form Version 4.11 Stream Classification Point 16 (SCP16)

Date: 4/29/2021	**Project/Site:** Cornbread	**Latitude:** 35.1062943
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.452482
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:* UT3B1

A. Geomorphology (Subtotal = 13)	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

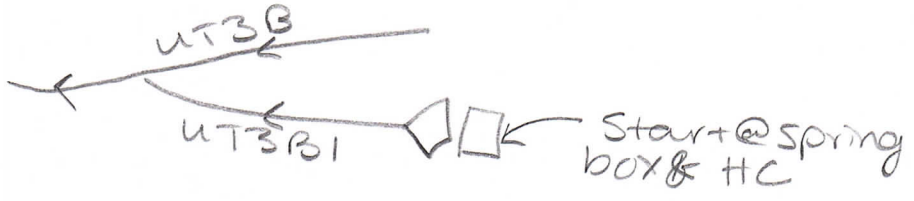
B. Hydrology (Subtotal = 11)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	1	(2)	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 8.5)				
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 (3+), frog, salamander, mayfly (2)

Sketch:



NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 17 (SCP17)

Date: 4/29/2021	**Project/Site:** Cornbread	**Latitude:** 35.106385
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.452377
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 32.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** UT3B *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

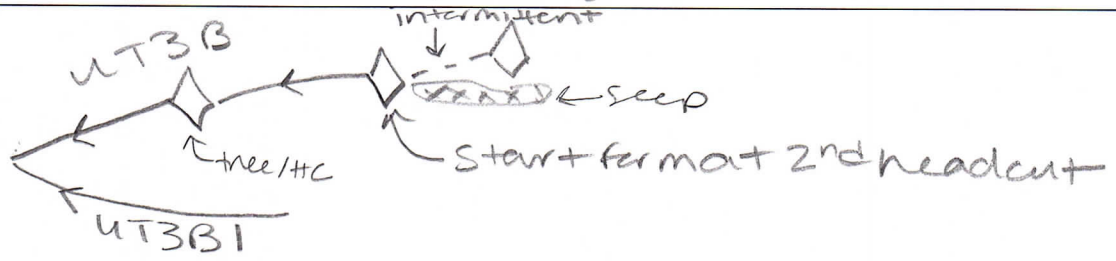
B. Hydrology (Subtotal = 10)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7.5)				
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 (3+), dragonfly (2)

Sketch:



NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 18 (SCP18)

Date: 4/29/2021	**Project/Site:** Cornbread	**Latitude:** 35.106405
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.452395
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 23.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** UT3B *e.g. Quad Name:* upper

A. Geomorphology (Subtotal = 9)	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

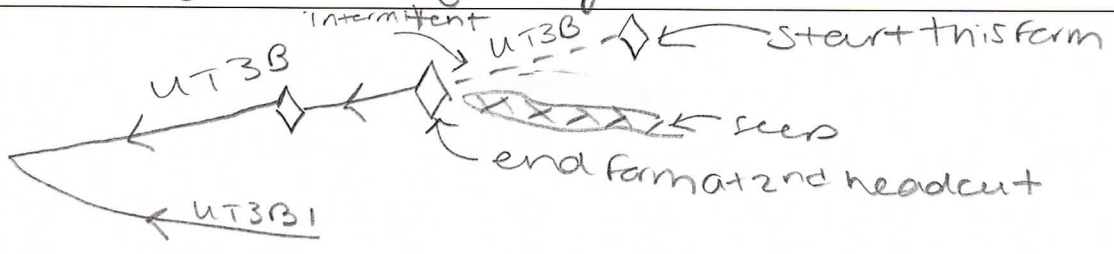
B. Hydrology (Subtotal = 7)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7.5)				
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 (4+), dragonfly (2)

Sketch:



NC DWQ Stream Identification Form Version 4.11 Stream Classification Point 19 (SCP19)

Date: 4/29/2021	**Project/Site:** Cornbread	**Latitude:** 35.1075773
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.4516831
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 42.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* UT3C

A. Geomorphology (Subtotal = 22)	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 = 10)				
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 = 10.5)				
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 (5+), mayfly (5+), stonefly, salamander (2+)

Sketch:

NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 20 (SCP20)

Date: 6/15/2021	**Project/Site:** Cornbread	**Latitude:** 35.107966
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.452993
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 24.75	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** non-project stream *e.g. Quad Name:* to UT3

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

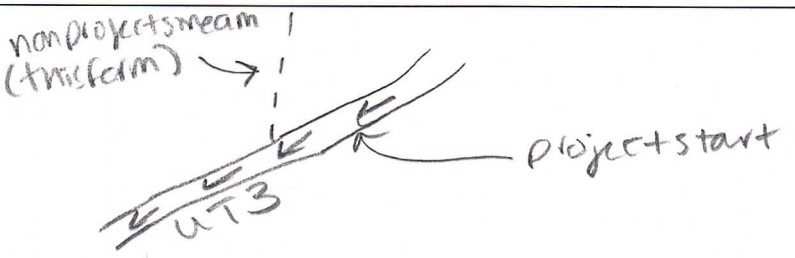
B. Hydrology (Subtotal = 8)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6.75)				
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 sedge)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: Crane fly, damselfly, dragonfly

Sketch:



NC DWQ Stream Identification Form Version 4.11 Stream Classification Point 21 (SCP21)

Date: 4/29/2021	**Project/Site:** Canbread	**Latitude:** 35.107913
Evaluator: M. Caddell	**County:** Macon	**Longitude:** -83.452866
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 46	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* UT3

A. Geomorphology (Subtotal = 23)	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)				
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 = 13.5)				
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: Mollusks (3+), mayfly (6+), stonefly (6+), caddisfly (3+), dragonfly (2), damselfly (2), salamander, crayfish

Sketch:

NC SAM FIELD ASSESSMENT FORM
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): Cornbread - Jones Creek Reach 1A
2. Date of evaluation: 3/24/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.100507, -83.457109

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Jones Reach 1A
10. Length of assessment reach evaluated (feet): ~100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4-5' ☐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 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] 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	Cornbread - Jones Creek Reach 1A	Date of Assessment	3/24/2021
Stream Category	Ma3	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**LOW**	
(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	**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	**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	**MEDIUM**	

NC SAM FIELD ASSESSMENT FORM
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): Cornbread - Jones Creek Reach 1B
2. Date of evaluation: 4/29/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.101352, -83.455376

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Jones Creek Reach 1B
10. Length of assessment reach evaluated (feet): ~300
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4-5 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 20-30
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 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] 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*******************

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	Cornbread - Jones Creek Reach 1B	Date of Assessment	4/29/2021
Stream Category	Ma3	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(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	**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	**HIGH**	
(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	**MEDIUM**	

NC SAM FIELD ASSESSMENT FORM
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): Cornbread - Jones Creek Reach 2
2. Date of evaluation: 4/29/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.100878, -83.456087

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Jones Creek Reach 2
10. Length of assessment reach evaluated (feet): ~350
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4-5 ☐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 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] 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*******************

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	Cornbread - Jones Creek Reach 2	Date of Assessment	4/29/2021
Stream Category	Ma3	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**LOW**	
(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	**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	**LOW**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(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 FORM
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): Cornbread - Jones Creek Reach 3
2. Date of evaluation: 4/29/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.103518, -83.454403

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Jones Creek Reach 3
10. Length of assessment reach evaluated (feet): ~850
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): 20-30
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 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] 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		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	Cornbread - Jones Creek Reach 3	Date of Assessment	4/29/2021
Stream Category	Ma3	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(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	**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	**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	**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	**MEDIUM**	

NC SAM FIELD ASSESSMENT FORM
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): Cornbread - Jones Creek Reach 4
2. Date of evaluation: 4/29/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.105574, -83.455509

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Jones Creek Reach 4
10. Length of assessment reach evaluated (feet): ~800
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 3-5 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 20-40
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] 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*******************

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	Cornbread - Jones Creek Reach 4	Date of Assessment	4/29/2021
Stream Category	Ma3	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**LOW**	
(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	**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	**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	**MEDIUM**	

NC SAM FIELD ASSESSMENT FORM
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): Cornbread - Jones Creek Reach 5
2. Date of evaluation: 4/29/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.106233, -83.456198

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Jones Creek Reach 5
10. Length of assessment reach evaluated (feet): ~325
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4-8 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 20-30
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 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] 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*******************

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	Cornbread - Jones Creek Reach 5	Date of Assessment	4/29/2021
Stream Category	Ma3	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**MEDIUM**	
(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	**MEDIUM**	
(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	**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 FORM
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): Cornbread - UT1 lower
2. Date of evaluation: 3/24/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.101302, -83.455378

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT1 lower
10. Length of assessment reach evaluated (feet): ~450
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 3-4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 5-7
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] 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	Cornbread - UT1 lower	Date of Assessment	3/24/2021
Stream Category	Ma1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(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	**MEDIUM**	
(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	**MEDIUM**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(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 FORM
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): Cornbread - UT1 upper
2. Date of evaluation: 3/24/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.100190, -83.455859

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT1 upper
10. Length of assessment reach evaluated (feet): ~600
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 3-4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 4-6
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] 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*******************

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	Cornbread - UT1 upper	Date of Assessment	3/24/2021
Stream Category	Ma1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**LOW**	
(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	**MEDIUM**	
(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	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(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 FORM
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): Cornbread - UT1A
2. Date of evaluation: 3/24/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.100205, -83.455850

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT1A
10. Length of assessment reach evaluated (feet): ~175
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1-4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 2-5
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 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] 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*******************

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	Cornbread - UT1A	Date of Assessment	3/24/2021
Stream Category	Ma1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**LOW**	
(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	**MEDIUM**	
(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	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(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 FORM
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): Cornbread - UT2 Reach 1
2. Date of evaluation: 3/24/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.102679, -83.456960

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT2 Reach 1
10. Length of assessment reach evaluated (feet): ~150
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1-4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 3-8
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 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] 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*******************

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	Cornbread - UT2 Reach 1	Date of Assessment	3/24/2021
Stream Category	Mb1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**LOW**	
(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	**HIGH**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**MEDIUM**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(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 FORM
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): Cornbread - UT2 Reach 2 lower
2. Date of evaluation: 3/24/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.103593, -83.454551

STREAM INFORMATION: (depth and width can be approximations)

UT2 Reach 2

9. Site number (show on attached map): lower
10. Length of assessment reach evaluated (feet): ~700
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2-3 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 4-6
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] 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*******************

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	Cornbread - UT2 Reach 2 lower	Date of Assessment	3/24/2021
Stream Category	Ma1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**LOW**	
(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	**MEDIUM**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**MEDIUM**	
(3) Thermoregulation	**LOW**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(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 FORM
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): Cornbread - UT2 Reach 2 Upper
2. Date of evaluation: 3/24/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.102819, -83.456575

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT2 Reach 2 Upper
10. Length of assessment reach evaluated (feet): ~120
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1-3 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 3-5
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 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] 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*******************

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	Cornbread - UT2 Reach 2 Upper	Date of Assessment	3/24/2021
Stream Category	Mb1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**LOW**	
(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	**MEDIUM**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**MEDIUM**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(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 FORM
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): Cornbread - UT2A
2. Date of evaluation: 4/29/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.103527, -83.454335

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT2A
10. Length of assessment reach evaluated (feet): ~500'
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2-4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 5-8
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 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] 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		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	Cornbread - UT2A	Date of Assessment	4/29/2021
Stream Category	Ma1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**HIGH**	
(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	**MEDIUM**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(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 FORM
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): Cornbread - UT3 Reach 1
2. Date of evaluation: 6/16/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.106570, -83.453998

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3 Reach 1
10. Length of assessment reach evaluated (feet): ~600
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2-4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 4-8
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 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] 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*******************

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	Cornbread - UT3 Reach 1	Date of Assessment	6/16/2021
Stream Category	Mb2	Assessor Name/Organization	M. Caddell

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	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(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	**LOW**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(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 FORM
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): Cornbread - UT3 Reach 2
2. Date of evaluation: 6/16/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.106073, 83.454788

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3 Reach 2
10. Length of assessment reach evaluated (feet): ~300
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2-5 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 5-10
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] 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		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	Cornbread - UT3 Reach 2	Date of Assessment	6/16/2021
Stream Category	Ma2	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(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	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(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	**MEDIUM**	
(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 FORM
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): Cornbread - UT3 Reach 3
2. Date of evaluation: 4/29/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.106430, -83.455293

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3 R3
10. Length of assessment reach evaluated (feet): ~200
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2-3 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 10
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] 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		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	Cornbread - UT3 Reach 3	Date of Assessment	4/29/2021
Stream Category	Ma2	Assessor Name/Organization	M. Caddell

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	YES
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	**MEDIUM**	
(4) Sediment Transport	**MEDIUM**	
(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	**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	**MEDIUM**	
(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 FORM
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): Cornbread - UT3 Reach 4
2. Date of evaluation: 4/29/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.106980, -83.456166

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3 Reach 4
10. Length of assessment reach evaluated (feet): ~350
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 3-4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 6-10
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] 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	Cornbread - UT3 Reach 4	Date of Assessment	4/29/2021
Stream Category	Ma2	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(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	**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	**HIGH**	
(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	**MEDIUM**	

NC SAM FIELD ASSESSMENT FORM
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): Cornbread - UT3A intermittent
2. Date of evaluation: 6/16/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.105639, -83.452537

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3A intermittent
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): 1-2
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] 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*******************

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	Cornbread - UT3A intermittent	Date of Assessment	6/16/2021
Stream Category	Mb1	Assessor Name/Organization	M. Caddell

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)	Intermittent

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

NC SAM FIELD ASSESSMENT FORM
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): Cornbread - UT3A perennial lower
2. Date of evaluation: 6/16/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.106074, -83.454792

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3A perennial lower
10. Length of assessment reach evaluated (feet): ~200
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1-3 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 2-3
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] 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*******************

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	Cornbread - UT3A perennial lower	Date of Assessment	6/16/2021
Stream Category	Ma1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**LOW**	
(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	**MEDIUM**	
(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	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**HIGH**	
(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 FORM
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): Cornbread - UT3A perennial upper
2. Date of evaluation: 6/16/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.105434, -83.453624

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3A perennial upper
10. Length of assessment reach evaluated (feet): ~200
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2-3 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 2-5
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 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] 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	Cornbread - UT3A perennial upper	Date of Assessment	6/16/2021
Stream Category	Mb1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**MEDIUM**	
(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	**LOW**	
(2) Baseflow	**MEDIUM**	
(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	**MEDIUM**	
(3) Substrate	**LOW**	
(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 FORM
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): Cornbread - UT3B
2. Date of evaluation: 6/16/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.106575, -83.453996

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3B
10. Length of assessment reach evaluated (feet): ~500
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1-4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 2-6
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] 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*******************

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	Cornbread - UT3B	Date of Assessment	6/16/2021
Stream Category	Mb1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(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	**LOW**	
(2) Baseflow	**MEDIUM**	
(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	**MEDIUM**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**MEDIUM**	
(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 FORM
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): Cornbread - UT3B1
2. Date of evaluation: 6/16/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.106313, -83.452704

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3B1
10. Length of assessment reach evaluated (feet): ~60
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1-2 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 2-3
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] 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*******************

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	Cornbread - UT3B1	Date of Assessment	6/16/2021
Stream Category	Mb1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(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	**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	**MEDIUM**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**MEDIUM**	
(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 FORM
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): Cornbread - UT3C Reach 1
2. Date of evaluation: 6/16/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.107235, -83.452762

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3C Reach 1
10. Length of assessment reach evaluated (feet): ~400
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2-5 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 3-6
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] 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*******************

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	Cornbread - UT3C Reach 1	Date of Assessment	6/16/2021
Stream Category	Mb1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(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	**MEDIUM**	
(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	**MEDIUM**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**MEDIUM**	
(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**	

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USACE AID #: NCDWR #:

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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): Cornbread - UT3C Reach 2
2. Date of evaluation: 6/16/2021
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Macon
6. Nearest named water body on USGS 7.5-minute quad: Jones/James Creek
7. River basin: Little Tennessee
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.107308, -83.453406

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT3C Reach 2
10. Length of assessment reach evaluated (feet): ~200
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2-4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 3-7
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)
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☐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] 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		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	Cornbread - UT3C Reach 2	Date of Assessment	6/16/2021
Stream Category	Mb1	Assessor Name/Organization	M. Caddell

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	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**MEDIUM**	
(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	**MEDIUM**	
(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	**LOW**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(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 WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#: NCDWR #:

Project Name	Cornbread Valley Mitigation Site	Date of Evaluation	6/15/21
Applicant/Owner Name	Wildlands Engineering, Inc.	Wetland Site Name	Wetland A
Wetland Type	Headwater Forest	Assessor Name/Organization	J.Hessler
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Jones Creek
River Basin	Little Tennessee	USGS 8-Digit Catalogue Unit	06010202
County	Macon	NCDWR Region	Asheville
○ Yes ◉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.10564, -83.45248

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately 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 of 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 for each group below. 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 foot 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 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). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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 dainage and/or overbank flow from affectio 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.

7b. How much of the first 50 feet from the bank is weltand? (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 tributary 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. 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 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 evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric 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, fields (pasture open and agriculture), or 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 directiions? 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.

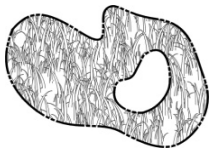
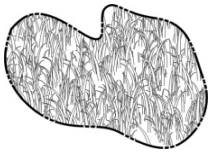
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

Wetland A is in an active cattle field.The wetland has been piped and filled.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland A	Date	6/15/21
Wetland Type	Headwater Forest	Assessor Name/Organization	J.Hessler

Notes on Field Assessment Form (Y/N)	YES
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)	NO
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	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		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/Notes	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 WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Cornbread Valley Mitigation Site	Date of Evaluation	6/15/21
Applicant/Owner Name	Wildlands Engineering, Inc.	Wetland Site Name	Wetland C, D, and E
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J.Hessler
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Jones Creek
River Basin	Little Tennessee	USGS 8-Digit Catalogue Unit	06010202
County	Macon	NCDWR Region	Asheville
○ Yes ◉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.1065, -83.45364

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately 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 of 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 for each group below. 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 foot 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 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). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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 dainage and/or overbank flow from affectio 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.

7b. How much of the first 50 feet from the bank is weltand? (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 tributary 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. 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 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 evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric 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, fields (pasture open and agriculture), or 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 directiions? 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.

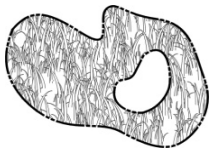
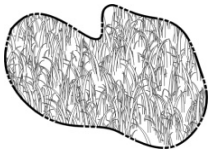
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

Wetland C, D, and E is in an active cattle field.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland C, D, and E	Date	6/15/21
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J.Hessler

Notes on Field Assessment Form (Y/N)	YES
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)	NO
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	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		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/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**MEDIUM**
	Condition/Opportunity	**MEDIUM**
	Opportunity Presence? (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **MEDIUM**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Cornbread Valley Mitigation Site	Date of Evaluation	6/15/21
Applicant/Owner Name	Wildlands Engineering, Inc.	Wetland Site Name	Wetland F, G, O, and P
Wetland Type	Headwater Forest	Assessor Name/Organization	J.Hessler
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Jones Creek
River Basin	Little Tennessee	USGS 8-Digit Catalogue Unit	06010202
County	Macon	NCDWR Region	Asheville
○ Yes ◉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.1062, -83.45236

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately 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 of 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 for each group below. 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 foot 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 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). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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 dainage and/or overbank flow from affectio 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.

7b. How much of the first 50 feet from the bank is weltand? (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 tributary 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. 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 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 evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric 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, fields (pasture open and agriculture), or 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 directiions? 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.

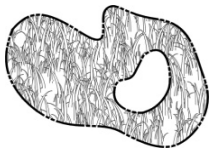
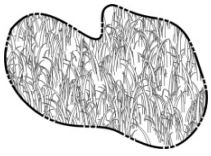
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

Wetland F, G, O, and P are in an active cattle pasture.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland F, G, O, and P	Date	6/15/21
Wetland Type	Headwater Forest	Assessor Name/Organization	J.Hessler

Notes on Field Assessment Form (Y/N)	YES
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)	NO
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	**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	**HIGH**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Condition	**MEDIUM**

Overall Wetland Rating **HIGH**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Cornbread Valley Mitigation Site	Date of Evaluation	6/15/21
Applicant/Owner Name	Wildlands Engineering, Inc.	Wetland Site Name	Wetland H, I, J, and R
Wetland Type	Headwater Forest	Assessor Name/Organization	J.Hessler
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Jones Creek
River Basin	Little Tennessee	USGS 8-Digit Catalogue Unit	06010202
County	Macon	NCDWR Region	Asheville
○ Yes ◉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.10764, -83.45327

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately 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 of 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 for each group below. 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 foot 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 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). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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 dainage and/or overbank flow from affectio 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.

7b. How much of the first 50 feet from the bank is weltand? (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 tributary 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. 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 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 evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric 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, fields (pasture open and agriculture), or 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 directiions? 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.

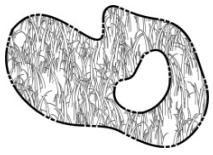
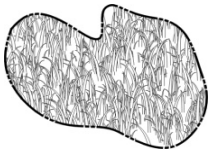
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

Wetlands H, I, J, and R are in an active cattle pasture.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland H, I, J, and R	Date	6/15/21
Wetland Type	Headwater Forest	Assessor Name/Organization	J.Hessler

Notes on Field Assessment Form (Y/N)	YES
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)	NO
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	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		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	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**MEDIUM**
	Condition/Opportunity	**MEDIUM**
	Opportunity Presence? (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **MEDIUM**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Cornbread Valley Mitigation Site	Date of Evaluation	6/15/21
Applicant/Owner Name	Wildlands Engineering, Inc.	Wetland Site Name	Wetland B, N, and Q
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J.Hessler
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Jones Creek
River Basin	Little Tennessee	USGS 8-Digit Catalogue Unit	06010202
County	Macon	NCDWR Region	Asheville
○ Yes ◉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.10556, -83.4548

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately 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 of 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 for each group below. 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 foot 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 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). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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 dainage and/or overbank flow from affectio 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.

7b. How much of the first 50 feet from the bank is weltand? (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 tributary 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. 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 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 evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric 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, fields (pasture open and agriculture), or 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 directiions? 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.

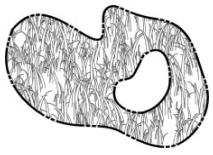
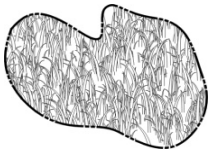
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

Wetlands B, N, and Q are in an active cattle pasture.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland B, N, and Q	Date	6/15/21
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J.Hessler

Notes on Field Assessment Form (Y/N)	YES
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)	NO
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	**LOW**
		Condition/Opportunity	**LOW**
		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	**LOW**
		Condition/Opportunity	**LOW**
		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/Notes	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 WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Cornbread Valley Mitigation Site	Date of Evaluation	6/15/21
Applicant/Owner Name	Wildlands Engineering, Inc.	Wetland Site Name	Wetland L, M, N, S, and T
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J.Hessler
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Jones Creek
River Basin	Little Tennessee	USGS 8-Digit Catalogue Unit	06010202
County	Macon	NCDWR Region	Asheville
○ Yes ◉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.10538, -83.45576

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately 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 of 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 for each group below. 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 foot 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 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). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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 dainage and/or overbank flow from affectio 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.

7b. How much of the first 50 feet from the bank is weltand? (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 tributary 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. 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 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 evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric 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, fields (pasture open and agriculture), or 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 directiions? 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.

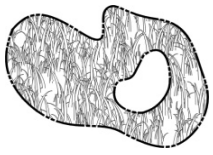
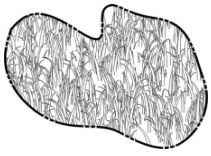
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

Wetlands L, M, S, and T are in an active cattle pasture.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland L, M, N, S, and T	Date	6/15/21
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J.Hessler

Notes on Field Assessment Form (Y/N)	YES
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	**LOW**
		Condition/Opportunity	**LOW**
		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/Notes	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 WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Cornbread Valley Mitigation Site	Date of Evaluation	6/15/21
Applicant/Owner Name	Wildlands Engineering, Inc.	Wetland Site Name	Wetland U, V, W, X, CC, and DD
Wetland Type	Seep	Assessor Name/Organization	J.Hessler
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Jones Creek
River Basin	Little Tennessee	USGS 8-Digit Catalogue Unit	06010202
County	Macon	NCDWR Region	Asheville
○ Yes ◉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.09955, -83.45596

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately 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 of 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 for each group below. 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 foot 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 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). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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 dainage and/or overbank flow from affectio 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.

7b. How much of the first 50 feet from the bank is weltand? (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 tributary 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. 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 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 evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric 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, fields (pasture open and agriculture), or 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 directiions? 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.

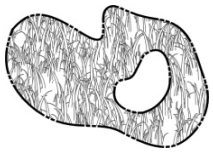
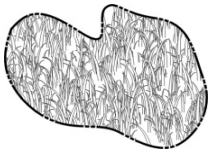
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

Wetlands U, V, W, X, CC, DD are in an active cattle pasture.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland U, V, W, X, CC, and DD	Date	6/15/21
Wetland Type	Seep	Assessor Name/Organization	J.Hessler

Notes on Field Assessment Form (Y/N)	YES
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	NA
	Sub-Surface Storage and Retention	Condition	NA
Water Quality	Pathogen Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Particulate Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	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	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	NA
	Opportunity Presence? (Y/N)	NA
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Cornbread Valley Mitigation Site	Date of Evaluation	6/15/21
Applicant/Owner Name	Wildlands Engineering, Inc.	Wetland Site Name	Wetland AA, BB, Z, and Y
Wetland Type	Headwater Forest	Assessor Name/Organization	J.Hessler
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Jones Creek
River Basin	Little Tennessee	USGS 8-Digit Catalogue Unit	06010202
County	Macon	NCDWR Region	Asheville
○ Yes ◉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.09955, -83.45596

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately 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 of 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 for each group below. 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 foot 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 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). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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 dainage and/or overbank flow from affectio 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.

7b. How much of the first 50 feet from the bank is weltand? (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 tributary 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. 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 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 evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric 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, fields (pasture open and agriculture), or 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 directiions? 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.

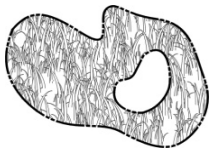
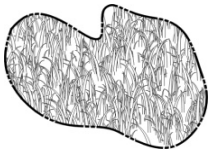
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

Wetlands AA, BB, Z, Y are in an active cattle pasture.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland AA, BB, Z, and Y	Date	6/15/21
Wetland Type	Headwater Forest	Assessor Name/Organization	J.Hessler

Notes on Field Assessment Form (Y/N)	YES
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)	NO
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	**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	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **HIGH**

APPENDIX 4 – Supplementary Design Information

Existing Conditions Geomorphic Parameters																							
Cornbread Valley Mitigation Site																							
Parameter	**Notation**	**Units**	**Jones Creek Reach 1a**		**Jones Creek Reach 2**		**Jones Creek Reach 1b**		**Jones Creek Reach 3**		**Jones Creek Reach 4**		**Jones Creek Reach 5**		**UT1**		**UT1A**		**UT2 Reach 1**		**UT2 Reach 2**	
			min	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**
stream type					C4		B4/C4		B3/C3		B3/C3		C3		G4		B5a/B4a		B4		B4	
drainage area	DA	AC	2722.6		2726.4		2732.3		2896.5		3153.5		3163.9		65.9		2.7		12.6		22.2	
drainage area	DA	sq mi	4.25		4.26		4.27		4.53		4.93		4.94		0.11		0.004		0.02		0.03	
bankfull cross-sectional area	A_{bkf}	SF			60.9		46.7		50.8		61.3		53.5		4.7		0.4		1.7		2.3	
avg velocity during bankfull event	v_{bkf}	fps			4.8		6.2		6.4		5.2		5.8		3.4		3.6		2.6		3.5	
width at bankfull	w_{bkf}	feet			38.3		30.0		29.8		36.4		35.1		7.4		1.9		5.6		4.3	
maximum depth at bankfull	d_{max}	feet			2.50		2.70		2.60		2.80		2.54		1.00		0.40		0.40		0.80	
mean depth at bankfull	d_{bkf}	feet			1.60		1.60		1.70		1.70		1.52		0.60		0.20		0.30		0.50	
bankfull width to depth ratio	w_{bkf}/d_{bkf}				24.1		19.3		17.5		21.6		23.1		11.5		7.9		18.1		8.0	
low bank height		feet			1.8		2.8		2.4		2.5		2.5		2.6		1.2		0.7		0.8	
bank height ratio	BHR				0.7 - 1.4		1.0		0.9		0.9		1.0		2.6		3.2		1.7		1.0	
floodprone area width	w_{fpa}	feet			306.4		58.3		55.0		60.0		141.9		10.1		4.4		7.7		9.1	
entrenchment ratio	ER				8.0		1.9		1.8		1.6		4.0		1.4		2.3		1.4		2.1	
max pool depth at bankfull	d_{pool}	feet			3.6		N/A		N/A				3.9		1.3		0.6		N/A		1.4	
pool depth ratio	d_{pool}/d_{bkf}				2.3		N/A		N/A		N/A		2.6		2.2		3.0		N/A		2.8	
pool width at bankfull	w_{pool}	feet			61.3		N/A		N/A		N/A		32.8		6.9		1.9		N/A		7.5	
pool width ratio	w_{pool}/w_{bkf}				1.6		N/A		N/A		N/A		0.9		0.9		1.0		N/A		1.7	
Bkf pool cross-sectional area	A_{pool}	SF			80.50		N/A		N/A		N/A		61.24		6.20		0.80		N/A		3.50	
pool area ratio	A_{pool}/A_{bkf}				1.3		N/A		N/A		N/A		1.1		1.3		2.0		N/A		1.5	
pool-pool spacing	p-p	feet			42	110	N/A	N/A	32	172	50	230	24	155	12	33	4	11	N/A	N/A	12	30
pool-pool spacing ratio	$p\text{-}p/W_{bkf}$				1.1	2.9	N/A	N/A	1.1	5.8	1.4	6.3	0.7	4.4	1.7	4.5	2.1	5.8	N/A	N/A	2.9	7.0
valley slope	S_{valley}	feet/foot	0.0292		0.0201		0.0232		0.0216		0.0142		0.0194		0.0244		0.0931		0.0410		0.0419	
channel slope	$S_{channel}$	feet/foot	0.0290		0.0160		0.0217		0.0193		0.0126		0.0180		0.0210		0.0905		0.0313		0.0395	
sinuosity	K		1.09		1.22		1.03		1.06		1.03		1.28		1.01		1.05		1.11		1.03	

Refer to JC Reach 1b for overall parameters that summarize JC Reach 1a/1b

Note: Stream pattern parameters other than sinuosity not reported due to limited channel pattern inherent of stream types (step-pool morphology) located within steep valleys and/or from channelized alignments.

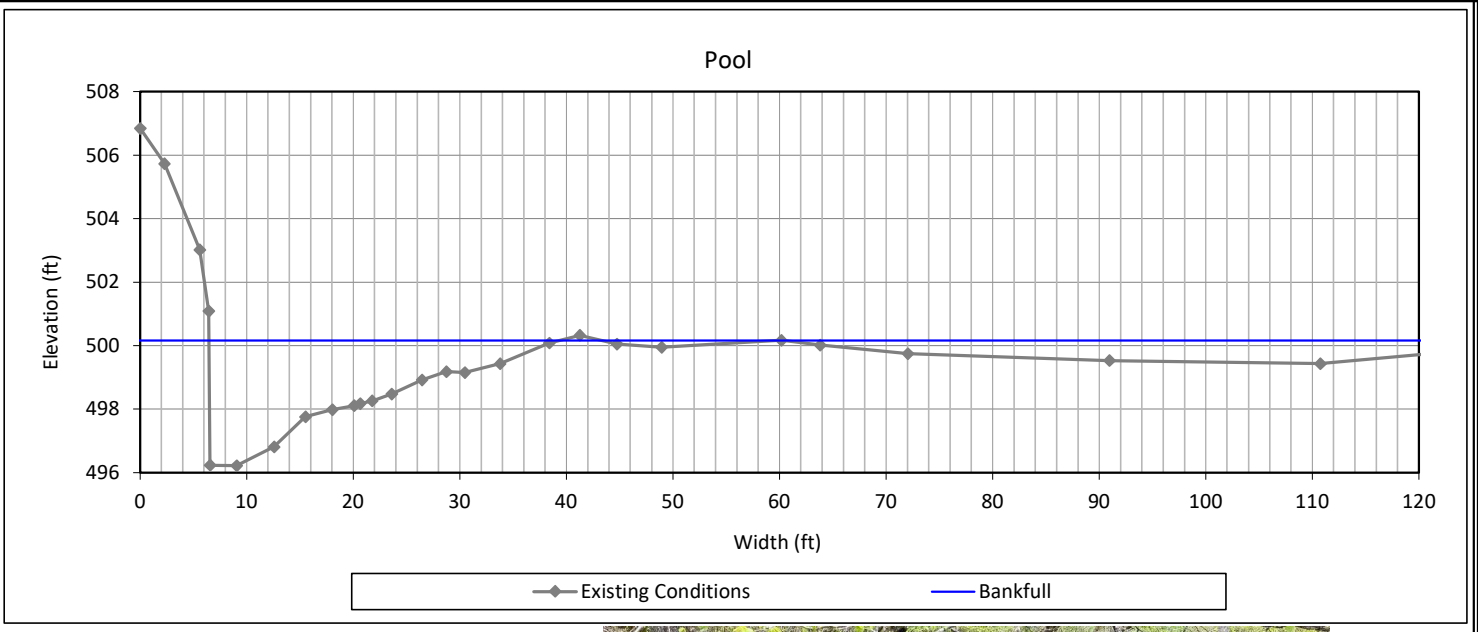
N/A - Channelized stream channel with limited pattern and bed form profile variability. Stream profile parameters not reported for Enhancement II reaches.

Existing Conditions Geomorphic Parameters																						
Cornbread Valley Mitigation Site																						
Parameter	**Notation**	**Units**	**UT2A**		**UT3 Reach 1**		**UT3 Reach 2**		**UT3 Reach 3**		**UT3 Reach 4**		**UT3A Reach 1**		**UT3A Reach 2**		**UT3B**		**UT3B1**		**UT3C Reach 1**		**UT3C Reach 2**	
			min	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**
stream type			G4		G4		Incised C4b		Incised E4		C4				B5a		F4b		B4a		Incised B4a		Incised B4a	
drainage area	DA	AC	14.3		156.0		158.3		173.8		180.9		11.1		12.9		7.2		1.0		53.2		54.2	
drainage area	DA	sq mi	0.02		0.24		0.25		0.27		0.28		0.02		0.02		0.01		0.002		0.08		0.08	
bankfull cross-sectional area	A_{bkf}	SF	3.9		9.3		10.3		11.5		9.4				1.4		0.7		0.6		3.5		3.9	
avg velocity during bankfull event	v_{bkf}	fps	5.2		5.7		4.7		4.9		4.6		Geomorphic data was not collected on UT3A Reach 1 due to cattle trampling impacts.		2.6		3.0		3.1		3.9		4.0	
width at bankfull	w_{bkf}	feet	5.2		8.1		11.6		7.8		11.2				5.3		3.3		3.9		6.1		10.6	
maximum depth at bankfull	d_{max}	feet	1.00		1.40		1.80		1.90		1.60				0.50		0.30		0.20		0.90		0.60	
mean depth at bankfull	d_{bkf}	feet	0.80		1.20		0.90		1.50		0.80				0.30		0.20		0.20		0.60		0.40	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		6.9		7.0		13.0		5.2		13.3				20.7		16.2		23.2		10.6		28.8	
low bank height		feet	2.0		4.4		3.0		2.8		2.4				2.8		0.8		0.2		1.6		2.2	
bank height ratio	BHR		2.0		3.1		1.7		1.5		1.5				5.8		2.8		1.0		1.7		3.7	
floodprone area width	w_{fpa}	feet	7.3		9.6		32.6		41.8		25.4				7.5		3.9		7.4		10.8		13.0	
entrenchment ratio	ER		1.4		1.2		2.8		5.4		2.3				1.4		1.2		1.9		1.8		1.2	
max pool depth at bankfull	d_{pool}	feet	1.3		2.2		N/A		2.5		N/A				1.1		0.9		N/A		N/A		1.3	
pool depth ratio	d_{pool}/d_{bkf}		1.6		1.8		N/A		1.7		N/A				3.7		4.5		N/A		N/A		3.3	
pool width at bankfull	w_{pool}	feet	4.1		9.6		N/A		6.9		N/A				8.5		4.4		N/A		N/A		6.2	
pool width ratio	w_{pool}/w_{bkf}		0.8		1.2		N/A		0.9		N/A				1.6		1.3		N/A		N/A		0.6	
Bkf pool cross-sectional area	A_{pool}	SF	4.00		15.10		N/A		12.80		N/A				3.40		2.40		N/A		N/A		4.80	
pool area ratio	A_{pool}/A_{bkf}		1.0		1.6		N/A		1.1		N/A				2.4		3.4		N/A		N/A		1.2	
pool-pool spacing	p-p	feet	5	21	14	33	N/A	N/A	18	55	18	55			6	15	7	34	N/A	N/A	N/A	N/A	25	28
pool-pool spacing ratio	$p\text{-}p/W_{bkf}$		1.0	4.0	1.7	4.1	N/A	N/A	2.3	7.1	1.6	4.9			1.0	2.8	2.0	10.3	N/A	N/A	N/A	N/A	2.4	2.7
valley slope	S_{valley}	feet/foot	0.0459		0.0410		0.0317		0.0199		0.0194		0.1111		0.0414		0.0853		0.1212		0.0866		0.0805	
channel slope	$S_{channel}$	feet/foot	0.0420		0.0384		0.0272		0.0177		0.0182		0.1076		0.0383		0.0708		0.0997		0.0794		0.0754	
sinuosity	K		1.04		1.07		1.08		1.10		1.05		1.02		1.08		1.13		1.01		1.10		1.04	

Note: Stream pattern parameters other than sinuosity not reported due to limited channel pattern inherent of stream types (step-pool morphology) located within steep valleys and/or from channelized alignments.

N/A - Channelized stream channel with limited pattern and bed form profile variability. Stream profile parameters not reported for Enhancement II reaches.

Cross Section 1, Jones Creek Reach 5

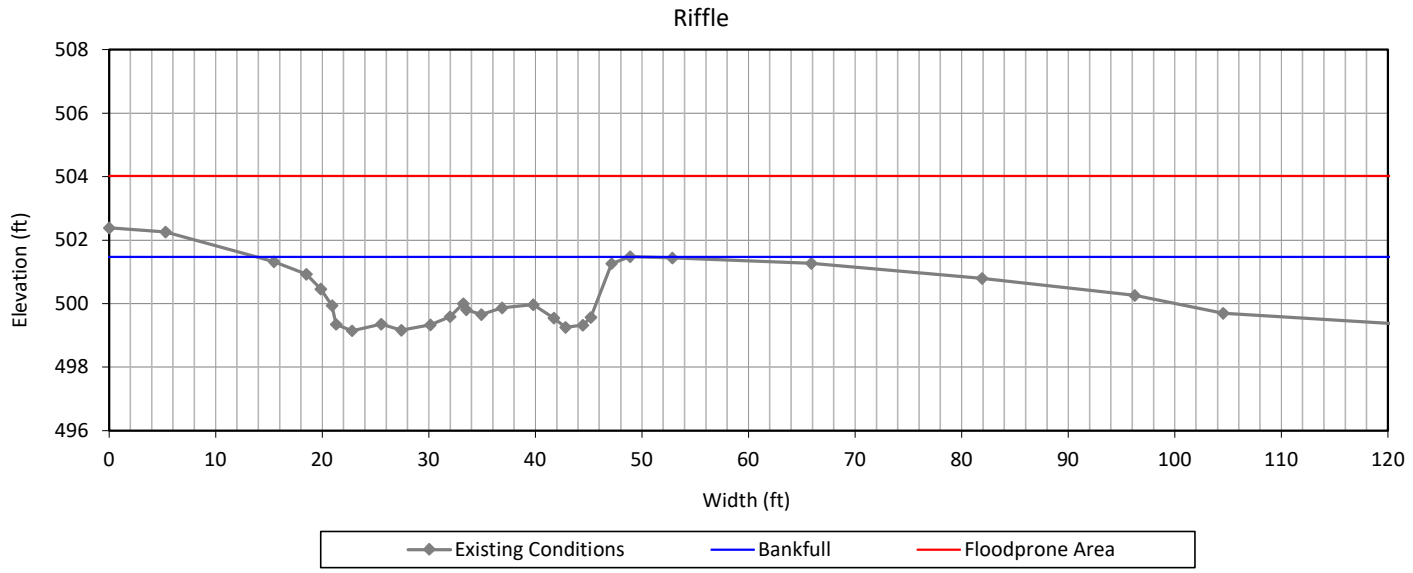


Bankfull Dimensions	
61.2	x-section area (ft.sq.)
32.8	width (ft)
1.9	mean depth (ft)
3.9	max depth (ft)
37.0	wetted perimeter (ft)
1.7	hyd radi (ft)
17.6	width-depth ratio
116.3	W flood prone area (ft)
3.5	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 2, Jones Creek Reach 5

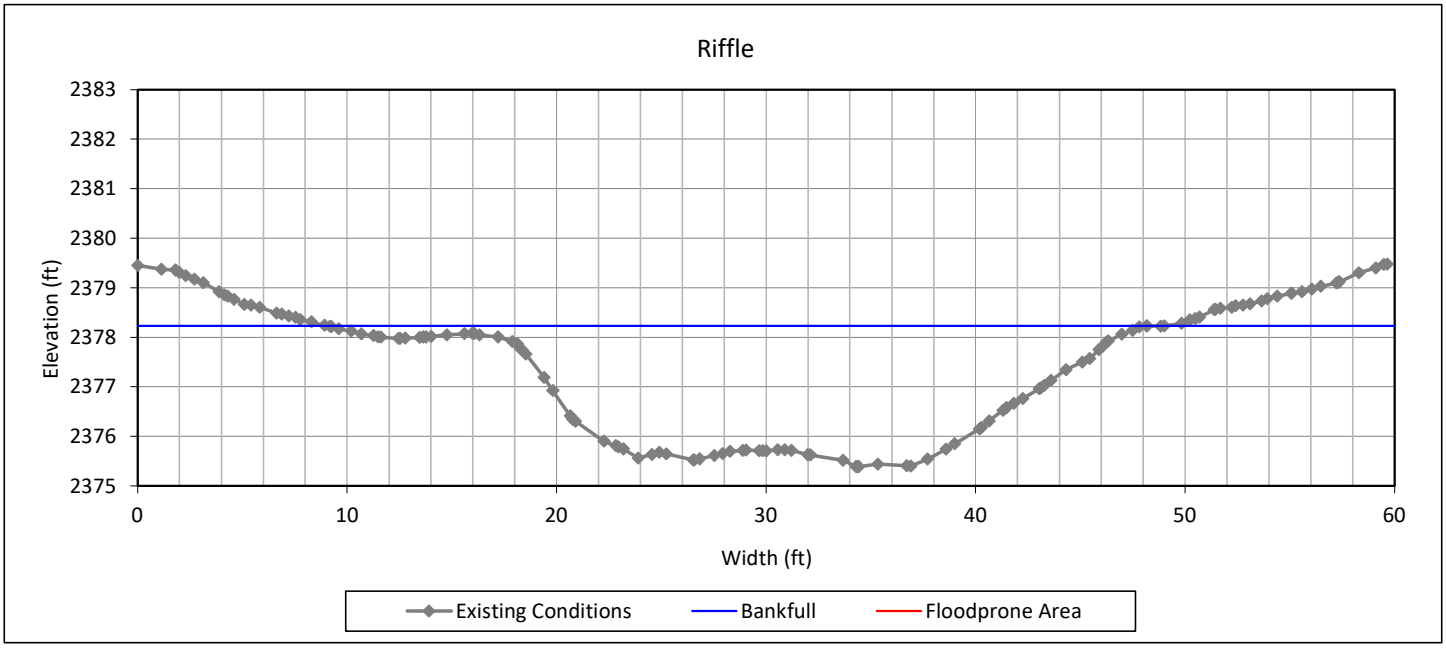


Bankfull Dimensions	
53.5	x-section area (ft.sq.)
35.1	width (ft)
1.5	mean depth (ft)
2.5	max depth (ft)
36.7	wetted perimeter (ft)
1.5	hyd radi (ft)
23.1	width-depth ratio
141.9	W flood prone area (ft)
4.0	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 3, Jones Creek Reach 4

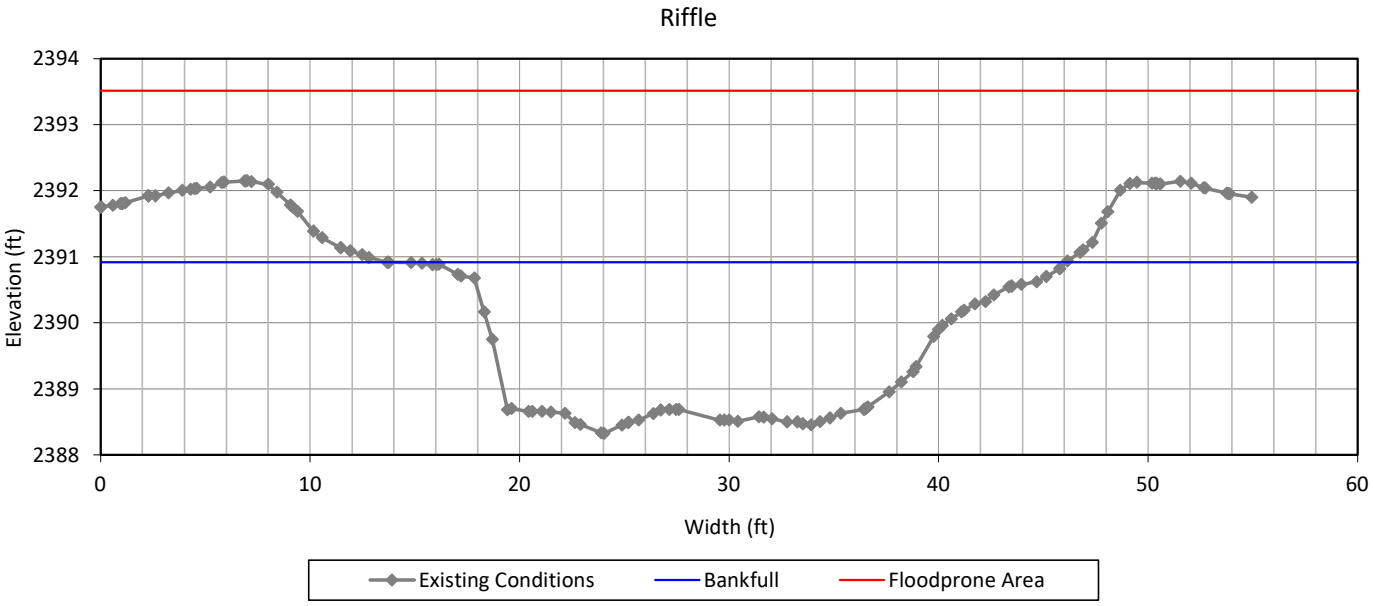


Bankfull Dimensions	
61.3	x-section area (ft.sq.)
36.4	width (ft)
1.7	mean depth (ft)
2.8	max depth (ft)
37.2	wetted perimeter (ft)
1.6	hyd radi (ft)
21.6	width-depth ratio
60.0	W flood prone area (ft)
1.6	entrenchment ratio
0.9	low bank height ratio

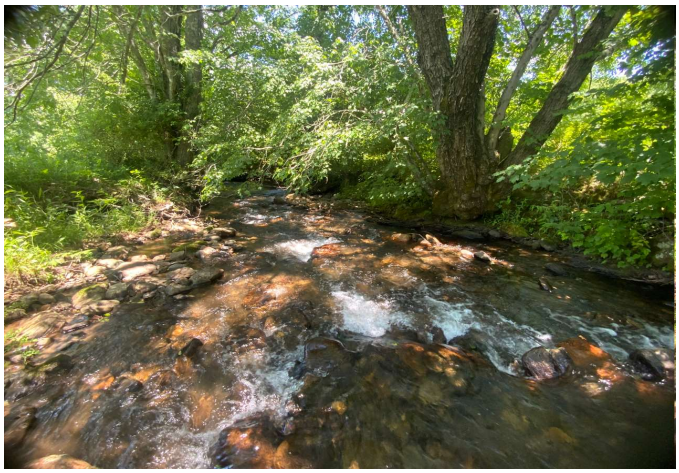


View Downstream

Cross Section 4, Jones Creek Reach 3

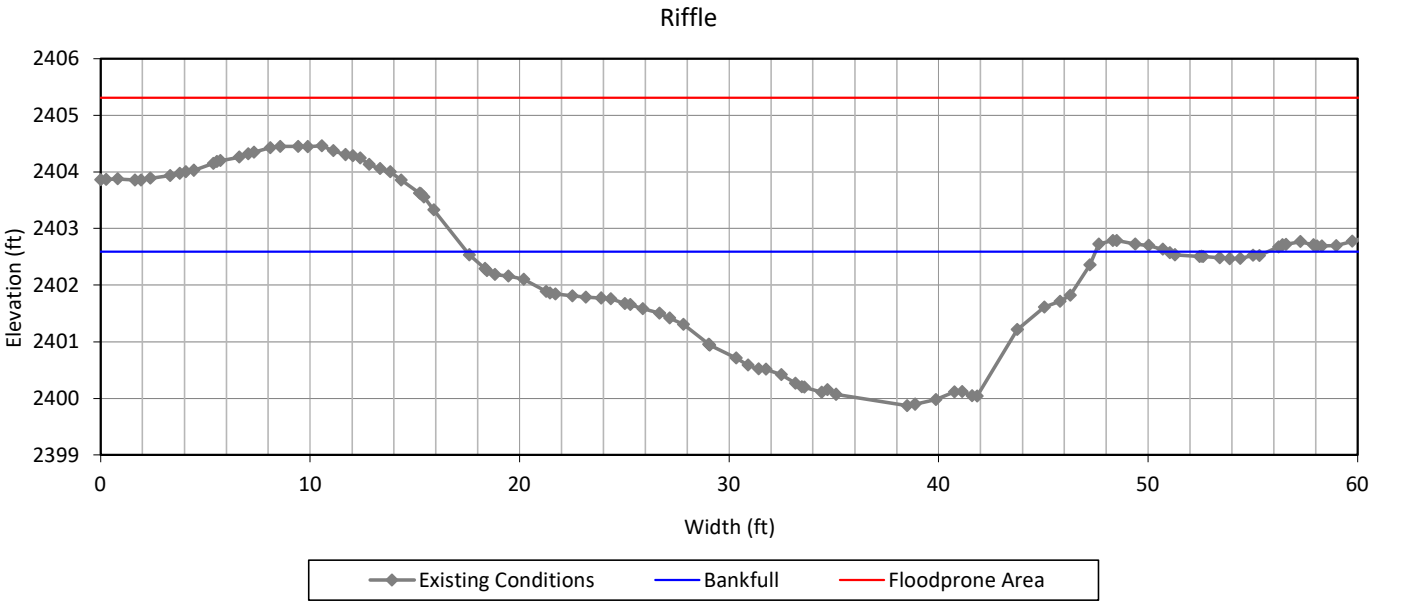


Bankfull Dimensions	
50.8	x-section area (ft.sq.)
29.8	width (ft)
1.7	mean depth (ft)
2.6	max depth (ft)
31.2	wetted perimeter (ft)
1.6	hyd radi (ft)
17.5	width-depth ratio
55.0	W flood prone area (ft)
1.8	entrenchment ratio
0.9	low bank height ratio



View Downstream

Cross Section 5, Jones Creek Reach 1b

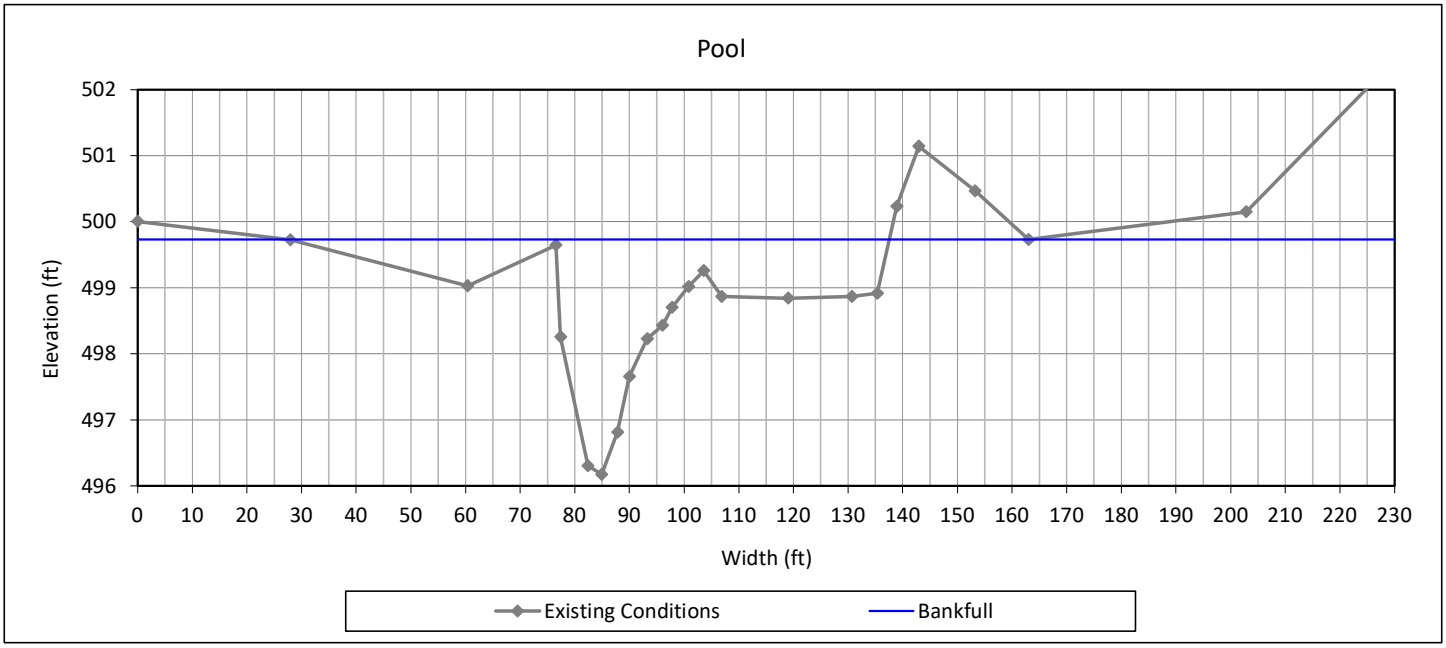


Bankfull Dimensions	
46.7	x-section area (ft.sq.)
30.0	width (ft)
1.6	mean depth (ft)
2.7	max depth (ft)
30.9	wetted perimeter (ft)
1.5	hyd radi (ft)
19.3	width-depth ratio
58.3	W flood prone area (ft)
1.9	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 6, Jones Creek Reach 2

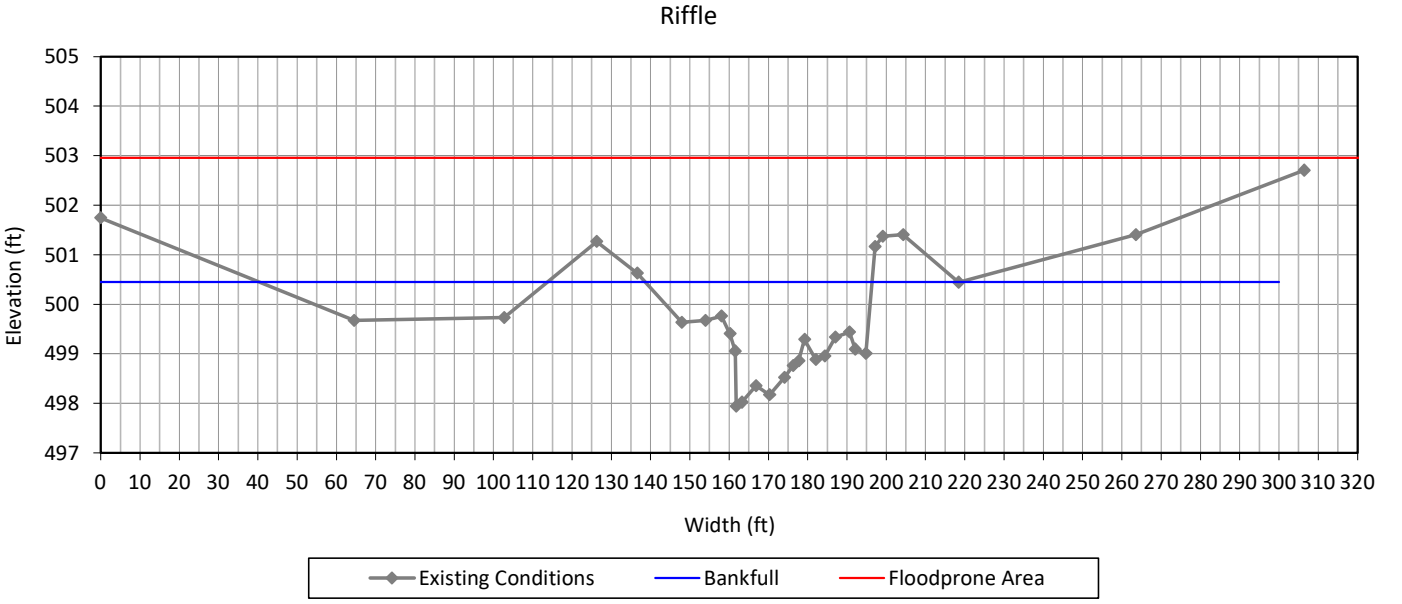


Bankfull Dimensions	
80.5	x-section area (ft.sq.)
61.3	width (ft)
1.3	mean depth (ft)
3.6	max depth (ft)
62.9	wetted perimeter (ft)
1.3	hyd radi (ft)
46.7	width-depth ratio
227.5	W flood prone area (ft)
3.7	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 7, Jones Creek Reach 2

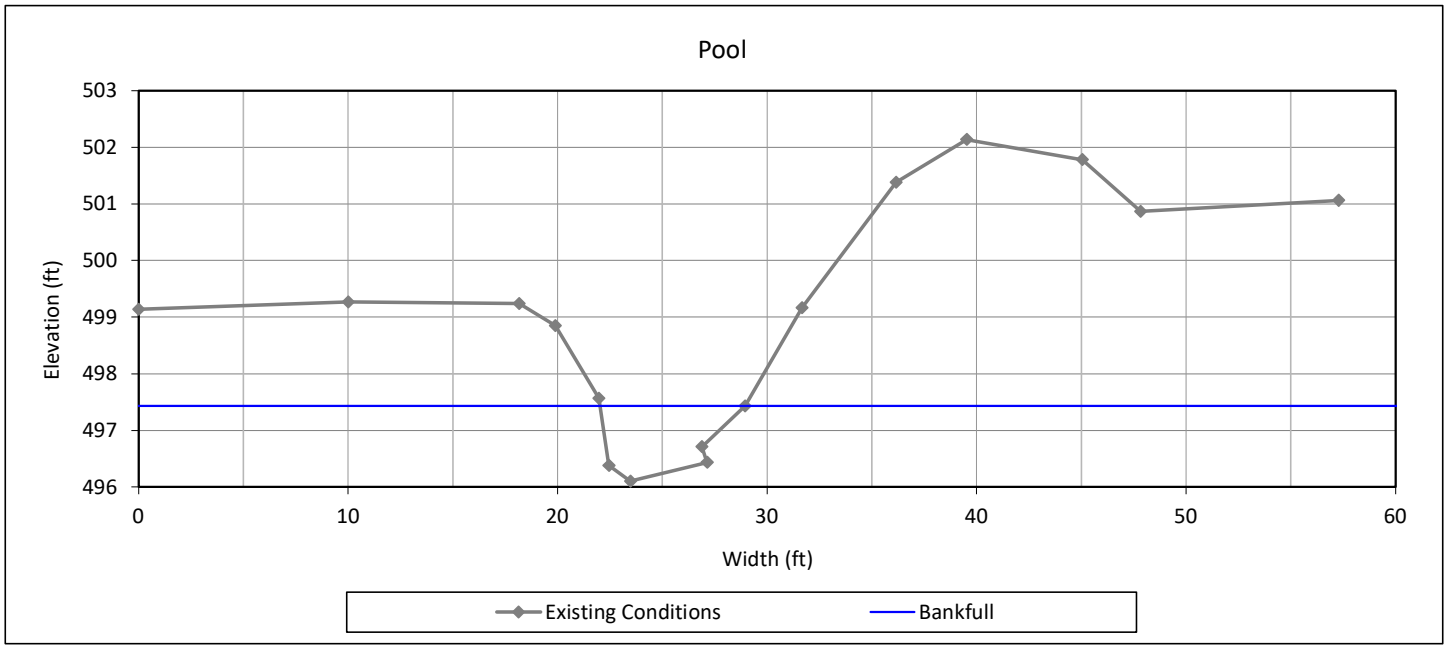


Bankfull Dimensions	
60.9	x-section area (ft.sq.)
38.3	width (ft)
1.6	mean depth (ft)
2.5	max depth (ft)
40.1	wetted perimeter (ft)
1.5	hyd radi (ft)
24.1	width-depth ratio
306.4	W flood prone area (ft)
8.0	entrenchment ratio
0.7	low bank height ratio



View Downstream

Cross Section 8, UT1

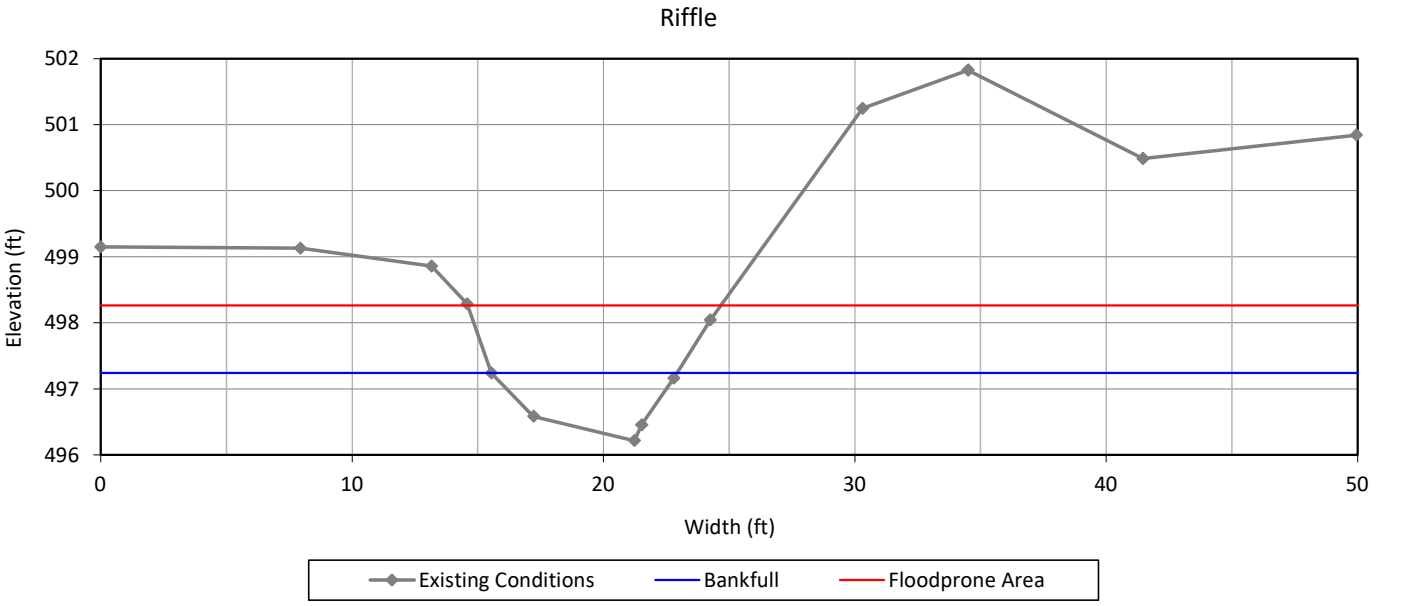


Bankfull Dimensions	
6.2	x-section area (ft.sq.)
6.9	width (ft)
0.9	mean depth (ft)
1.3	max depth (ft)
8.4	wetted perimeter (ft)
0.7	hyd radi (ft)
7.7	width-depth ratio
10.0	W flood prone area (ft)
1.4	entrenchment ratio
2.1	low bank height ratio



View Downstream

Cross Section 9, UT1

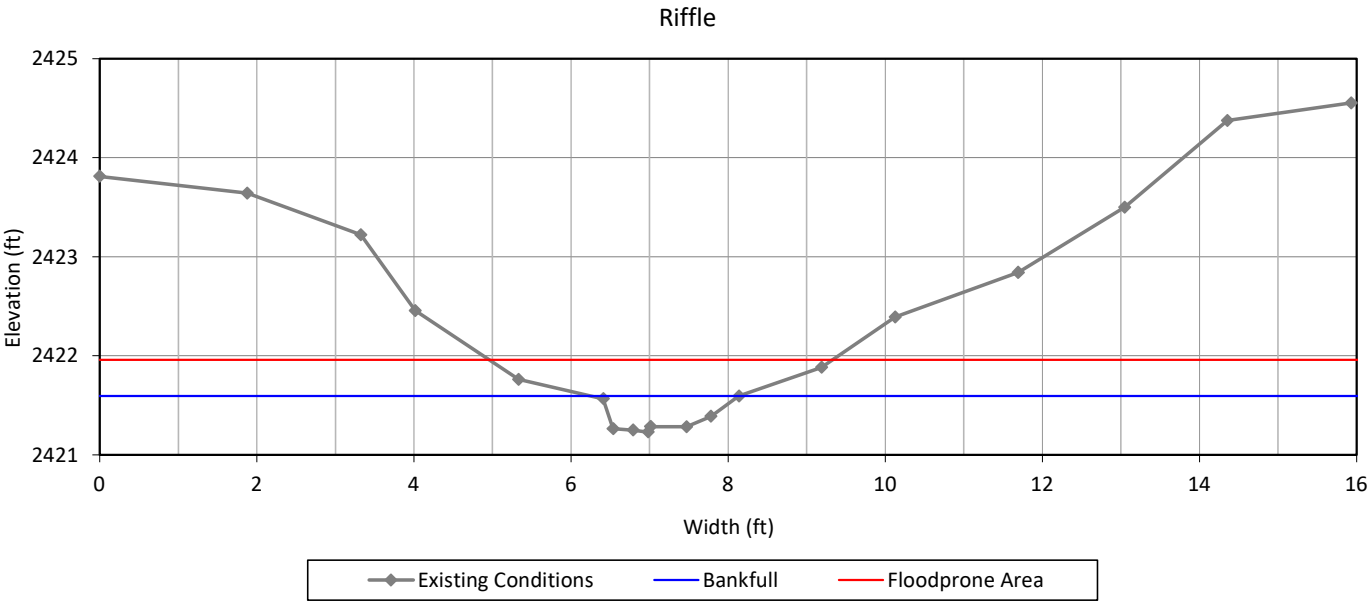


Bankfull Dimensions	
4.7	x-section area (ft.sq.)
7.4	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
7.8	wetted perimeter (ft)
0.6	hyd radi (ft)
11.5	width-depth ratio
10.1	W flood prone area (ft)
1.4	entrenchment ratio
2.6	low bank height ratio



View Downstream

Cross Section 10, UT1A

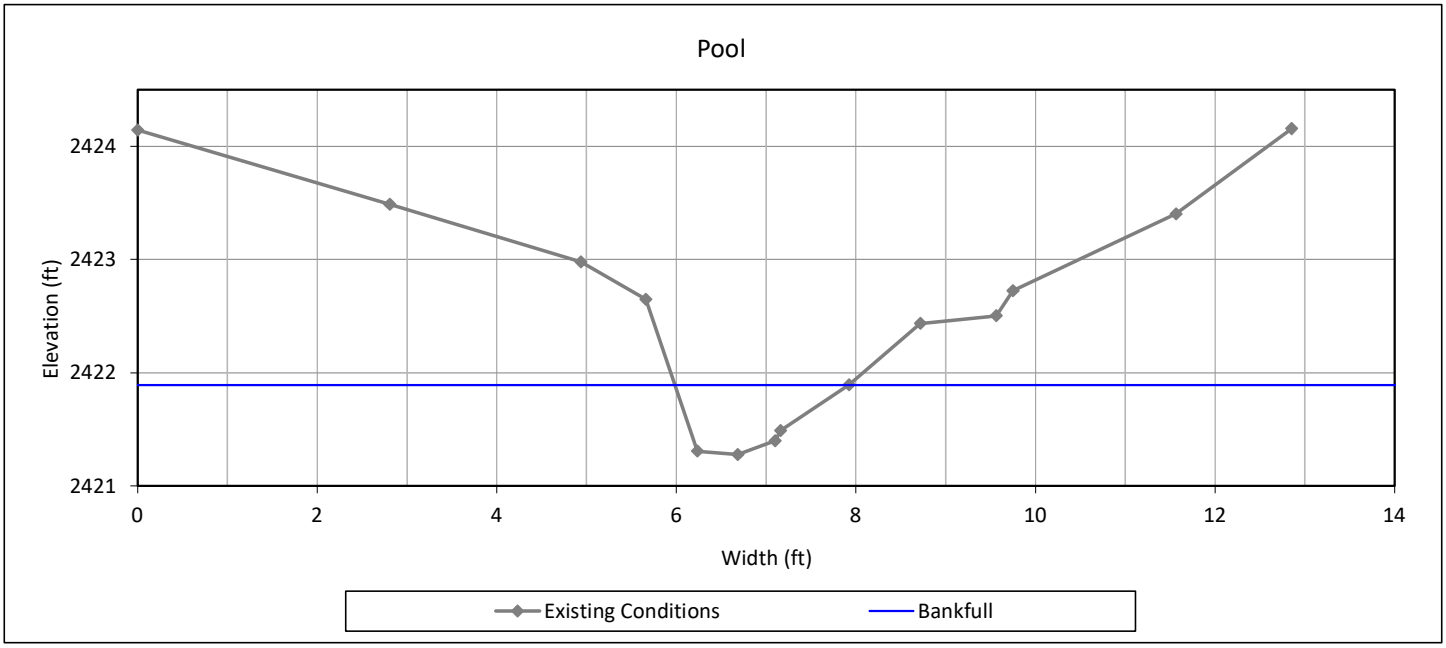


Bankfull Dimensions	
0.4	x-section area (ft.sq.)
1.9	width (ft)
0.2	mean depth (ft)
0.4	max depth (ft)
2.2	wetted perimeter (ft)
0.2	hyd radi (ft)
7.9	width-depth ratio
4.4	W flood prone area (ft)
2.3	entrenchment ratio
3.2	low bank height ratio



View Downstream

Cross Section 11, UT1A

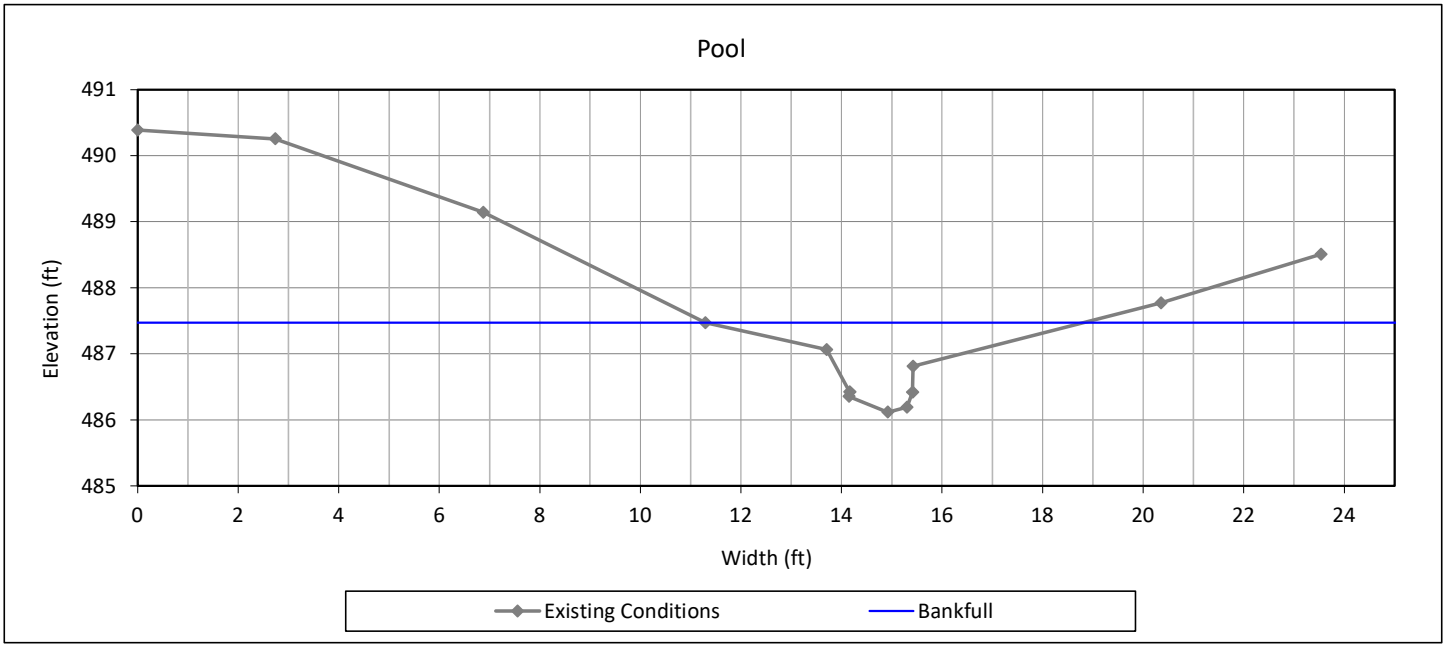


Bankfull Dimensions	
0.8	x-section area (ft.sq.)
1.9	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
2.5	wetted perimeter (ft)
0.3	hyd radi (ft)
5.0	width-depth ratio
2.6	W flood prone area (ft)
1.3	entrenchment ratio
1.8	low bank height ratio



View Downstream

Cross Section 12, UT2 Reach 2

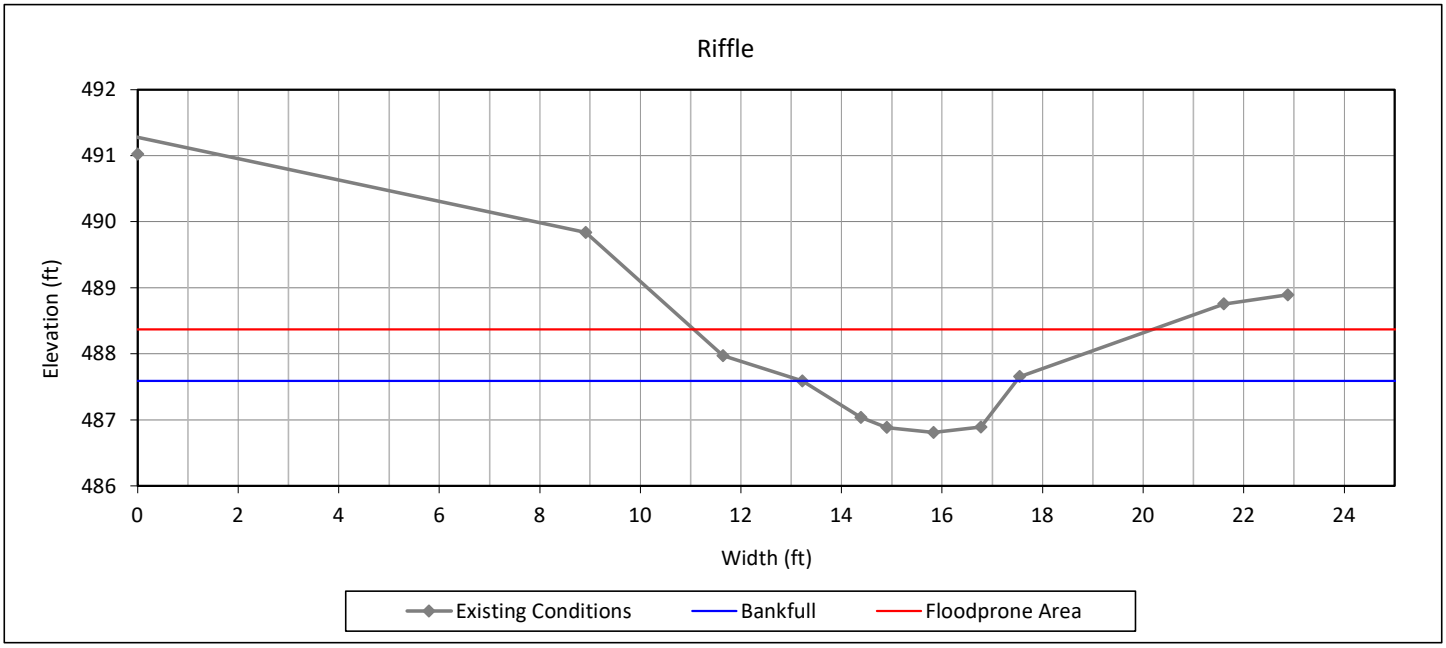


Bankfull Dimensions	
3.5	x-section area (ft.sq.)
7.5	width (ft)
0.5	mean depth (ft)
1.4	max depth (ft)
8.6	wetted perimeter (ft)
0.4	hyd radi (ft)
16.0	width-depth ratio
8.5	W flood prone area (ft)
1.1	entrenchment ratio
0.5	low bank height ratio



View Downstream

Cross Section 13, UT2 Reach 2

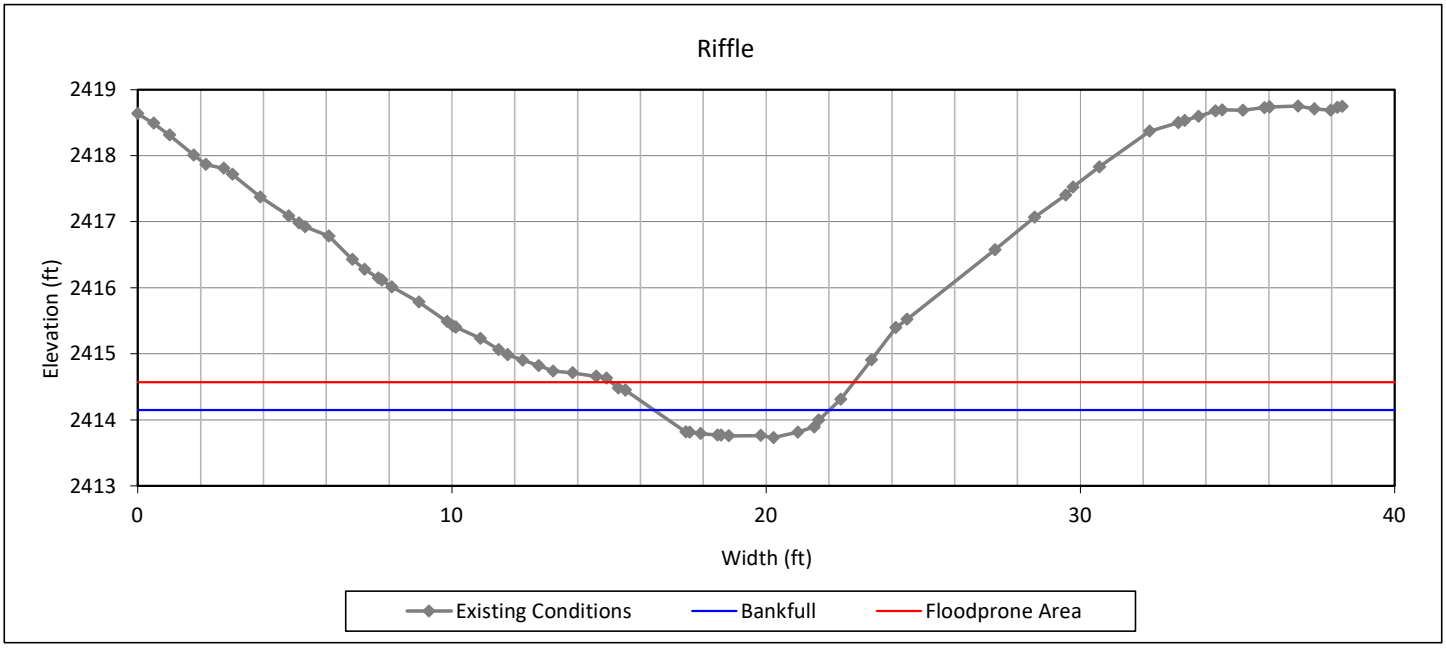


Bankfull Dimensions	
2.3	x-section area (ft.sq.)
4.3	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
4.7	wetted perimeter (ft)
0.5	hyd radi (ft)
8.0	width-depth ratio
9.1	W flood prone area (ft)
2.1	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 14, UT2 Reach 1

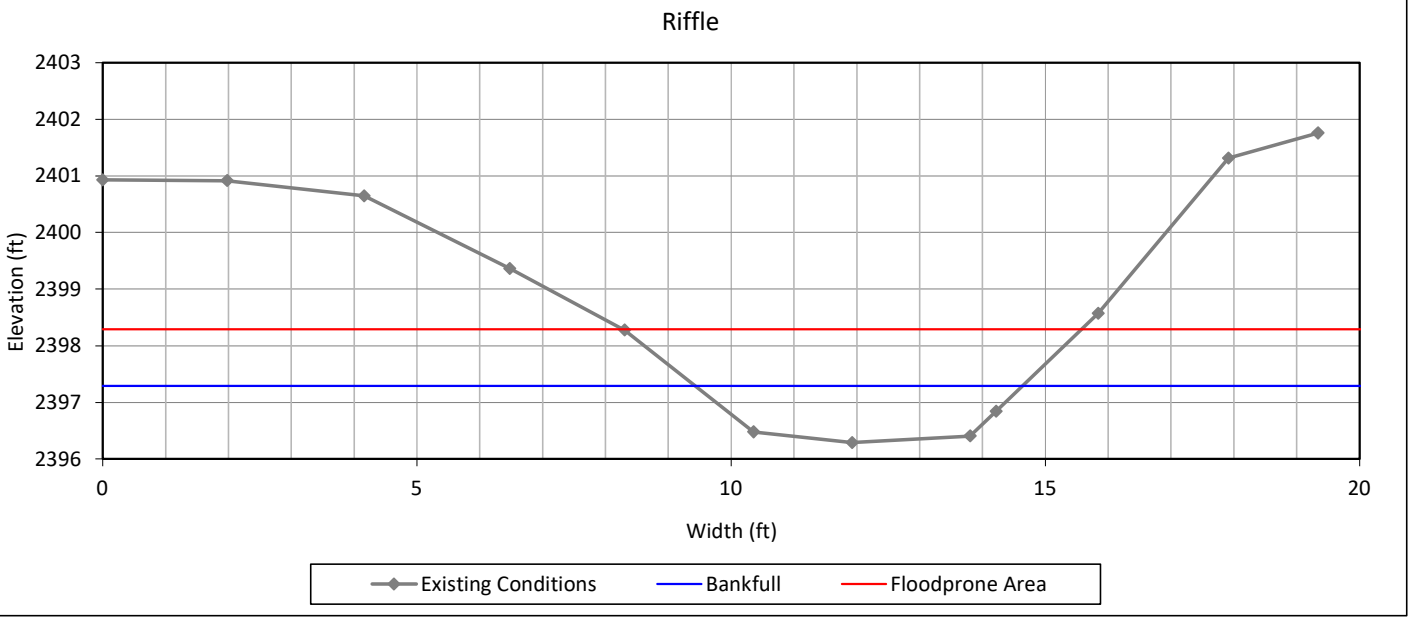


Bankfull Dimensions	
1.7	x-section area (ft.sq.)
5.6	width (ft)
0.3	mean depth (ft)
0.4	max depth (ft)
5.7	wetted perimeter (ft)
0.3	hyd radi (ft)
18.1	width-depth ratio
7.7	W flood prone area (ft)
1.4	entrenchment ratio
1.7	low bank height ratio



View Downstream

Cross Section 15, UT2A

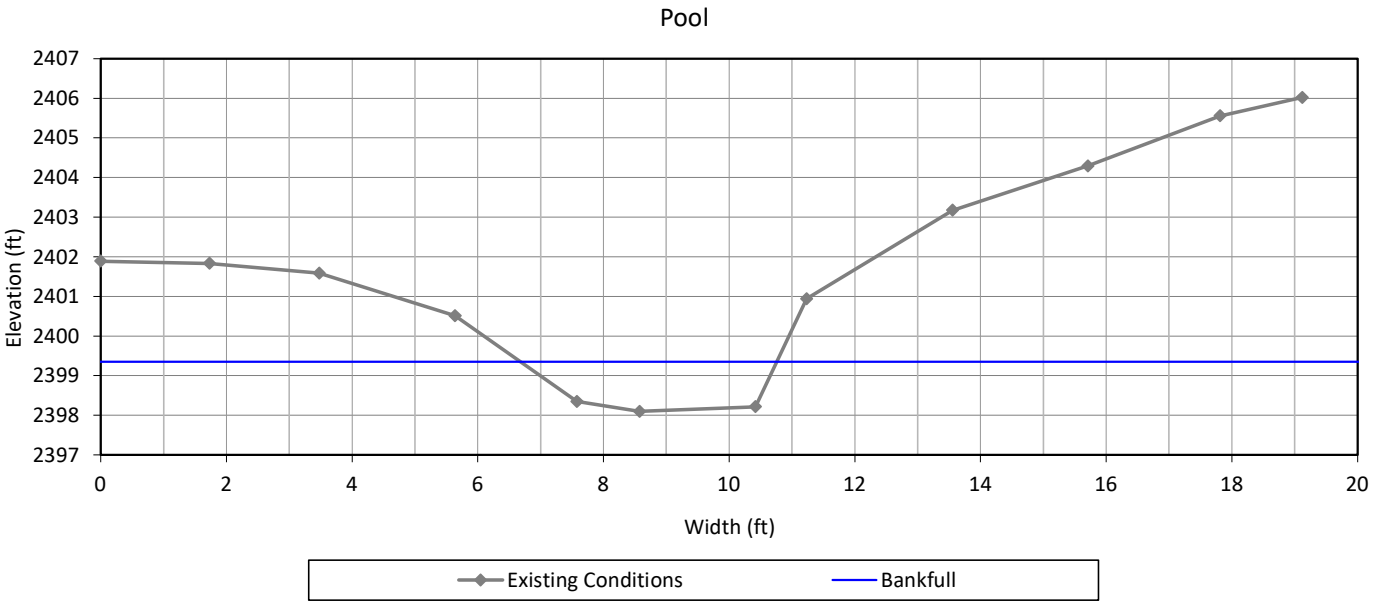


Bankfull Dimensions	
3.9	x-section area (ft.sq.)
5.2	width (ft)
0.8	mean depth (ft)
1.0	max depth (ft)
5.9	wetted perimeter (ft)
0.7	hyd radi (ft)
6.9	width-depth ratio
7.3	W flood prone area (ft)
1.4	entrenchment ratio
2.0	low bank height ratio



View Downstream

Cross Section 16, UT2A



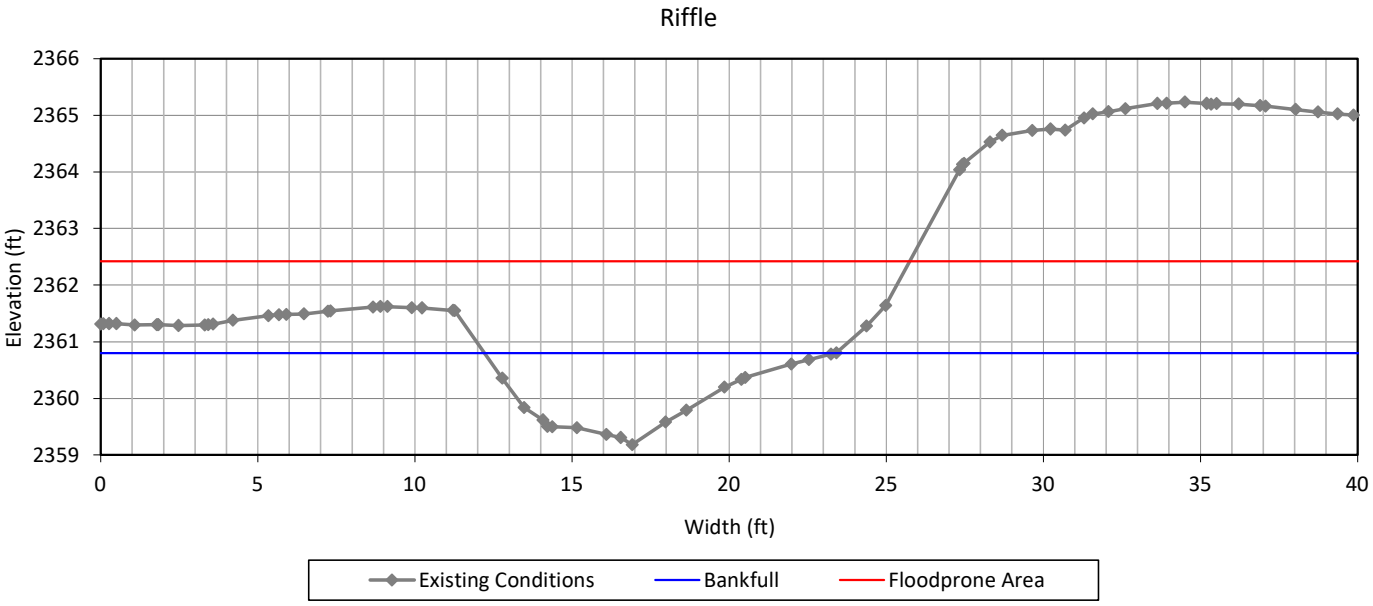
Bankfull Dimensions

4.0	x-section area (ft.sq.)
4.1	width (ft)
1.0	mean depth (ft)
1.3	max depth (ft)
5.4	wetted perimeter (ft)
0.7	hyd radi (ft)
4.2	width-depth ratio
5.3	W flood prone area (ft)
1.3	entrenchment ratio
2.7	low bank height ratio



View Downstream

Cross Section 17, UT3 Reach 4

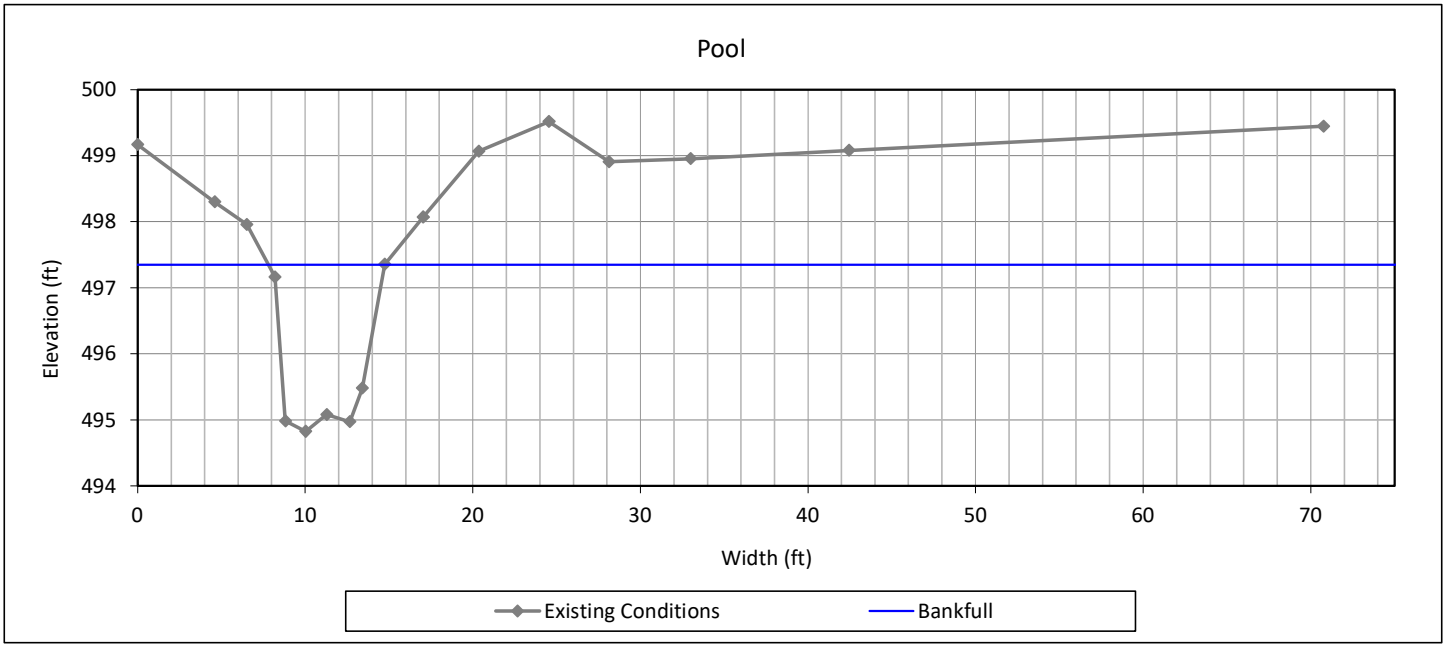


Bankfull Dimensions	
9.4	x-section area (ft.sq.)
11.2	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
11.8	wetted perimeter (ft)
0.8	hyd radi (ft)
13.3	width-depth ratio
25.4	W flood prone area (ft)
2.3	entrenchment ratio
1.5	low bank height ratio



View Downstream

Cross Section 18, UT3 Reach 3

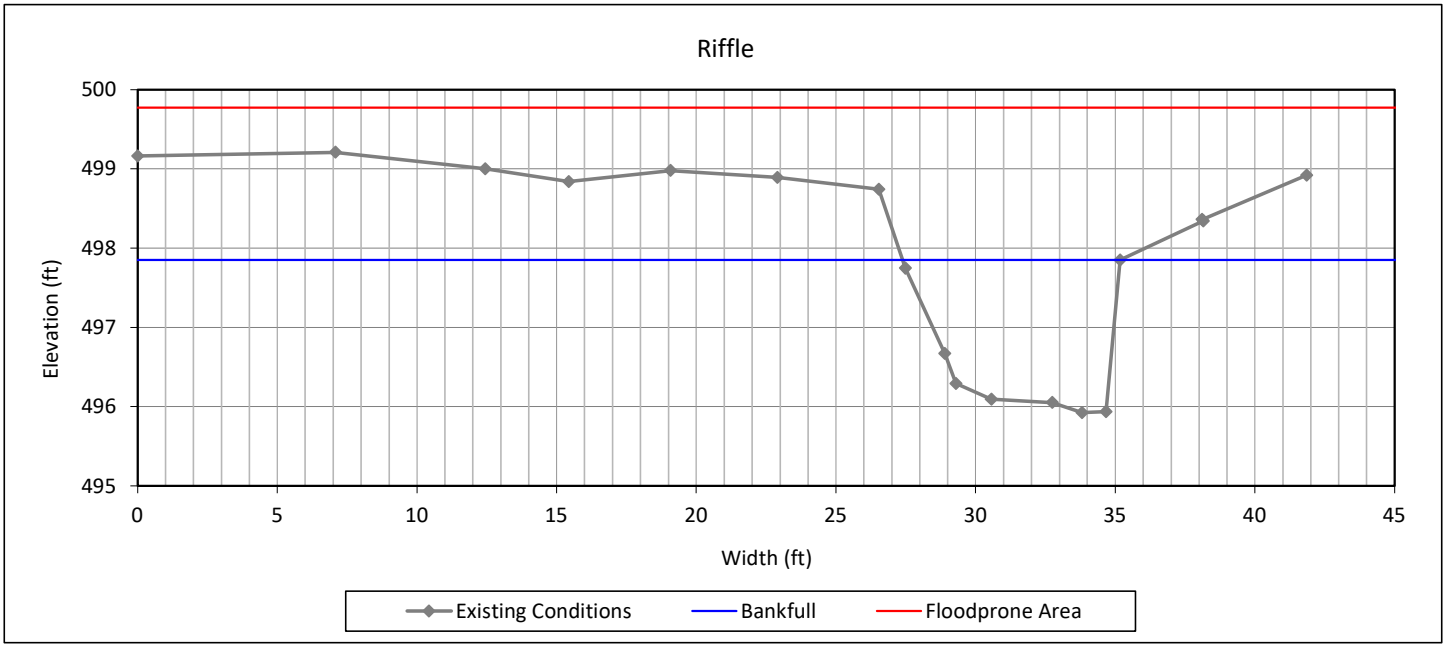


Bankfull Dimensions	
12.8	x-section area (ft.sq.)
6.9	width (ft)
1.8	mean depth (ft)
2.5	max depth (ft)
9.8	wetted perimeter (ft)
1.3	hyd radi (ft)
3.8	width-depth ratio
54.0	W flood prone area (ft)
7.8	entrenchment ratio
0.9	low bank height ratio



View Downstream

Cross Section 19, UT3 Reach 3

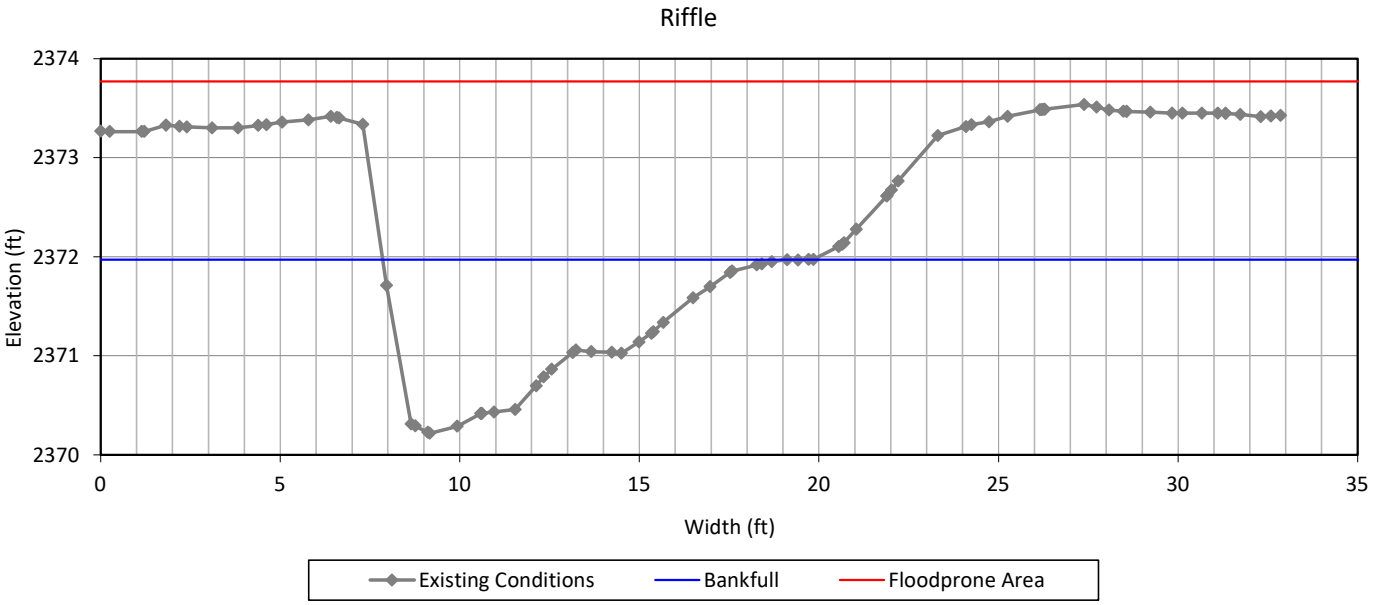


Bankfull Dimensions	
11.5	x-section area (ft.sq.)
7.8	width (ft)
1.5	mean depth (ft)
1.9	max depth (ft)
9.8	wetted perimeter (ft)
1.2	hyd radi (ft)
5.2	width-depth ratio
41.8	W flood prone area (ft)
5.4	entrenchment ratio
1.5	low bank height ratio



View Downstream

Cross Section 20, UT3 Reach 2

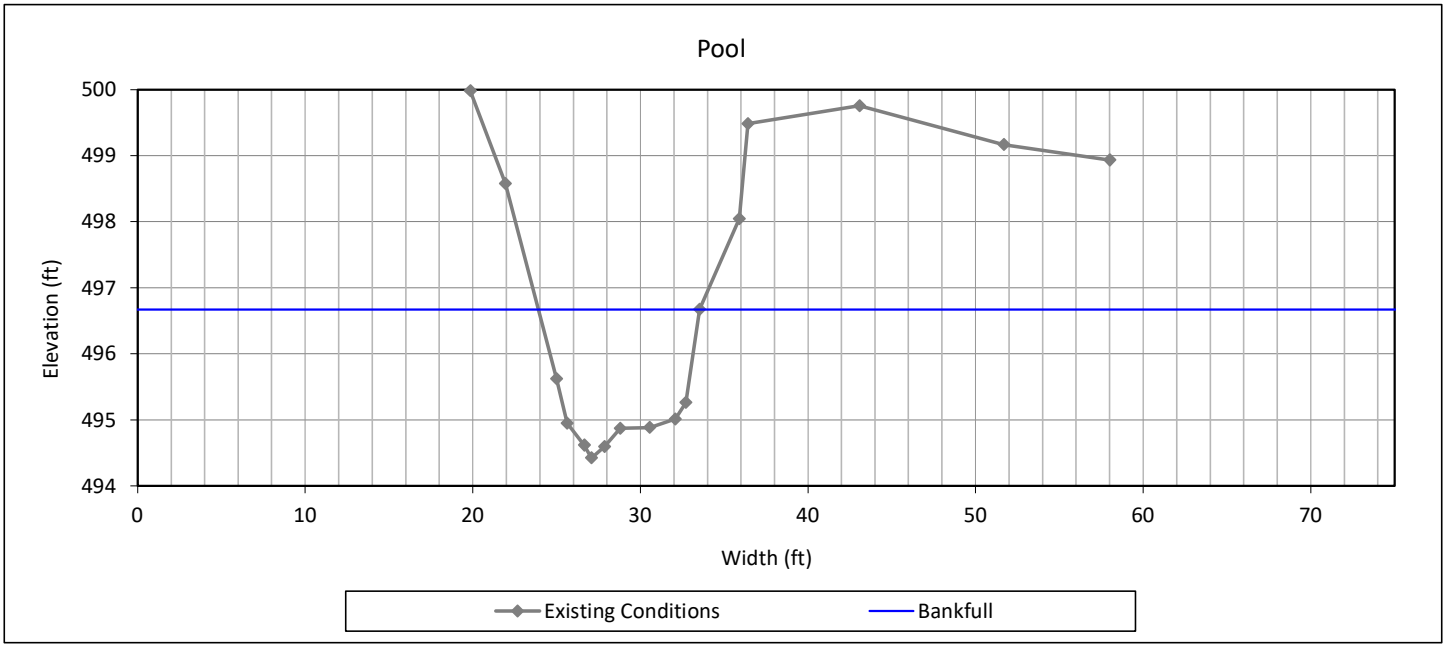


Bankfull Dimensions	
10.3	x-section area (ft.sq.)
11.6	width (ft)
0.9	mean depth (ft)
1.8	max depth (ft)
12.9	wetted perimeter (ft)
0.8	hyd radi (ft)
13.0	width-depth ratio
32.6	W flood prone area (ft)
2.8	entrenchment ratio
1.7	low bank height ratio



View Upstream

Cross Section 21, UT3 Reach 1

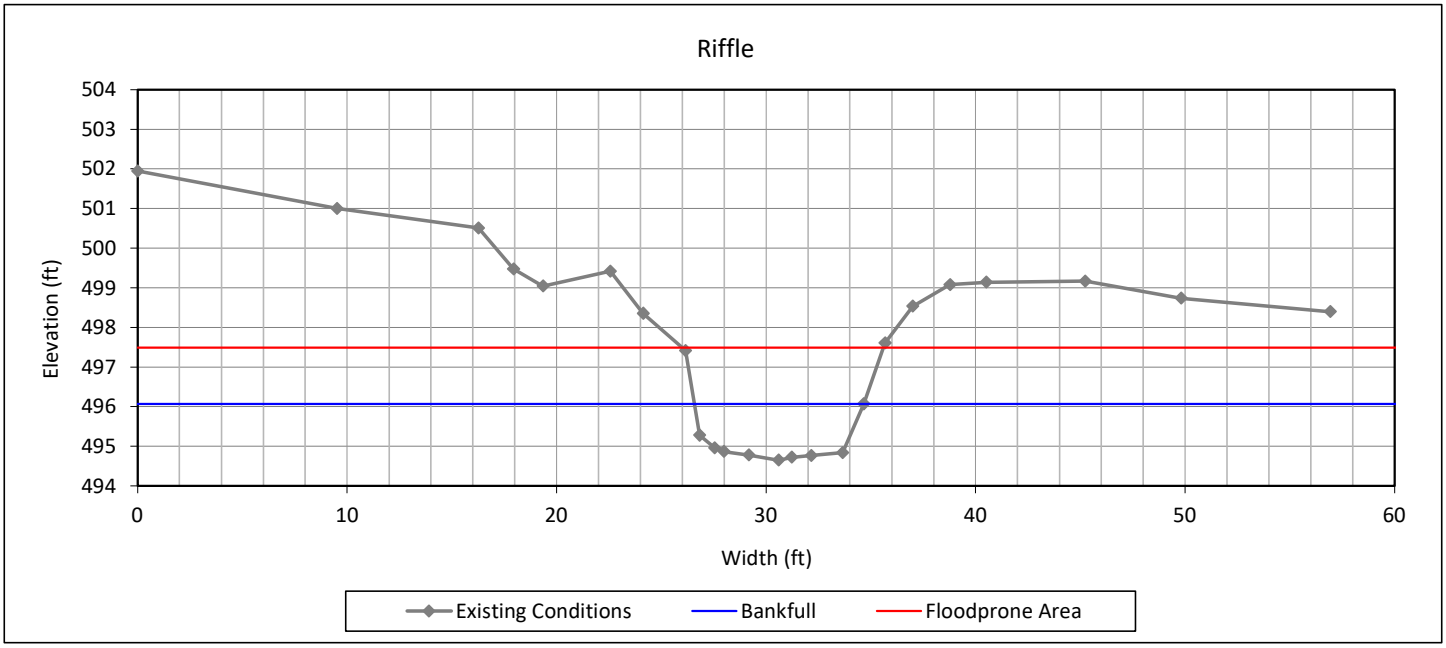


Bankfull Dimensions	
15.1	x-section area (ft.sq.)
9.6	width (ft)
1.6	mean depth (ft)
2.2	max depth (ft)
11.3	wetted perimeter (ft)
1.3	hyd radi (ft)
6.1	width-depth ratio
11.5	W flood prone area (ft)
1.2	entrenchment ratio
2.3	low bank height ratio



View Downstream

Cross Section 22, UT3 Reach 1

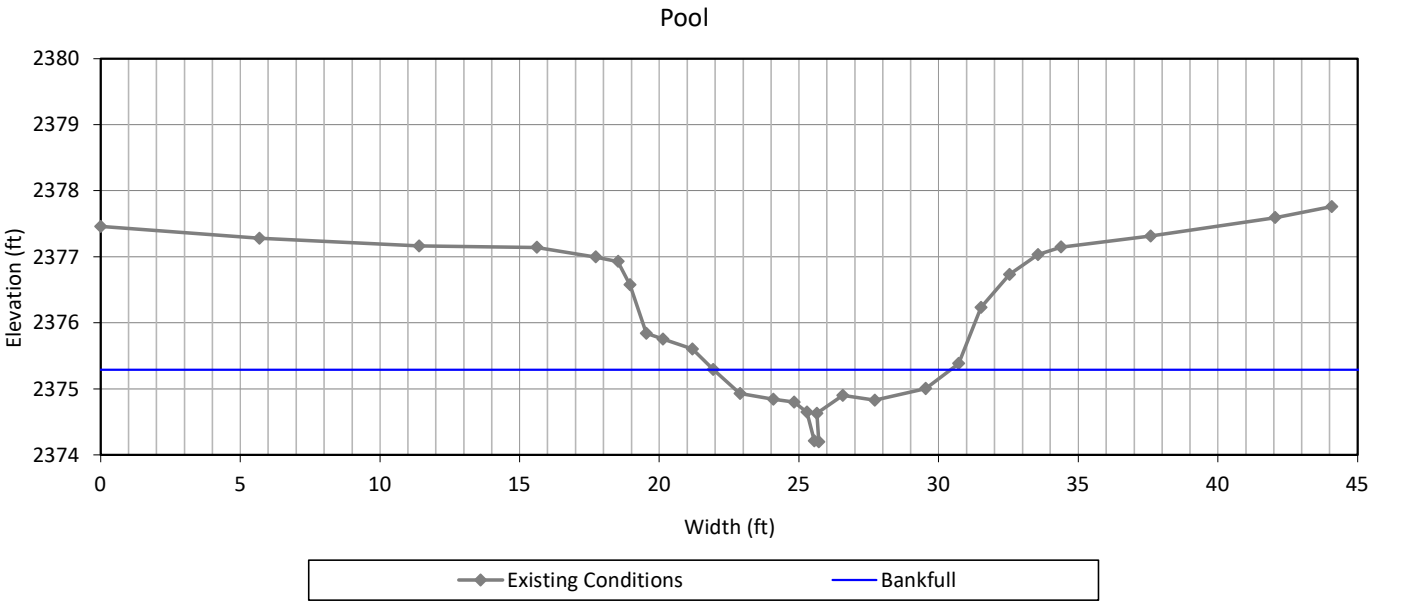


Bankfull Dimensions	
9.3	x-section area (ft.sq.)
8.1	width (ft)
1.2	mean depth (ft)
1.4	max depth (ft)
9.3	wetted perimeter (ft)
1.0	hyd radi (ft)
7.0	width-depth ratio
9.6	W flood prone area (ft)
1.2	entrenchment ratio
3.1	low bank height ratio



View Downstream

Cross Section 23, UT3A Reach 2

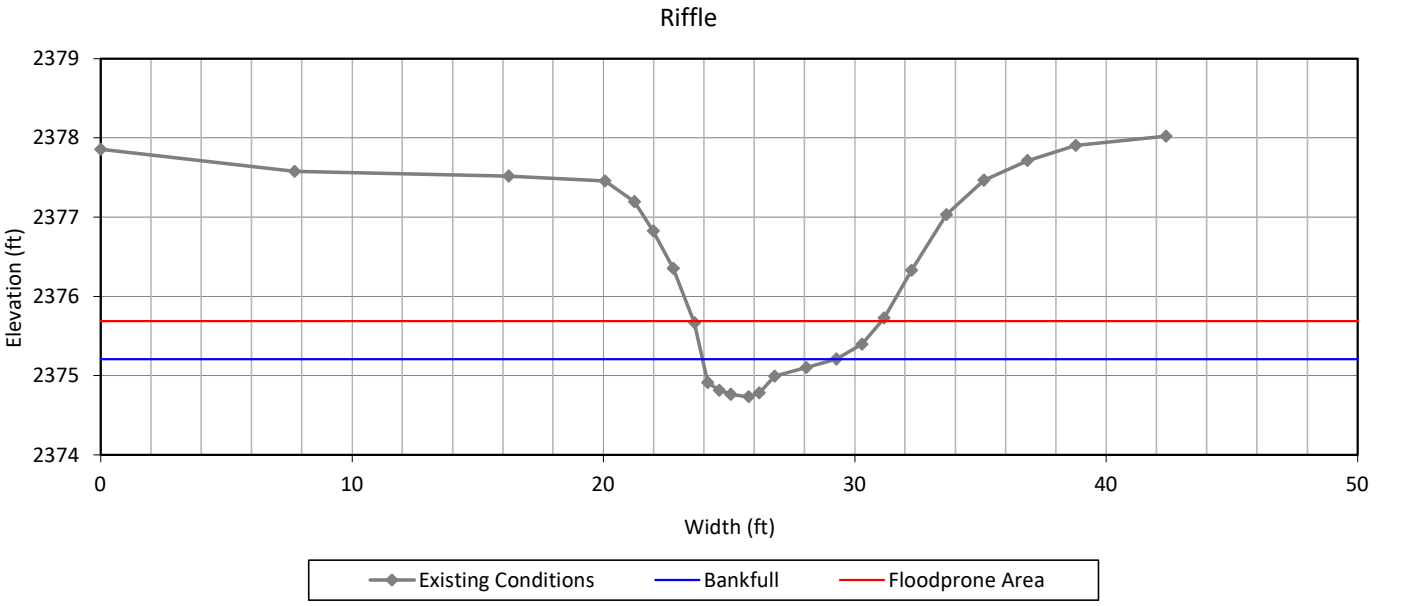


Bankfull Dimensions	
3.4	x-section area (ft.sq.)
8.5	width (ft)
0.4	mean depth (ft)
1.1	max depth (ft)
9.4	wetted perimeter (ft)
0.4	hyd radi (ft)
21.3	width-depth ratio
70.0	W flood prone area (ft)
8.2	entrenchment ratio
1.3	low bank height ratio



View Downstream

Cross Section 24, UT3A Reach 2

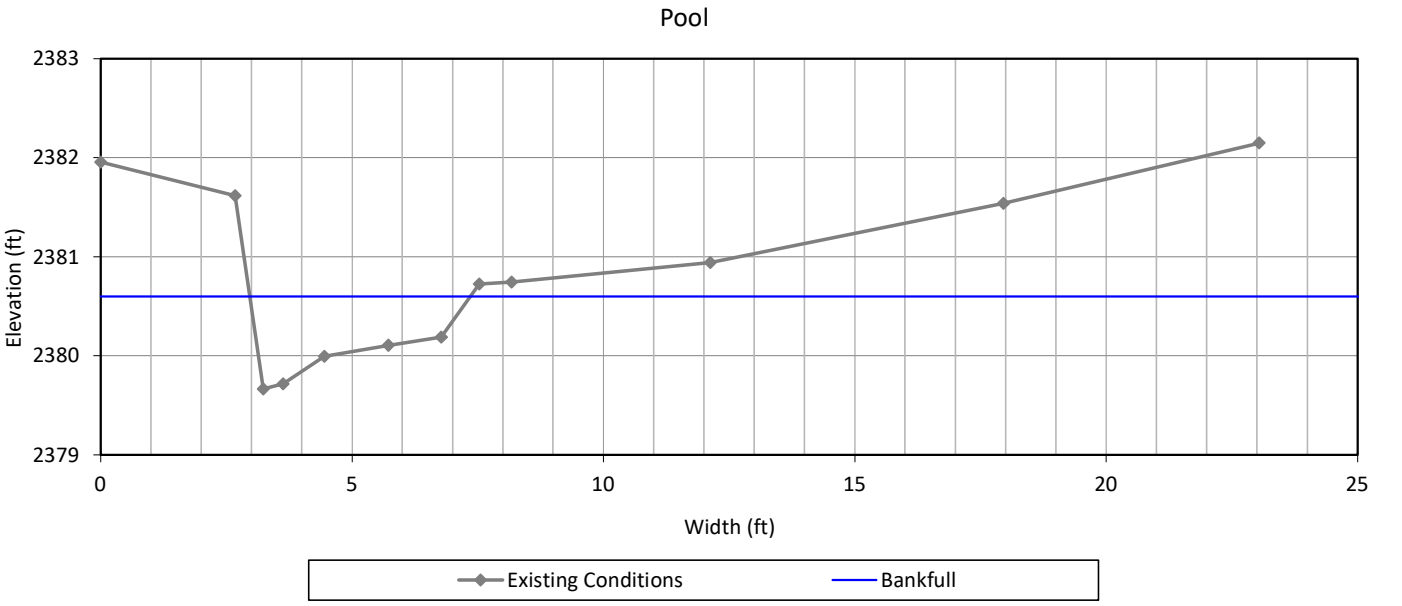


Bankfull Dimensions	
1.4	x-section area (ft.sq.)
5.3	width (ft)
0.3	mean depth (ft)
0.5	max depth (ft)
5.5	wetted perimeter (ft)
0.2	hyd radi (ft)
20.7	width-depth ratio
7.5	W flood prone area (ft)
1.4	entrenchment ratio
5.8	low bank height ratio



View Downstream

Cross Section 25, UT3B

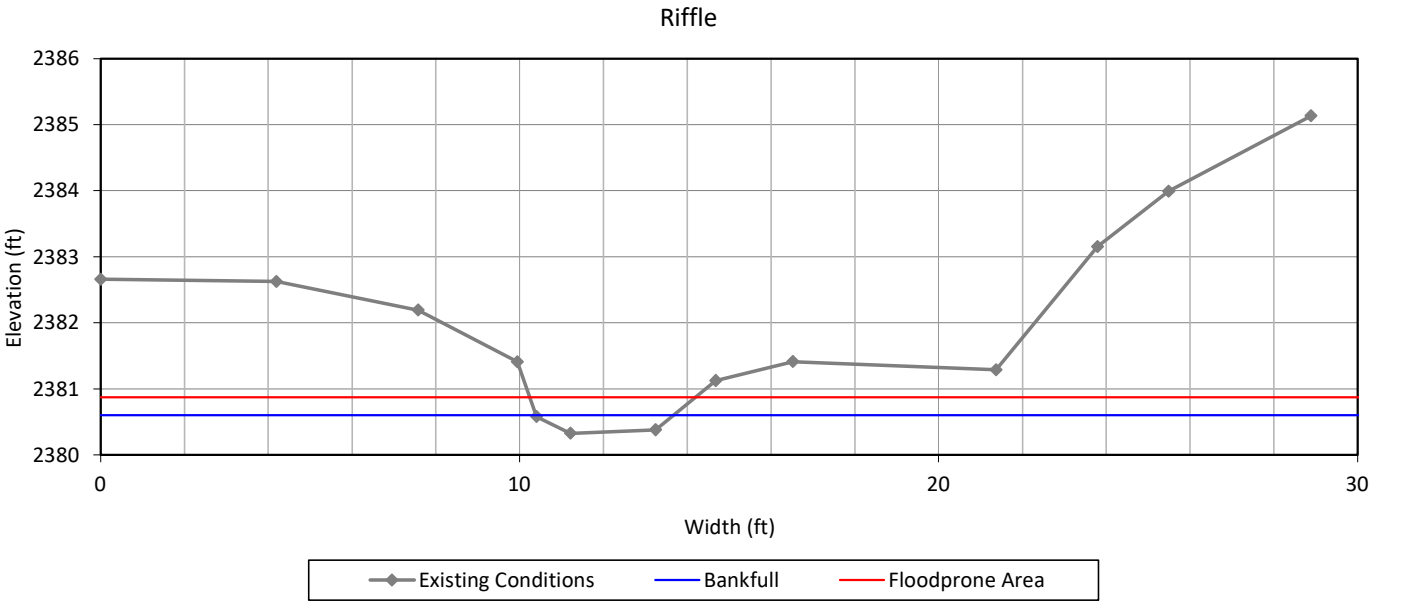


Bankfull Dimensions	
2.4	x-section area (ft.sq.)
4.4	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
5.3	wetted perimeter (ft)
0.5	hyd radi (ft)
8.1	width-depth ratio
18.4	W flood prone area (ft)
4.2	entrenchment ratio
1.1	low bank height ratio



View Downstream

Cross Section 26, UT3B

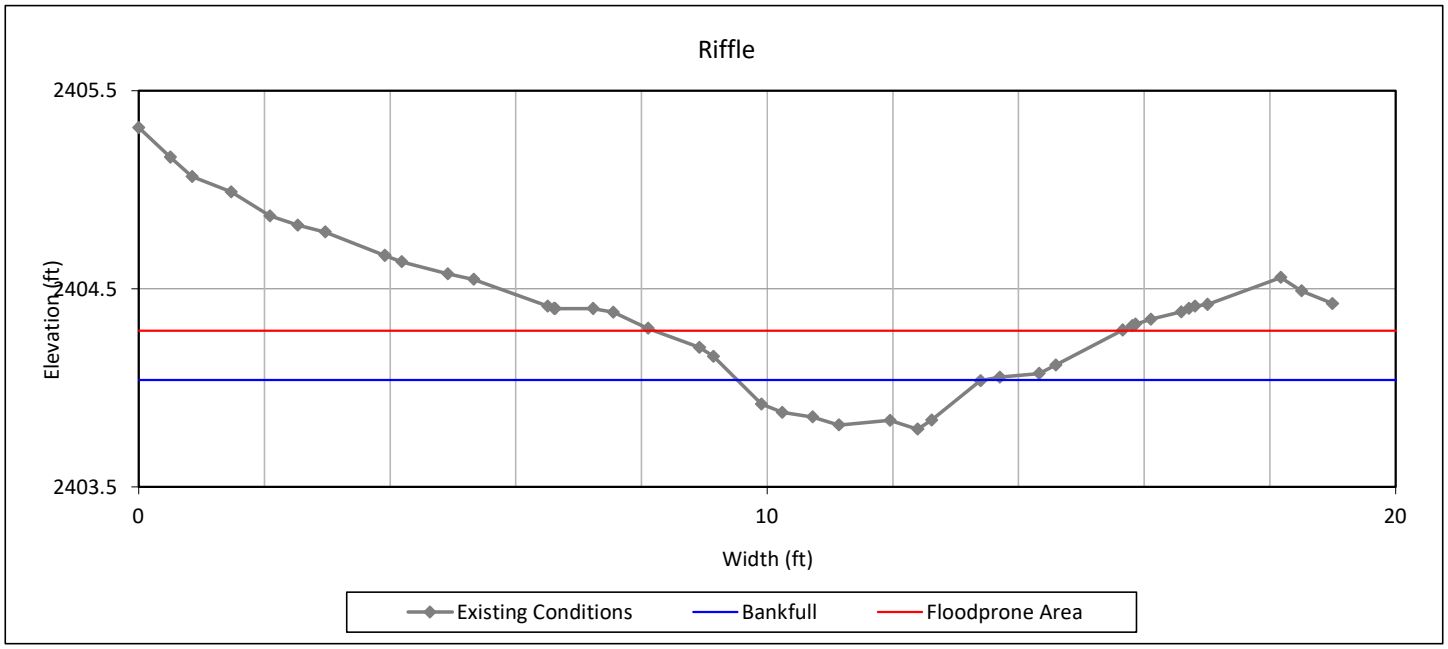


Bankfull Dimensions	
0.7	x-section area (ft.sq.)
3.3	width (ft)
0.2	mean depth (ft)
0.3	max depth (ft)
3.4	wetted perimeter (ft)
0.2	hyd radi (ft)
16.2	width-depth ratio
3.9	W flood prone area (ft)
1.2	entrenchment ratio
2.8	low bank height ratio



View Downstream

Cross Section 27, UT3B1

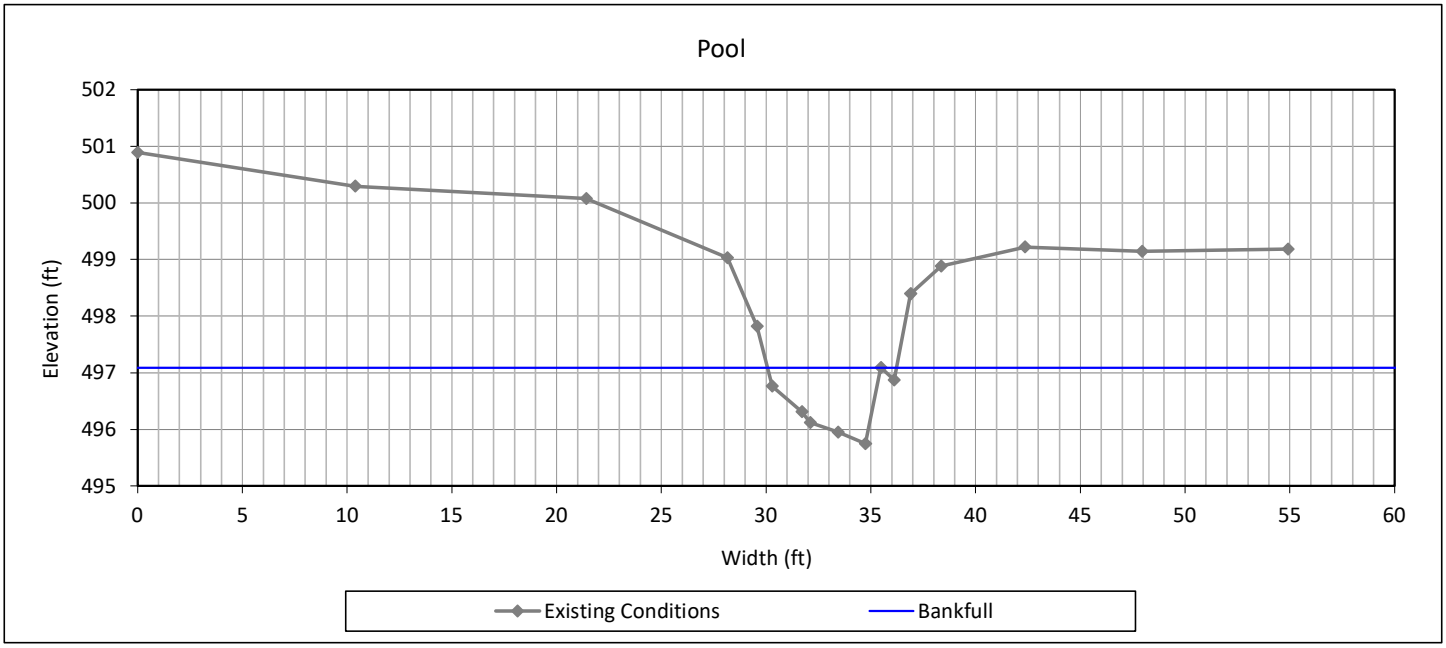


Bankfull Dimensions	
0.6	x-section area (ft.sq.)
3.9	width (ft)
0.2	mean depth (ft)
0.2	max depth (ft)
3.9	wetted perimeter (ft)
0.2	hyd radi (ft)
23.2	width-depth ratio
7.4	W flood prone area (ft)
1.9	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 28, UT3C Reach 2

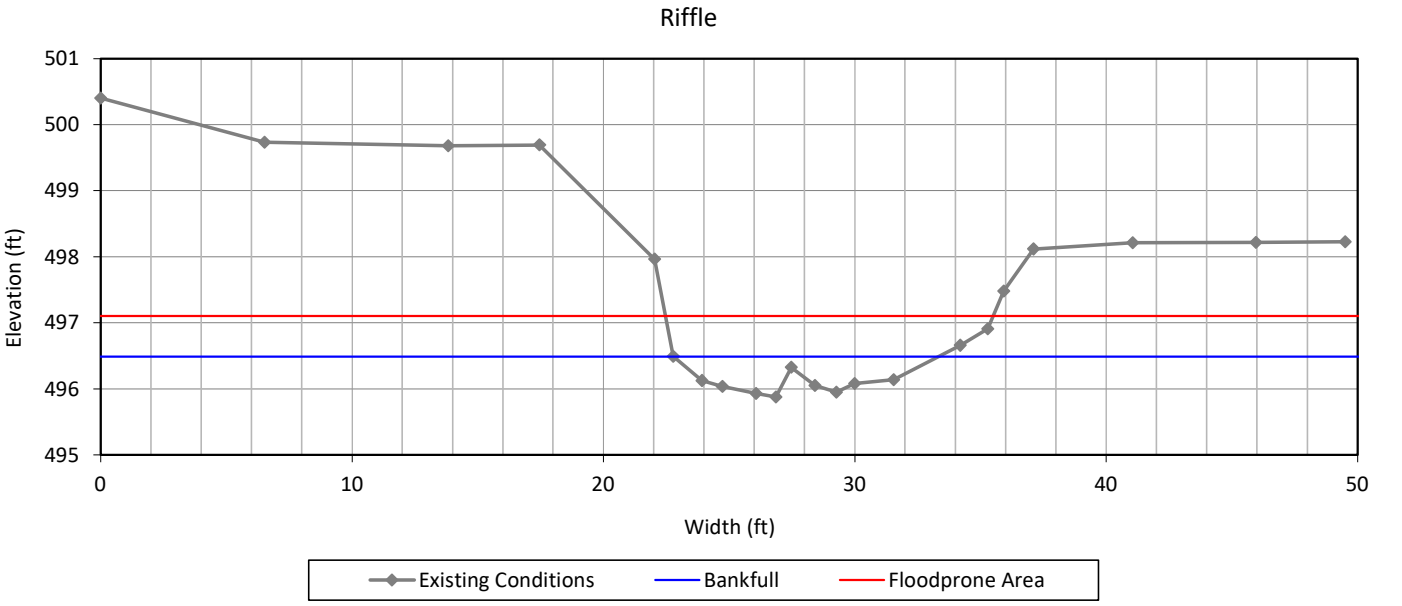


Bankfull Dimensions	
4.7	x-section area (ft.sq.)
5.4	width (ft)
0.9	mean depth (ft)
1.3	max depth (ft)
6.5	wetted perimeter (ft)
0.7	hyd radi (ft)
6.2	width-depth ratio
7.0	W flood prone area (ft)
1.3	entrenchment ratio
2.3	low bank height ratio



View Upstream

Cross Section 29, UT3C Reach 2

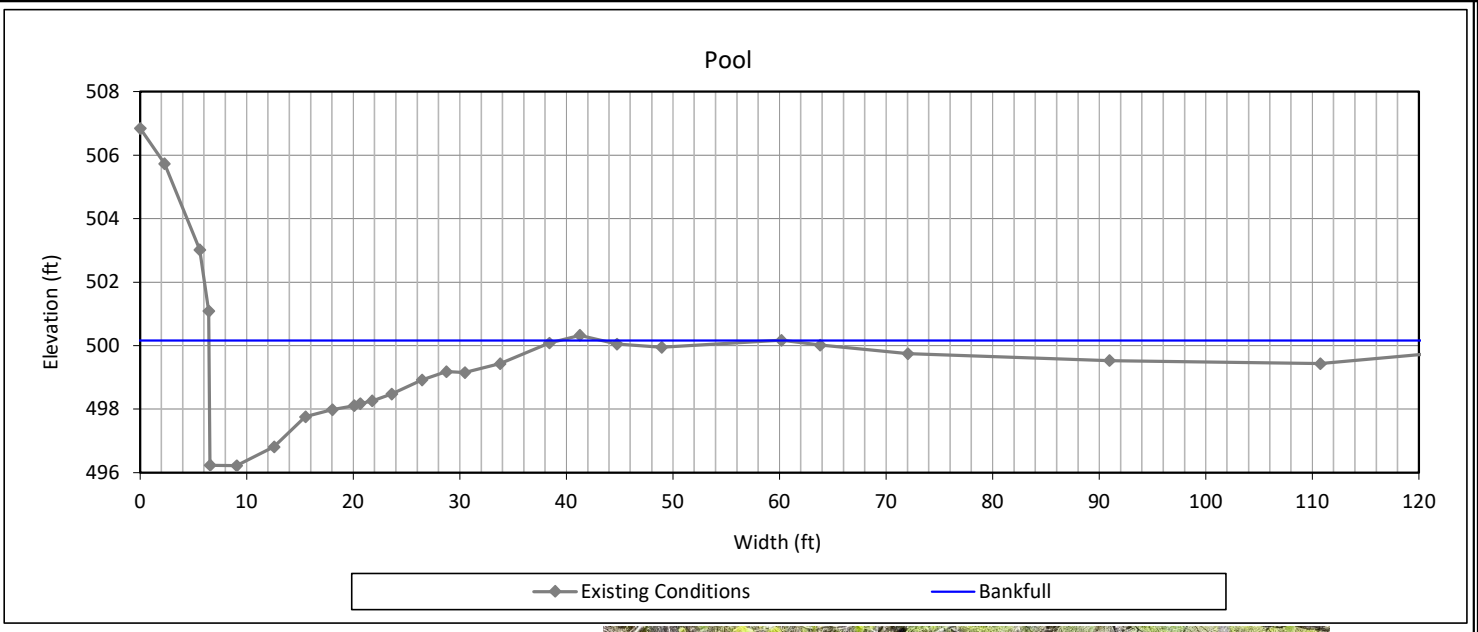


Bankfull Dimensions	
3.9	x-section area (ft.sq.)
10.6	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
10.9	wetted perimeter (ft)
0.4	hyd radi (ft)
28.8	width-depth ratio
13.0	W flood prone area (ft)
1.2	entrenchment ratio
3.7	low bank height ratio



View Downstream

Cross Section 1, Jones Creek Reach 5

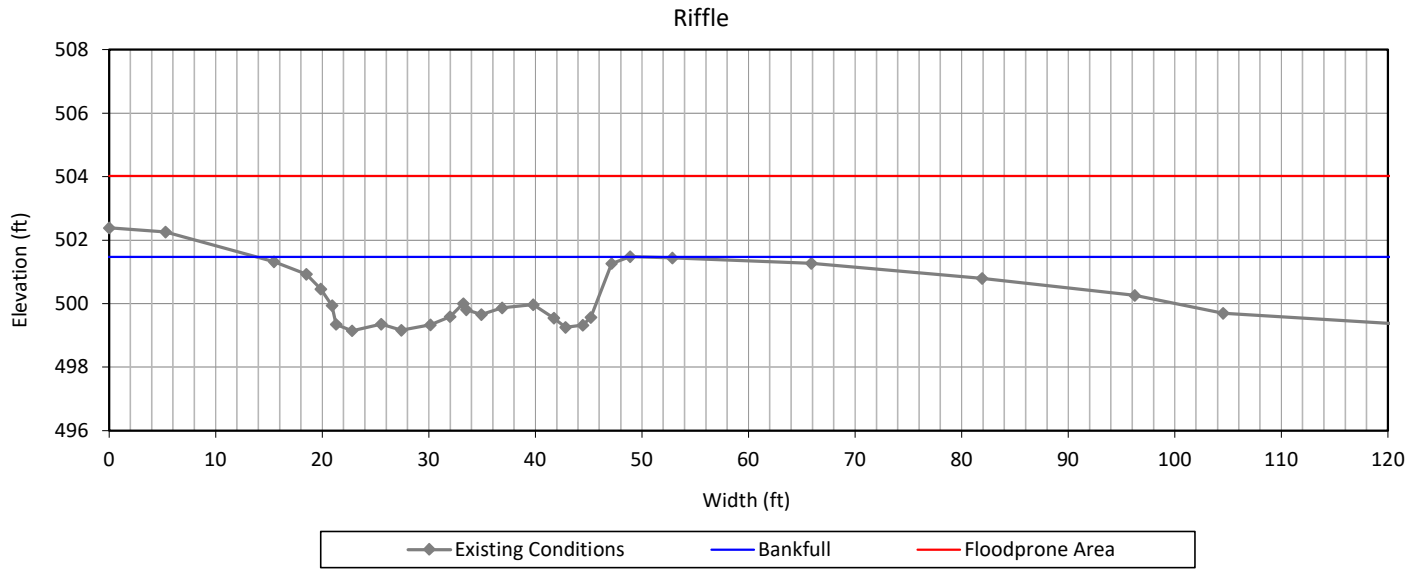


Bankfull Dimensions	
61.2	x-section area (ft.sq.)
32.8	width (ft)
1.9	mean depth (ft)
3.9	max depth (ft)
37.0	wetted perimeter (ft)
1.7	hyd radi (ft)
17.6	width-depth ratio
116.3	W flood prone area (ft)
3.5	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 2, Jones Creek Reach 5

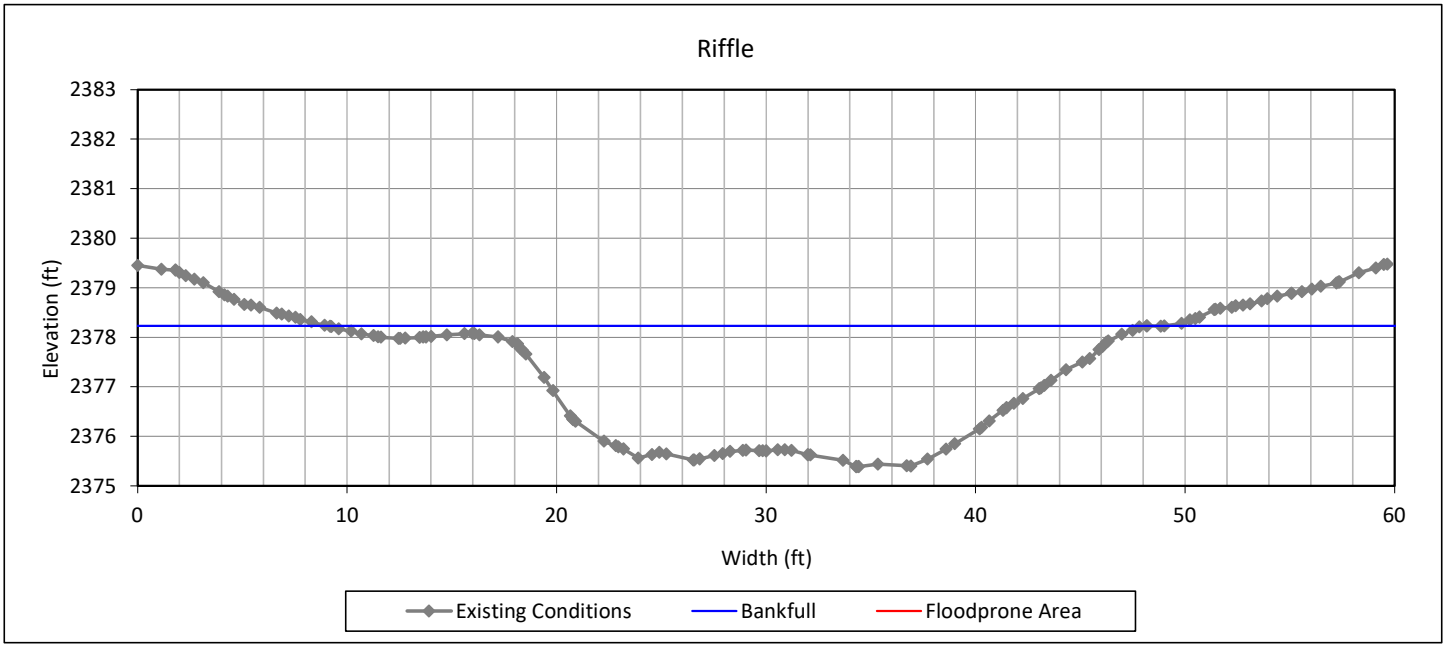


Bankfull Dimensions	
53.5	x-section area (ft.sq.)
35.1	width (ft)
1.5	mean depth (ft)
2.5	max depth (ft)
36.7	wetted perimeter (ft)
1.5	hyd radi (ft)
23.1	width-depth ratio
141.9	W flood prone area (ft)
4.0	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 3, Jones Creek Reach 4

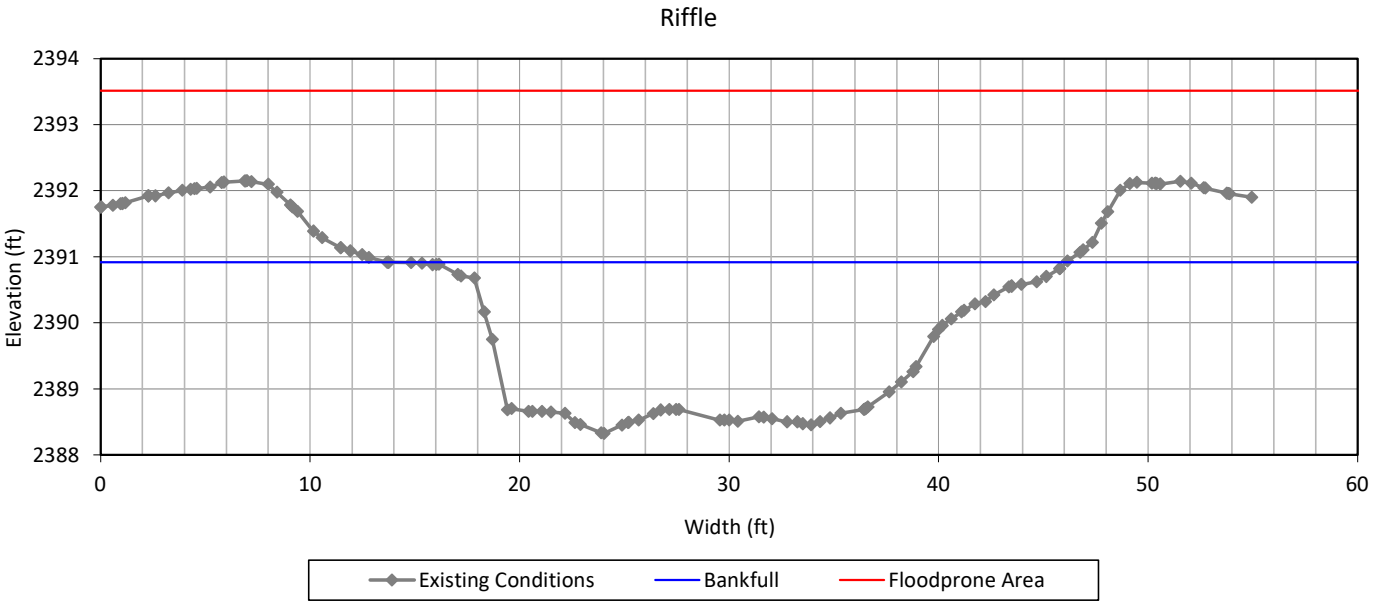


Bankfull Dimensions	
61.3	x-section area (ft.sq.)
36.4	width (ft)
1.7	mean depth (ft)
2.8	max depth (ft)
37.2	wetted perimeter (ft)
1.6	hyd radi (ft)
21.6	width-depth ratio
60.0	W flood prone area (ft)
1.6	entrenchment ratio
0.9	low bank height ratio

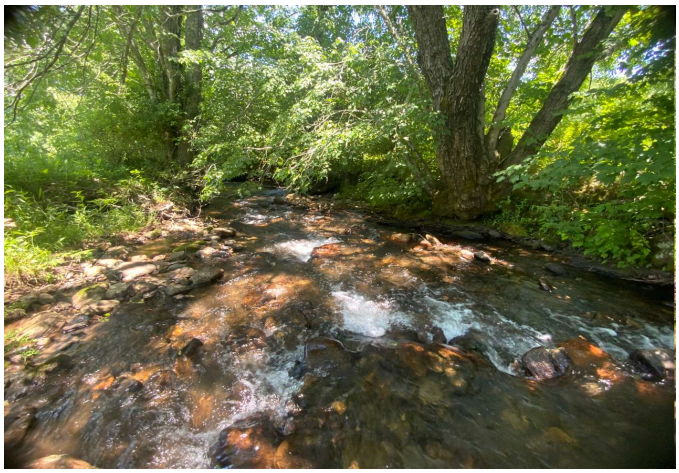


View Downstream

Cross Section 4, Jones Creek Reach 3

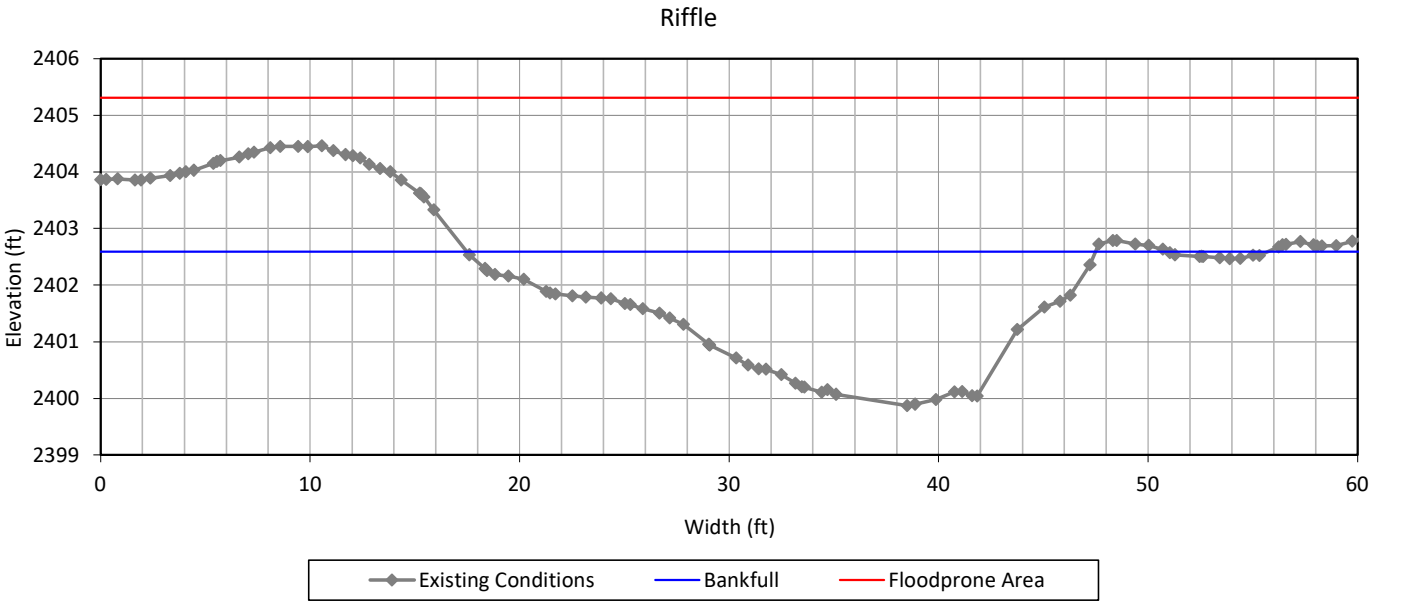


Bankfull Dimensions	
50.8	x-section area (ft.sq.)
29.8	width (ft)
1.7	mean depth (ft)
2.6	max depth (ft)
31.2	wetted perimeter (ft)
1.6	hyd radi (ft)
17.5	width-depth ratio
55.0	W flood prone area (ft)
1.8	entrenchment ratio
0.9	low bank height ratio



View Downstream

Cross Section 5, Jones Creek Reach 1b

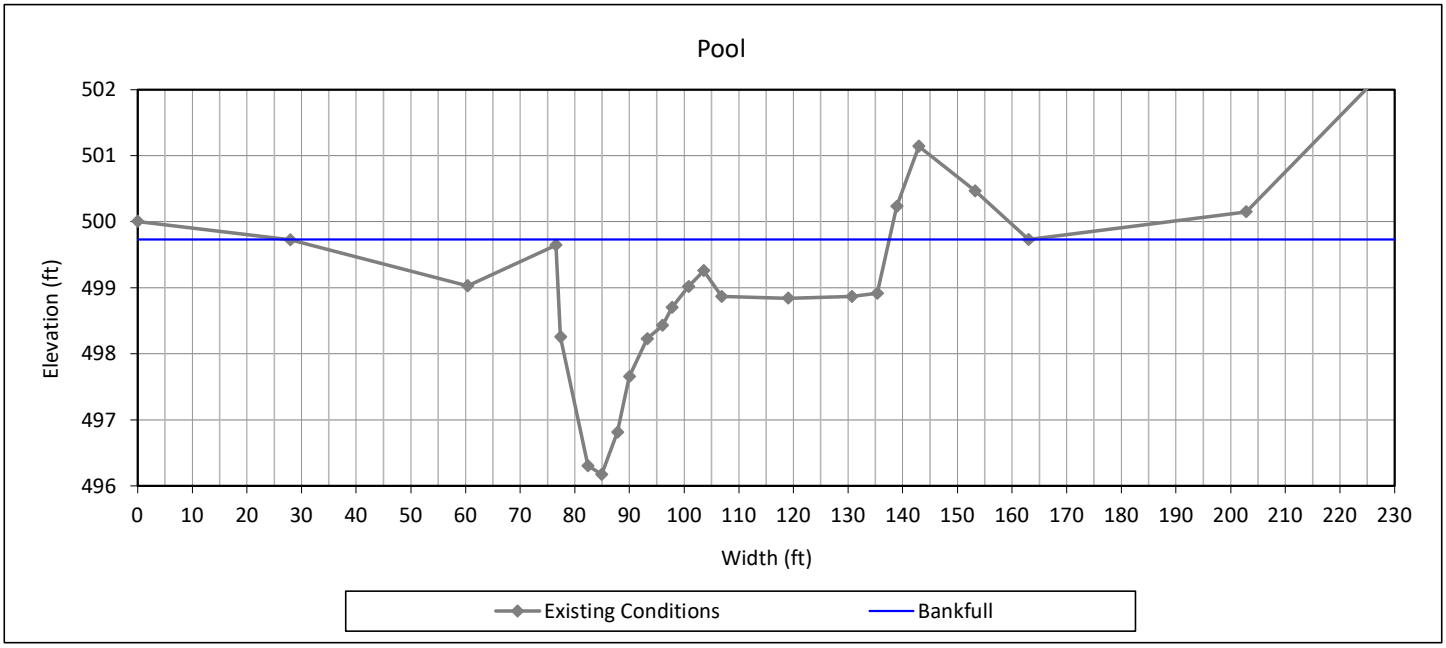


Bankfull Dimensions	
46.7	x-section area (ft.sq.)
30.0	width (ft)
1.6	mean depth (ft)
2.7	max depth (ft)
30.9	wetted perimeter (ft)
1.5	hyd radi (ft)
19.3	width-depth ratio
58.3	W flood prone area (ft)
1.9	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 6, Jones Creek Reach 2

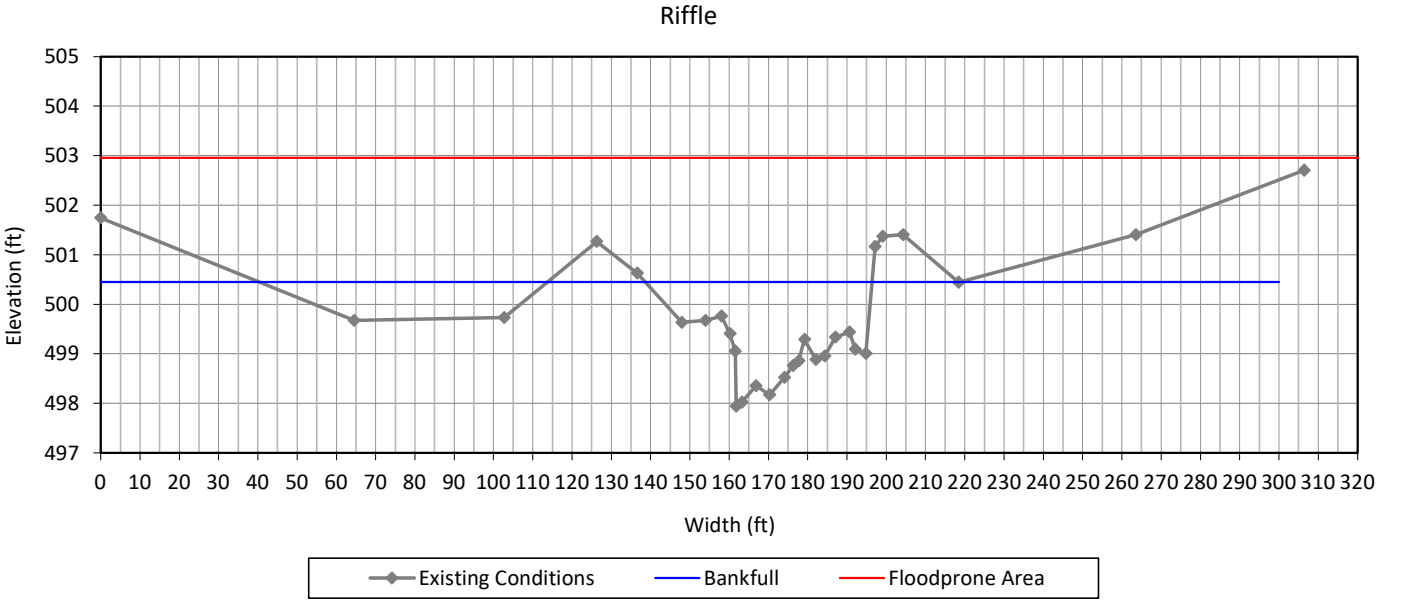


Bankfull Dimensions	
80.5	x-section area (ft.sq.)
61.3	width (ft)
1.3	mean depth (ft)
3.6	max depth (ft)
62.9	wetted perimeter (ft)
1.3	hyd radi (ft)
46.7	width-depth ratio
227.5	W flood prone area (ft)
3.7	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 7, Jones Creek Reach 2

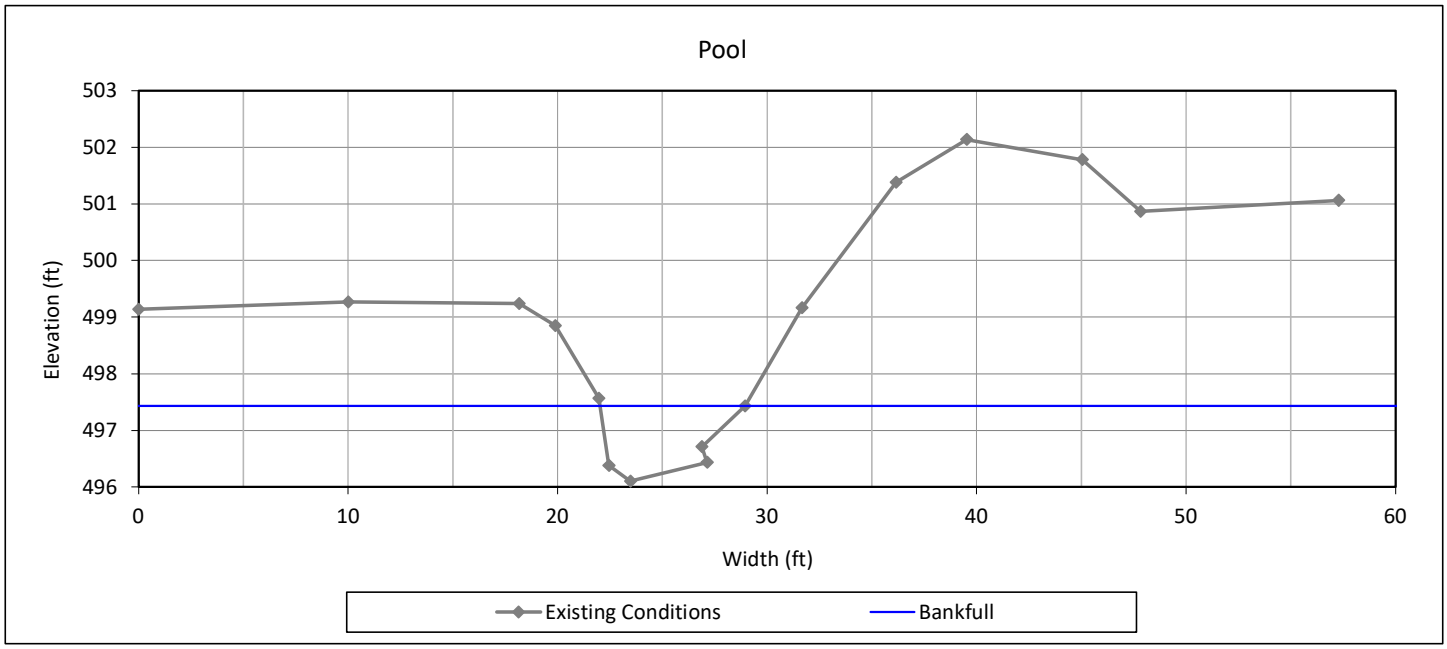


Bankfull Dimensions	
60.9	x-section area (ft.sq.)
38.3	width (ft)
1.6	mean depth (ft)
2.5	max depth (ft)
40.1	wetted perimeter (ft)
1.5	hyd radi (ft)
24.1	width-depth ratio
306.4	W flood prone area (ft)
8.0	entrenchment ratio
0.7	low bank height ratio



View Downstream

Cross Section 8, UT1

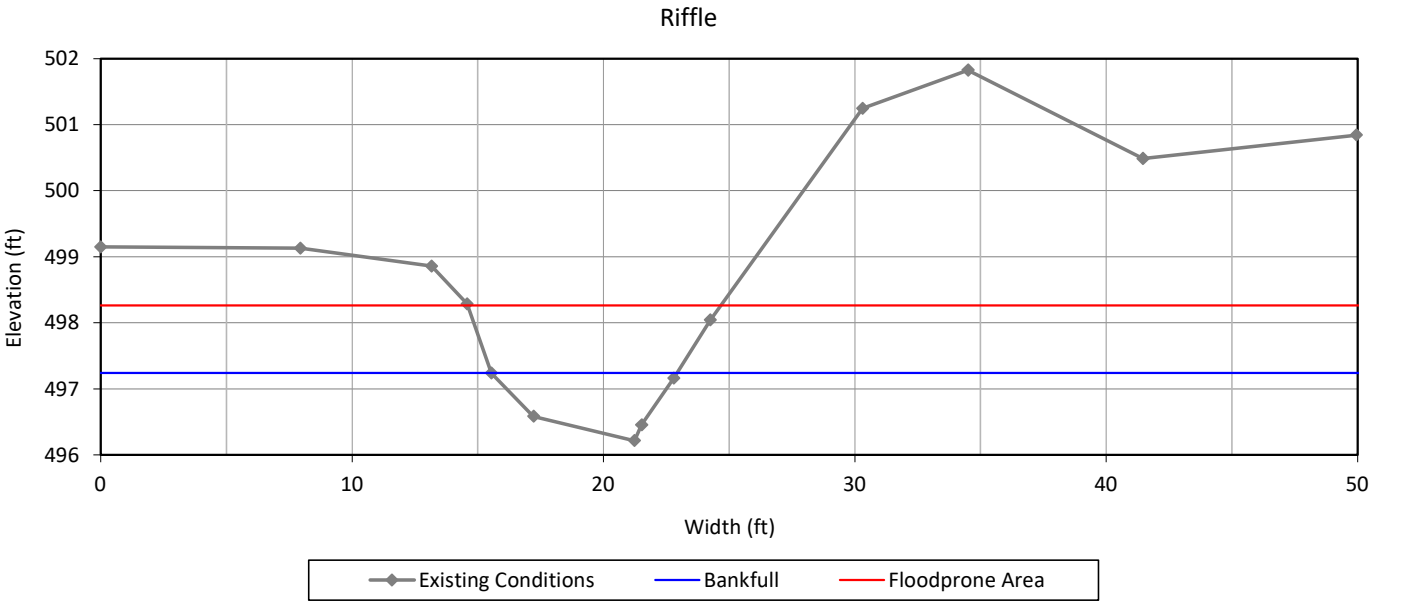


Bankfull Dimensions	
6.2	x-section area (ft.sq.)
6.9	width (ft)
0.9	mean depth (ft)
1.3	max depth (ft)
8.4	wetted perimeter (ft)
0.7	hyd radi (ft)
7.7	width-depth ratio
10.0	W flood prone area (ft)
1.4	entrenchment ratio
2.1	low bank height ratio



View Downstream

Cross Section 9, UT1

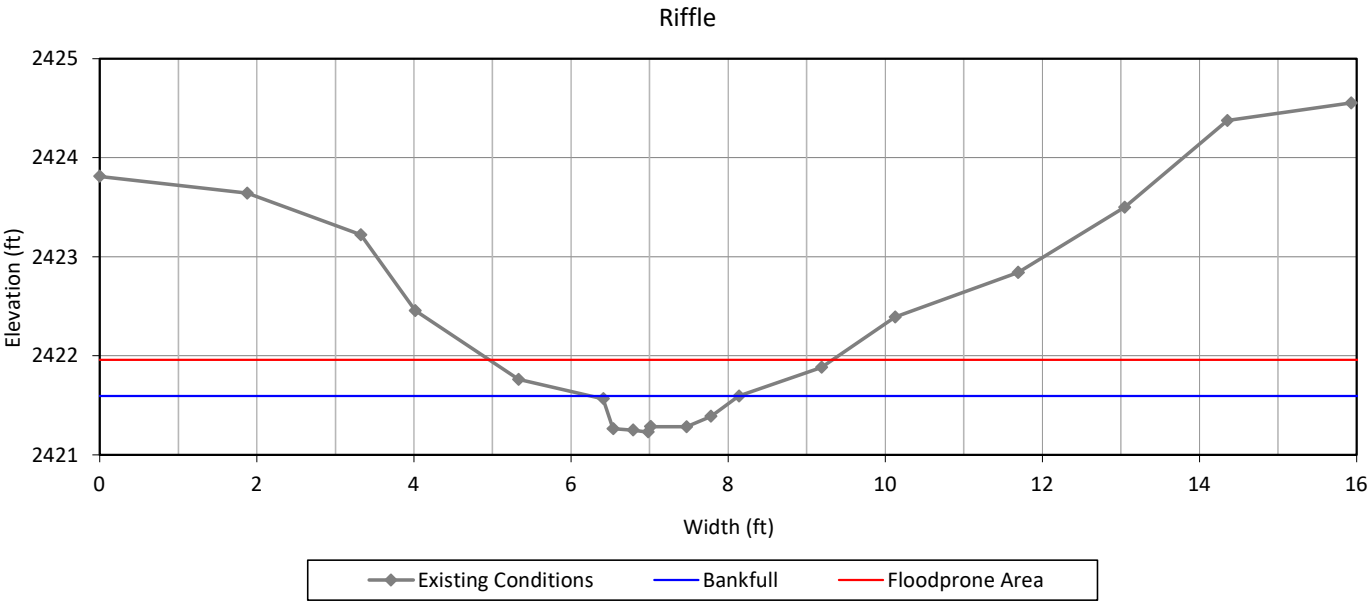


Bankfull Dimensions	
4.7	x-section area (ft.sq.)
7.4	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
7.8	wetted perimeter (ft)
0.6	hyd radi (ft)
11.5	width-depth ratio
10.1	W flood prone area (ft)
1.4	entrenchment ratio
2.6	low bank height ratio



View Downstream

Cross Section 10, UT1A

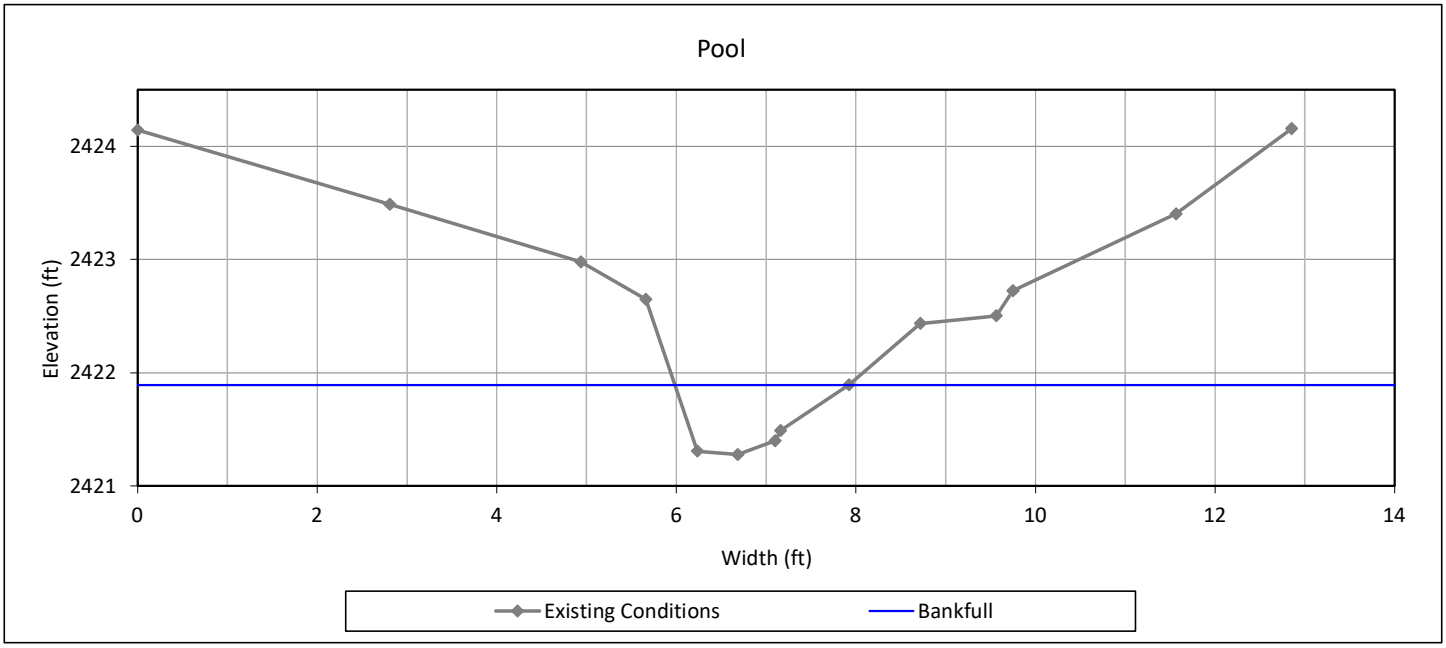


Bankfull Dimensions	
0.4	x-section area (ft.sq.)
1.9	width (ft)
0.2	mean depth (ft)
0.4	max depth (ft)
2.2	wetted perimeter (ft)
0.2	hyd radi (ft)
7.9	width-depth ratio
4.4	W flood prone area (ft)
2.3	entrenchment ratio
3.2	low bank height ratio



View Downstream

Cross Section 11, UT1A

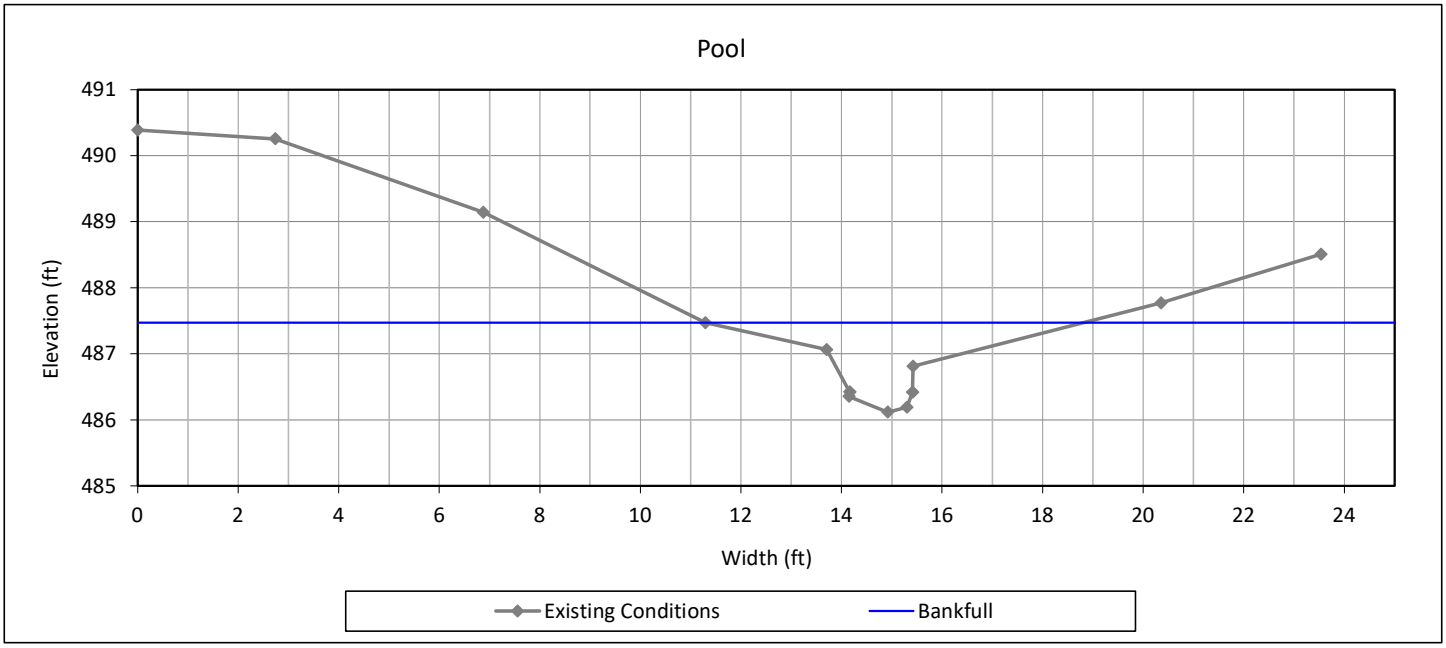


Bankfull Dimensions	
0.8	x-section area (ft.sq.)
1.9	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
2.5	wetted perimeter (ft)
0.3	hyd radi (ft)
5.0	width-depth ratio
2.6	W flood prone area (ft)
1.3	entrenchment ratio
1.8	low bank height ratio



View Downstream

Cross Section 12, UT2 Reach 2

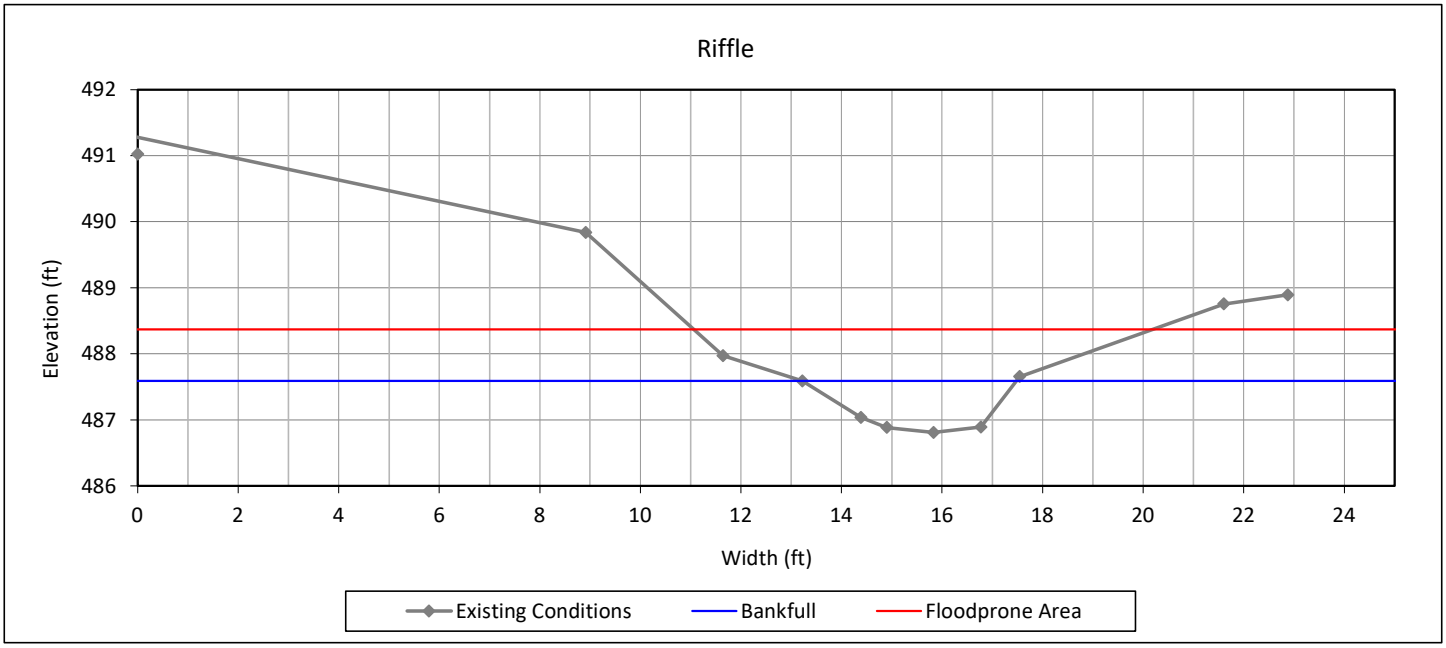


Bankfull Dimensions	
3.5	x-section area (ft.sq.)
7.5	width (ft)
0.5	mean depth (ft)
1.4	max depth (ft)
8.6	wetted perimeter (ft)
0.4	hyd radi (ft)
16.0	width-depth ratio
8.5	W flood prone area (ft)
1.1	entrenchment ratio
0.5	low bank height ratio



View Downstream

Cross Section 13, UT2 Reach 2

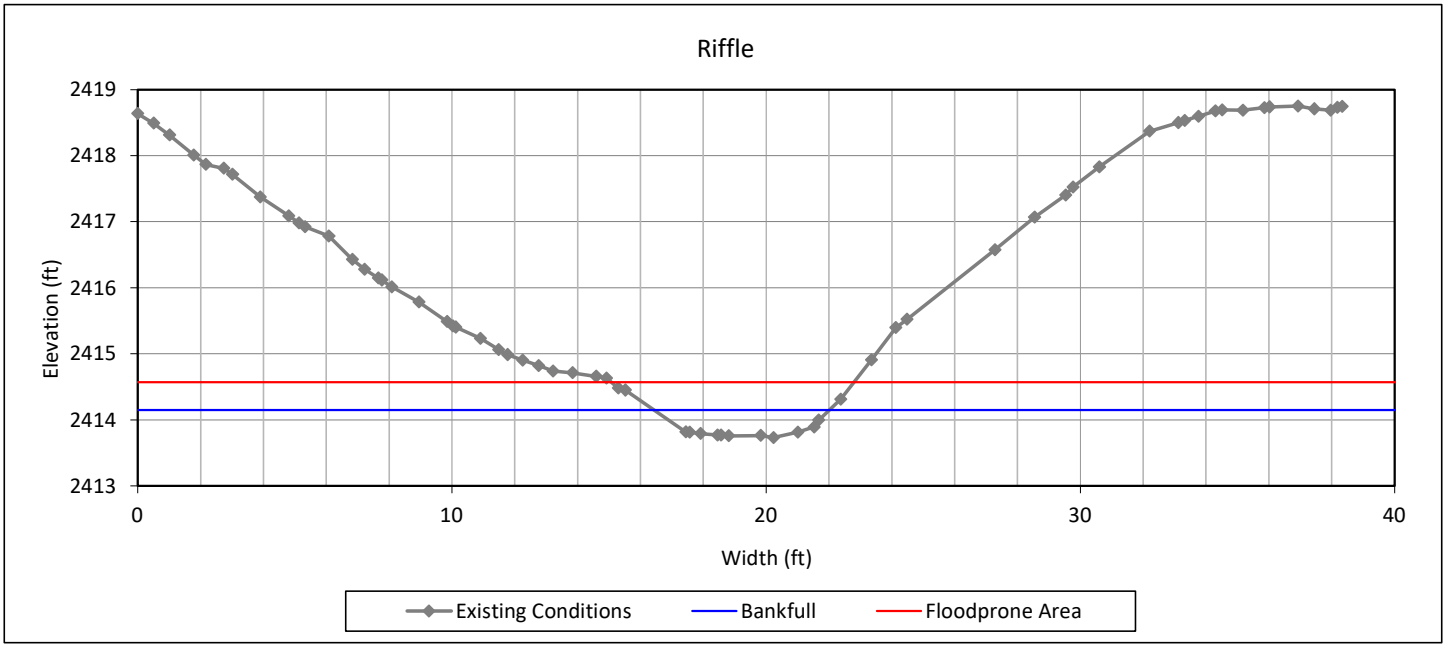


Bankfull Dimensions	
2.3	x-section area (ft.sq.)
4.3	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
4.7	wetted perimeter (ft)
0.5	hyd radi (ft)
8.0	width-depth ratio
9.1	W flood prone area (ft)
2.1	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 14, UT2 Reach 1

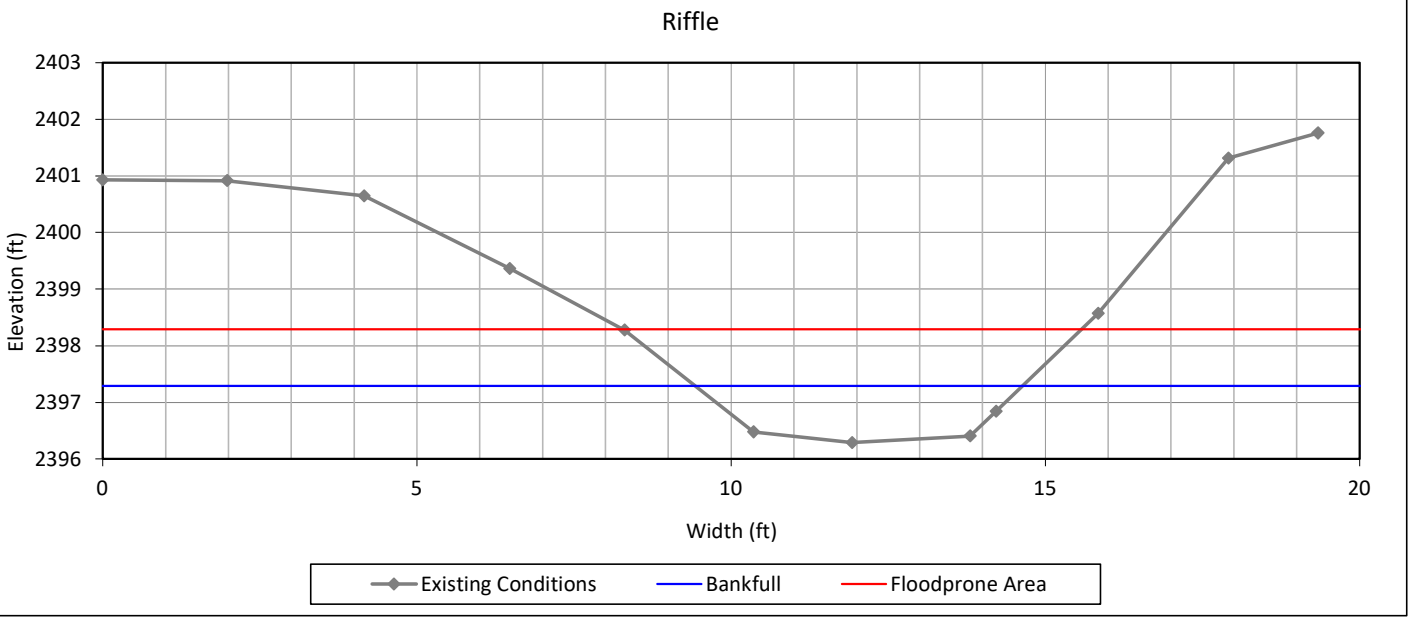


Bankfull Dimensions	
1.7	x-section area (ft.sq.)
5.6	width (ft)
0.3	mean depth (ft)
0.4	max depth (ft)
5.7	wetted perimeter (ft)
0.3	hyd radi (ft)
18.1	width-depth ratio
7.7	W flood prone area (ft)
1.4	entrenchment ratio
1.7	low bank height ratio



View Downstream

Cross Section 15, UT2A

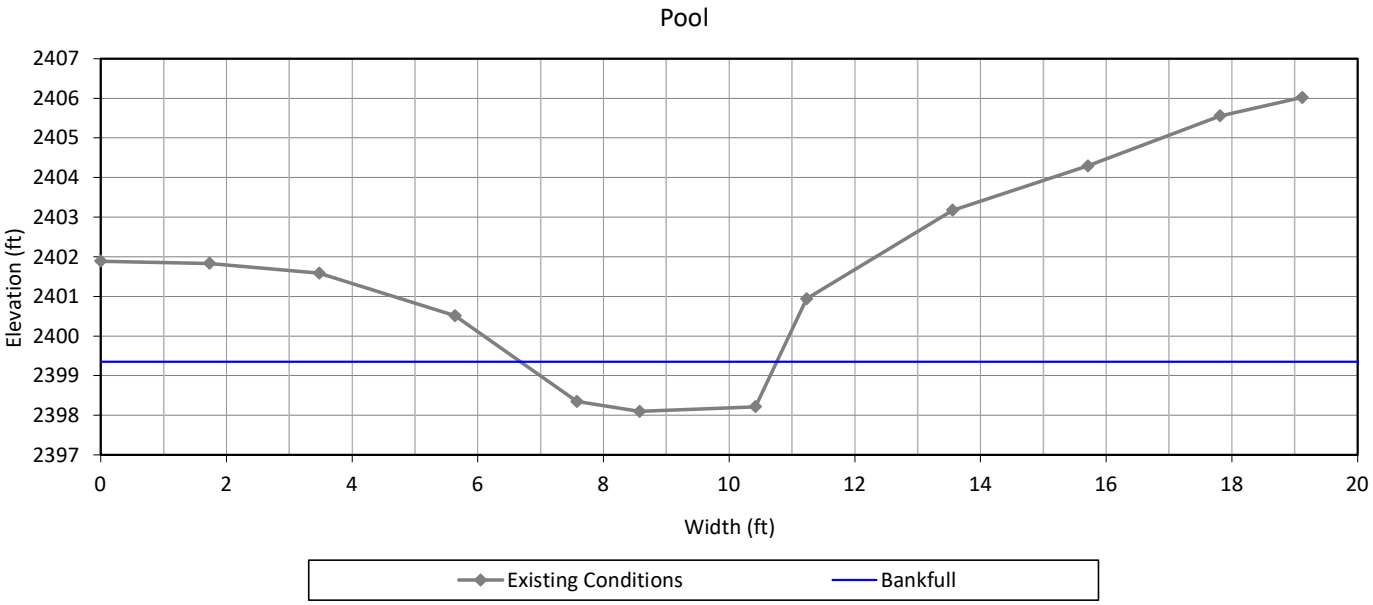


Bankfull Dimensions	
3.9	x-section area (ft.sq.)
5.2	width (ft)
0.8	mean depth (ft)
1.0	max depth (ft)
5.9	wetted perimeter (ft)
0.7	hyd radi (ft)
6.9	width-depth ratio
7.3	W flood prone area (ft)
1.4	entrenchment ratio
2.0	low bank height ratio



View Downstream

Cross Section 16, UT2A



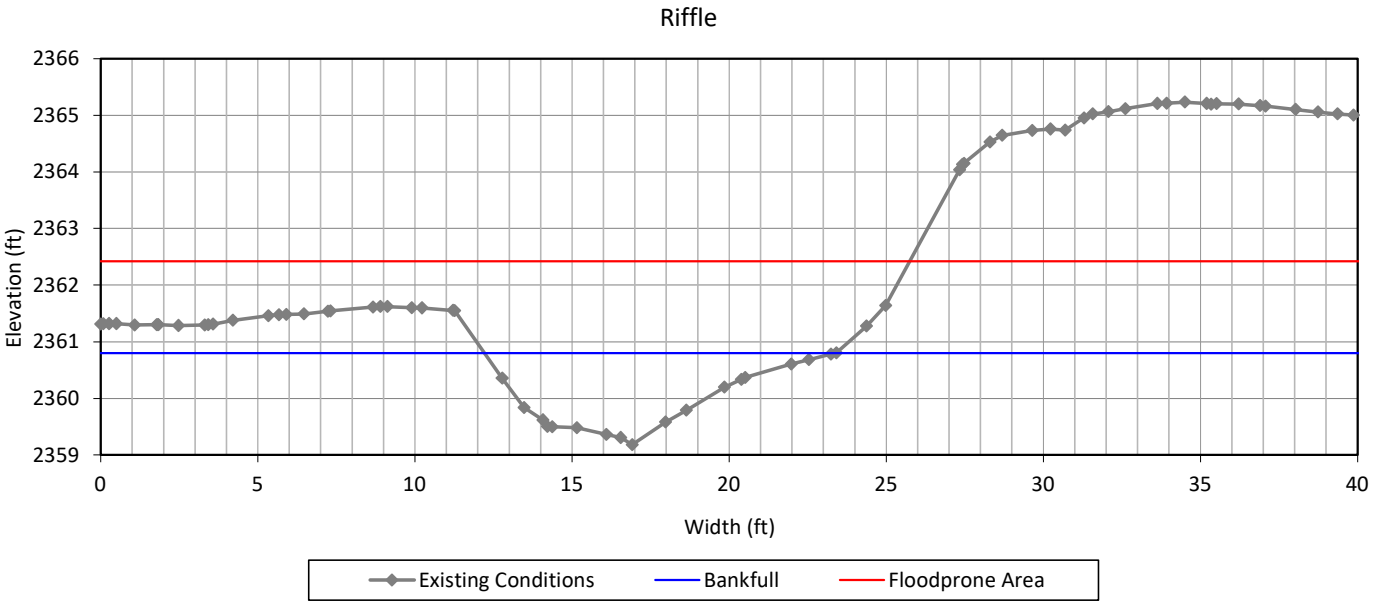
Bankfull Dimensions

4.0	x-section area (ft.sq.)
4.1	width (ft)
1.0	mean depth (ft)
1.3	max depth (ft)
5.4	wetted perimeter (ft)
0.7	hyd radi (ft)
4.2	width-depth ratio
5.3	W flood prone area (ft)
1.3	entrenchment ratio
2.7	low bank height ratio



View Downstream

Cross Section 17, UT3 Reach 4

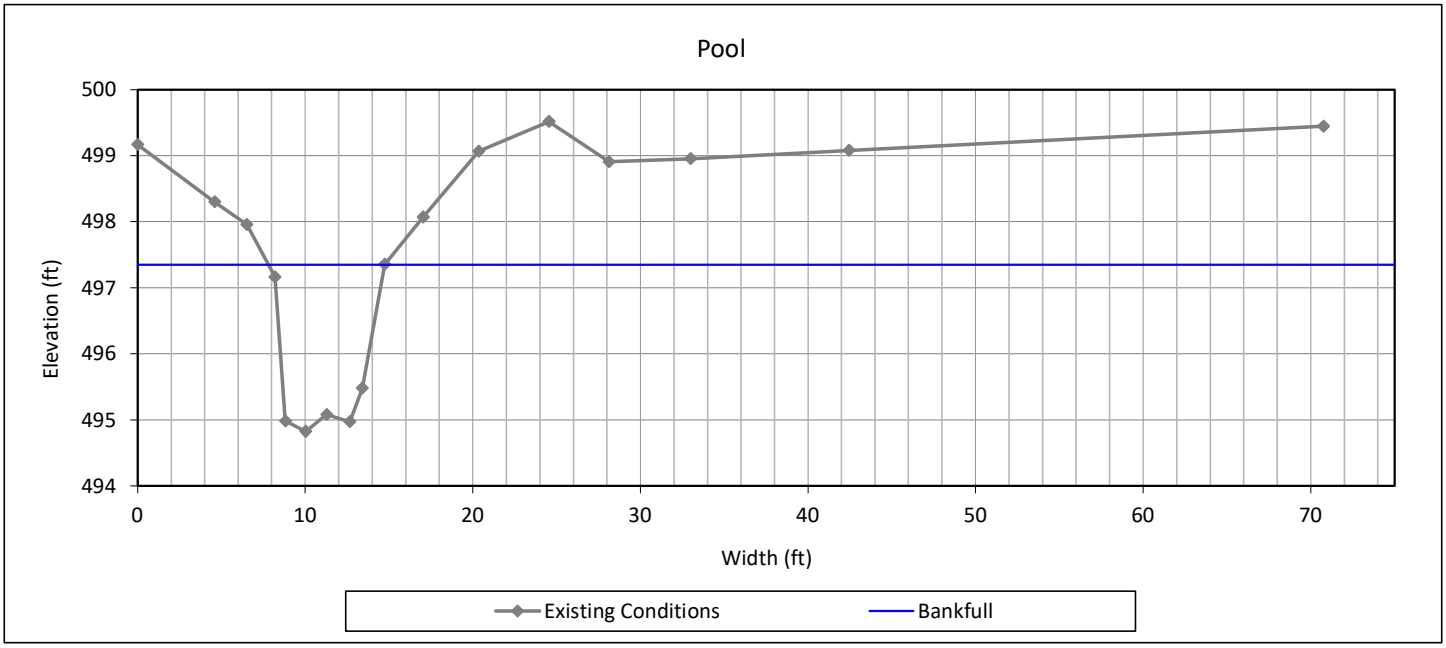


Bankfull Dimensions	
9.4	x-section area (ft.sq.)
11.2	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
11.8	wetted perimeter (ft)
0.8	hyd radi (ft)
13.3	width-depth ratio
25.4	W flood prone area (ft)
2.3	entrenchment ratio
1.5	low bank height ratio



View Downstream

Cross Section 18, UT3 Reach 3

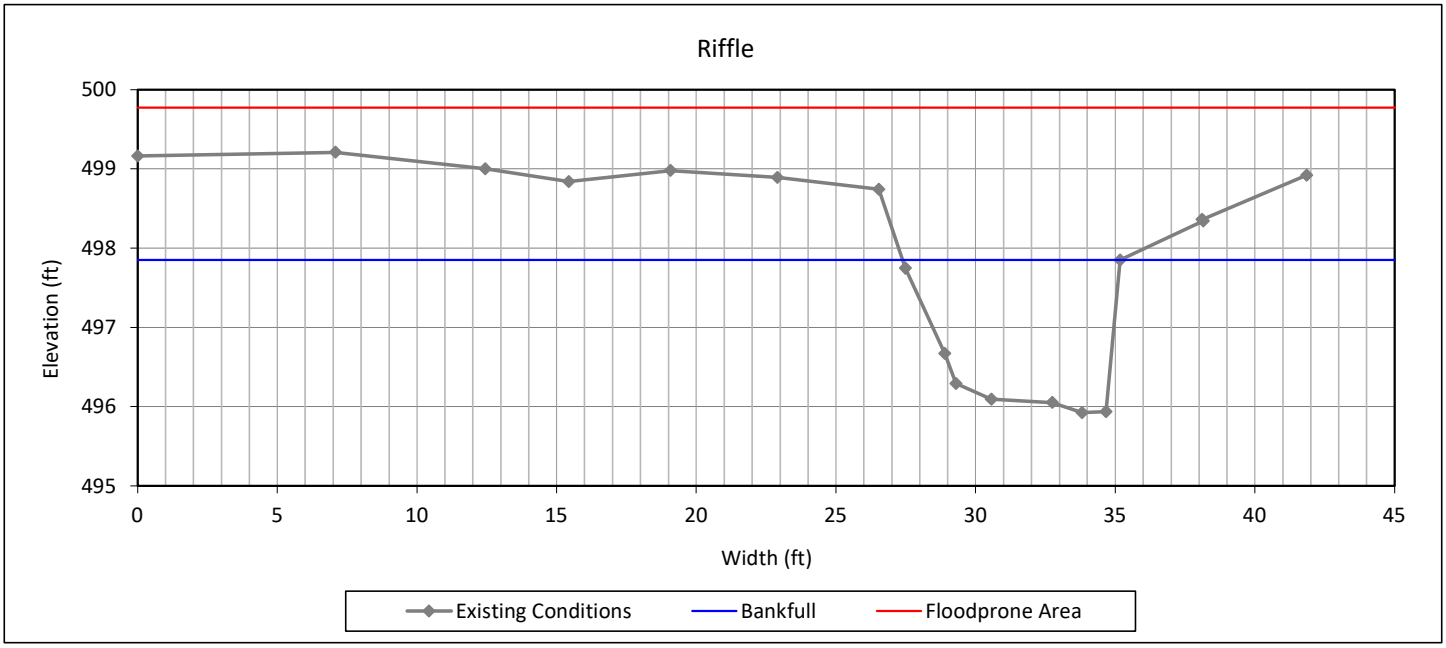


Bankfull Dimensions	
12.8	x-section area (ft.sq.)
6.9	width (ft)
1.8	mean depth (ft)
2.5	max depth (ft)
9.8	wetted perimeter (ft)
1.3	hyd radi (ft)
3.8	width-depth ratio
54.0	W flood prone area (ft)
7.8	entrenchment ratio
0.9	low bank height ratio



View Downstream

Cross Section 19, UT3 Reach 3

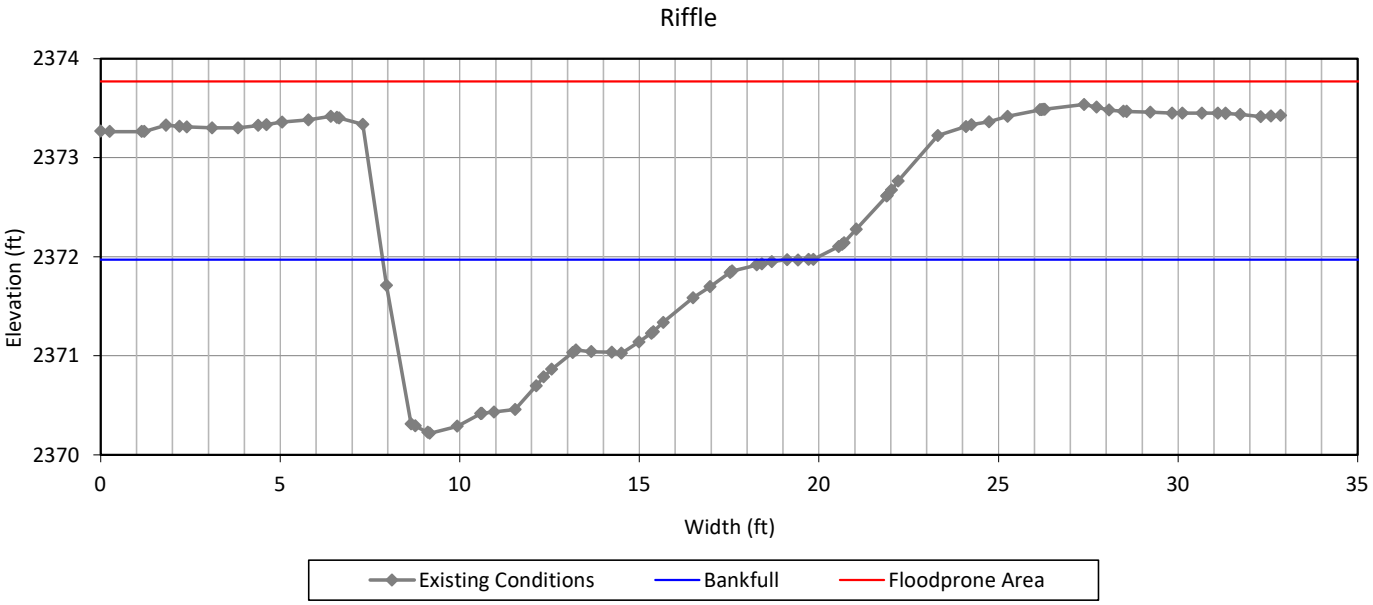


Bankfull Dimensions	
11.5	x-section area (ft.sq.)
7.8	width (ft)
1.5	mean depth (ft)
1.9	max depth (ft)
9.8	wetted perimeter (ft)
1.2	hyd radi (ft)
5.2	width-depth ratio
41.8	W flood prone area (ft)
5.4	entrenchment ratio
1.5	low bank height ratio



View Downstream

Cross Section 20, UT3 Reach 2

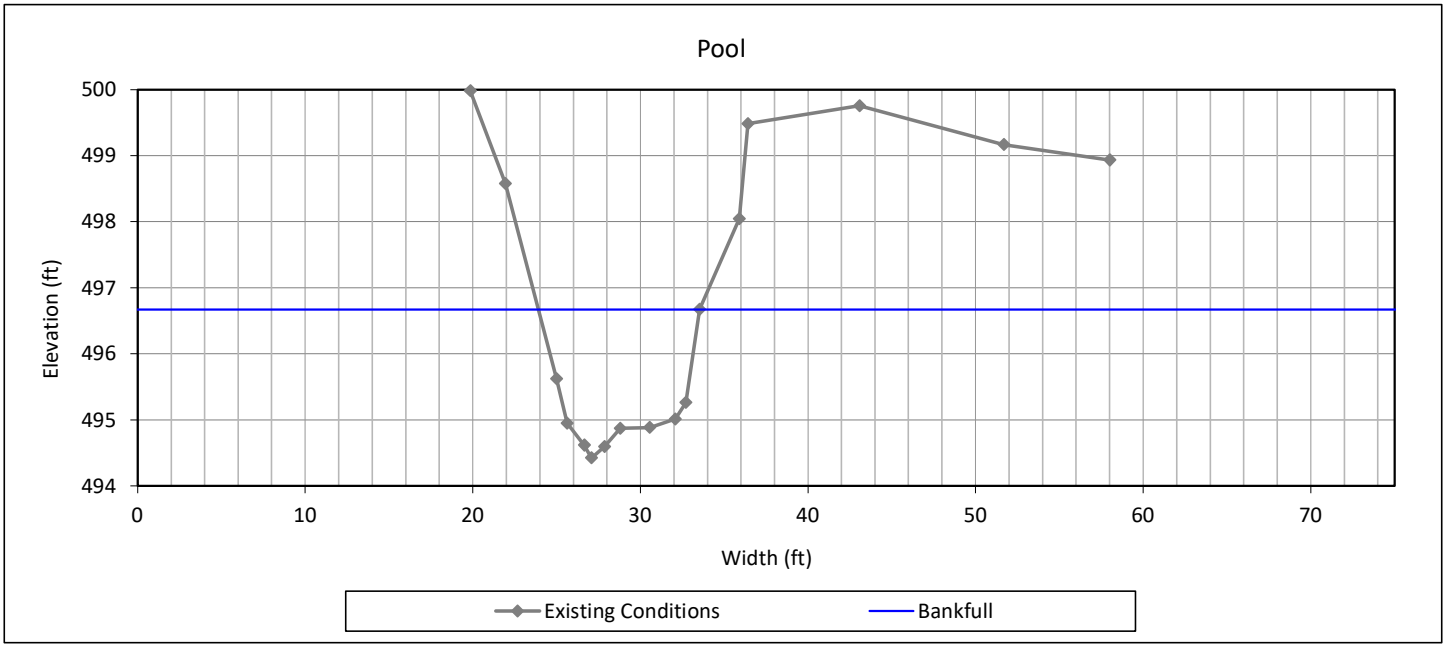


Bankfull Dimensions	
10.3	x-section area (ft.sq.)
11.6	width (ft)
0.9	mean depth (ft)
1.8	max depth (ft)
12.9	wetted perimeter (ft)
0.8	hyd radi (ft)
13.0	width-depth ratio
32.6	W flood prone area (ft)
2.8	entrenchment ratio
1.7	low bank height ratio



View Upstream

Cross Section 21, UT3 Reach 1

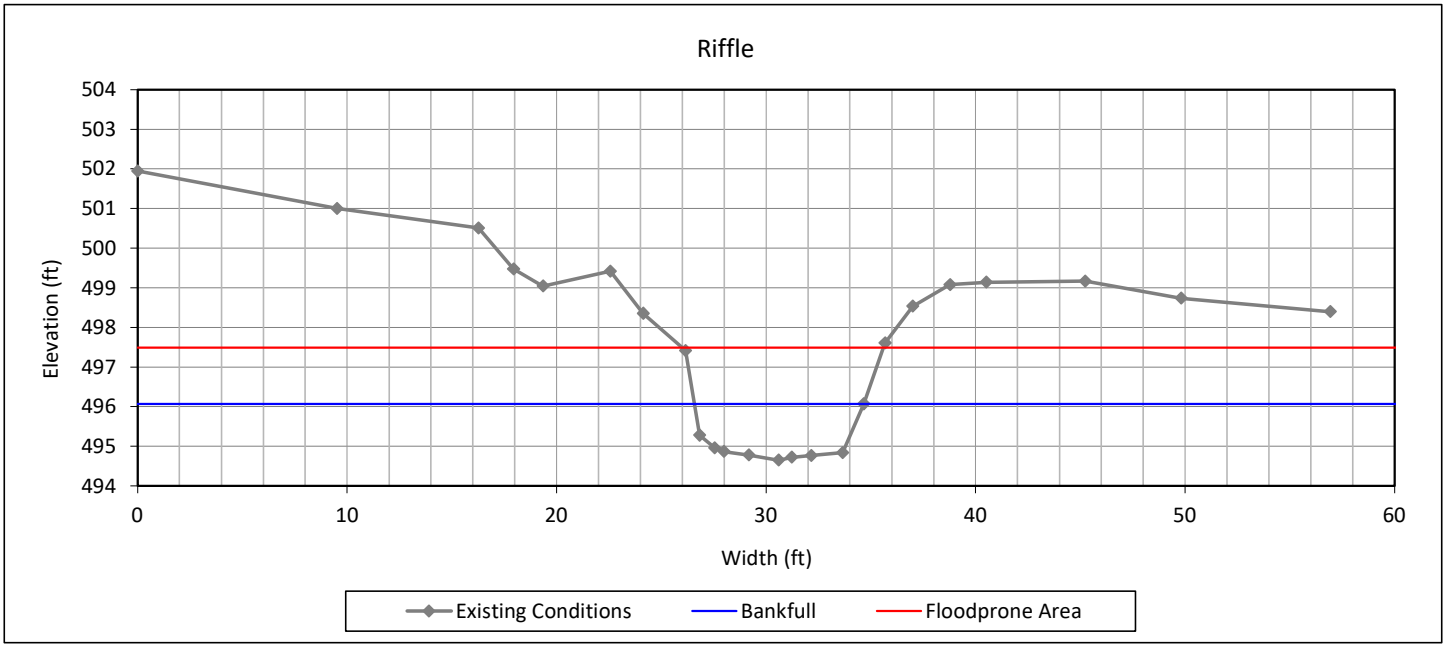


Bankfull Dimensions	
15.1	x-section area (ft.sq.)
9.6	width (ft)
1.6	mean depth (ft)
2.2	max depth (ft)
11.3	wetted perimeter (ft)
1.3	hyd radi (ft)
6.1	width-depth ratio
11.5	W flood prone area (ft)
1.2	entrenchment ratio
2.3	low bank height ratio



View Downstream

Cross Section 22, UT3 Reach 1

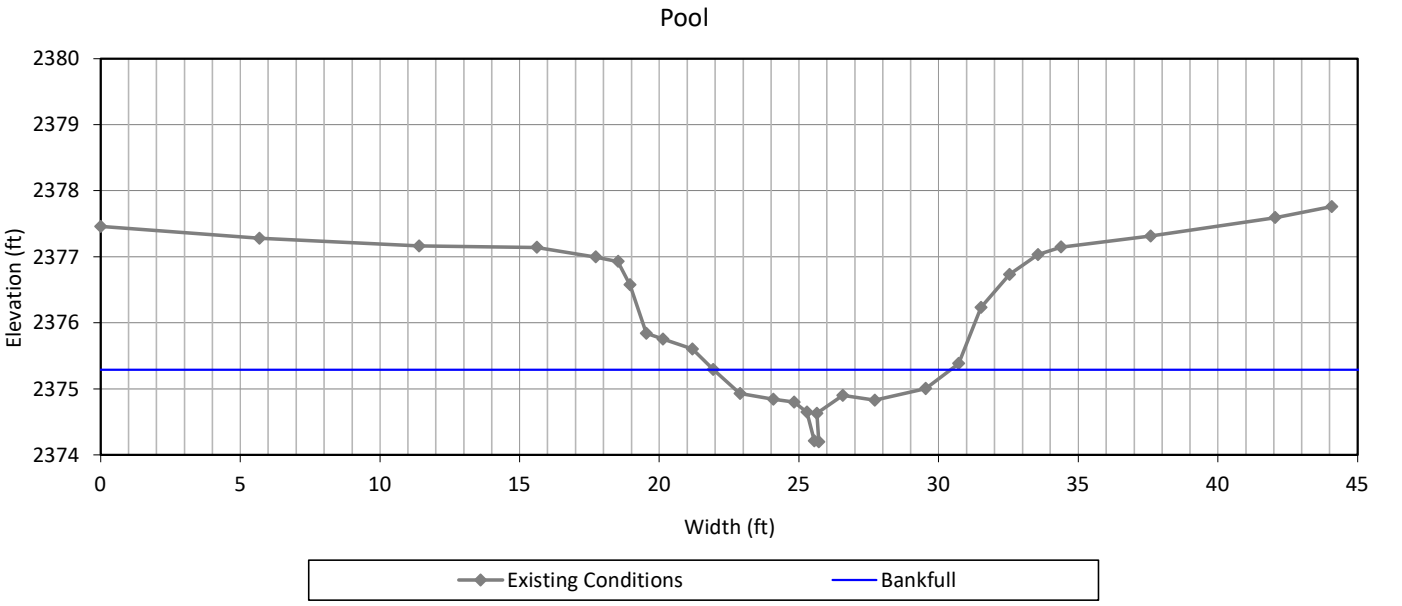


Bankfull Dimensions	
9.3	x-section area (ft.sq.)
8.1	width (ft)
1.2	mean depth (ft)
1.4	max depth (ft)
9.3	wetted perimeter (ft)
1.0	hyd radi (ft)
7.0	width-depth ratio
9.6	W flood prone area (ft)
1.2	entrenchment ratio
3.1	low bank height ratio



View Downstream

Cross Section 23, UT3A Reach 2

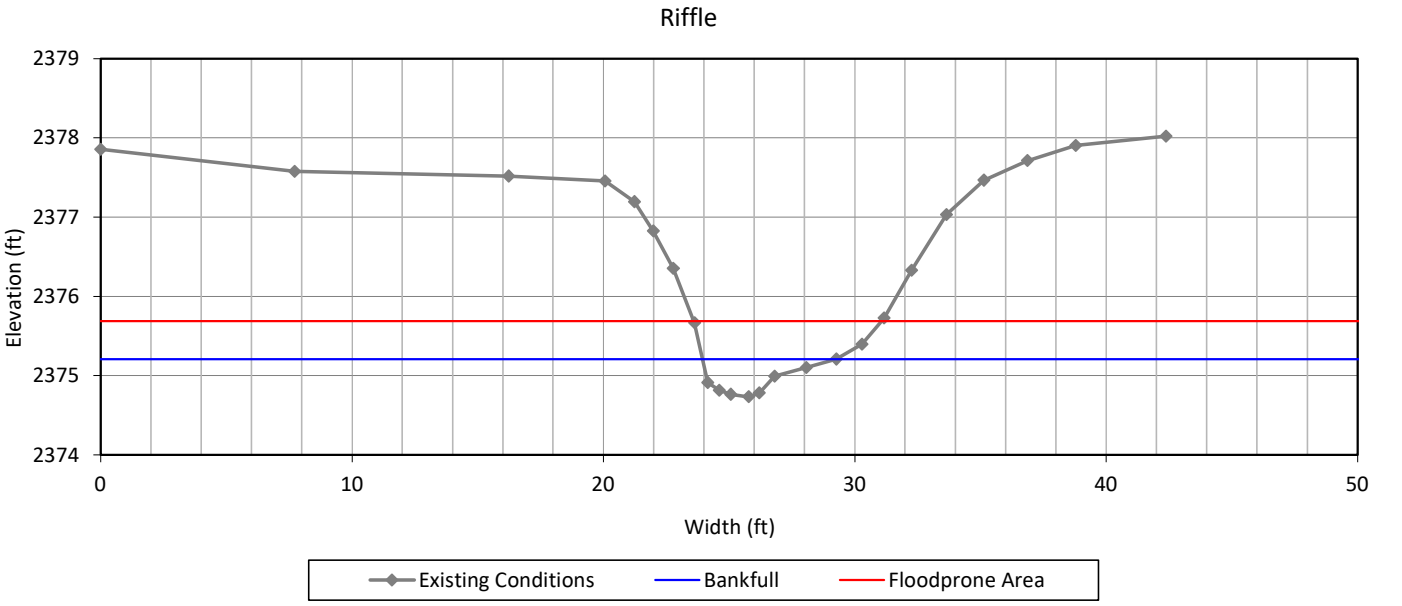


Bankfull Dimensions	
3.4	x-section area (ft.sq.)
8.5	width (ft)
0.4	mean depth (ft)
1.1	max depth (ft)
9.4	wetted perimeter (ft)
0.4	hyd radi (ft)
21.3	width-depth ratio
70.0	W flood prone area (ft)
8.2	entrenchment ratio
1.3	low bank height ratio



View Downstream

Cross Section 24, UT3A Reach 2

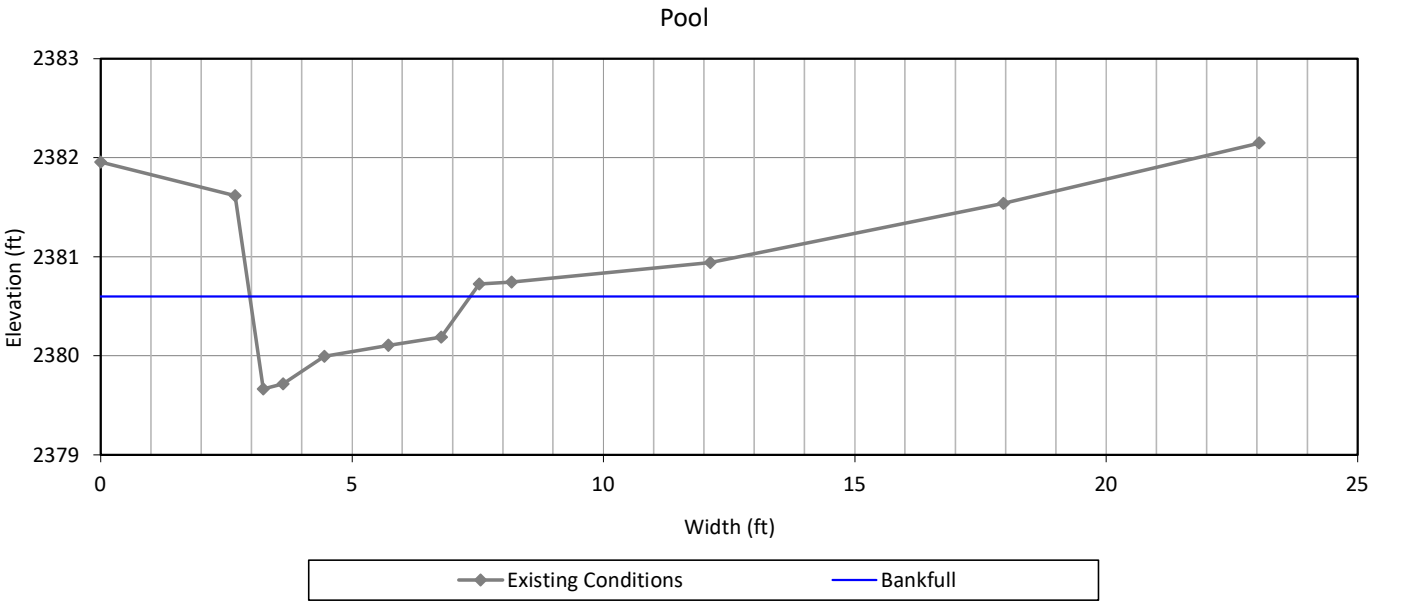


Bankfull Dimensions	
1.4	x-section area (ft.sq.)
5.3	width (ft)
0.3	mean depth (ft)
0.5	max depth (ft)
5.5	wetted perimeter (ft)
0.2	hyd radi (ft)
20.7	width-depth ratio
7.5	W flood prone area (ft)
1.4	entrenchment ratio
5.8	low bank height ratio



View Downstream

Cross Section 25, UT3B

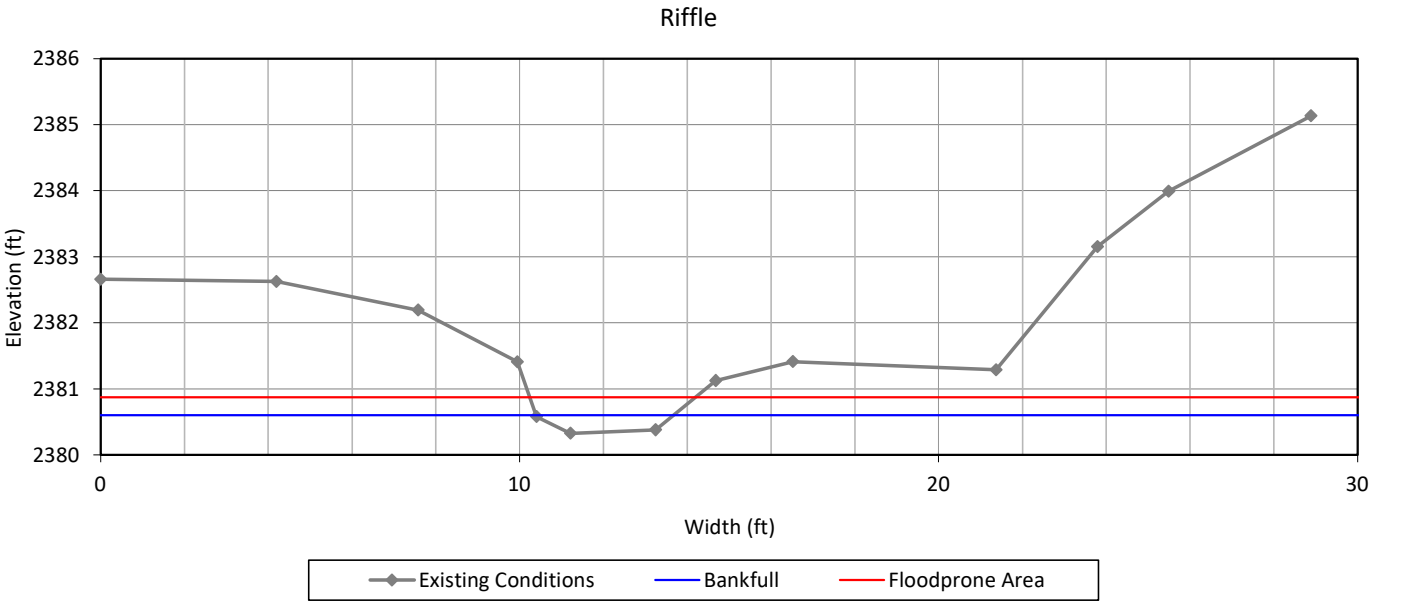


Bankfull Dimensions	
2.4	x-section area (ft.sq.)
4.4	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
5.3	wetted perimeter (ft)
0.5	hyd radi (ft)
8.1	width-depth ratio
18.4	W flood prone area (ft)
4.2	entrenchment ratio
1.1	low bank height ratio



View Downstream

Cross Section 26, UT3B

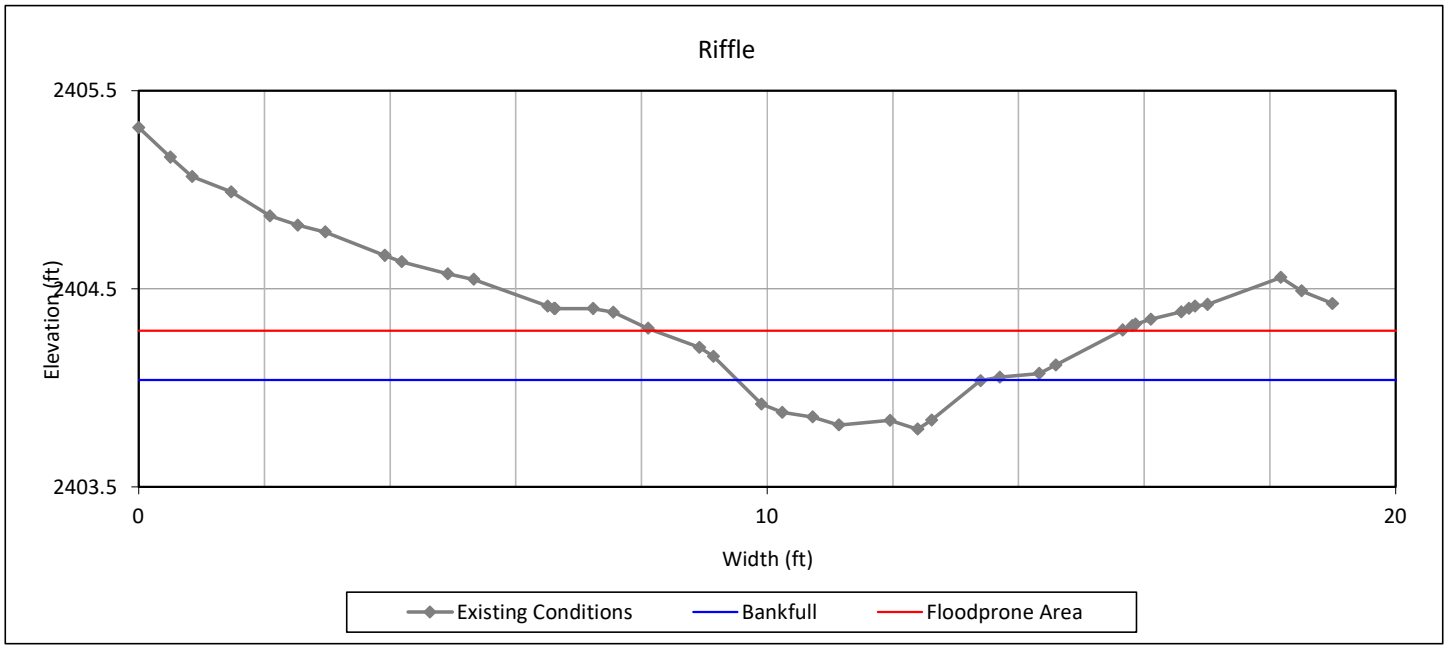


Bankfull Dimensions	
0.7	x-section area (ft.sq.)
3.3	width (ft)
0.2	mean depth (ft)
0.3	max depth (ft)
3.4	wetted perimeter (ft)
0.2	hyd radi (ft)
16.2	width-depth ratio
3.9	W flood prone area (ft)
1.2	entrenchment ratio
2.8	low bank height ratio



View Downstream

Cross Section 27, UT3B1

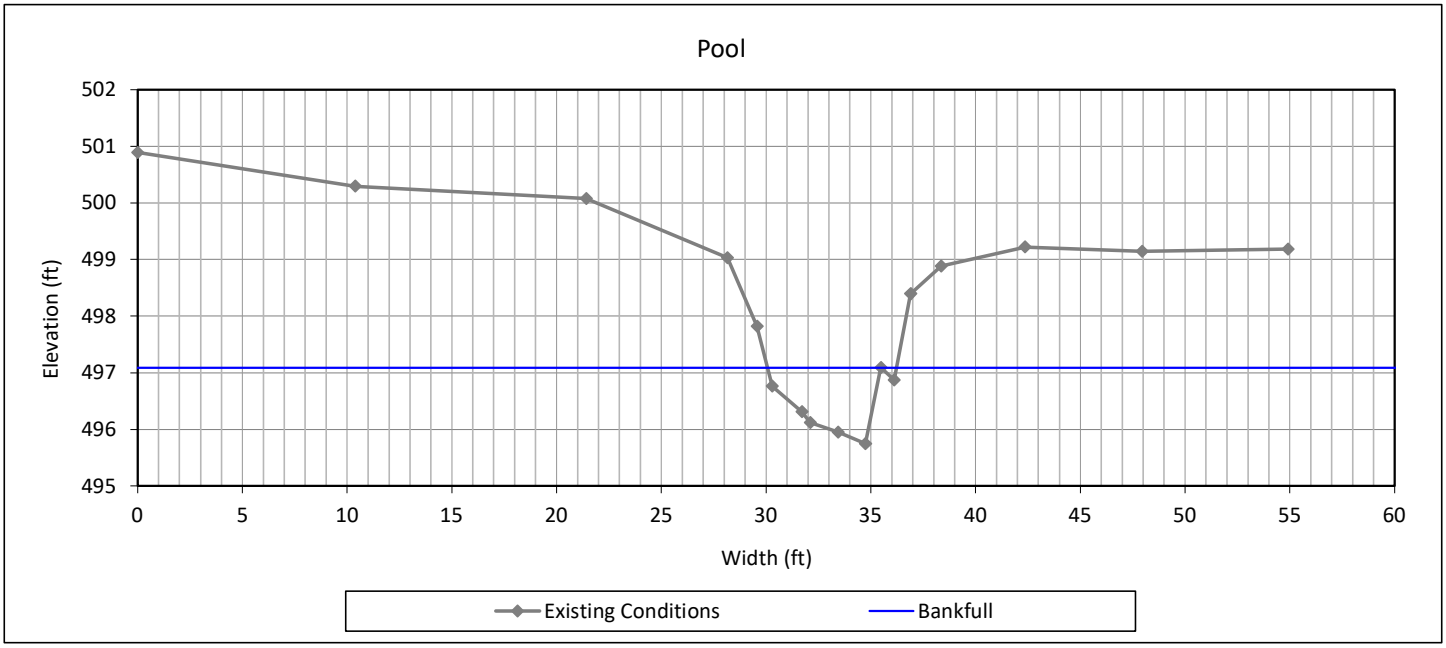


Bankfull Dimensions	
0.6	x-section area (ft.sq.)
3.9	width (ft)
0.2	mean depth (ft)
0.2	max depth (ft)
3.9	wetted perimeter (ft)
0.2	hyd radi (ft)
23.2	width-depth ratio
7.4	W flood prone area (ft)
1.9	entrenchment ratio
1.0	low bank height ratio



View Downstream

Cross Section 28, UT3C Reach 2

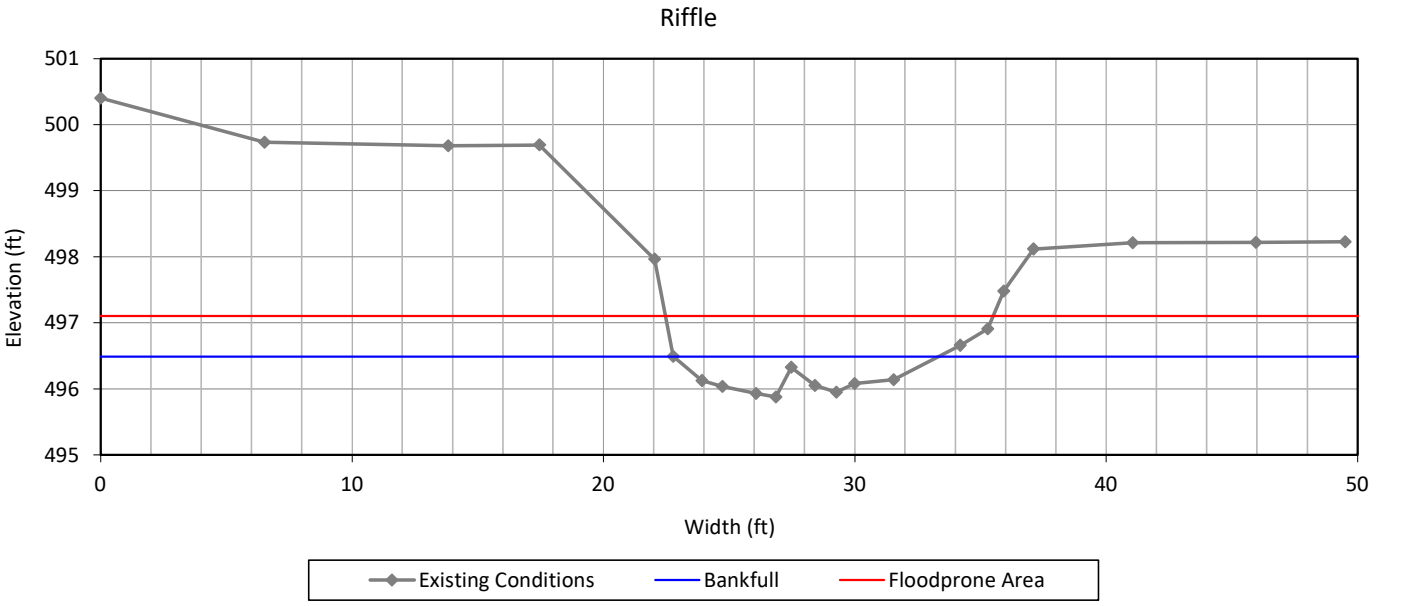


Bankfull Dimensions	
4.7	x-section area (ft.sq.)
5.4	width (ft)
0.9	mean depth (ft)
1.3	max depth (ft)
6.5	wetted perimeter (ft)
0.7	hyd radi (ft)
6.2	width-depth ratio
7.0	W flood prone area (ft)
1.3	entrenchment ratio
2.3	low bank height ratio



View Upstream

Cross Section 29, UT3C Reach 2

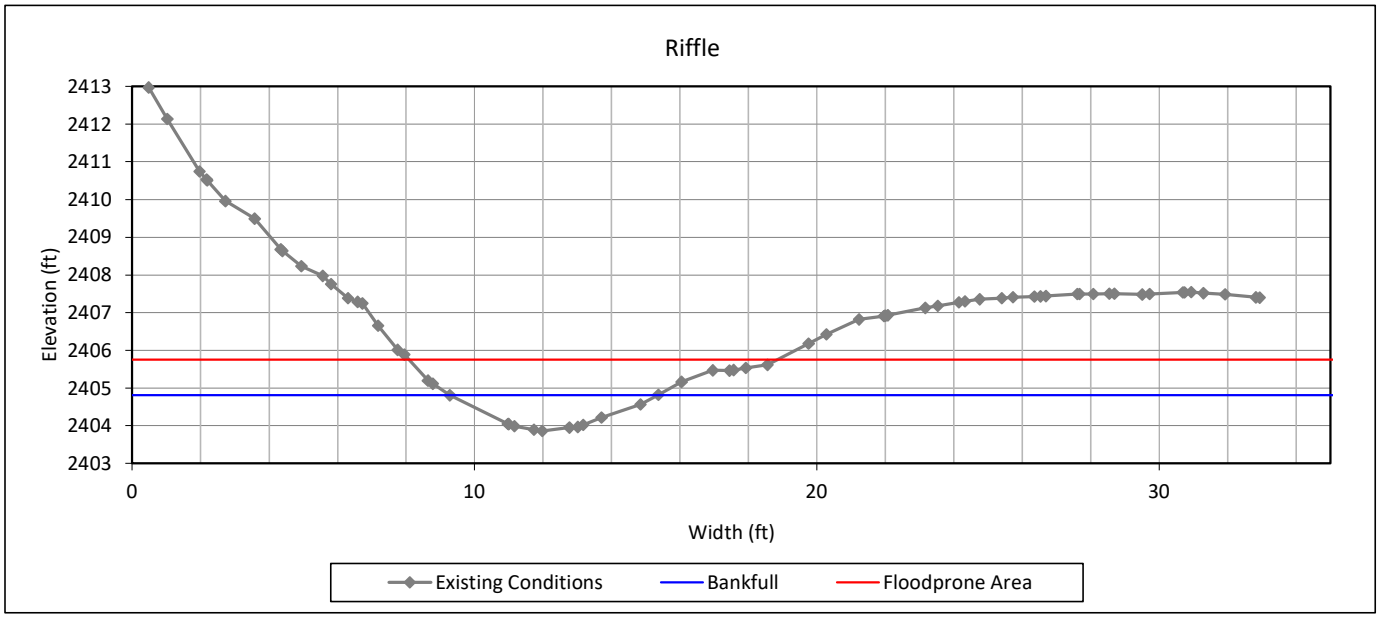


Bankfull Dimensions	
3.9	x-section area (ft.sq.)
10.6	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
10.9	wetted perimeter (ft)
0.4	hyd radi (ft)
28.8	width-depth ratio
13.0	W flood prone area (ft)
1.2	entrenchment ratio
3.7	low bank height ratio



View Downstream

Cross Section 30, UT3C Reach 1



Bankfull Dimensions	
3.5	x-section area (ft.sq.)
6.1	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
6.4	wetted perimeter (ft)
0.5	hyd radi (ft)
10.6	width-depth ratio
10.8	W flood prone area (ft)
1.8	entrenchment ratio
1.7	low bank height ratio



View Downstream

PEBBLE COUNT ANALYSIS WORKSHEET

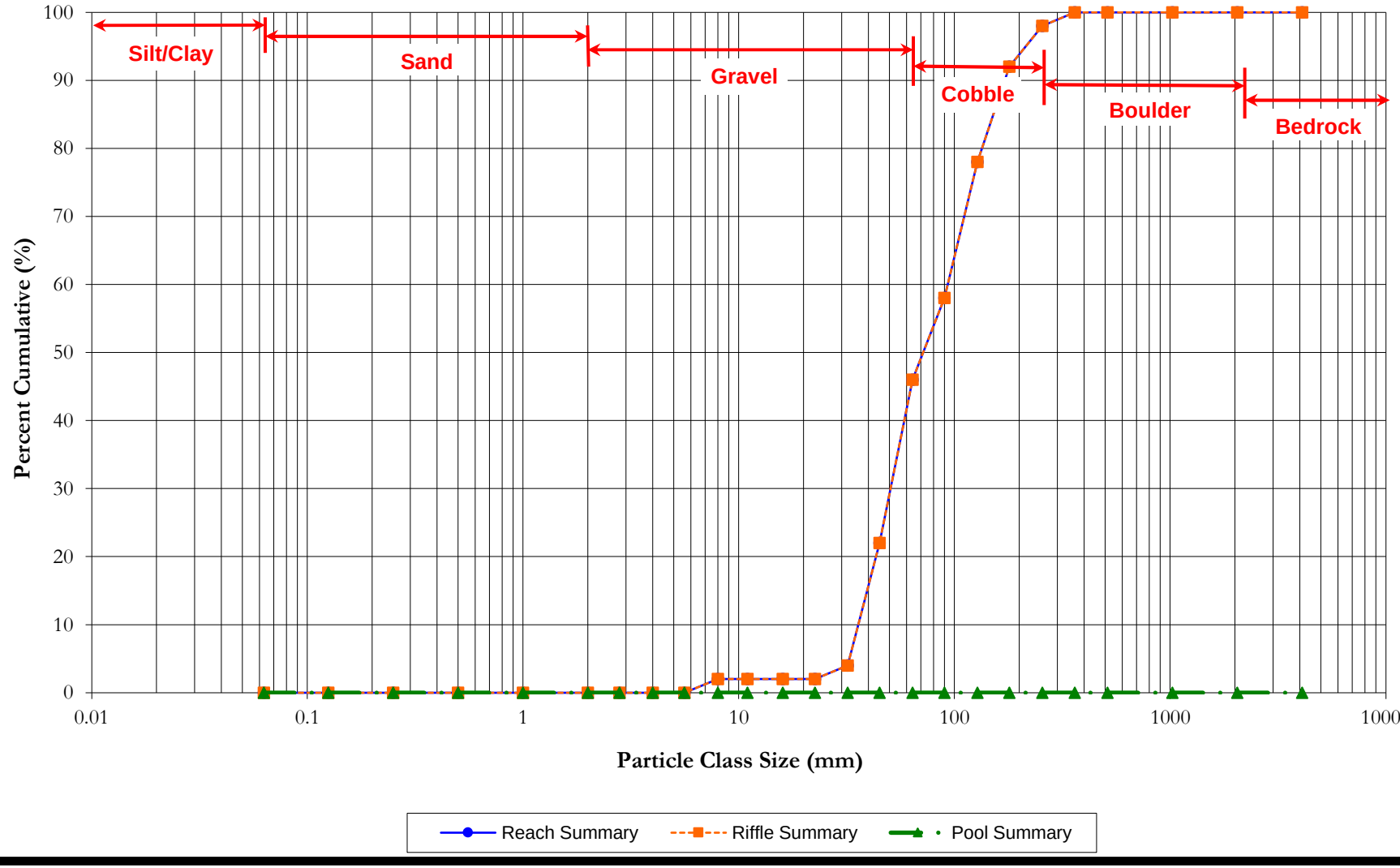
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JDW
Location:	Franklin, NC	**Data Collected On:**	3/24/2021
Job #:	W02191	**Reach:**	Jones Creek - Reach 2 (also 1a & 1b)
Date:	3/29/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0.00		#DIV/0!		0.00
SAND	Very fine	0.062	0.125					0.00		#DIV/0!		0.00
	Fine	0.125	0.250					0.00		#DIV/0!		0.00
	Medium	0.250	0.500					0.00		#DIV/0!		0.00
	Coarse	0.5	1.0					0.00		#DIV/0!		0.00
	Very Coarse	1.0	2.0					0.00		#DIV/0!		0.00
GRAVEL	Very Fine	2.0	2.8					0.00		#DIV/0!		0.00
	Very Fine	2.8	4.0					0.00		#DIV/0!		0.00
	Fine	4.0	5.7					0.00		#DIV/0!		0.00
	Fine	5.7	8.0	**1**		1	2.00	2.00		#DIV/0!	2.00	2.00
	Medium	8.0	11.3					2.00		#DIV/0!		2.00
	Medium	11.3	16.0					2.00		#DIV/0!		2.00
	Coarse	16.0	22.6					2.00		#DIV/0!		2.00
	Coarse	22.6	32	**1**		1	2.00	4.00		#DIV/0!	2.00	4.00
	Very Coarse	32	45	**9**		9	18.00	22.00		#DIV/0!	18.00	22.00
	Very Coarse	45	64	**12**		12	24.00	46.00		#DIV/0!	24.00	46.00
COBBLE	Small	64	90	**6**		6	12.00	58.00		#DIV/0!	12.00	58.00
	Small	90	128	**10**		10	20.00	78.00		#DIV/0!	20.00	78.00
	Large	128	180	**7**		7	14.00	92.00		#DIV/0!	14.00	92.00
	Large	180	256	**3**		3	6.00	98.00		#DIV/0!	6.00	98.00
BOULDER	Small	256	362	**1**		1	2.00	100.00		#DIV/0!	2.00	100.00
	Small	362	512					100.00		#DIV/0!		100.00
	Medium	512	1024					100.00		#DIV/0!		100.00
	Large/Very Large	1024	2048					100.00		#DIV/0!		100.00
BEDROCK	Bedrock	2048	>2048					100.00		#DIV/0!		100.00
			Total:	**50**	**0**	**50**	**100**	100	**0**	#DIV/0!	**100**	100

Largest Particle (mm): >256

Riffle Channel materials (mm)	
D_{16} =	40.17
D_{35} =	54.5
D_{50} =	71.7
D_{84} =	148.1
D_{95} =	214.7
D_{100} =	362

Jones Creek - Reach 2 (also 1a & 1b)
50-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

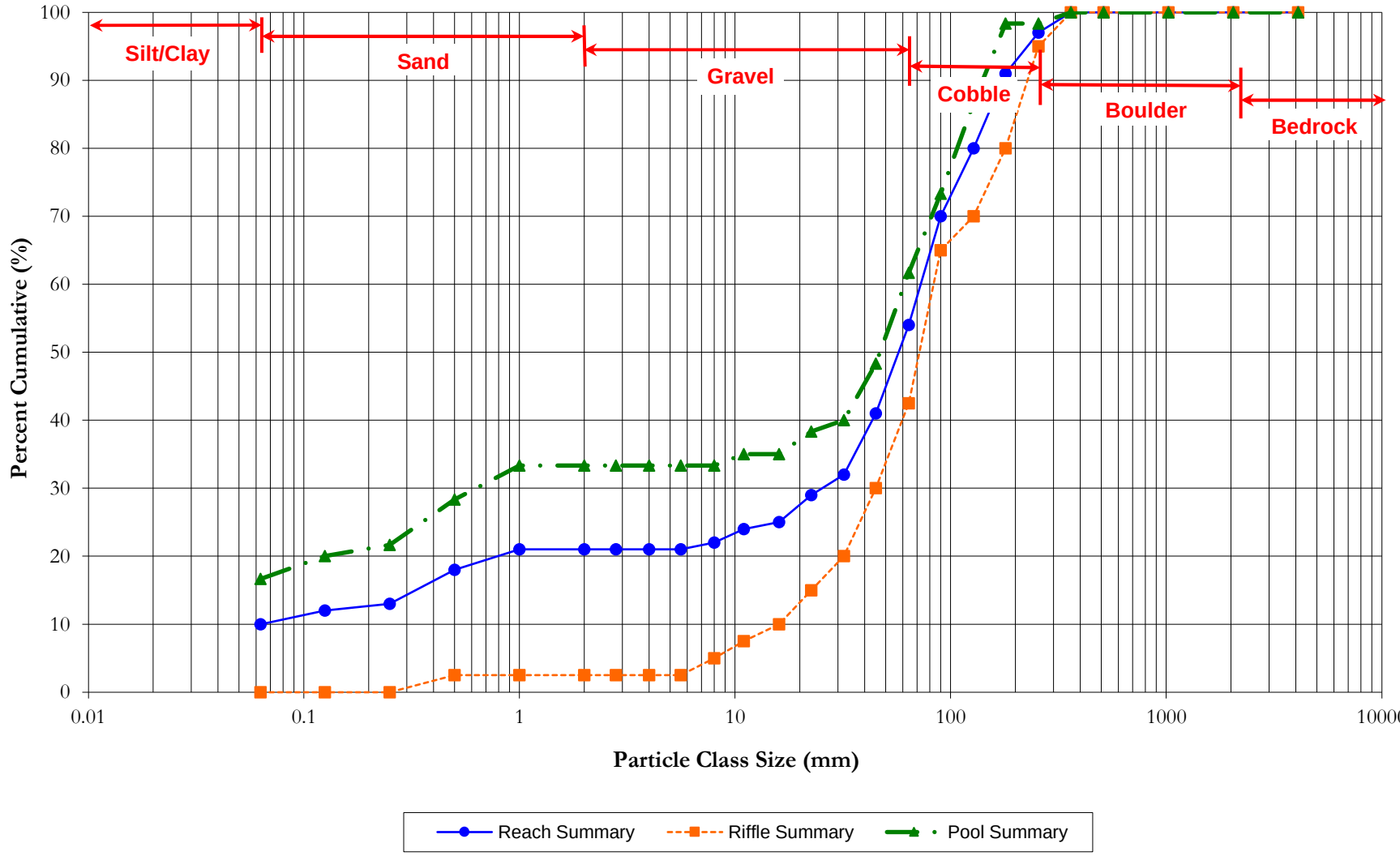
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + SG
Location:	Franklin, NC	**Data Collected On:**	7/15/2021
Job #:	W02191	**Reach:**	Jones Creek - Reach 2 (also 1a & 1b)
Date:	7/16/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		**10**	10		0.00	16.67	16.67	10.00	10.00
SAND	Very fine	0.062	0.125		**2**	2		0.00	3.33	20.00	2.00	12.00
	Fine	0.125	0.250		**1**	1		0.00	1.67	21.67	1.00	13.00
	Medium	0.250	0.500	**1**	**4**	5	2.50	2.50	6.67	28.33	5.00	18.00
	Coarse	0.5	1.0		**3**	3		2.50	5.00	33.33	3.00	21.00
	Very Coarse	1.0	2.0					2.50		33.33		21.00
GRAVEL	Very Fine	2.0	2.8					2.50		33.33		21.00
	Very Fine	2.8	4.0					2.50		33.33		21.00
	Fine	4.0	5.7					2.50		33.33		21.00
	Fine	5.7	8.0	**1**		1	2.50	5.00		33.33	1.00	22.00
	Medium	8.0	11.3	**1**	**1**	2	2.50	7.50	1.67	35.00	2.00	24.00
	Medium	11.3	16.0	**1**		1	2.50	10.00		35.00	1.00	25.00
	Coarse	16.0	22.6	**2**	**2**	4	5.00	15.00	3.33	38.33	4.00	29.00
	Coarse	22.6	32	**2**	**1**	3	5.00	20.00	1.67	40.00	3.00	32.00
	Very Coarse	32	45	**4**	**5**	9	10.00	30.00	8.33	48.33	9.00	41.00
	Very Coarse	45	64	**5**	**8**	13	12.50	42.50	13.33	61.67	13.00	54.00
COBBLE	Small	64	90	**9**	**7**	16	22.50	65.00	11.67	73.33	16.00	70.00
	Small	90	128	**2**	**8**	10	5.00	70.00	13.33	86.67	10.00	80.00
	Large	128	180	**4**	**7**	11	10.00	80.00	11.67	98.33	11.00	91.00
	Large	180	256	**6**		6	15.00	95.00		98.33	6.00	97.00
BOULDER	Small	256	362	**2**	**1**	3	5.00	100.00	1.67	100.00	3.00	100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	>2048					100.00		100.00		100.00
			Total:	**40**	**60**	**100**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	24.23	D_{16} =	0.06	D_{16} =	0.38
D_{35} =	51.8	D_{35} =	11.0	D_{35} =	35.9
D_{50} =	71.7	D_{50} =	47.0	D_{50} =	57.4
D_{84} =	197.7	D_{84} =	119.3	D_{84} =	144.9
D_{95} =	256.0	D_{95} =	163.3	D_{95} =	227.6
D_{100} =	362	D_{99} =	362	D_{99} =	362

Jones Creek - Reach 2 (also 1a & 1b)
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	JMB + JDW
Location:	Franklin, NC	**Data Collected On:**	
Job #:	W02191	**Reach:**	Jones Creek - R2
Date:	8/12/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	666.2	298	1196	**80%**	**20.0**
SAND	Very Coarse	#10	2.0	4.0	480.0	511.8	32	1164	**78%**	**22.1**
GRAVEL	Fine	#5	4.0	8.0	495.3	538.4	43	1121	**75%**	**25.0**
	Medium	5/16"	8.0	16.0	513.9	693.3	179	942	**63%**	**37.0**
	Coarse	5/8"	16.0	31.5	541.4	1169.1	628	314	**21%**	**79.0**
	Very Coarse	1 1/4"	31.5	38.0	540.8	854.9	314	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): **38** mm
Largest Particle (2): **46** mm

Total Sample Weight (g) 1495

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	14.27
D_{50} =	19.74
D_{84} =	32.9
D_{95} =	36.3
D_{100} =	38.0

PEBBLE COUNT ANALYSIS WORKSHEET

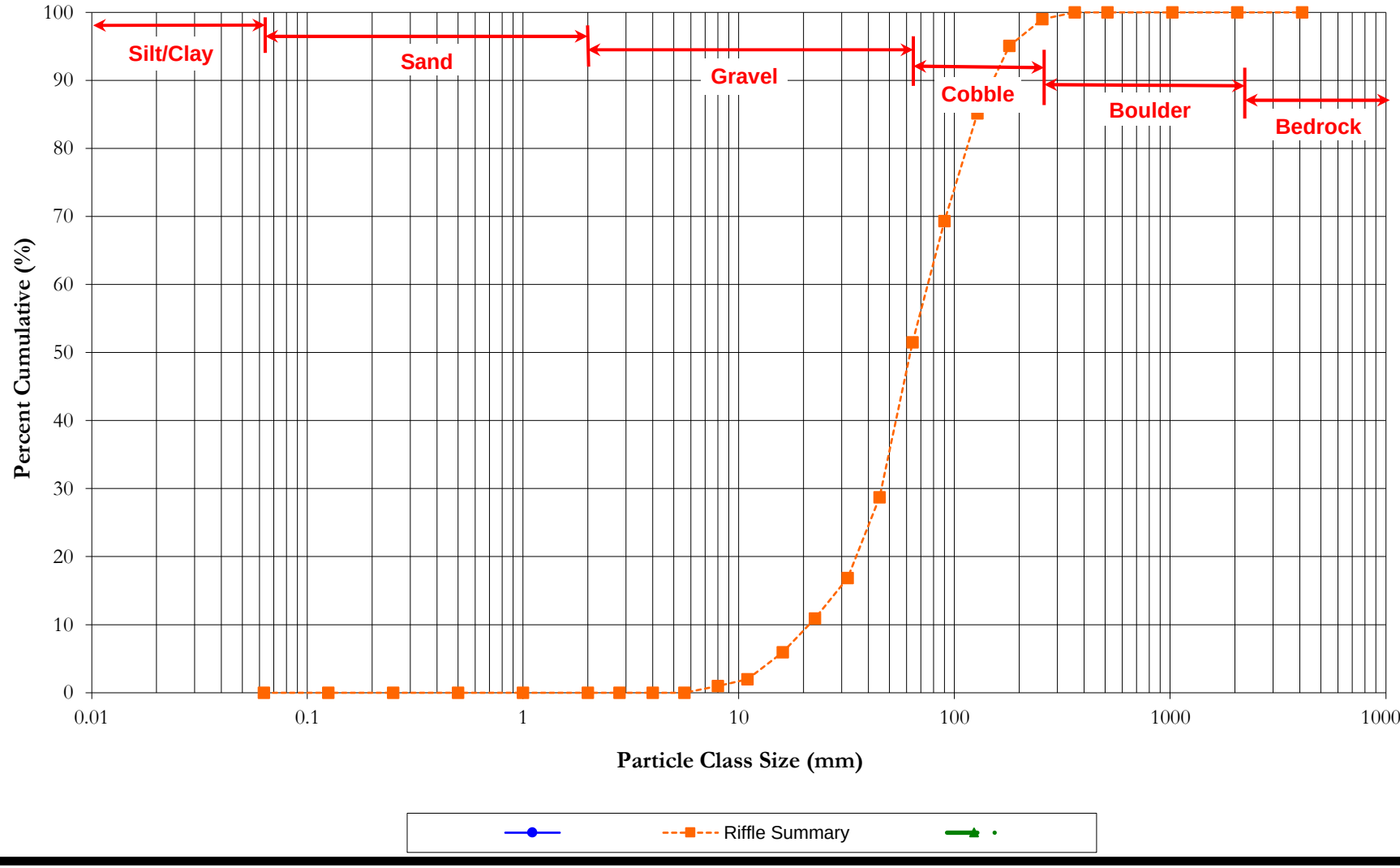
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JDW + JH
Location:	Franklin, NC	**Data Collected On:**	4/23/2021
Job #:	W02191	**Reach:**	Jones Creek - Reach 4-5
Date:	4/26/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary					
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative				
SILT/CLAY	Silt/Clay	0.000	0.062					0.00				
SAND	Very fine	0.062	0.125					0.00				
	Fine	0.125	0.250					0.00				
	Medium	0.250	0.500					0.00				
	Coarse	0.5	1.0					0.00				
	Very Coarse	1.0	2.0					0.00				
GRAVEL	Very Fine	2.0	2.8					0.00				
	Very Fine	2.8	4.0					0.00				
	Fine	4.0	5.7					0.00				
	Fine	5.7	8.0	**1**		1	0.99	0.99				
	Medium	8.0	11.3	**1**		1	0.99	1.98				
	Medium	11.3	16.0	**4**		4	3.96	5.94				
	Coarse	16.0	22.6	**5**		5	4.95	10.89				
	Coarse	22.6	32	**6**		6	5.94	16.83				
	Very Coarse	32	45	**12**		12	11.88	28.71				
	Very Coarse	45	64	**23**		23	22.77	51.49				
COBBLE	Small	64	90	**18**		18	17.82	69.31				
	Small	90	128	**16**		16	15.84	85.15				
	Large	128	180	**10**		10	9.90	95.05				
	Large	180	256	**4**		4	3.96	99.01				
BOULDER	Small	256	362	**1**		1	0.99	100.00				
	Small	362	512					100.00				
	Medium	512	1024					100.00				
	Large/Very Large	1024	2048					100.00				
BEDROCK	Bedrock	2048	>2048					100.00				
			Total:	**101**	**0**	**101**	**100**	100				

Largest Particle (mm): 280

Riffle Channel materials (mm)		Pool Channel materials (mm)	Cumulative Channel materials (mm)
D_{16} =	54.95		
D_{35} =	49.3		
D_{50} =	61.5		
D_{84} =	116.6		
D_{95} =	162.7		
D_{100} =	362		

Jones Creek - Reach 4-5
100-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

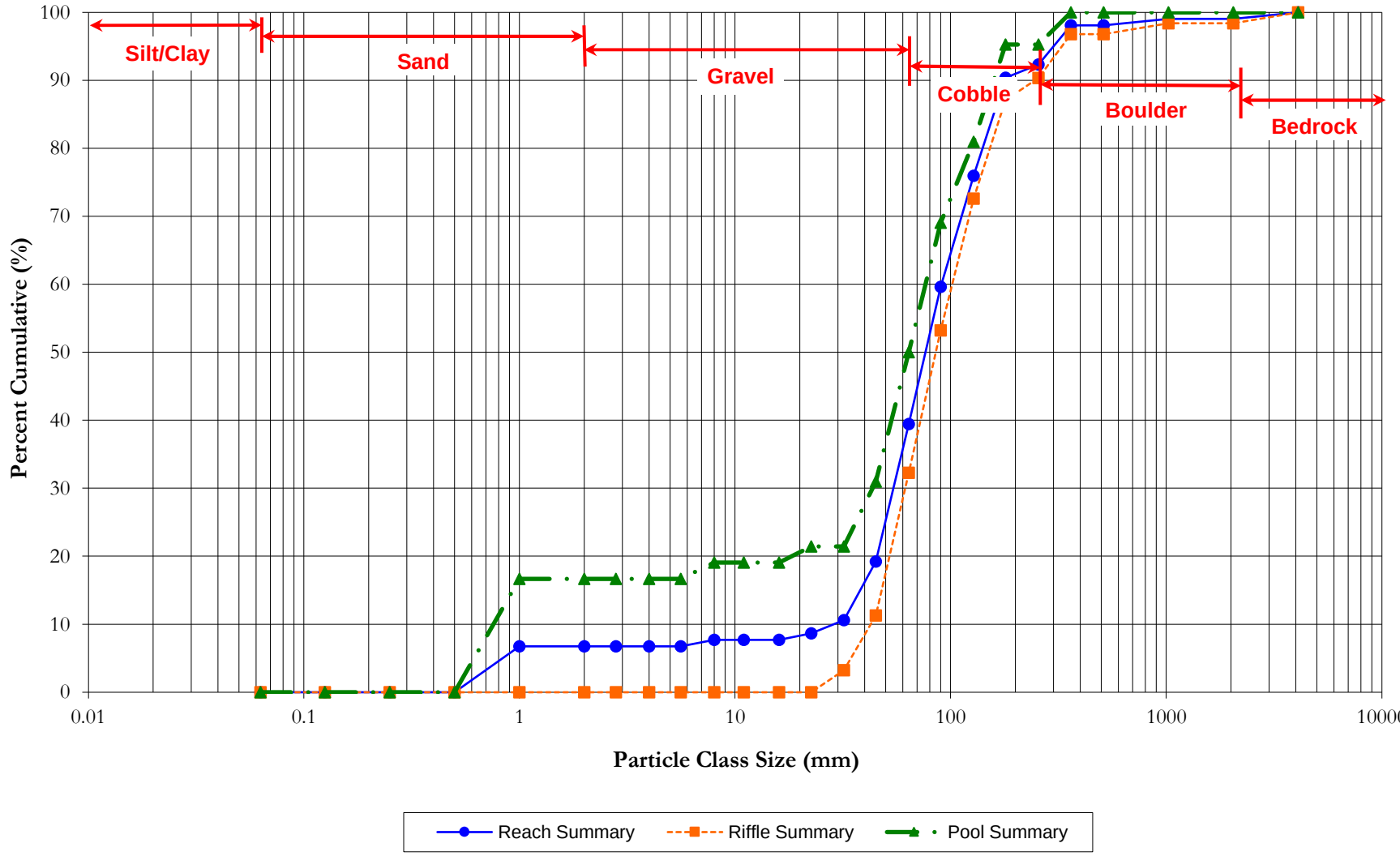
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JDW + JH
Location:	Franklin, NC	**Data Collected On:**	4/23/2021
Job #:	W02191	**Reach:**	Jones Creek - Reach 4-5
Date:	4/26/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0.00		0.00		0.00
SAND	Very fine	0.062	0.125					0.00		0.00		0.00
	Fine	0.125	0.250					0.00		0.00		0.00
	Medium	0.250	0.500					0.00		0.00		0.00
	Coarse	0.5	1.0		**7**	7		0.00	16.67	16.67	6.73	6.73
	Very Coarse	1.0	2.0					0.00		16.67		6.73
GRAVEL	Very Fine	2.0	2.8					0.00		16.67		6.73
	Very Fine	2.8	4.0					0.00		16.67		6.73
	Fine	4.0	5.7					0.00		16.67		6.73
	Fine	5.7	8.0		**1**	1		0.00	2.38	19.05	0.96	7.69
	Medium	8.0	11.3					0.00		19.05		7.69
	Medium	11.3	16.0					0.00		19.05		7.69
	Coarse	16.0	22.6		**1**	1		0.00	2.38	21.43	0.96	8.65
	Coarse	22.6	32	**2**		2	3.23	3.23		21.43	1.92	10.58
	Very Coarse	32	45	**5**	**4**	9	8.06	11.29	9.52	30.95	8.65	19.23
	Very Coarse	45	64	**13**	**8**	21	20.97	32.26	19.05	50.00	20.19	39.42
COBBLE	Small	64	90	**13**	**8**	21	20.97	53.23	19.05	69.05	20.19	59.62
	Small	90	128	**12**	**5**	17	19.35	72.58	11.90	80.95	16.35	75.96
	Large	128	180	**9**	**6**	15	14.52	87.10	14.29	95.24	14.42	90.38
	Large	180	256	**2**		2	3.23	90.32		95.24	1.92	92.31
BOULDER	Small	256	362	**4**	**2**	6	6.45	96.77	4.76	100.00	5.77	98.08
	Small	362	512					96.77		100.00		98.08
	Medium	512	1024	**1**		1	1.61	98.39		100.00	0.96	99.04
	Large/Very Large	1024	2048					98.39		100.00		99.04
BEDROCK	Bedrock	2048	>2048	**1**		1	1.61	100.00		100.00	0.96	100.00
			Total:	**62**	**42**	**104**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): bedrock 350

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	48.7	D_{16} =	0.97	D_{16} =	39.62
D_{35} =	66.9	D_{35} =	48.50	D_{35} =	59.25
D_{50} =	85.4	D_{50} =	64.00	D_{50} =	76.51
D_{84} =	167.4	D_{84} =	137.7	D_{84} =	154.8
D_{95} =	329.1	D_{95} =	179.0	D_{95} =	300.9
D_{100} =	>2048	D_{99} =	362	D_{99} =	>2048

Jones Creek - Reach 4-5
Reachwide Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

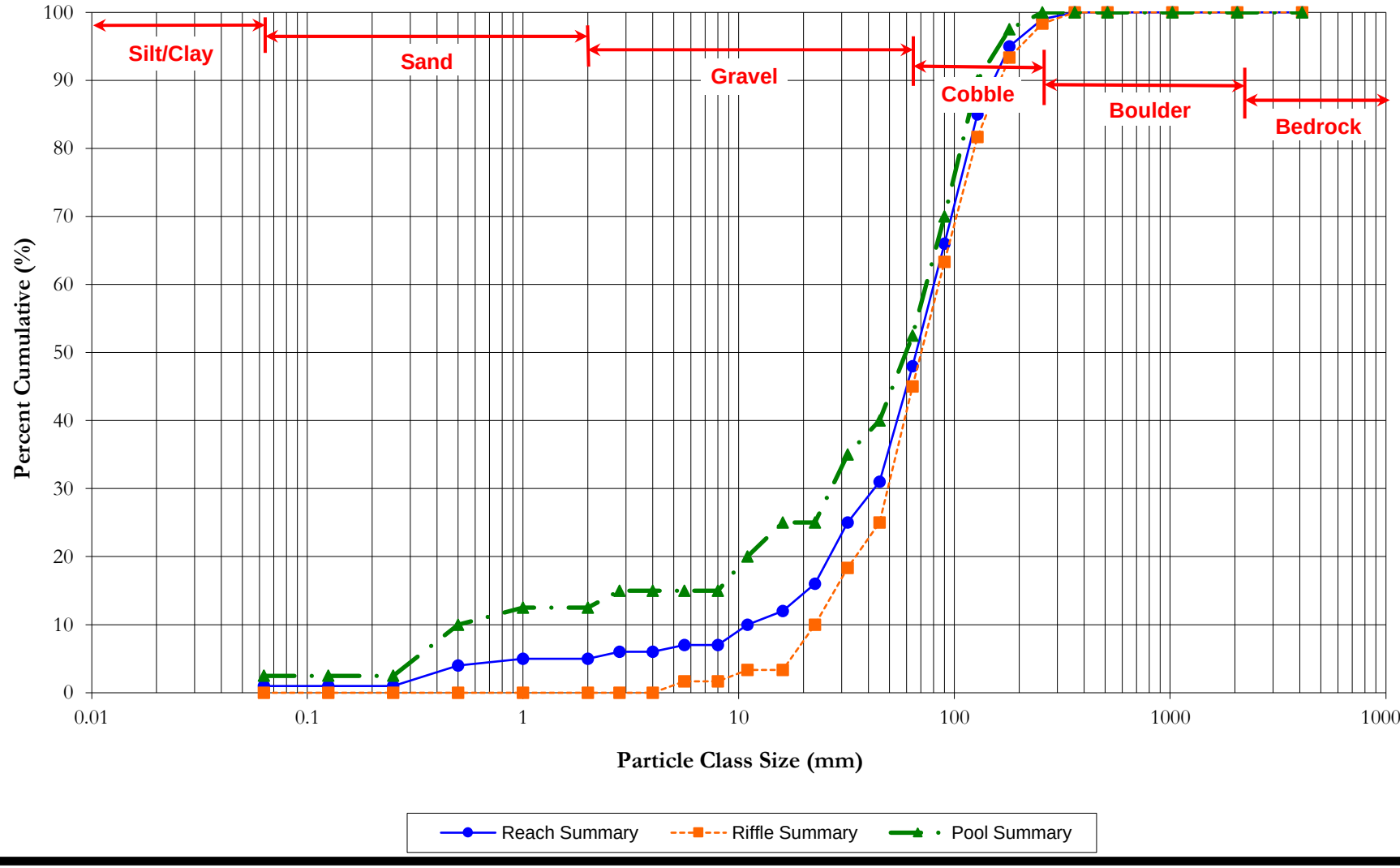
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + SG
Location:	Franklin, NC	**Data Collected On:**	7/15/2021
Job #:	W02191	**Reach:**	Jones Creek - Reach 3
Date:	7/16/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		**1**	1		0.00	2.50	2.50	1.00	1.00
SAND	Very fine	0.062	0.125					0.00		2.50		1.00
	Fine	0.125	0.250					0.00		2.50		1.00
	Medium	0.250	0.500		**3**	3		0.00	7.50	10.00	3.00	4.00
	Coarse	0.5	1.0		**1**	1		0.00	2.50	12.50	1.00	5.00
	Very Coarse	1.0	2.0					0.00		12.50		5.00
GRAVEL	Very Fine	2.0	2.8		**1**	1		0.00	2.50	15.00	1.00	6.00
	Very Fine	2.8	4.0					0.00		15.00		6.00
	Fine	4.0	5.7	**1**		1	1.67	1.67		15.00	1.00	7.00
	Fine	5.7	8.0					1.67		15.00		7.00
	Medium	8.0	11.3	**1**	**2**	3	1.67	3.33	5.00	20.00	3.00	10.00
	Medium	11.3	16.0		**2**	2		3.33	5.00	25.00	2.00	12.00
	Coarse	16.0	22.6	**4**		4	6.67	10.00		25.00	4.00	16.00
	Coarse	22.6	32	**5**	**4**	9	8.33	18.33	10.00	35.00	9.00	25.00
	Very Coarse	32	45	**4**	**2**	6	6.67	25.00	5.00	40.00	6.00	31.00
	Very Coarse	45	64	**12**	**5**	17	20.00	45.00	12.50	52.50	17.00	48.00
COBBLE	Small	64	90	**11**	**7**	18	18.33	63.33	17.50	70.00	18.00	66.00
	Small	90	128	**11**	**8**	19	18.33	81.67	20.00	90.00	19.00	85.00
	Large	128	180	**7**	**3**	10	11.67	93.33	7.50	97.50	10.00	95.00
	Large	180	256	**3**	**1**	4	5.00	98.33	2.50	100.00	4.00	99.00
BOULDER	Small	256	362	**1**		1	1.67	100.00		100.00	1.00	100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	>2048					100.00		100.00		100.00
			Total:	**60**	**40**	**100**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	29.03	D_{16} =	8.53	D_{16} =	22.60
D_{35} =	53.7	D_{35} =	32.0	D_{35} =	48.9
D_{50} =	70.2	D_{50} =	59.6	D_{50} =	66.5
D_{84} =	137.0	D_{84} =	115.2	D_{84} =	125.6
D_{95} =	202.4	D_{95} =	160.7	D_{95} =	180.0
D_{100} =	362	D_{99} =	256	D_{99} =	362

Jones Creek - Reach 3
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	JMB + JDW
Location:	Franklin, NC	**Data Collected On:**	
Job #:	W02191	**Reach:**	Jones Creek - R5
Date:	8/12/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	1064.4	697	3748	**84%**	**15.7**
SAND	Very Coarse	#10	2.0	4.0	480.0	670.6	191	3557	**80%**	**20.0**
GRAVEL	Fine	#5	4.0	8.0	495.3	749.5	254	3303	**74%**	**25.7**
	Medium	5/16"	8.0	16.0	513.9	1000.7	487	2816	**63%**	**36.6**
	Coarse	5/8"	16.0	31.5	541.4	1325.9	785	2032	**46%**	**54.3**
	Very Coarse	1 1/4"	31.5	63.0	540.8	2572.5	2032	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): **98** mm
Largest Particle (2): **64** mm

Total Sample Weight (g) 4444

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	0.09
D_{35} =	14.43
D_{50} =	26.72
D_{84} =	49.4
D_{95} =	58.4
D_{100} =	63.0

PEBBLE COUNT ANALYSIS WORKSHEET

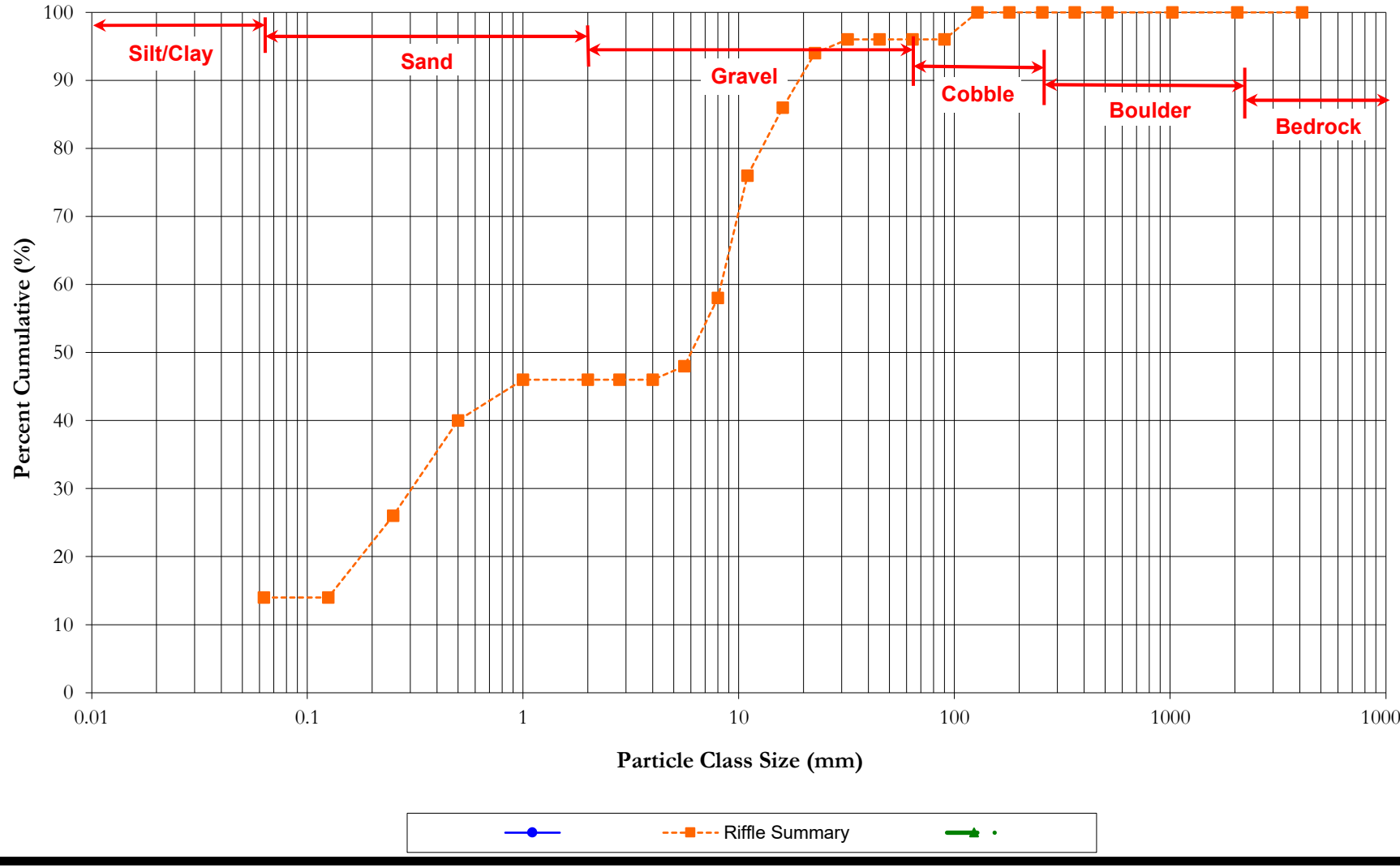
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JDW
Location:	Franklin, NC	**Data Collected On:**	3/23/2021
Job #:	W02191	**Reach:**	UT1 - Reach 1 (Upper)
Date:	3/29/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary					
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative				
SILT/CLAY	Silt/Clay	0.000	0.062	**7**		7	14.00	14.00				
SAND	Very fine	0.062	0.125					14.00				
	Fine	0.125	0.250	**6**		6	12.00	26.00				
	Medium	0.250	0.500	**7**		7	14.00	40.00				
	Coarse	0.5	1.0	**3**		3	6.00	46.00				
	Very Coarse	1.0	2.0					46.00				
GRAVEL	Very Fine	2.0	2.8					46.00				
	Very Fine	2.8	4.0					46.00				
	Fine	4.0	5.7	**1**		1	2.00	48.00				
	Fine	5.7	8.0	**5**		5	10.00	58.00				
	Medium	8.0	11.3	**9**		9	18.00	76.00				
	Medium	11.3	16.0	**5**		5	10.00	86.00				
	Coarse	16.0	22.6	**4**		4	8.00	94.00				
	Coarse	22.6	32	**1**		1	2.00	96.00				
	Very Coarse	32	45					96.00				
	Very Coarse	45	64					96.00				
COBBLE	Small	64	90					96.00				
	Small	90	128	**2**		2	4.00	100.00				
	Large	128	180					100.00				
	Large	180	256					100.00				
BOULDER	Small	256	362					100.00				
	Small	362	512					100.00				
	Medium	512	1024					100.00				
	Large/Very Large	1024	2048					100.00				
BEDROCK	Bedrock	2048	>2048					100.00				
			Total:	**50**	**0**	**50**	**100**	100				

Largest Particle (mm): 128

Riffle Channel materials (mm)		Pool Channel materials (mm)	Cumulative Channel materials (mm)
D_{16} =	0.26		
D_{35} =	6.8		
D_{50} =	6.4		
D_{84} =	13.4		
D_{95} =	23.3		
D_{100} =	128		

UT1 - Reach 1 (Upper)
50-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

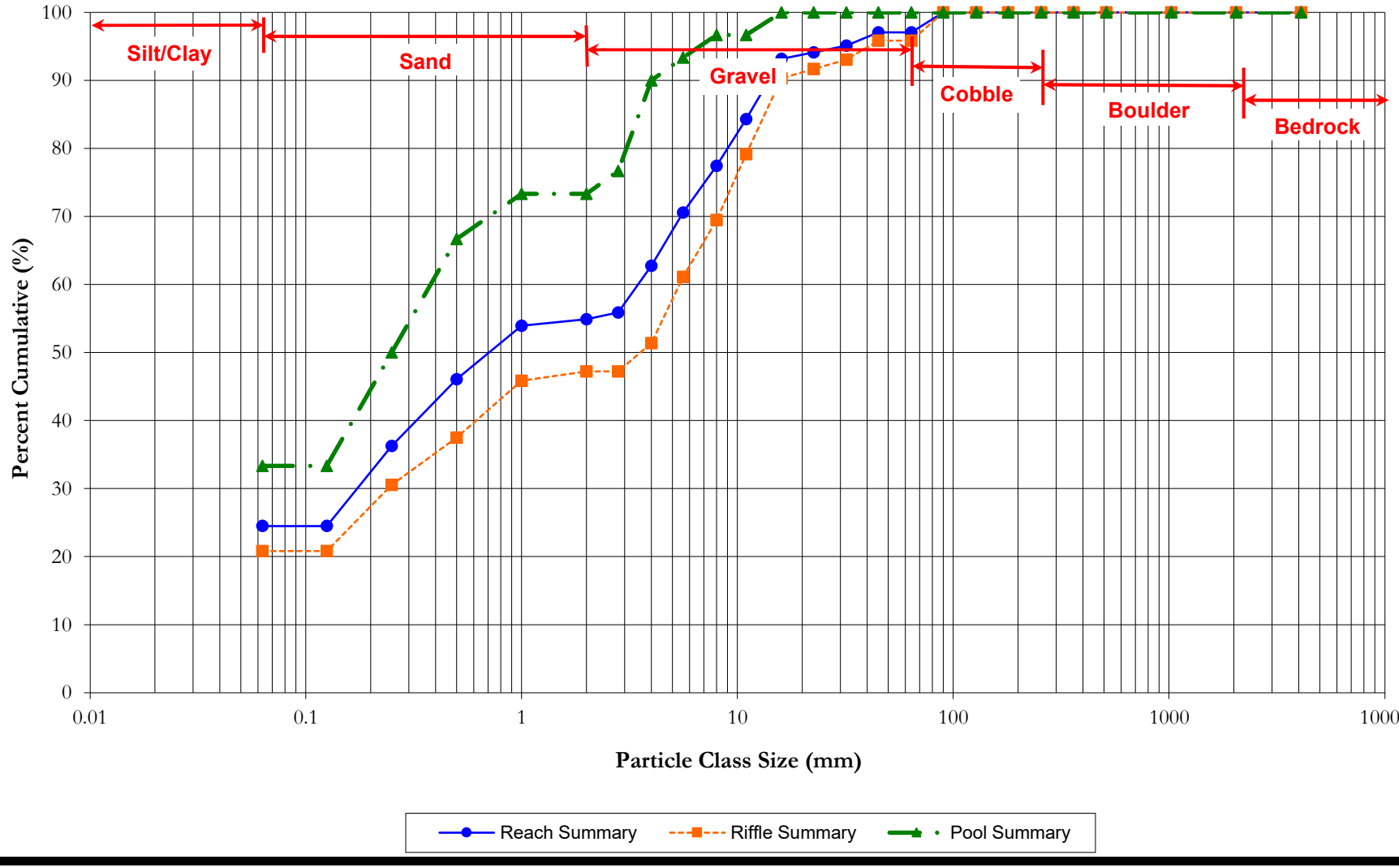
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JDW
Location:	Franklin, NC	**Data Collected On:**	3/24/2021
Job #:	W02191	**Reach:**	UT1 - Reach 1 (Upper)
Date:	3/29/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	**15**	**10**	25	20.83	20.83	33.33	33.33	24.51	24.51
SAND	Very fine	0.062	0.125					20.83		33.33		24.51
	Fine	0.125	0.250	**7**	**5**	12	9.72	30.56	16.67	50.00	11.76	36.27
	Medium	0.250	0.500	**5**	**5**	10	6.94	37.50	16.67	66.67	9.80	46.08
	Coarse	0.5	1.0	**6**	**2**	8	8.33	45.83	6.67	73.33	7.84	53.92
	Very Coarse	1.0	2.0	**1**		1	1.39	47.22		73.33	0.98	54.90
GRAVEL	Very Fine	2.0	2.8		**1**	1		47.22	3.33	76.67	0.98	55.88
	Very Fine	2.8	4.0	**3**	**4**	7	4.17	51.39	13.33	90.00	6.86	62.75
	Fine	4.0	5.7	**7**	**1**	8	9.72	61.11	3.33	93.33	7.84	70.59
	Fine	5.7	8.0	**6**	**1**	7	8.33	69.44	3.33	96.67	6.86	77.45
	Medium	8.0	11.3	**7**		7	9.72	79.17		96.67	6.86	84.31
	Medium	11.3	16.0	**8**	**1**	9	11.11	90.28	3.33	100.00	8.82	93.14
	Coarse	16.0	22.6	**1**		1	1.39	91.67		100.00	0.98	94.12
	Coarse	22.6	32	**1**		1	1.39	93.06		100.00	0.98	95.10
	Very Coarse	32	45	**2**		2	2.78	95.83		100.00	1.96	97.06
	Very Coarse	45	64					95.83		100.00		97.06
COBBLE	Small	64	90	**3**		3	4.17	100.00		100.00	2.94	100.00
	Small	90	128					100.00		100.00		100.00
	Large	128	180					100.00		100.00		100.00
	Large	180	256					100.00		100.00		100.00
BOULDER	Small	256	362					100.00		100.00		100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	>2048					100.00		100.00		100.00
			Total:	**72**	**30**	**102**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): 90 16

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	Silt/Clay	D_{16} =	Silt/Clay	D_{16} =	Silt/Clay
D_{35} =	0.4	D_{35} =	0.13	D_{35} =	0.23
D_{50} =	3.6	D_{50} =	0.25	D_{50} =	0.71
D_{84} =	12.9	D_{84} =	3.4	D_{84} =	10.8
D_{95} =	40.6	D_{95} =	6.7	D_{95} =	30.9
D_{100} =	90	D_{99} =	16	D_{99} =	90

UT1 - Reach 1 (Upper)
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	JMB + JDW
Location:	Franklin, NC	**Data Collected On:**	3/24/2021
Job #:	W02191	**Reach:**	UT1-Lower
Date:	8/12/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	941.0	573	854	**60%**	**40.2**
SAND	Very Coarse	#10	2.0	4.0	480.0	594.0	114	740	**52%**	**48.2**
GRAVEL	Fine	#5	4.0	8.0	495.3	656.1	161	579	**41%**	**59.4**
	Medium	5/16"	8.0	16.0	513.9	746.5	233	346	**24%**	**75.7**
	Coarse	5/8"	16.0	31.5	541.4	782.7	241	105	**7%**	**92.6**
	Very Coarse	1 1/4"	31.5	42.0	540.8	645.8	105	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): **42** mm
Largest Particle (2): **28** mm

Total Sample Weight (g) 1427

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	4.48
D_{84} =	22.3
D_{95} =	34.5
D_{100} =	42.0

PEBBLE COUNT ANALYSIS WORKSHEET

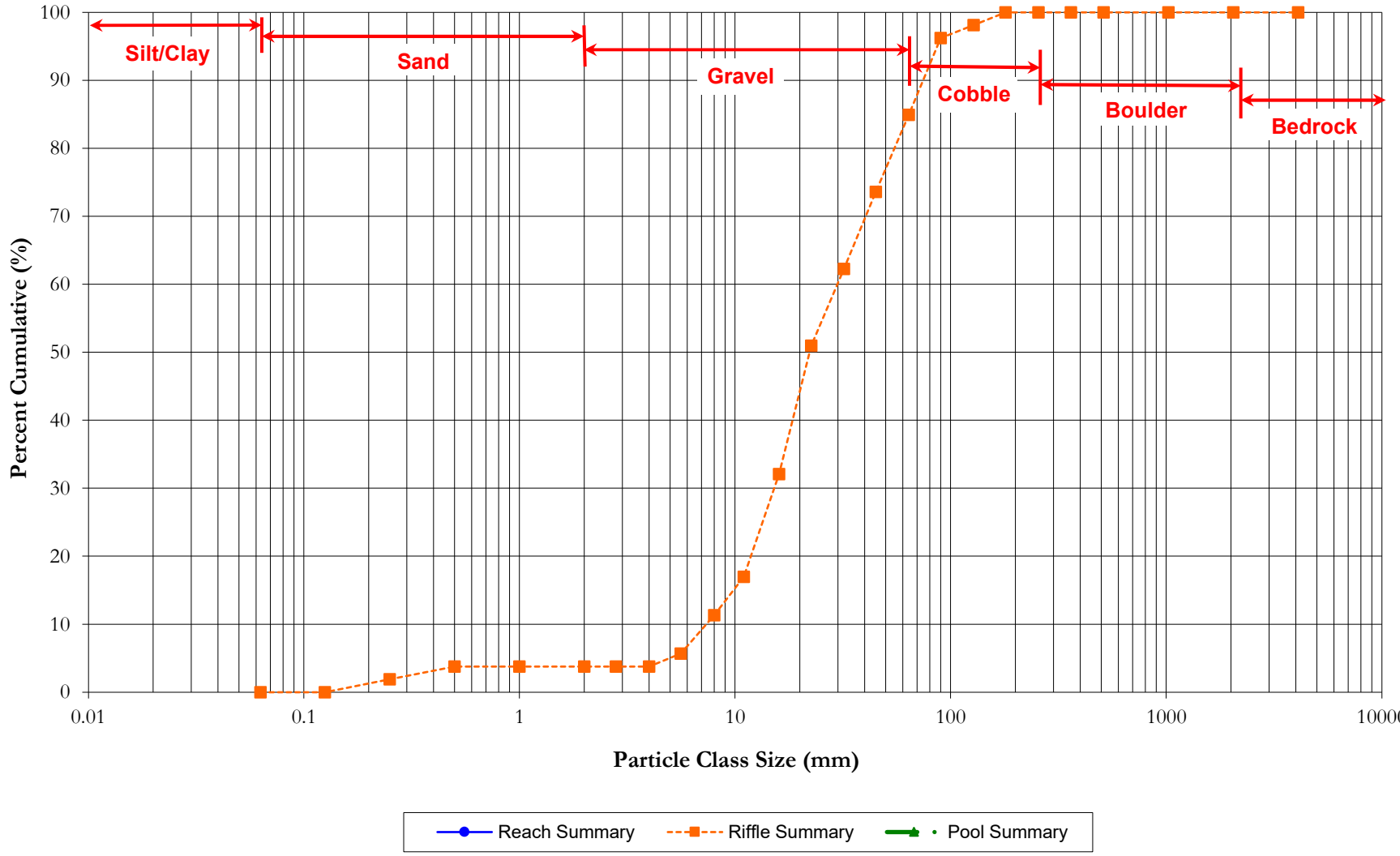
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JDW
Location:	Franklin, NC	**Data Collected On:**	3/22/2021
Job #:	W02191	**Reach:**	UT1 - Reach 2 (Lower)
Date:	3/29/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0.00				
SAND	Very fine	0.062	0.125					0.00				
	Fine	0.125	0.250	**1**		1	1.89	1.89				
	Medium	0.250	0.500	**1**		1	1.89	3.77				
	Coarse	0.5	1.0					3.77				
	Very Coarse	1.0	2.0					3.77				
GRAVEL	Very Fine	2.0	2.8					3.77				
	Very Fine	2.8	4.0					3.77				
	Fine	4.0	5.7	**1**		1	1.89	5.66				
	Fine	5.7	8.0	**3**		3	5.66	11.32				
	Medium	8.0	11.3	**3**		3	5.66	16.98				
	Medium	11.3	16.0	**8**		8	15.09	32.08				
	Coarse	16.0	22.6	**10**		10	18.87	50.94				
	Coarse	22.6	32	**6**		6	11.32	62.26				
	Very Coarse	32	45	**6**		6	11.32	73.58				
	Very Coarse	45	64	**6**		6	11.32	84.91				
COBBLE	Small	64	90	**6**		6	11.32	96.23				
	Small	90	128	**1**		1	1.89	98.11				
	Large	128	180	**1**		1	1.89	100.00				
	Large	180	256					100.00				
BOULDER	Small	256	362					100.00				
	Small	362	512					100.00				
	Medium	512	1024					100.00				
	Large/Very Large	1024	2048					100.00				
BEDROCK	Bedrock	2048	>2048					100.00				
			Total:	**53**	**0**	**53**	**100**	100				

Largest Particle (mm): 180

Riffle Channel materials (mm)			
D_{16} =	10.41		
D_{35} =	16.9		
D_{50} =	22.2		
D_{84} =	62.2		
D_{95} =	86.7		
D_{100} =	180		

UT1 - Reach 2 (Lower)
50-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

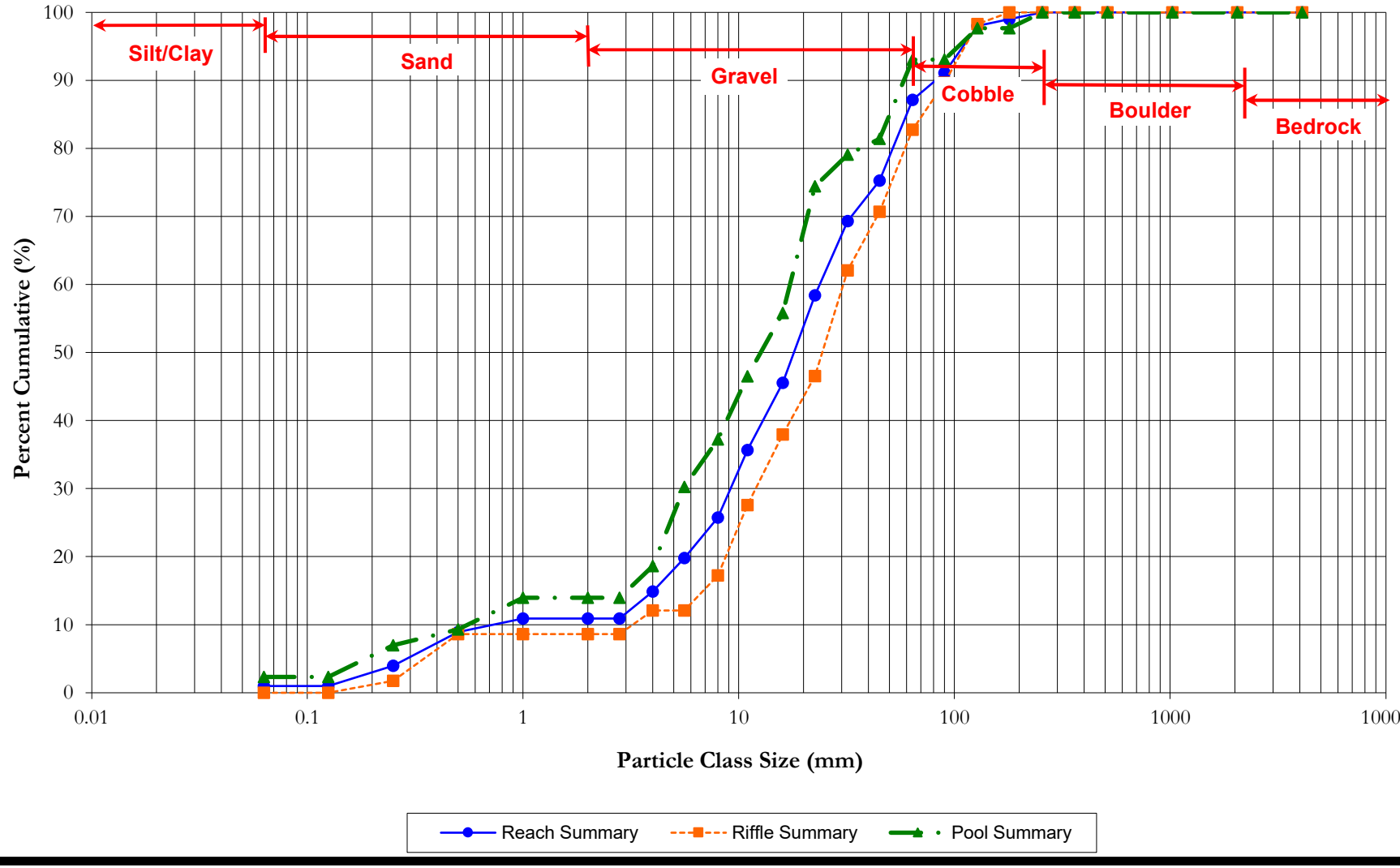
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JDW
Location:	Franklin, NC	**Data Collected On:**	3/24/2021
Job #:	W02191	**Reach:**	UT1 - Reach 2 (Lower)
Date:	3/29/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		**1**	1		0.00	2.33	2.33	0.99	0.99
SAND	Very fine	0.062	0.125					0.00		2.33		0.99
	Fine	0.125	0.250	**1**	**2**	3	1.72	1.72	4.65	6.98	2.97	3.96
	Medium	0.250	0.500	**4**	**1**	5	6.90	8.62	2.33	9.30	4.95	8.91
	Coarse	0.5	1.0		**2**	2		8.62	4.65	13.95	1.98	10.89
	Very Coarse	1.0	2.0					8.62		13.95		10.89
GRAVEL	Very Fine	2.0	2.8					8.62		13.95		10.89
	Very Fine	2.8	4.0	**2**	**2**	4	3.45	12.07	4.65	18.60	3.96	14.85
	Fine	4.0	5.7		**5**	5		12.07	11.63	30.23	4.95	19.80
	Fine	5.7	8.0	**3**	**3**	6	5.17	17.24	6.98	37.21	5.94	25.74
	Medium	8.0	11.3	**6**	**4**	10	10.34	27.59	9.30	46.51	9.90	35.64
	Medium	11.3	16.0	**6**	**4**	10	10.34	37.93	9.30	55.81	9.90	45.54
	Coarse	16.0	22.6	**5**	**8**	13	8.62	46.55	18.60	74.42	12.87	58.42
	Coarse	22.6	32	**9**	**2**	11	15.52	62.07	4.65	79.07	10.89	69.31
	Very Coarse	32	45	**5**	**1**	6	8.62	70.69	2.33	81.40	5.94	75.25
	Very Coarse	45	64	**7**	**5**	12	12.07	82.76	11.63	93.02	11.88	87.13
COBBLE	Small	64	90	**4**		4	6.90	89.66		93.02	3.96	91.09
	Small	90	128	**5**	**2**	7	8.62	98.28	4.65	97.67	6.93	98.02
	Large	128	180	**1**		1	1.72	100.00		97.67	0.99	99.01
	Large	180	256		**1**	1		100.00	2.33	100.00	0.99	100.00
BOULDER	Small	256	362					100.00		100.00		100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	>2048					100.00		100.00		100.00
			Total:	**58**	**43**	**101**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): 180 256

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	7.34	D_{16} =	3.28	D_{16} =	4.32
D_{35} =	14.4	D_{35} =	7.1	D_{35} =	10.8
D_{50} =	24.4	D_{50} =	12.7	D_{50} =	18.0
D_{84} =	68.1	D_{84} =	48.7	D_{84} =	58.3
D_{95} =	112.0	D_{95} =	104.5	D_{95} =	109.8
D_{100} =	180	D_{99} =	256	D_{99} =	256

UT1 - Reach 2 (Lower)
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	JMB + JDW
Location:	Franklin, NC	**Data Collected On:**	3/24/2021
Job #:	W02191	**Reach:**	UT1-Lower
Date:	8/12/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	941.0	573	854	**60%**	**40.2**
SAND	Very Coarse	#10	2.0	4.0	480.0	594.0	114	740	**52%**	**48.2**
GRAVEL	Fine	#5	4.0	8.0	495.3	656.1	161	579	**41%**	**59.4**
	Medium	5/16"	8.0	16.0	513.9	746.5	233	346	**24%**	**75.7**
	Coarse	5/8"	16.0	31.5	541.4	782.7	241	105	**7%**	**92.6**
	Very Coarse	1 1/4"	31.5	42.0	540.8	645.8	105	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): **42** mm
Largest Particle (2): **28** mm

Total Sample Weight (g) 1427

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	4.48
D_{84} =	22.3
D_{95} =	34.5
D_{100} =	42.0

SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	
Location:	Franklin, NC	**Data Collected On:**	
Job #:	W02191	**Reach:**	UT1A
Date:	8/17/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	1340.7	973	10058	**91%**	**8.8**
SAND	Very Coarse	#10	2.0	4.0	480.0	7407.0	6927	3131	**28%**	**71.6**
GRAVEL	Fine	#5	4.0	8.0	495.3	882.1	387	2744	**25%**	**75.1**
	Medium	5/16"	8.0	16.0	513.9	1422.3	908	1836	**17%**	**83.4**
	Coarse	5/8"	16.0	31.5	541.4	1546.3	1005	831	**8%**	**92.5**
	Very Coarse	1 1/4"	31.5	63.0	540.8	1371.8	831	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): **80** mm
Largest Particle (2): **52** mm

Total Sample Weight (g) 11031

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	0.10
D_{35} =	0.36
D_{50} =	0.96
D_{84} =	16.8
D_{95} =	39.8
D_{100} =	31.5

PEBBLE COUNT ANALYSIS WORKSHEET

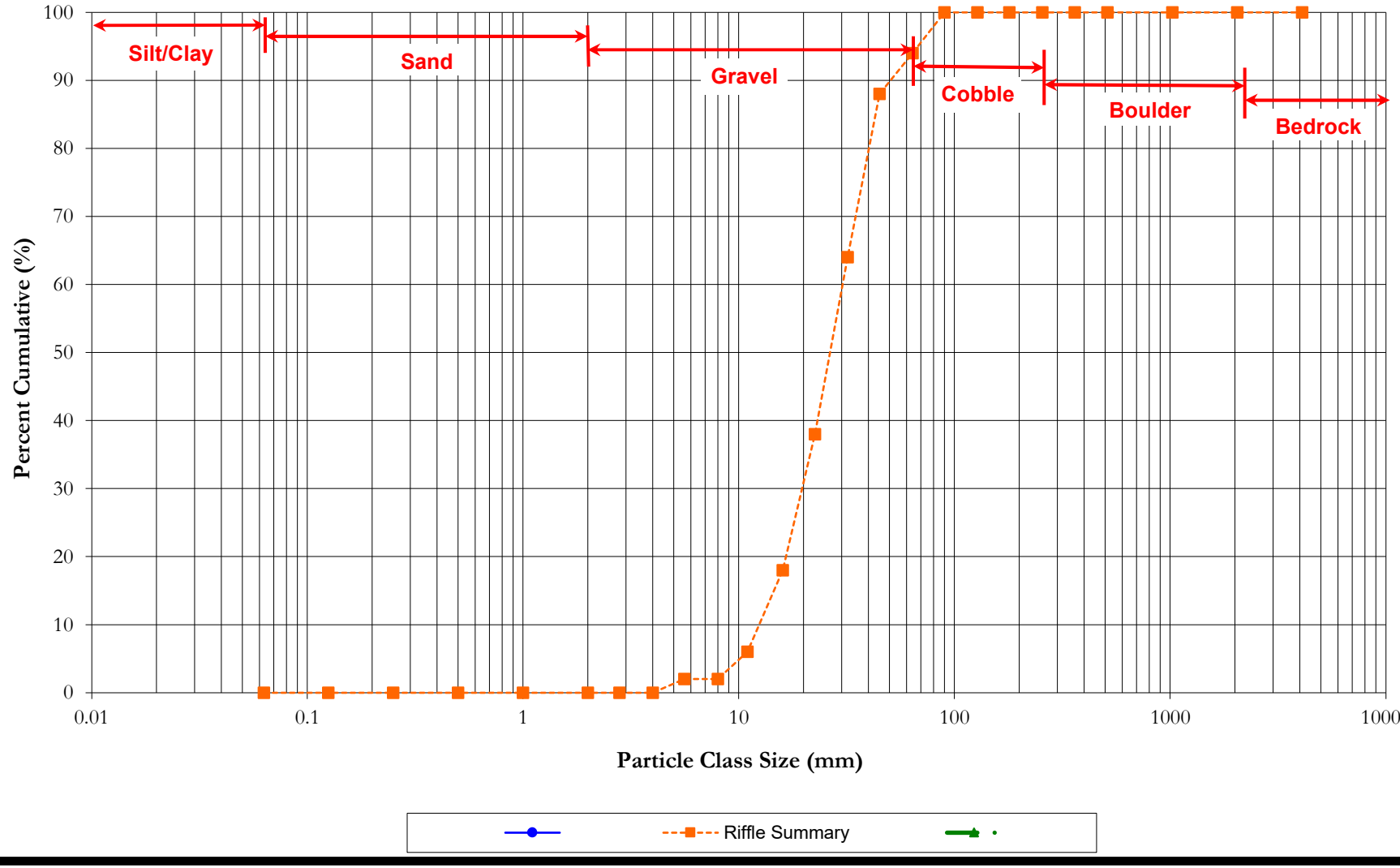
Project Name:	Cornbread Valley	**Data Collected By:**	JDW + JH +JMB
Location:	Franklin, NC	**Data Collected On:**	5/6/2021
Job #:	W02191	**Reach:**	UT2
Date:	6/24/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary					
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative				
SILT/CLAY	Silt/Clay	0.000	0.062					0.00				
SAND	Very fine	0.062	0.125					0.00				
	Fine	0.125	0.250					0.00				
	Medium	0.250	0.500					0.00				
	Coarse	0.5	1.0					0.00				
	Very Coarse	1.0	2.0					0.00				
GRAVEL	Very Fine	2.0	2.8					0.00				
	Very Fine	2.8	4.0					0.00				
	Fine	4.0	5.7	**1**		1	2.00	2.00				
	Fine	5.7	8.0					2.00				
	Medium	8.0	11.3	**2**		2	4.00	6.00				
	Medium	11.3	16.0	**6**		6	12.00	18.00				
	Coarse	16.0	22.6	**10**		10	20.00	38.00				
	Coarse	22.6	32	**13**		13	26.00	64.00				
	Very Coarse	32	45	**12**		12	24.00	88.00				
	Very Coarse	45	64	**3**		3	6.00	94.00				
COBBLE	Small	64	90	**3**		3	6.00	100.00				
	Small	90	128					100.00				
	Large	128	180					100.00				
	Large	180	256					100.00				
BOULDER	Small	256	362					100.00				
	Small	362	512					100.00				
	Medium	512	1024					100.00				
	Large/Very Large	1024	2048					100.00				
BEDROCK	Bedrock	2048	>2048					100.00				
			Total:	**50**	**0**	**50**	**100**	100				

Largest Particle (mm): 90

Riffle Channel materials (mm)	
D_{16} =	15.03
D_{35} =	21.5
D_{50} =	26.5
D_{84} =	42.5
D_{95} =	67.7
D_{100} =	90

UT2
50-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

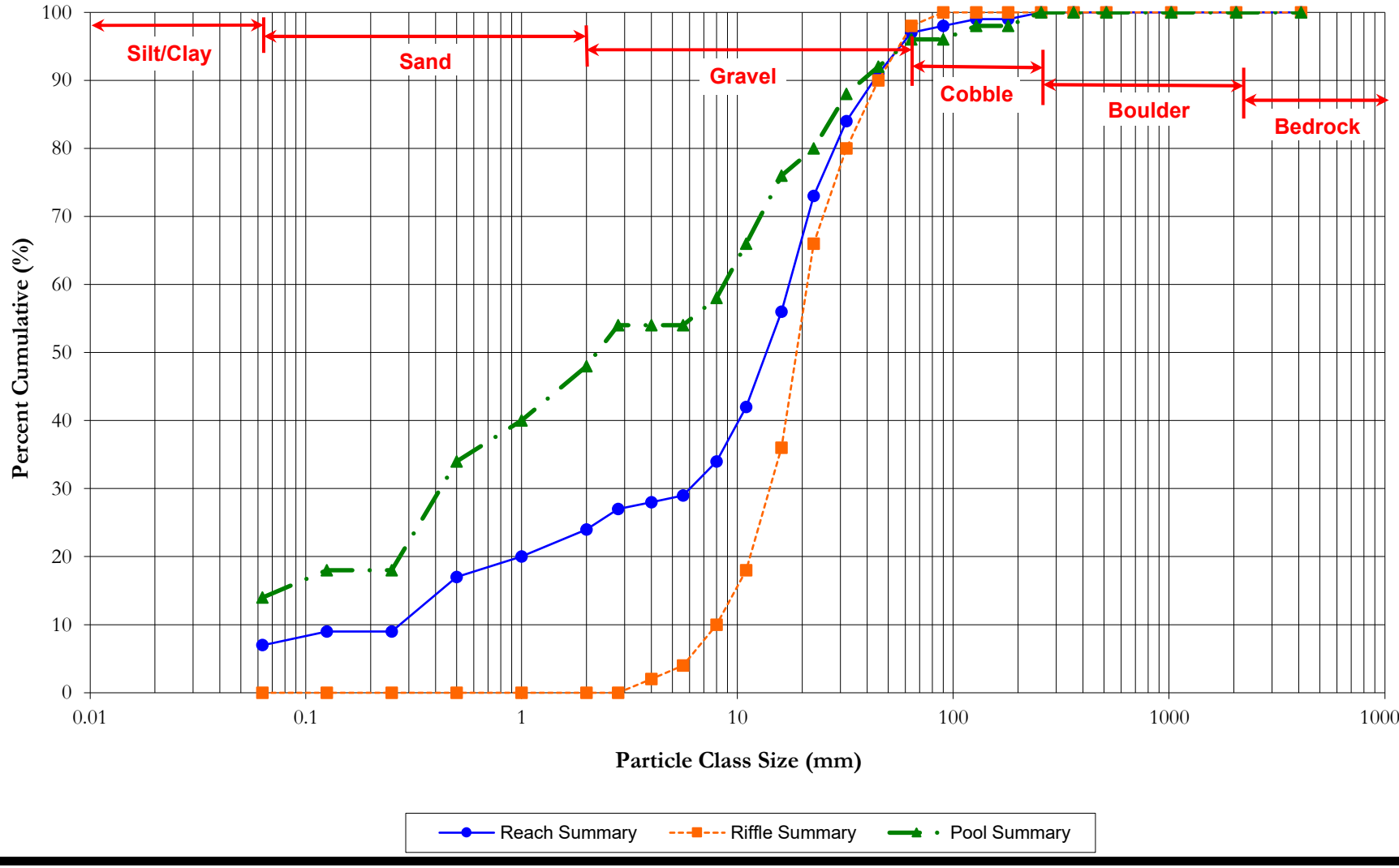
Project Name:	Cornbread Valley	**Data Collected By:**	JDW + JH +JMB
Location:	Franklin, NC	**Data Collected On:**	5/6/2021
Job #:	W02191	**Reach:**	UT2
Date:	6/24/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		**7**	7		0.00	14.00	14.00	7.00	7.00
SAND	Very fine	0.062	0.125		**2**	2		0.00	4.00	18.00	2.00	9.00
	Fine	0.125	0.250					0.00		18.00		9.00
	Medium	0.250	0.500		**8**	8		0.00	16.00	34.00	8.00	17.00
	Coarse	0.5	1.0		**3**	3		0.00	6.00	40.00	3.00	20.00
	Very Coarse	1.0	2.0		**4**	4		0.00	8.00	48.00	4.00	24.00
GRAVEL	Very Fine	2.0	2.8		**3**	3		0.00	6.00	54.00	3.00	27.00
	Very Fine	2.8	4.0	**1**		1	2.00	2.00		54.00	1.00	28.00
	Fine	4.0	5.7	**1**		1	2.00	4.00		54.00	1.00	29.00
	Fine	5.7	8.0	**3**	**2**	5	6.00	10.00	4.00	58.00	5.00	34.00
	Medium	8.0	11.3	**4**	**4**	8	8.00	18.00	8.00	66.00	8.00	42.00
	Medium	11.3	16.0	**9**	**5**	14	18.00	36.00	10.00	76.00	14.00	56.00
	Coarse	16.0	22.6	**15**	**2**	17	30.00	66.00	4.00	80.00	17.00	73.00
	Coarse	22.6	32	**7**	**4**	11	14.00	80.00	8.00	88.00	11.00	84.00
	Very Coarse	32	45	**5**	**2**	7	10.00	90.00	4.00	92.00	7.00	91.00
	Very Coarse	45	64	**4**	**2**	6	8.00	98.00	4.00	96.00	6.00	97.00
COBBLE	Small	64	90	**1**		1	2.00	100.00		96.00	1.00	98.00
	Small	90	128		**1**	1		100.00	2.00	98.00	1.00	99.00
	Large	128	180					100.00		98.00		99.00
	Large	180	256		**1**	1		100.00	2.00	100.00	1.00	100.00
BOULDER	Small	256	362					100.00		100.00		100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	>2048					100.00		100.00		100.00
			Total:	**50**	**50**	**100**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): 180 180

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	10.16	D_{16} =	0.09	D_{16} =	0.46
D_{35} =	15.7	D_{35} =	0.6	D_{35} =	8.3
D_{50} =	18.8	D_{50} =	2.2	D_{50} =	13.6
D_{84} =	36.7	D_{84} =	26.9	D_{84} =	32.0
D_{95} =	56.1	D_{95} =	58.6	D_{95} =	56.9
D_{100} =	90	D_{99} =	256	D_{99} =	256

UT2
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	
Location:	Franklin, NC	**Data Collected On:**	
Job #:	W02191	**Reach:**	UT2-R2
Date:	8/12/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	883.4	516	574	**53%**	**47.3**
SAND	Very Coarse	#10	2.0	4.0	480.0	524.5	45	530	**49%**	**51.4**
GRAVEL	Fine	#5	4.0	8.0	495.3	532.7	37	492	**45%**	**54.8**
	Medium	5/16"	8.0	16.0	513.9	608.0	94	398	**37%**	**63.5**
	Coarse	5/8"	16.0	31.5	541.4	746.0	205	194	**18%**	**82.2**
	Very Coarse	1 1/4"	31.5	62.0	540.8	734.5	194	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): **62** mm
Largest Particle (2): mm

Total Sample Weight (g) 1090

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	0.97
D_{84} =	33.7
D_{95} =	51.2
D_{100} =	62.0

PEBBLE COUNT ANALYSIS WORKSHEET

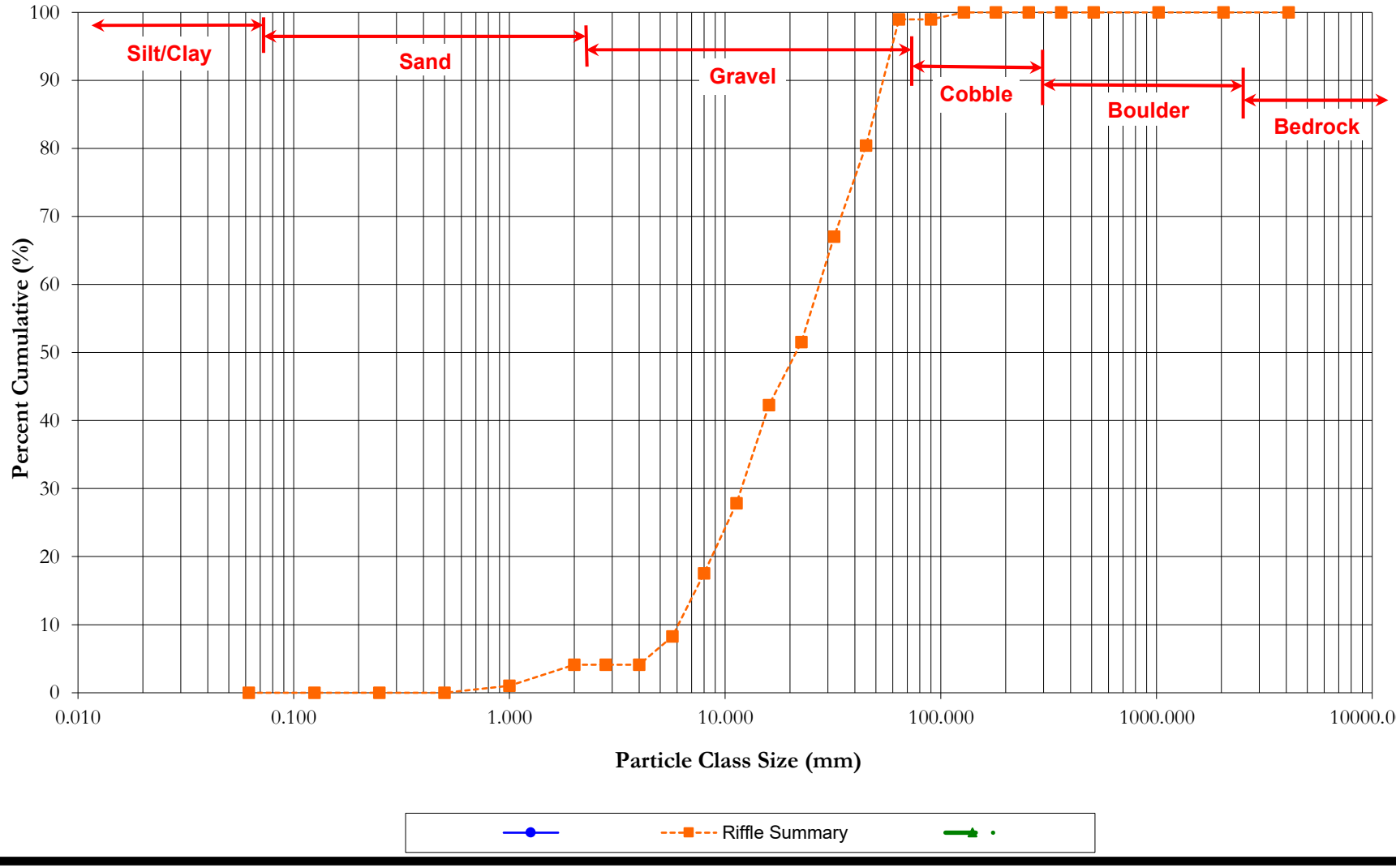
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + SEG
Location:	Franklin, NC	**Data Collected On:**	8/26/2021
Job #:	W02191	**Reach:**	UT2A
Date:	8/9/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary					
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative				
SILT/CLAY	Silt/Clay	0.000	0.062					0.00				
SAND	Very fine	0.062	0.125					0.00				
	Fine	0.125	0.250					0.00				
	Medium	0.250	0.500					0.00				
	Coarse	0.5	1.0	**1**		1	1.03	1.03				
	Very Coarse	1.0	2.0	**3**		3	3.09	4.12				
GRAVEL	Very Fine	2.0	2.8					4.12				
	Very Fine	2.8	4.0					4.12				
	Fine	4.0	5.7	**4**		4	4.12	8.25				
	Fine	5.7	8.0	**9**		9	9.28	17.53				
	Medium	8.0	11.3	**10**		10	10.31	27.84				
	Medium	11.3	16.0	**14**		14	14.43	42.27				
	Coarse	16.0	22.6	**9**		9	9.28	51.55				
	Coarse	22.6	32	**15**		15	15.46	67.01				
	Very Coarse	32	45	**13**		13	13.40	80.41				
	Very Coarse	45	64	**18**		18	18.56	98.97				
COBBLE	Small	64	90					98.97				
	Small	90	128	**1**		1	1.03	100.00				
	Large	128	180					100.00				
	Large	180	256					100.00				
BOULDER	Small	256	362					100.00				
	Small	362	512					100.00				
	Medium	512	1024					100.00				
	Large/Very Large	1024	2048					100.00				
BEDROCK	Bedrock	2048	>2048					100.00				
			Total:	**97**	**0**	**97**	**100**	100				

Largest Particle (mm): 128

Riffle Channel materials (mm)	
D_{16} =	7.57
D_{35} =	13.4
D_{50} =	21.3
D_{84} =	48.2
D_{95} =	59.4
D_{100} =	128

UT2A
50-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

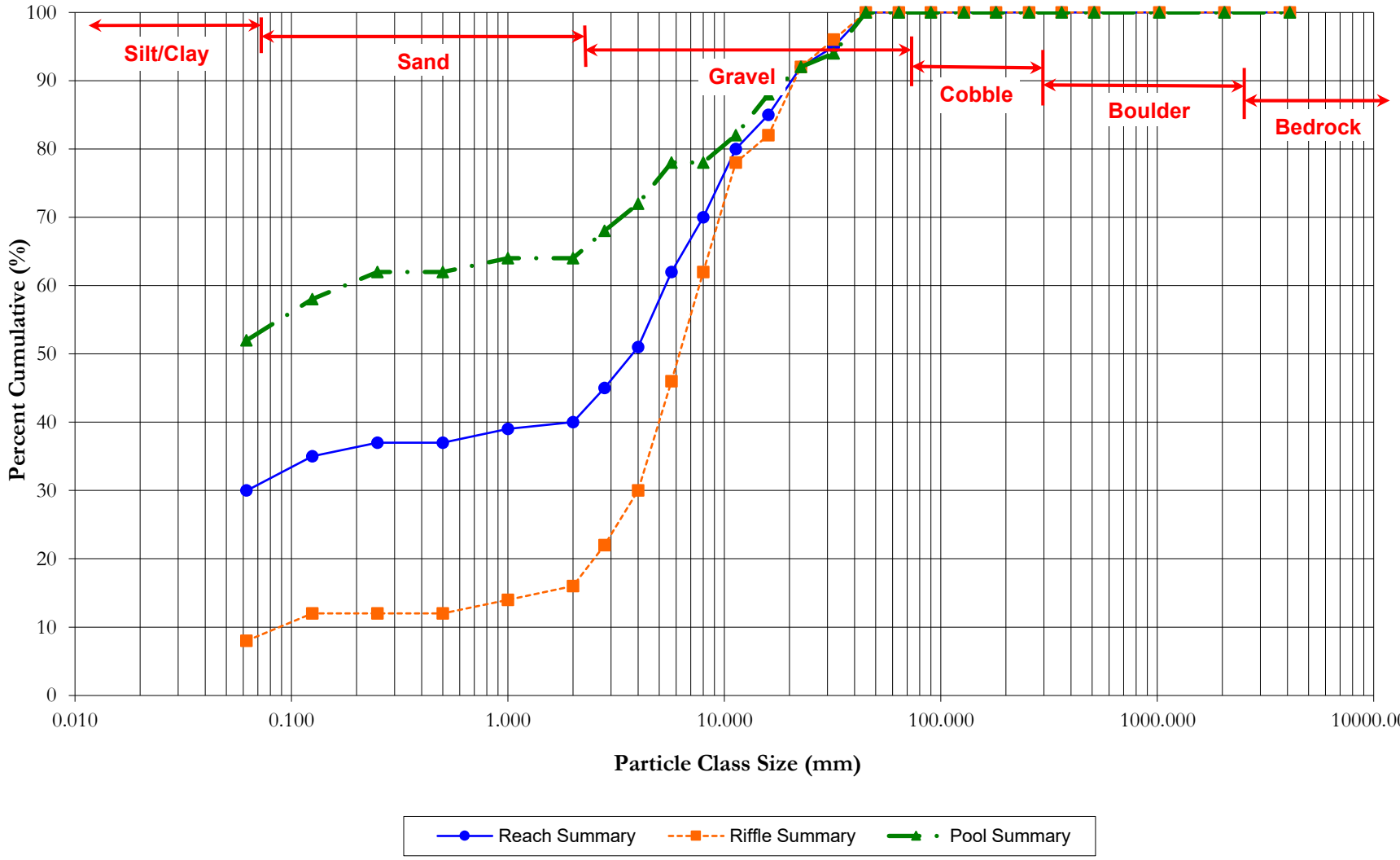
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + SEG
Location:	Franklin, NC	**Data Collected On:**	8/26/2021
Job #:	W02191	**Reach:**	UT2A
Date:	8/9/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	**4**	**26**	30	8.00	8.00	52.00	52.00	30.00	30.00
SAND	Very fine	0.062	0.125	**2**	**3**	5	4.00	12.00	6.00	58.00	5.00	35.00
	Fine	0.125	0.250		**2**	2		12.00	4.00	62.00	2.00	37.00
	Medium	0.250	0.500					12.00		62.00		37.00
	Coarse	0.5	1.0	**1**	**1**	2	2.00	14.00	2.00	64.00	2.00	39.00
	Very Coarse	1.0	2.0	**1**		1	2.00	16.00		64.00	1.00	40.00
GRAVEL	Very Fine	2.0	2.8	**3**	**2**	5	6.00	22.00	4.00	68.00	5.00	45.00
	Very Fine	2.8	4.0	**4**	**2**	6	8.00	30.00	4.00	72.00	6.00	51.00
	Fine	4.0	5.7	**8**	**3**	11	16.00	46.00	6.00	78.00	11.00	62.00
	Fine	5.7	8.0	**8**		8	16.00	62.00		78.00	8.00	70.00
	Medium	8.0	11.3	**8**	**2**	10	16.00	78.00	4.00	82.00	10.00	80.00
	Medium	11.3	16.0	**2**	**3**	5	4.00	82.00	6.00	88.00	5.00	85.00
	Coarse	16.0	22.6	**5**	**2**	7	10.00	92.00	4.00	92.00	7.00	92.00
	Coarse	22.6	32	**2**	**1**	3	4.00	96.00	2.00	94.00	3.00	95.00
	Very Coarse	32	45	**2**	**3**	5	4.00	100.00	6.00	100.00	5.00	100.00
	Very Coarse	45	64					100.00		100.00		100.00
COBBLE	Small	64	90					100.00		100.00		100.00
	Small	90	128					100.00		100.00		100.00
	Large	128	180					100.00		100.00		100.00
	Large	180	256					100.00		100.00		100.00
BOULDER	Small	256	362					100.00		100.00		100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	4096					100.00		100.00		100.00
			Total:	**50**	**50**	**100**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	2.00	D_{16} =	0.06	D_{16} =	26.00
D_{35} =	4.5	D_{35} =	0.1	D_{35} =	0.1
D_{50} =	6.2	D_{50} =	#N/A	D_{50} =	3.8
D_{84} =	17.1	D_{84} =	12.7	D_{84} =	14.9
D_{95} =	29.3	D_{95} =	33.9	D_{95} =	32.0
D_{100} =	45	D_{99} =	45	D_{99} =	45

UT2A
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	
Location:	Franklin, NC	**Data Collected On:**	
Job #:	W02191	**Reach:**	UT2A
Date:	8/12/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	1657.3	1290	2556	**66%**	**33.5**
SAND	Very Coarse	#10	2.0	4.0	480.0	758.7	279	2278	**59%**	**40.8**
GRAVEL	Fine	#5	4.0	8.0	495.3	825.1	330	1948	**51%**	**49.4**
	Medium	5/16"	8.0	16.0	513.9	1098.0	584	1364	**35%**	**64.5**
	Coarse	5/8"	16.0	31.5	541.4	1185.0	644	720	**19%**	**81.3**
	Very Coarse	1 1/4"	31.5	63.0	540.8	1260.8	720	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): mm
Largest Particle (2): mm

Total Sample Weight (g) 3846

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.15
D_{50} =	8.24
D_{84} =	34.8
D_{95} =	52.4
D_{100} =	63.0

PEBBLE COUNT ANALYSIS WORKSHEET

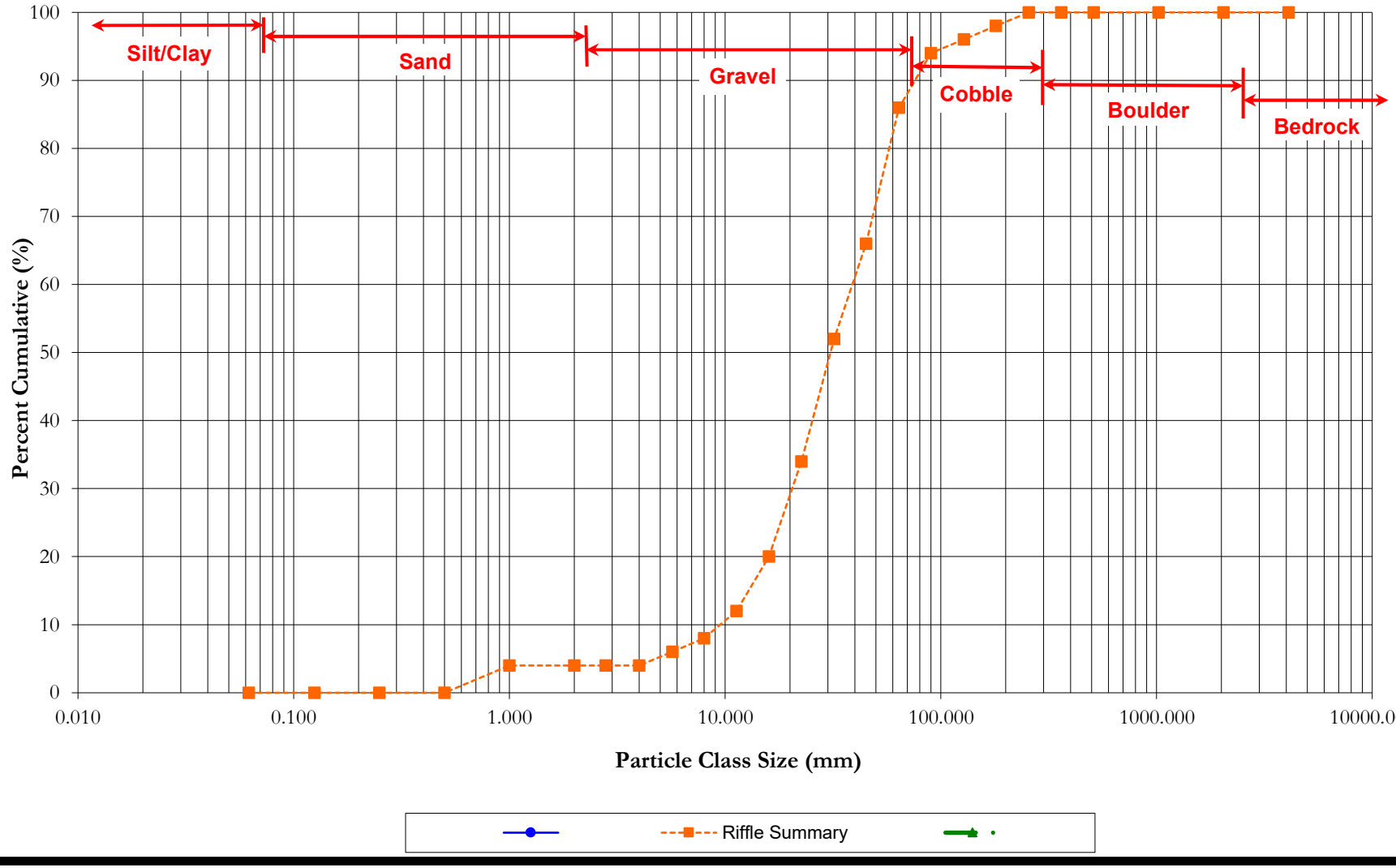
Project Name:	Cornbread Valley	**Data Collected By:**	JDW + JH
Location:	Franklin, NC	**Data Collected On:**	4/30/2021
Job #:	W02191	**Reach:**	UT3 - Reach 1
Date:	6/24/2021	**Cross Section #:**	XS1-Riffle

Particle Class		Diameter (mm)		Particle Count			Riffle Summary					
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative				
SILT/CLAY	Silt/Clay	0.000	0.062					0.00				
SAND	Very fine	0.062	0.125					0.00				
	Fine	0.125	0.250					0.00				
	Medium	0.250	0.500					0.00				
	Coarse	0.5	1.0	**2**		2	4.00	4.00				
	Very Coarse	1.0	2.0					4.00				
GRAVEL	Very Fine	2.0	2.8					4.00				
	Very Fine	2.8	4.0					4.00				
	Fine	4.0	5.7	**1**		1	2.00	6.00				
	Fine	5.7	8.0	**1**		1	2.00	8.00				
	Medium	8.0	11.3	**2**		2	4.00	12.00				
	Medium	11.3	16.0	**4**		4	8.00	20.00				
	Coarse	16.0	22.6	**7**		7	14.00	34.00				
	Coarse	22.6	32	**9**		9	18.00	52.00				
	Very Coarse	32	45	**7**		7	14.00	66.00				
	Very Coarse	45	64	**10**		10	20.00	86.00				
COBBLE	Small	64	90	**4**		4	8.00	94.00				
	Small	90	128	**1**		1	2.00	96.00				
	Large	128	180	**1**		1	2.00	98.00				
	Large	180	256	**1**		1	2.00	100.00				
BOULDER	Small	256	362					100.00				
	Small	362	512					100.00				
	Medium	512	1024					100.00				
	Large/Very Large	1024	2048					100.00				
BEDROCK	Bedrock	2048	>2048					100.00				
			Total:	**50**	**0**	**50**	**100**	100				

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials (mm)	Cumulative Channel materials (mm)
D_{16} =	15.29		
D_{35} =	23.6		
D_{50} =	45.1		
D_{84} =	59.3		
D_{95} =	94.7		
D_{100} =	256		

UT3 - Reach 1
50-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

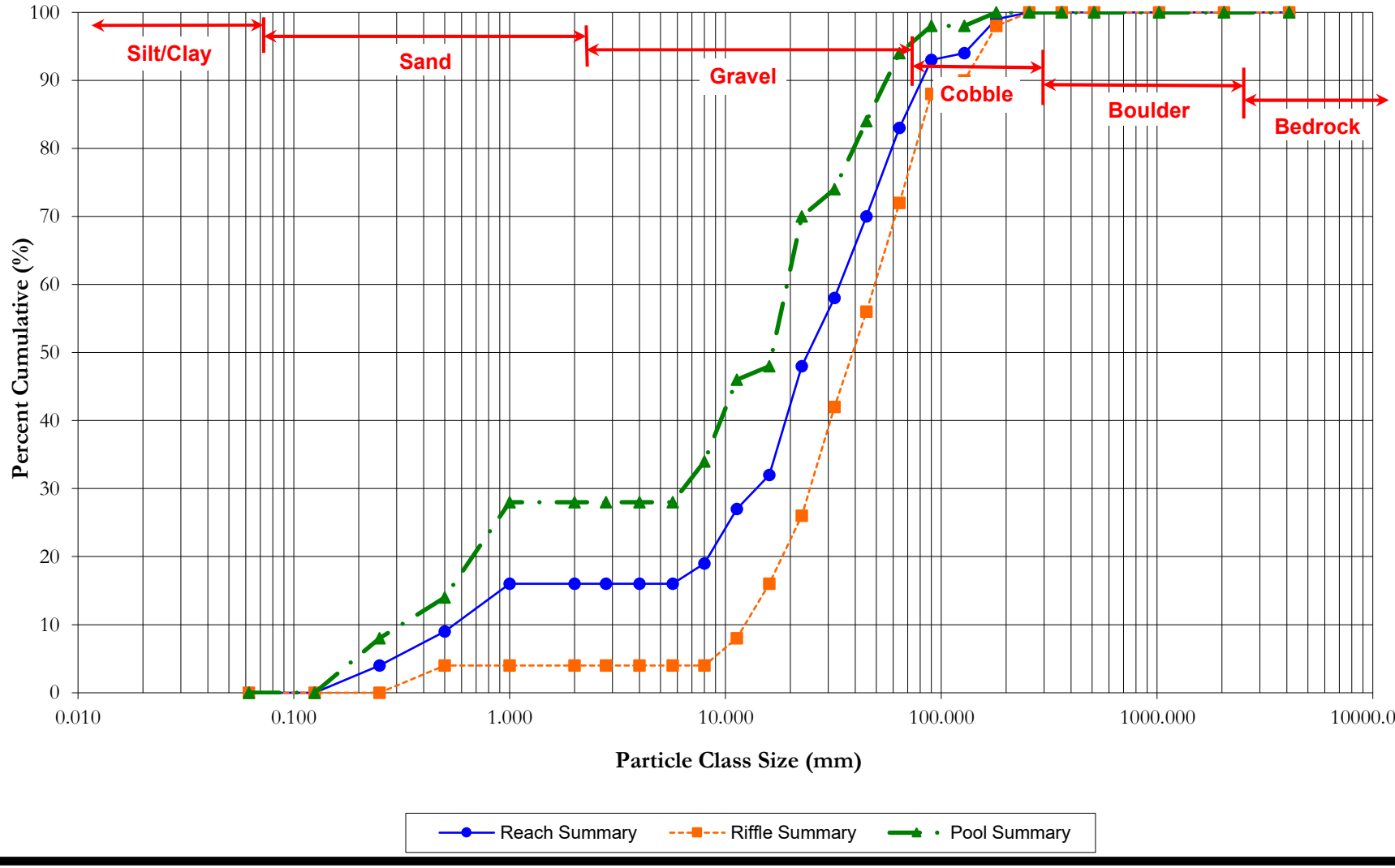
Project Name:	Cornbread Valley	**Data Collected By:**	JDW + JH
Location:	Franklin, NC	**Data Collected On:**	4/30/2021
Job #:	W02191	**Reach:**	UT3 - Reach 1
Date:	6/24/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0.00		0.00		0.00
SAND	Very fine	0.062	0.125					0.00		0.00		0.00
	Fine	0.125	0.250		**4**	4		0.00	8.00	8.00	4.00	4.00
	Medium	0.250	0.500	**2**	**3**	5	4.00	4.00	6.00	14.00	5.00	9.00
	Coarse	0.5	1.0		**7**	7		4.00	14.00	28.00	7.00	16.00
	Very Coarse	1.0	2.0					4.00		28.00		16.00
GRAVEL	Very Fine	2.0	2.8					4.00		28.00		16.00
	Very Fine	2.8	4.0					4.00		28.00		16.00
	Fine	4.0	5.7					4.00		28.00		16.00
	Fine	5.7	8.0		**3**	3		4.00	6.00	34.00	3.00	19.00
	Medium	8.0	11.3	**2**	**6**	8	4.00	8.00	12.00	46.00	8.00	27.00
	Medium	11.3	16.0	**4**	**1**	5	8.00	16.00	2.00	48.00	5.00	32.00
	Coarse	16.0	22.6	**5**	**11**	16	10.00	26.00	22.00	70.00	16.00	48.00
	Coarse	22.6	32	**8**	**2**	10	16.00	42.00	4.00	74.00	10.00	58.00
	Very Coarse	32	45	**7**	**5**	12	14.00	56.00	10.00	84.00	12.00	70.00
	Very Coarse	45	64	**8**	**5**	13	16.00	72.00	10.00	94.00	13.00	83.00
COBBLE	Small	64	90	**8**	**2**	10	16.00	88.00	4.00	98.00	10.00	93.00
	Small	90	128	**1**		1	2.00	90.00		98.00	1.00	94.00
	Large	128	180	**4**	**1**	5	8.00	98.00	2.00	100.00	5.00	99.00
	Large	180	256	**1**		1	2.00	100.00		100.00	1.00	100.00
BOULDER	Small	256	362					100.00		100.00		100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	>2048					100.00		100.00		100.00
			Total:	**50**	**50**	**100**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	16.0	D_{16} =	0.55	D_{16} =	1.00
D_{35} =	27.5	D_{35} =	8.23	D_{35} =	17.07
D_{50} =	38.9	D_{50} =	16.51	D_{50} =	24.23
D_{84} =	82.6	D_{84} =	45.0	D_{84} =	66.2
D_{95} =	158.4	D_{95} =	69.7	D_{95} =	137.0
D_{100} =	256	D_{99} =	180	D_{99} =	256

UT3 - Reach 1
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	
Location:	Franklin, NC	**Data Collected On:**	
Job #:	W02191	**Reach:**	UT3-R1
Date:	8/12/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	1170.0	802	1814	**69%**	**30.7**
SAND	Very Coarse	#10	2.0	4.0	480.0	661.3	181	1632	**62%**	**37.6**
GRAVEL	Fine	#5	4.0	8.0	495.3	644.6	149	1483	**57%**	**43.3**
	Medium	5/16"	8.0	16.0	513.9	721.6	208	1275	**49%**	**51.2**
	Coarse	5/8"	16.0	31.5	541.4	750.0	209	1067	**41%**	**59.2**
	Very Coarse	1 1/4"	31.5	63.0	540.8	1607.5	1067	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): **85** mm
Largest Particle (2): mm

Total Sample Weight (g) 2616

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.84
D_{50} =	14.35
D_{84} =	48.0
D_{95} =	57.9
D_{100} =	63.0

PEBBLE COUNT ANALYSIS WORKSHEET

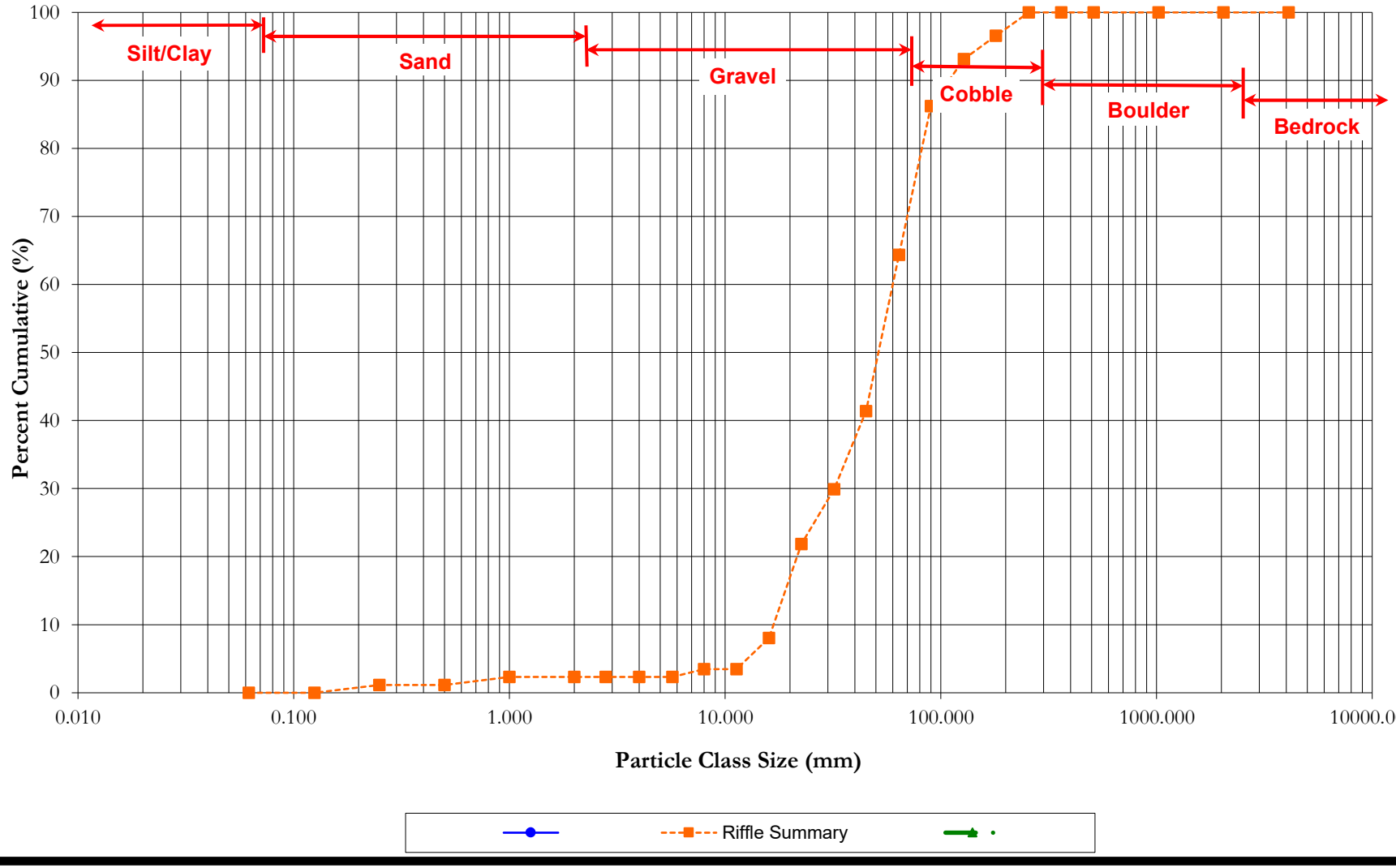
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JDW + JH
Location:	Franklin, NC	**Data Collected On:**	4/23/2021
Job #:	W02191	**Reach:**	UT3 - Reach 3
Date:	4/26/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary					
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative				
SILT/CLAY	Silt/Clay	0.000	0.062					0.00				
SAND	Very fine	0.062	0.125					0.00				
	Fine	0.125	0.250	**1**		1	1.15	1.15				
	Medium	0.250	0.500					1.15				
	Coarse	0.5	1.0	**1**		1	1.15	2.30				
	Very Coarse	1.0	2.0					2.30				
GRAVEL	Very Fine	2.0	2.8					2.30				
	Very Fine	2.8	4.0					2.30				
	Fine	4.0	5.7					2.30				
	Fine	5.7	8.0	**1**		1	1.15	3.45				
	Medium	8.0	11.3					3.45				
	Medium	11.3	16.0	**4**		4	4.60	8.05				
	Coarse	16.0	22.6	**12**		12	13.79	21.84				
	Coarse	22.6	32	**7**		7	8.05	29.89				
	Very Coarse	32	45	**10**		10	11.49	41.38				
	Very Coarse	45	64	**20**		20	22.99	64.37				
COBBLE	Small	64	90	**19**		19	21.84	86.21				
	Small	90	128	**6**		6	6.90	93.10				
	Large	128	180	**3**		3	3.45	96.55				
	Large	180	256	**3**		3	3.45	100.00				
BOULDER	Small	256	362					100.00				
	Small	362	512					100.00				
	Medium	512	1024					100.00				
	Large/Very Large	1024	2048					100.00				
BEDROCK	Bedrock	2048	>2048					100.00				
			Total:	**87**	**0**	**87**	**100**	100				

Largest Particle (mm): 256

Riffle Channel materials (mm)	
D_{16} =	19.53
D_{35} =	37.2
D_{50} =	51.4
D_{84} =	87.0
D_{95} =	154.4
D_{100} =	256

UT3 - Reach 3
50-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

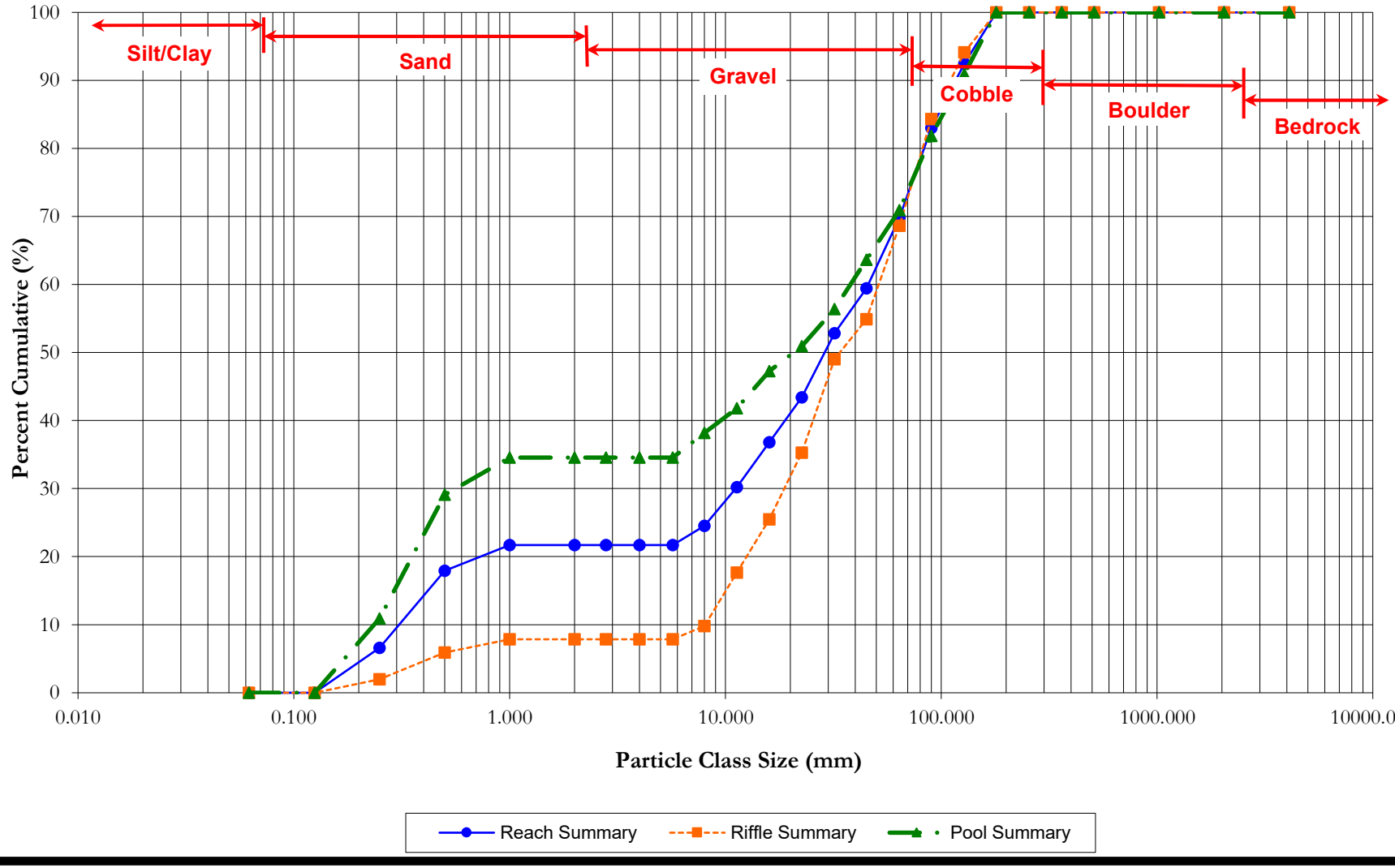
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JDW + JH
Location:	Franklin, NC	**Data Collected On:**	4/23/2021
Job #:	W02191	**Reach:**	UT3 - Reach 3
Date:	4/26/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0.00		0.00		0.00
SAND	Very fine	0.062	0.125					0.00		0.00		0.00
	Fine	0.125	0.250	**1**	**6**	7	1.96	1.96	10.91	10.91	6.60	6.60
	Medium	0.250	0.500	**2**	**10**	12	3.92	5.88	18.18	29.09	11.32	17.92
	Coarse	0.5	1.0	**1**	**3**	4	1.96	7.84	5.45	34.55	3.77	21.70
	Very Coarse	1.0	2.0					7.84		34.55		21.70
GRAVEL	Very Fine	2.0	2.8					7.84		34.55		21.70
	Very Fine	2.8	4.0					7.84		34.55		21.70
	Fine	4.0	5.7					7.84		34.55		21.70
	Fine	5.7	8.0	**1**	**2**	3	1.96	9.80	3.64	38.18	2.83	24.53
	Medium	8.0	11.3	**4**	**2**	6	7.84	17.65	3.64	41.82	5.66	30.19
	Medium	11.3	16.0	**4**	**3**	7	7.84	25.49	5.45	47.27	6.60	36.79
	Coarse	16.0	22.6	**5**	**2**	7	9.80	35.29	3.64	50.91	6.60	43.40
	Coarse	22.6	32	**7**	**3**	10	13.73	49.02	5.45	56.36	9.43	52.83
	Very Coarse	32	45	**3**	**4**	7	5.88	54.90	7.27	63.64	6.60	59.43
	Very Coarse	45	64	**7**	**4**	11	13.73	68.63	7.27	70.91	10.38	69.81
COBBLE	Small	64	90	**8**	**6**	14	15.69	84.31	10.91	81.82	13.21	83.02
	Small	90	128	**5**	**5**	10	9.80	94.12	9.09	90.91	9.43	92.45
	Large	128	180	**3**	**5**	8	5.88	100.00	9.09	100.00	7.55	100.00
	Large	180	256					100.00		100.00		100.00
BOULDER	Small	256	362					100.00		100.00		100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	4096					100.00		100.00		100.00
			Total:	**51**	**55**	**106**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): 180 180

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	10.51	D_{16} =	0.30	D_{16} =	0.44
D_{35} =	22.4	D_{35} =	5.9	D_{35} =	14.6
D_{50} =	33.9	D_{50} =	20.7	D_{50} =	28.8
D_{84} =	89.4	D_{84} =	97.9	D_{84} =	93.4
D_{95} =	134.7	D_{95} =	149.2	D_{95} =	143.6
D_{100} =	180	D_{99} =	180	D_{99} =	180

UT3 - Reach 3
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	
Location:	Franklin, NC	**Data Collected On:**	
Job #:	W02191	**Reach:**	UT3-R3
Date:	8/12/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	893.4	526	896	**63%**	**37.0**
SAND	Very Coarse	#10	2.0	4.0	480.0	580.0	100	796	**56%**	**44.0**
GRAVEL	Fine	#5	4.0	8.0	495.3	622.7	127	668	**47%**	**53.0**
	Medium	5/16"	8.0	16.0	513.9	784.1	270	398	**28%**	**72.0**
	Coarse	5/8"	16.0	31.5	541.4	770.0	229	169	**12%**	**88.1**
	Very Coarse	1 1/4"	31.5	63.0	540.8	710.2	169	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): mm
Largest Particle (2): mm

Total Sample Weight (g) 1421

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	6.35
D_{84} =	26.5
D_{95} =	47.1
D_{100} =	63.0

PEBBLE COUNT ANALYSIS WORKSHEET

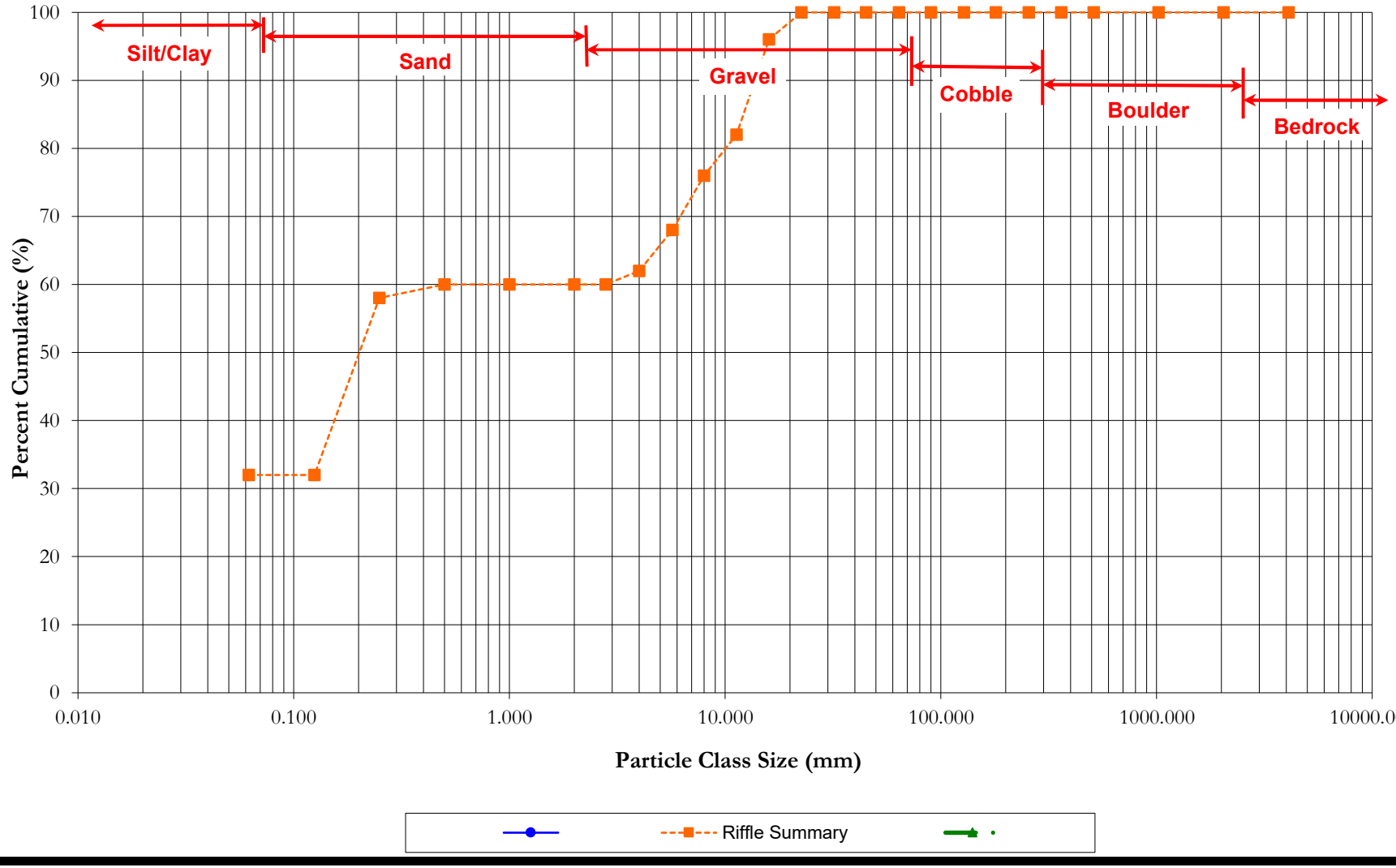
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JW
Location:	Franklin, NC	**Data Collected On:**	8/2/2021
Job #:	W02191	**Reach:**	UT3A - Reach 2
Date:	8/4/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary					
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative				
SILT/CLAY	Silt/Clay	0.000	0.062	**16**		16	32.00	32.00				
SAND	Very fine	0.062	0.125					32.00				
	Fine	0.125	0.250	**13**		13	26.00	58.00				
	Medium	0.250	0.500	**1**		1	2.00	60.00				
	Coarse	0.5	1.0					60.00				
	Very Coarse	1.0	2.0					60.00				
GRAVEL	Very Fine	2.0	2.8					60.00				
	Very Fine	2.8	4.0	**1**		1	2.00	62.00				
	Fine	4.0	5.7	**3**		3	6.00	68.00				
	Fine	5.7	8.0	**4**		4	8.00	76.00				
	Medium	8.0	11.3	**3**		3	6.00	82.00				
	Medium	11.3	16.0	**7**		7	14.00	96.00				
	Coarse	16.0	22.6	**2**		2	4.00	100.00				
	Coarse	22.6	32					100.00				
	Very Coarse	32	45					100.00				
	Very Coarse	45	64					100.00				
COBBLE	Small	64	90					100.00				
	Small	90	128					100.00				
	Large	128	180					100.00				
	Large	180	256					100.00				
BOULDER	Small	256	362					100.00				
	Small	362	512					100.00				
	Medium	512	1024					100.00				
	Large/Very Large	1024	2048					100.00				
BEDROCK	Bedrock	2048	>2048					100.00				
			Total:	**50**	**0**	**50**	**100**	100				

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials (mm)	Cumulative Channel materials (mm)
D_{16} =	Silt/Clay		
D_{35} =	Silt/Clay		
D_{50} =	Silt/Clay		
D_{84} =	16.0		
D_{95} =	108.4		
D_{100} =	22.6		

UT3A - Reach 2
50-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

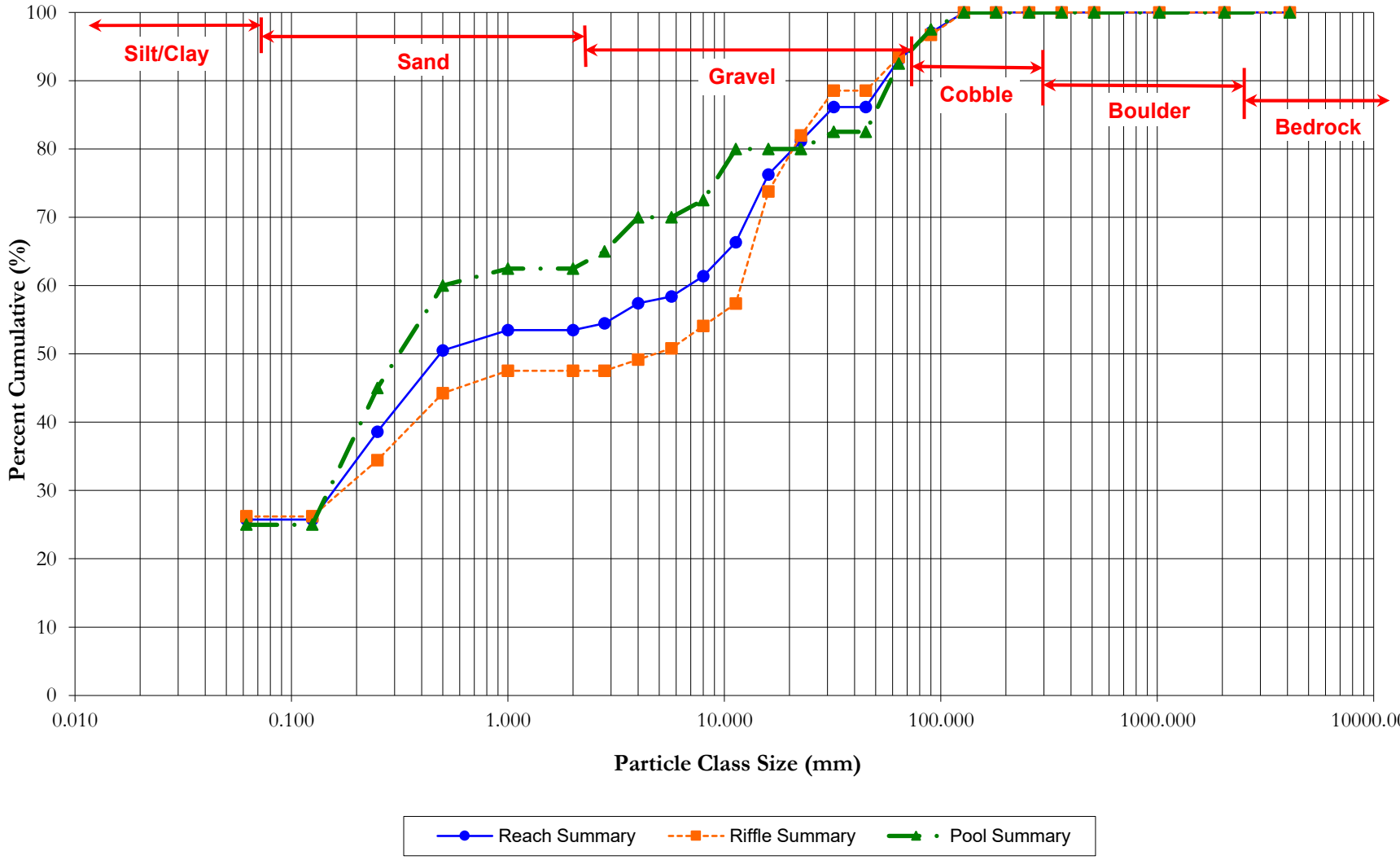
Project Name:	Cornbread Valley	**Data Collected By:**	JMB + JW
Location:	Franklin, NC	**Data Collected On:**	8/2/2021
Job #:	W02191	**Reach:**	UT3A - Reach 2
Date:	8/4/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	**16**	**10**	26	26.23	26.23	25.00	25.00	25.74	25.74
SAND	Very fine	0.062	0.125					26.23		25.00		25.74
	Fine	0.125	0.250	**5**	**8**	13	8.20	34.43	20.00	45.00	12.87	38.61
	Medium	0.250	0.500	**6**	**6**	12	9.84	44.26	15.00	60.00	11.88	50.50
	Coarse	0.5	1.0	**2**	**1**	3	3.28	47.54	2.50	62.50	2.97	53.47
	Very Coarse	1.0	2.0					47.54		62.50		53.47
GRAVEL	Very Fine	2.0	2.8		**1**	1		47.54	2.50	65.00	0.99	54.46
	Very Fine	2.8	4.0	**1**	**2**	3	1.64	49.18	5.00	70.00	2.97	57.43
	Fine	4.0	5.7	**1**		1	1.64	50.82		70.00	0.99	58.42
	Fine	5.7	8.0	**2**	**1**	3	3.28	54.10	2.50	72.50	2.97	61.39
	Medium	8.0	11.3	**2**	**3**	5	3.28	57.38	7.50	80.00	4.95	66.34
	Medium	11.3	16.0	**10**		10	16.39	73.77		80.00	9.90	76.24
	Coarse	16.0	22.6	**5**		5	8.20	81.97		80.00	4.95	81.19
	Coarse	22.6	32	**4**	**1**	5	6.56	88.52	2.50	82.50	4.95	86.14
	Very Coarse	32	45					88.52		82.50		86.14
	Very Coarse	45	64	**3**	**4**	7	4.92	93.44	10.00	92.50	6.93	93.07
COBBLE	Small	64	90	**2**	**2**	4	3.28	96.72	5.00	97.50	3.96	97.03
	Small	90	128	**2**	**1**	3	3.28	100.00	2.50	100.00	2.97	100.00
	Large	128	180					100.00		100.00		100.00
	Large	180	256					100.00		100.00		100.00
BOULDER	Small	256	362					100.00		100.00		100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	>2048					100.00		100.00		100.00
			Total:	**61**	**40**	**101**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	Silt/Clay	D_{16} =	Silt/Clay	D_{16} =	Silt/Clay
D_{35} =	0.3	D_{35} =	0.18	D_{35} =	0.21
D_{50} =	4.8	D_{50} =	0.31	D_{50} =	0.49
D_{84} =	25.2	D_{84} =	47.4	D_{84} =	27.5
D_{95} =	75.3	D_{95} =	75.9	D_{95} =	75.6
D_{100} =	128	D_{99} =	128	D_{99} =	128

UT3A - Reach 2
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	
Location:	Franklin, NC	**Data Collected On:**	
Job #:	W02191	**Reach:**	UT3A-R2
Date:	8/18/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	1064.9	697	207	**23%**	**77.1**
SAND	Very Coarse	#10	2.0	4.0	480.0	536.1	56	151	**17%**	**83.3**
GRAVEL	Fine	#5	4.0	8.0	495.3	564.8	69	81	**9%**	**91.0**
	Medium	5/16"	8.0	16.0	513.9	595.1	81	0	**0%**	**100.0**
	Coarse	5/8"	16.0	31.5	541.4	541.4	0	0	**0%**	**100.0**
	Very Coarse	1 1/4"	31.5	63.0	540.8	540.8	0	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): **63** mm
Largest Particle (2): mm

Total Sample Weight (g) 904

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	Silt/Clay
D_{84} =	4.2
D_{95} =	10.9
D_{100} =	63.0

PEBBLE COUNT ANALYSIS WORKSHEET

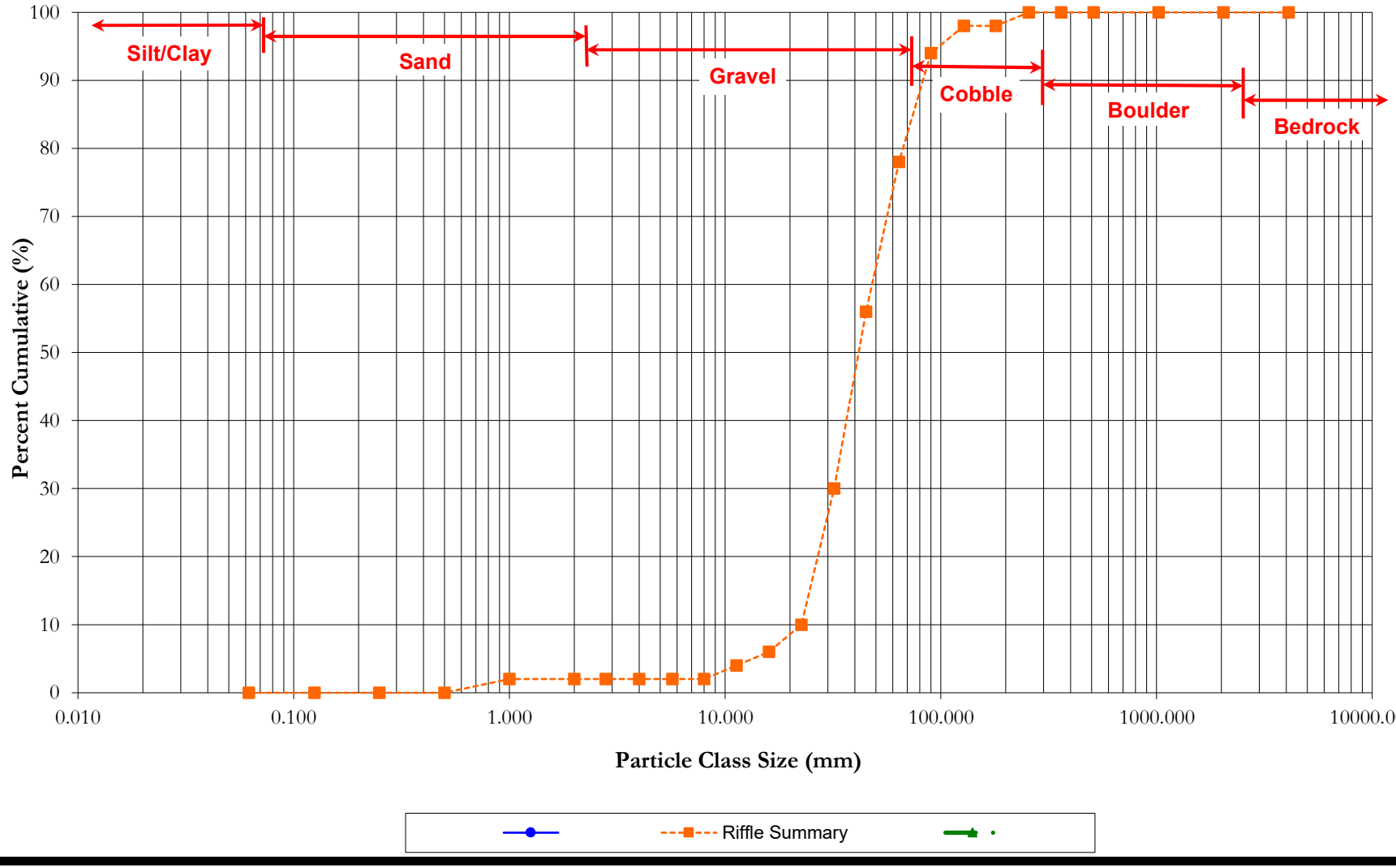
Project Name:	Cornbread Valley	**Data Collected By:**	JDW + JH
Location:	Franklin, NC	**Data Collected On:**	4/30/2021
Job #:	W02191	**Reach:**	UT3C
Date:	6/24/2021	**Cross Section #:**	4

Particle Class		Diameter (mm)		Particle Count			Riffle Summary					
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative				
SILT/CLAY	Silt/Clay	0.000	0.062					0.00				
SAND	Very fine	0.062	0.125					0.00				
	Fine	0.125	0.250					0.00				
	Medium	0.250	0.500					0.00				
	Coarse	0.5	1.0	**1**		1	2.00	2.00				
	Very Coarse	1.0	2.0					2.00				
GRAVEL	Very Fine	2.0	2.8					2.00				
	Very Fine	2.8	4.0					2.00				
	Fine	4.0	5.7					2.00				
	Fine	5.7	8.0					2.00				
	Medium	8.0	11.3	**1**		1	2.00	4.00				
	Medium	11.3	16.0	**1**		1	2.00	6.00				
	Coarse	16.0	22.6	**2**		2	4.00	10.00				
	Coarse	22.6	32	**10**		10	20.00	30.00				
	Very Coarse	32	45	**13**		13	26.00	56.00				
	Very Coarse	45	64	**11**		11	22.00	78.00				
COBBLE	Small	64	90	**8**		8	16.00	94.00				
	Small	90	128	**2**		2	4.00	98.00				
	Large	128	180					98.00				
	Large	180	256	**1**		1	2.00	100.00				
BOULDER	Small	256	362					100.00				
	Small	362	512					100.00				
	Medium	512	1024					100.00				
	Large/Very Large	1024	2048					100.00				
BEDROCK	Bedrock	2048	>2048					100.00				
			Total:	**50**	**0**	**50**	**100**	100				

Largest Particle (mm): _____

Riffle Channel materials (mm)	
D_{16} =	25.09
D_{35} =	34.2
D_{50} =	41.6
D_{84} =	72.7
D_{95} =	98.3
D_{100} =	256

UT3C
50-Count Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

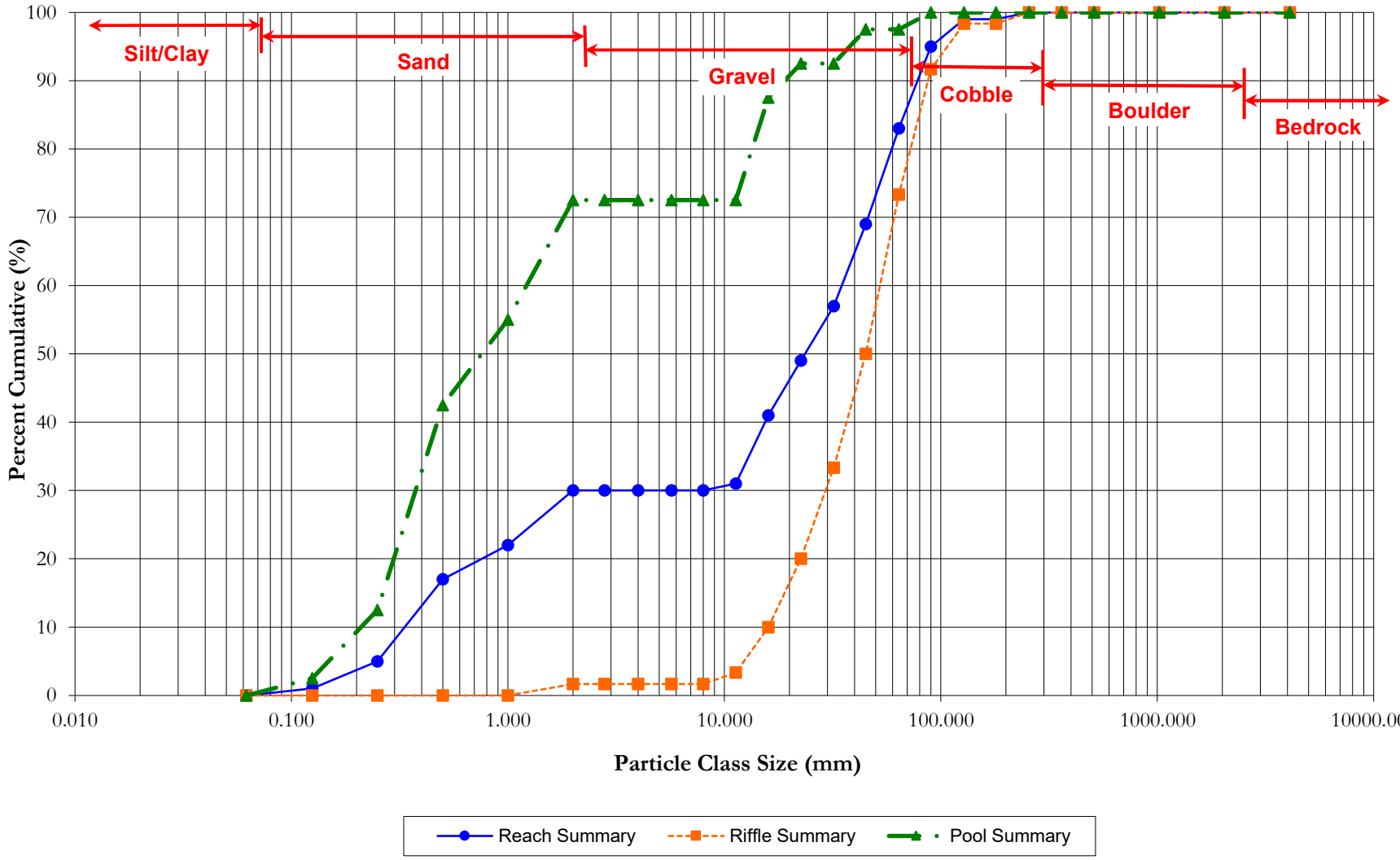
Project Name:	Cornbread Valley	**Data Collected By:**	JDW + JH
Location:	Franklin, NC	**Data Collected On:**	4/30/2021
Job #:	W02191	**Reach:**	UT3C
Date:	6/24/2021	**Cross Section #:**	

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0.00		0.00		0.00
SAND	Very fine	0.062	0.125		**1**	1		0.00	2.50	2.50	1.00	1.00
	Fine	0.125	0.250		**4**	4		0.00	10.00	12.50	4.00	5.00
	Medium	0.250	0.500		**12**	12		0.00	30.00	42.50	12.00	17.00
	Coarse	0.5	1.0		**5**	5		0.00	12.50	55.00	5.00	22.00
	Very Coarse	1.0	2.0	**1**	**7**	8	1.67	1.67	17.50	72.50	8.00	30.00
GRAVEL	Very Fine	2.0	2.8					1.67		72.50		30.00
	Very Fine	2.8	4.0					1.67		72.50		30.00
	Fine	4.0	5.7					1.67		72.50		30.00
	Fine	5.7	8.0					1.67		72.50		30.00
	Medium	8.0	11.3	**1**		1	1.67	3.33		72.50	1.00	31.00
	Medium	11.3	16.0	**4**	**6**	10	6.67	10.00	15.00	87.50	10.00	41.00
	Coarse	16.0	22.6	**6**	**2**	8	10.00	20.00	5.00	92.50	8.00	49.00
	Coarse	22.6	32	**8**		8	13.33	33.33		92.50	8.00	57.00
	Very Coarse	32	45	**10**	**2**	12	16.67	50.00	5.00	97.50	12.00	69.00
	Very Coarse	45	64	**14**		14	23.33	73.33		97.50	14.00	83.00
COBBLE	Small	64	90	**11**	**1**	12	18.33	91.67	2.50	100.00	12.00	95.00
	Small	90	128	**4**		4	6.67	98.33		100.00	4.00	99.00
	Large	128	180					98.33		100.00		99.00
	Large	180	256	**1**		1	1.67	100.00		100.00	1.00	100.00
BOULDER	Small	256	362					100.00		100.00		100.00
	Small	362	512					100.00		100.00		100.00
	Medium	512	1024					100.00		100.00		100.00
	Large/Very Large	1024	2048					100.00		100.00		100.00
BEDROCK	Bedrock	2048	4096					100.00		100.00		100.00
			Total:	**60**	**40**	**100**	**100**	100	**100**	100	**100**	100

Largest Particle (mm): 256

Riffle Channel materials (mm)		Pool Channel materials (mm)		Cumulative Channel materials (mm)	
D_{16} =	19.68	D_{16} =	0.27	D_{16} =	0.47
D_{35} =	33.1	D_{35} =	0.4	D_{35} =	13.0
D_{50} =	45.0	D_{50} =	0.8	D_{50} =	23.6
D_{84} =	78.0	D_{84} =	14.8	D_{84} =	65.8
D_{95} =	107.3	D_{95} =	37.9	D_{95} =	90.0
D_{100} =	256	D_{99} =	90	D_{99} =	256

UT3C
Reachwide Pebble Count Particle Distribution



SUBPAVEMENT OR BAR SAMPLE SIEVE RESULTS

Project Name:	Cornbread Valley Mitigation Site	**Data Collected By:**	
Location:	Franklin, NC	**Data Collected On:**	
Job #:	W02191	**Reach:**	UT3C-R2
Date:	8/12/2021	**Cross Section #:**	

Particle Class		Seive Opening Size	Diameter (mm)		Sieve Data Collection		Net Weight Retained (g)	Cumulative Weight Retained (g)	Percent Cumulative Retained	Percent Cumulative Passing
			min	max	Sieve Tare Weight (g)	Total Sample Wt w/ Sieve (g)				
SILT/CLAY	Silt/Clay	Bucket	0	0.063	367.8	672.8	305	1416	**82%**	**17.7**
SAND	Very Coarse	#10	2.0	4.0	480.0	569.3	89	1327	**77%**	**22.9**
GRAVEL	Fine	#5	4.0	8.0	495.3	585.0	90	1237	**72%**	**28.1**
	Medium	5/16"	8.0	16.0	513.9	752.5	239	998	**58%**	**42.0**
	Coarse	5/8"	16.0	31.5	541.4	1097.9	557	442	**26%**	**74.3**
	Very Coarse	1 1/4"	31.5	54.0	540.8	982.7	442	0	**0%**	**100.0**
COBBLE	Small									

Largest Particle (1): **54** mm
Largest Particle (2): **44** mm

Total Sample Weight (g) 1721

Subpavement/Bar Sample Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	11.28
D_{50} =	18.92
D_{84} =	38.6
D_{95} =	48.6
D_{100} =	54.0

		Jones Creek Reach 2	Jones Creek Reach 5	UT1	UT1A	UT2 Reach 1	UT2 Reach 2	UT2A	UT3 Reach 1	UT3 Reach 3	UT3A Reach 1	UT3A Reach 2	UT3B	UT3C Reach 1	UT3C Reach 2
	DA (acres)	2726	3164	66	3	13	22	14	156	174	11	13	7	53	54
	DA (sq. mi.)	4.26	4.94	0.10	0.004	0.02	0.03	0.02	0.24	0.27	0.02	0.02	0.01	0.08	0.08
		Qbkf (cfs)	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*	*Qbkf (cfs)*
Wildlands Tool -USGS Peak Discharge Estimation for NC Rural Piedmont	**1-yr event**	85	96	4	0	1	1	1	21	26	1	1	1	3	3
	1.2-yr event	226	252	15	1	4	6	4	27	30	4	4	3	13	13
	1.5-yr event	315	350	22	2	7	9	7	39	43	7	7	4	19	19
	1.8-yr event	382	425	28	5	8	11	8	48	55	8	8	5	24	24
	2-yr event	416	462	30	8	9	12	9	60	67	9	9	5	26	26
Manning's Equation at Surveyed Riffle XS from Mecklenburg Spreadsheets		292	309	16	2	5	8	21	53	57	-	4	2	14	15
NC Mountain Regional Curve		303	340	17	2	5	7	6	34	37	5	5	3	15	15
TN Blue Ridge Curve		282	316	15	1	4	6	5	30	33	4	4	3	13	13
Alan Walker Curve		174	195	9	1	3	4	3	18	20	3	3	1	8	8
Site Specific Reference Reach Curve		226	248	22	3	8	10	9	37	40	8	8	5	19	19
Final Design Q		**275**	**300**	**17**	**6**	**5**	**5**	**6**	**34**	**38**	**6**	**6**	**4**	**13**	**13**

Table 1: Jones Creek Reach 2

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B4/C4		
drainage area	DA	sq mi	4.26		
bankfull design discharge	Q_{bkf}	cfs	275.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	48.4		
average velocity during bankfull event	v_{bkf}	fps	5.7		
width at bankfull	w_{bkf}	feet	30.0		
mean depth at bankfull	d_{bkf}	feet	1.6		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		19		
maximum depth at bankfull	d_{max}	feet	1.9	2.6	
max depth ratio	d_{max}/d_{bkf}		1.2	1.6	1.4
bank height ratio	BHR		1.0	1.1	
floodprone area width	w_{fpa}	feet	45	150	
entrenchment ratio	ER		1.5	5.0	
Slope					
valley slope	S_{valley}	feet/ foot	0.0201		
channel slope	$S_{channel}$	feet/ foot	0.0175	0.0191	0.0160
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0210	0.0651	
riffle slope ratio	$S_{riffle}/S_{channel}$		1.2	3.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0077	
pool slope ratio	$S_{poo}l/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	48	186	
pool spacing ratio	L_{p-p}/w_{bkf}		1.6	6.2	
maximum pool depth at bankfull	d_{pool}	feet	3.2	4.8	
pool depth ratio	d_{pool}/d_{bkf}		2.0	3.0	
pool width at bankfull	w_{pool}	feet	30.0	48.0	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	53.2	121.0	
pool area ratio	A_{pool}/A_{bkf}		1.1	2.5	
Pattern Features					
sinuosity	K		1.05	1.15	1.08
belt width	w_{blt}	feet	60	198	
meander width ratio	w_{blt}/w_{bkf}		2.0	6.6	
linear wavelength	LW	feet	180	360	
linear wavelength ratio	LW/w_{bkf}		6.0	12.0	
meander length	L_m	feet	225	450	
meander length ratio	L_m/w_{bkf}		7.5	15.0	
radius of curvature	R_c	feet	60	90	
radius of curvature ratio	R_c/ w_{bkf}		2.0	3.0	

Table 1: Jones Creek Reach 5

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B3/C3		
drainage area	DA	sq mi	4.94		
bankfull design discharge	Q_{bkf}	cfs	300.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	51.4		
average velocity during bankfull event	v_{bkf}	fps	5.8		
width at bankfull	w_{bkf}	feet	30.7		
mean depth at bankfull	d_{bkf}	feet	1.7		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		18		
maximum depth at bankfull	d_{max}	feet	2.0	2.5	
max depth ratio	d_{max}/d_{bkf}		1.2	1.5	1.4
bank height ratio	BHR		1.0	1.1	
floodprone area width	w_{fpa}	feet	46	154	
entrenchment ratio	ER		1.5	5.0	
Slope					
valley slope	S_{valley}	feet/ foot	0.0194		
channel slope	$S_{channel}$	feet/ foot	0.0169	0.0185	0.0160
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0202	0.0628	
riffle slope ratio	$S_{riffle}/S_{channel}$		1.2	3.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0074	
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	49	190	
pool spacing ratio	L_{p-p}/w_{bkf}		1.6	6.2	
maximum pool depth at bankfull	d_{pool}	feet	3.4	5.0	
pool depth ratio	d_{pool}/d_{bkf}		2.0	3.0	
pool width at bankfull	w_{pool}	feet	30.7	49.1	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	56.6	128.6	
pool area ratio	A_{pool}/A_{bkf}		1.1	2.5	
Pattern Features					
sinuosity	K		1.05	1.15	1.06
belt width	w_{blt}	feet	61	203	
meander width ratio	w_{blt}/w_{bkf}		2.0	6.6	
linear wavelength	LW	feet	184	368	
linear wavelength ratio	LW/w_{bkf}		6.0	12.0	
meander length	L_m	feet	230	461	
meander length ratio	L_m/w_{bkf}		7.5	15.0	
radius of curvature	R_c	feet	61	92	
radius of curvature ratio	R_c/ w_{bkf}		2.0	3.0	

Table 1: UT1A

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B4a		
drainage area	DA	sq mi	0.004		
bankfull design discharge	Q_{bkf}	cfs	6.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	1.4		
average velocity during bankfull event	v_{bkf}	fps	4.5		
width at bankfull	w_{bkf}	feet	4.0		
mean depth at bankfull	d_{bkf}	feet	0.3		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		12		
maximum depth at bankfull	d_{max}	feet	0.4	0.6	
max depth ratio	d_{max}/d_{bkf}		1.2	1.6	1.5
bank height ratio	BHR		1.0	1.1	
floodprone area width	w_{fpa}	feet	6	10	
entrenchment ratio	ER		1.4	2.4	
Slope					
valley slope	S_{valley}	feet/ foot	0.0865		
channel slope	$S_{channel}$	feet/ foot	0.0721	0.0865	0.1000
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0649	0.2941	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9	3.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0346	
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	4	14	
pool spacing ratio	L_{p-p}/w_{bkf}		1.0	3.5	
maximum pool depth at bankfull	d_{pool}	feet	0.7	1.2	
pool depth ratio	d_{pool}/d_{bkf}		2.0	3.5	
pool width at bankfull	w_{pool}	feet	4.0	6.4	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	1.7	3.4	
pool area ratio	A_{pool}/A_{bkf}		1.2	2.5	
Pattern Features					
sinuosity	K		1.00	1.20	1.05
belt width	w_{blt}	feet	N/A	N/A	
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	
linear wavelength	LW	feet	N/A	N/A	
linear wavelength ratio	LW/w_{bkf}		N/A	N/A	
meander length	L_m	feet	N/A	N/A	
meander length ratio	L_m/w_{bkf}		N/A	N/A	
radius of curvature	R_c	feet	N/A	N/A	
radius of curvature ratio	R_c/ w_{bkf}		N/A	N/A	

Table 1: UT3A Reach 1

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B4/5		
drainage area	DA	sq mi	0.02		
bankfull design discharge	Q_{bkf}	cfs	6.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	1.4		
average velocity during bankfull event	v_{bkf}	fps	4.4		
width at bankfull	w_{bkf}	feet	4.0		
mean depth at bankfull	d_{bkf}	feet	0.3		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		12		
maximum depth at bankfull	d_{max}	feet	0.4	0.7	
max depth ratio	d_{max}/d_{bkf}		1.2	2.0	1.5
bank height ratio	BHR		1.0	1.1	
floodprone area width	w_{fpa}	feet	6	10	
entrenchment ratio	ER		1.4	2.4	
Slope					
valley slope	S_{valley}	feet/ foot	0.0414		
channel slope	$S_{channel}$	feet/ foot	0.0345	0.0414	0.0950
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0311	0.1408	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9	3.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0166	
pool slope ratio	$S_{pool}l/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	4	16	
pool spacing ratio	L_{p-p}/w_{bkf}		1.0	4.0	
maximum pool depth at bankfull	d_{pool}	feet	0.7	1.0	
pool depth ratio	d_{pool}/d_{bkf}		2.0	3.0	
pool width at bankfull	w_{pool}	feet	4.0	6.4	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	1.7	3.4	
pool area ratio	A_{pool}/A_{bkf}		1.2	2.5	
Pattern Features					
sinuosity	K		1.00	1.20	1.10
belt width	w_{blt}	feet	N/A	N/A	
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	
linear wavelength	LW	feet	N/A	N/A	
linear wavelength ratio	LW/w_{bkf}		N/A	N/A	
meander length	L_m	feet	N/A	N/A	
meander length ratio	L_m/w_{bkf}		N/A	N/A	
radius of curvature	R_c	feet	N/A	N/A	
radius of curvature ratio	R_c/ w_{bkf}		N/A	N/A	

Table 1: UT3B

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B4/B4a		
drainage area	DA	sq mi	0.01		
bankfull design discharge	Q_{bkf}	cfs	4.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	1.4		
average velocity during bankfull event	v_{bkf}	fps	2.7		
width at bankfull	w_{bkf}	feet	4.0		
mean depth at bankfull	d_{bkf}	feet	0.3		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		12		
maximum depth at bankfull	d_{max}	feet	0.4	0.7	
max depth ratio	d_{max}/d_{bkf}		1.2	2.0	1.5
bank height ratio	BHR		0.9	1.1	
floodprone area width	w_{fpa}	feet	6	10	
entrenchment ratio	ER		1.4	2.4	
Slope					
valley slope	S_{valley}	feet/ foot	0.035-0.085		
channel slope	$S_{channel}$	feet/ foot	0.0368	0.0893	0.0350
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0315	0.1190	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9	3.4	
Pool Features					
pool slope	S_{pool}	0.1	0.0000	0.0140	
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	1.5	4	16	
pool spacing ratio	L_{p-p}/w_{bkf}		1.0	4.0	
maximum pool depth at bankfull	d_{pool}	feet	0.7	1.5	
pool depth ratio	d_{pool}/d_{bkf}		2.0	4.3	
pool width at bankfull	w_{pool}	feet	4.0	6.4	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	1.7	4.5	
pool area ratio	A_{pool}/A_{bkf}		1.2	3.3	
Pattern Features					
sinuosity	K		1.00	1.20	1.05
belt width	w_{blt}	feet	N/A	N/A	
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	
linear wavelength	LW	feet	N/A	N/A	
linear wavelength ratio	LW/w_{bkf}		N/A	N/A	
meander length	L_m	feet	N/A	N/A	
meander length ratio	L_m/w_{bkf}		N/A	N/A	
radius of curvature	R_c	feet	N/A	N/A	
radius of curvature ratio	R_c/ w_{bkf}		N/A	N/A	

Table 1: UT2 Reach 2

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B4		
drainage area	DA	sq mi	0.03		
bankfull design discharge	Q_{bkf}	cfs	5.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	1.8		
average velocity during bankfull event	v_{bkf}	fps	2.8		
width at bankfull	w_{bkf}	feet	5.0		
mean depth at bankfull	d_{bkf}	feet	0.4		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		14		
maximum depth at bankfull	d_{max}	feet	0.4	0.6	
max depth ratio	d_{max}/d_{bkf}		1.2	1.6	1.4
bank height ratio	BHR		1.0	1.1	
floodprone area width	w_{fpa}	feet	7	12	
entrenchment ratio	ER		1.4	2.4*	
Slope					
valley slope	S_{valley}	feet/ foot	0.0380		
channel slope	$S_{channel}$	feet/ foot	0.0190	0.0780	varies
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.02-0.07	0.07-0.23	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9	3.0	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.01-0.03	
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	5	20	
pool spacing ratio	L_{p-p}/w_{bkf}		1.0	4.0	
maximum pool depth at bankfull	d_{pool}	feet	0.9	1.5	
pool depth ratio	d_{pool}/d_{bkf}		2.5	4.2	
pool width at bankfull	w_{pool}	feet	5.0	8.5	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.7	
pool cross-sectional area at bankfull	A_{pool}	SF	2.6	6.0	
pool area ratio	A_{pool}/A_{bkf}		1.5	3.4	
Pattern Features					
sinuosity	K		1.00	1.20	1.11
belt width	w_{blt}	feet	N/A	N/A	
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	
linear wavelength	LW	feet	N/A	N/A	
linear wavelength ratio	LW/w_{bkf}		N/A	N/A	
meander length	L_m	feet	N/A	N/A	
meander length ratio	L_m/w_{bkf}		N/A	N/A	
radius of curvature	R_c	feet	N/A	N/A	
radius of curvature ratio	R_c/ w_{bkf}		N/A	N/A	

Table 1: UT3A Reach 2

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B4		
drainage area	DA	sq mi	0.02		
bankfull design discharge	Q_{bkf}	cfs	4.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	1.4		
average velocity during bankfull event	v_{bkf}	fps	2.7		
width at bankfull	w_{bkf}	feet	4.0		
mean depth at bankfull	d_{bkf}	feet	0.3		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		12		
maximum depth at bankfull	d_{max}	feet	0.4	0.7	
max depth ratio	d_{max}/d_{bkf}		1.2	2.0	1.5
bank height ratio	BHR		1.0	1.1	
floodprone area width	w_{fpa}	feet	6	10	
entrenchment ratio	ER		1.4	2.4	
Slope					
valley slope	S_{valley}	feet/ foot	0.0414		
channel slope	$S_{channel}$	feet/ foot	0.0345	0.0414	0.0350
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0311	0.1408	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9	3.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0166	
pool slope ratio	$S_{pool}l/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	4	16	
pool spacing ratio	L_{p-p}/w_{bkf}		1.0	4.0	
maximum pool depth at bankfull	d_{pool}	feet	0.7	1.0	
pool depth ratio	d_{pool}/d_{bkf}		2.0	3.0	
pool width at bankfull	w_{pool}	feet	4.0	6.4	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	1.7	3.4	
pool area ratio	A_{pool}/A_{bkf}		1.2	2.5	
Pattern Features					
sinuosity	K		1.00	1.20	1.10
belt width	w_{blt}	feet	N/A	N/A	
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	
linear wavelength	LW	feet	N/A	N/A	
linear wavelength ratio	LW/w_{bkf}		N/A	N/A	
meander length	L_m	feet	N/A	N/A	
meander length ratio	L_m/w_{bkf}		N/A	N/A	
radius of curvature	R_c	feet	N/A	N/A	
radius of curvature ratio	R_c/ w_{bkf}		N/A	N/A	

Table 1: UT1

	Notation	Units	Designed Conditions		
			min	max	design
stream type			C4b		
drainage area	DA	sq mi	0.11		
bankfull design discharge	Q_{bkf}	cfs	17.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	4.9		
average velocity during bankfull event	v_{bkf}	fps	3.4		
width at bankfull	w_{bkf}	feet	8.6		
mean depth at bankfull	d_{bkf}	feet	0.6		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		15		
maximum depth at bankfull	d_{max}	feet	0.7	1.0	
max depth ratio	d_{max}/d_{bkf}		1.2	1.7	1.7
bank height ratio	BHR		0.9	1.0	
floodprone area width	w_{fpa}	feet	19	43	
entrenchment ratio	ER		2.2	5.0	
Slope					
valley slope	S_{valley}	feet/ foot	0.0244		
channel slope	$S_{channel}$	feet/ foot	0.0203	0.0222	0.0225
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0183	0.0754	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9	3.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0089	
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	14	53	
pool spacing ratio	L_{p-p}/w_{bkf}		1.6	6.2	
maximum pool depth at bankfull	d_{pool}	feet	1.1	1.7	
pool depth ratio	d_{pool}/d_{bkf}		2.0	3.0	
pool width at bankfull	w_{pool}	feet	8.6	13.8	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	5.4	12.4	
pool area ratio	A_{pool}/A_{bkf}		1.1	2.5	
Pattern Features					
sinuosity	K		1.10	1.20	1.13
belt width	w_{blt}	feet	17	57	
meander width ratio	w_{blt}/w_{bkf}		2.0	6.6	
linear wavelength	LW	feet	52	103	
linear wavelength ratio	LW/w_{bkf}		6.0	12.0	
meander length	L_m	feet	65	129	
meander length ratio	L_m/w_{bkf}		7.5	15.0	
radius of curvature	R_c	feet	17	26	
radius of curvature ratio	R_c/ w_{bkf}		2.0	3.0	

Table 1: UT2A

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B3a		
drainage area	DA	sq mi	0.02		
bankfull design discharge	Q_{bkf}	cfs	7.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	2.0		
average velocity during bankfull event	v_{bkf}	fps	3.1		
width at bankfull	w_{bkf}	feet	5.1		
mean depth at bankfull	d_{bkf}	feet	0.4		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		13		
maximum depth at bankfull	d_{max}	feet	0.5	0.8	
max depth ratio	d_{max}/d_{bkf}		1.2	2.0	1.5
bank height ratio	BHR		1.0	1.1	
floodprone area width	w_{fpa}	feet	7	12	
entrenchment ratio	ER		1.4	2.4	
Slope					
valley slope	S_{valley}	feet/ foot	0.0459		
channel slope	$S_{channel}$	feet/ foot	0.0383	0.0459	0.0400
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0360	0.1360	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9	3.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0184	
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	5	20	
pool spacing ratio	L_{p-p}/w_{bkf}		1.0	4.0	
maximum pool depth at bankfull	d_{pool}	feet	1.0	1.2	
pool depth ratio	d_{pool}/d_{bkf}		2.5	3.0	
pool width at bankfull	w_{pool}	feet	5.1	8.2	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	2.4	6.7	
pool area ratio	A_{pool}/A_{bkf}		1.2	3.4	
Pattern Features					
sinuosity	K		1.00	1.20	1.00
belt width	w_{blt}	feet	N/A	N/A	
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	
linear wavelength	LW	feet	N/A	N/A	
linear wavelength ratio	LW/w_{bkf}		N/A	N/A	
meander length	L_m	feet	N/A	N/A	
meander length ratio	L_m/w_{bkf}		N/A	N/A	
radius of curvature	R_c	feet	N/A	N/A	
radius of curvature ratio	R_c/ w_{bkf}		N/A	N/A	

Table 1: UT3 Reach 1

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B4/B4a		
drainage area	DA	sq mi	0.24		
bankfull design discharge	Q_{bkf}	cfs	34.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	7.6		
average velocity during bankfull event	v_{bkf}	fps	4.5		
width at bankfull	w_{bkf}	feet	11.6		
mean depth at bankfull	d_{bkf}	feet	0.7		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		18		
maximum depth at bankfull	d_{max}	feet	0.9	1.2	
max depth ratio	d_{max}/d_{bkf}		1.3	1.8	1.5
bank height ratio	BHR		1.0	1.1	
floodprone area width	w_{fpa}	feet	21	28	
entrenchment ratio	ER		1.8	2.4	
Slope					
valley slope	S_{valley}	feet/ foot	0.0446		
channel slope	$S_{channel}$	feet/ foot	0.0372	0.0413	0.0410
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0297	0.0991	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.8	2.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0165	
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	17	41	
pool spacing ratio	L_{p-p}/w_{bkf}		1.5	3.5	
maximum pool depth at bankfull	d_{pool}	feet	1.3	2.3	
pool depth ratio	d_{pool}/d_{bkf}		2.0	3.5	
pool width at bankfull	w_{pool}	feet	12.8	17.4	
pool width ratio	w_{pool}/w_{bkf}		1.1	1.5	
pool cross-sectional area at bankfull	A_{pool}	SF	9.9	19.9	
pool area ratio	A_{pool}/A_{bkf}		1.3	2.6	
Pattern Features					
sinuosity	K		1.08	1.20	1.09
belt width	w_{blt}	feet	N/A	N/A	
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	
linear wavelength	LW	feet	N/A	N/A	
linear wavelength ratio	LW/w_{bkf}		N/A	N/A	
meander length	L_m	feet	N/A	N/A	
meander length ratio	L_m/w_{bkf}		N/A	N/A	
radius of curvature	R_c	feet	N/A	N/A	
radius of curvature ratio	R_c/ w_{bkf}		N/A	N/A	

Table 1: UT3 Reach 3

	Notation	Units	Designed Conditions		
			min	max	design
stream type			C4		
drainage area	DA	sq mi	0.27		
bankfull design discharge	Q_{bkf}	cfs	38.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	10.1		
average velocity during bankfull event	v_{bkf}	fps	3.8		
width at bankfull	w_{bkf}	feet	13.0		
mean depth at bankfull	d_{bkf}	feet	0.8		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		17		
maximum depth at bankfull	d_{max}	feet	0.9	1.2	
max depth ratio	d_{max}/d_{bkf}		1.2	1.6	1.5
bank height ratio	BHR		0.9	1.1	
floodprone area width	w_{fpa}	feet	23	65	
entrenchment ratio	ER		1.8	5.0	
Slope					
valley slope	S_{valley}	feet/ foot	0.0199		
channel slope	$S_{channel}$	feet/ foot	0.0153	0.0173	0.0190
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0184	0.0588	
riffle slope ratio	$S_{riffle}/S_{channel}$		1.2	3.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0052	
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.30	
pool-to-pool spacing	L_{p-p}	feet	21	81	
pool spacing ratio	L_{p-p}/w_{bkf}		1.6	6.2	
maximum pool depth at bankfull	d_{pool}	feet	1.6	3.0	
pool depth ratio	d_{pool}/d_{bkf}		2.0	3.8	
pool width at bankfull	w_{pool}	feet	13.0	20.8	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	11.1	25.3	
pool area ratio	A_{pool}/A_{bkf}		1.1	2.5	
Pattern Features					
sinuosity	K		1.15	1.30	1.12
belt width	w_{blt}	feet	26	86	
meander width ratio	w_{blt}/w_{bkf}		2.0	6.6	
linear wavelength	LW	feet	78	156	
linear wavelength ratio	LW/w_{bkf}		6.0	12.0	
meander length	L_m	feet	98	195	
meander length ratio	L_m/w_{bkf}		7.5	15.0	
radius of curvature	R_c	feet	26	39	
radius of curvature ratio	R_c/ w_{bkf}		2.0	3.0	

Table 1: UT3C Reach 2

	Notation	Units	Designed Conditions		
			min	max	design
stream type			B4a		
drainage area	DA	sq mi	0.08		
bankfull design discharge	Q_{bkf}	cfs	13.0		
Cross-Section Features					
bankfull cross-sectional area	A_{bkf}	SF	2.9		
average velocity during bankfull event	v_{bkf}	fps	4.5		
width at bankfull	w_{bkf}	feet	6.2		
mean depth at bankfull	d_{bkf}	feet	0.5		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		13		
maximum depth at bankfull	d_{max}	feet	0.6	0.7	
max depth ratio	d_{max}/d_{bkf}		1.2	1.5	1.5
bank height ratio	BHR		1.0	1.1	
floodprone area width	w_{fpa}	feet	9	15	
entrenchment ratio	ER		1.4	2.4	
Slope					
valley slope	S_{valley}	feet/ foot	0.0805		
channel slope	$S_{channel}$	feet/ foot	0.0671	0.0805	0.0680
Riffle Features					
riffle slope	S_{riffle}	feet/ foot	0.0604	0.2737	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9	3.4	
Pool Features					
pool slope	S_{pool}	feet/ foot	0.0000	0.0322	
pool slope ratio	$S_{pool}l/S_{channel}$		0.00	0.40	
pool-to-pool spacing	L_{p-p}	feet	6	25	
pool spacing ratio	L_{p-p}/w_{bkf}		1.0	4.0	
maximum pool depth at bankfull	d_{pool}	feet	0.9	1.4	
pool depth ratio	d_{pool}/d_{bkf}		2.0	3.0	
pool width at bankfull	w_{pool}	feet	6.2	9.9	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6	
pool cross-sectional area at bankfull	A_{pool}	SF	3.4	7.2	
pool area ratio	A_{pool}/A_{bkf}		1.2	2.5	
Pattern Features					
sinuosity	K		1.00	1.20	1.03
belt width	w_{blt}	feet	N/A	N/A	
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	
linear wavelength	LW	feet	N/A	N/A	
linear wavelength ratio	LW/w_{bkf}		N/A	N/A	
meander length	L_m	feet	N/A	N/A	
meander length ratio	L_m/w_{bkf}		N/A	N/A	
radius of curvature	R_c	feet	N/A	N/A	
radius of curvature ratio	R_c/ w_{bkf}		N/A	N/A	

Reference Reach Geomorphic Parameters

Cornbread Valley Mitigation Site

Description	Notation	Units	Ironwood Tributary		UT to South Fork Fishing Creek		UT to Austin Branch (upstream)		UT to Austin Branch (downstream)		UT to Gap Branch		Shew Tributary A		Timber Tributary		Pilot Mountain Tributary		Meadow Creek		Choga Creek		Upper Jones Creek	
			min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
stream type			A5a+		B5a		A4/B4a		A4/B4a		A4/B4a		B5a		B4		B4		E4		B4/C4		B3/C3	
drainage area	DA	sq mi	0.03		0.02		0.12		0.12		0.04		0.02		0.04		0.27		4.37		4.60		4.07	
bankfull discharge	Q_{bkf}	cfs	13		8		26		27		19		4		17		32		224		347		306	
bankfull cross-sectional area	A_{bkf}	SF	2.7		1.8		3.6		4.4		3.8		1.1		4.6		6.0		44.0		53.9		49.9	
average bankfull velocity	v_{bkf}	fps	4.9		4.1		7.3		6.2		5.0		3.3		3.7		5.3		5.1		6.4		6.1	
width at bankfull	w_{bkf}	feet	5.0		4.1		6.7		6.2		6.2		3.6		8.9		8.6		21.4		31.3		29.6	
maximum depth at bankfull	d_{max}	feet	0.8		0.7		0.8		1.2		1.0		0.5		0.7		1.0		3.1		2.8		2.4	
mean depth at bankfull	d_{bkf}	feet	0.6		0.4		0.5		0.7		0.6		0.3		0.5		0.7		2.1		1.7		1.7	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		9.1		9.3		12.8		8.8		10.1		12.1		17.0		12.5		10.4		18.1		17.5	
depth ratio	d_{max}/d_{bkf}		1.3		1.8		1.6		1.7		1.7		1.7		1.4		1.4		1.5		1.6		1.4	
low bank height			1.0		0.7		0.8		1.2		1.0		-		-		-		-		2.8		2.4	
bank height ratio	BHR		1.3		1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.1		1.0		1.0	
floodprone area width	w_{fpa}	feet	10.3		7.0		18		27		21		8		14		13		0		198		220	
entrenchment ratio	ER		2.1		1.7		2.6		4.3		3.4		2.1		1.5		1.5		>2.2		6.3		>7.4	
sinuosity	K		1.2		1.25		1		1.2		NA		1.1		1.1		1.1		NA		1.16		1.12	
belt width	w_{blt}	feet	NA		NA		NA		NA		NA		NA		NA		12	31	NA		NA		NA	
meander width ratio	w_{blt}/w_{bkf}		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
meander length	L_m	feet	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
meander length ratio	L_m/w_{bkf}		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
radius of curvature	R_c	feet	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
radius of curvature ratio	R_c/w_{bkf}		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
valley slope	S_{valley}	feet/ foot	0.1418		0.1025		0.1000		0.0480		NA		0.0647		0.0406		0.0404		-		-		-	
channel slope	$S_{channel}$	feet/ foot	0.1139		0.0815		0.0986		0.0400		0.0680		0.0634		0.0334		0.0378		0.0100		0.0183		0.0180	
riffle slope	S_{riffle}	feet/ foot	NA		0.0240	0.2000	0.0810	0.2900	0.0250	0.0730	0.0110	0.1400	0.0300	0.1100	0.0230	0.1500	0.0150	0.1200	0.0239		NA		NA	
riffle slope ratio	$S_{riffle}/S_{channel}$		NA		0.3	2.5	0.8	2.9	0.6	1.8	0.2	2.1	0.5	1.7	0.7	4.5	0.4	3.2	2.4		NA		NA	
pool slope	S_{pool}	feet/ foot	NA		0.000	0.170	0.000	0.170	0.000	0.015	0.004	0.061	0.030	0.060	0.000	0.082	0.000	0.011	NA	NA	NA		NA	
pool slope ratio	$S_{pool}/S_{channel}$		NA		0.00	2.09	0.00	1.70	0.00	0.40	0.06	0.90	0.44	0.93	0.00	2.46	0.00	0.30	NA	NA	NA		NA	
pool-to-pool spacing	L_{p-p}	feet	NA		6	32	10	17	14	31	18	27	21	45	6	49	7	52	NA	NA	NA		NA	
pool spacing ratio	L_{p-p}/w_{bkf}		NA		1.5	7.8	1.5	2.5	2.2	4.9	3.0	4.4	5.8	12.5	0.7	5.6	0.8	6.0	NA	NA	NA		NA	
maximum pool depth at bankfull	d_{pool}	feet	NA		NA		1.7		1.7		1.6		NA		NA		1.6		2	4	NA		NA	
pool depth ratio	d_{pool}/d_{bkf}		NA		NA		3.2		2.4		2.5		NA		NA		2.3		1.2	2.1	NA		NA	
pool width at bankfull	w_{pool}	feet	NA		NA		8.8		8.8		6.1		NA		NA		8.0		20	35	NA		NA	
pool width ratio	w_{pool}/w_{bkf}		NA		NA		1.3		1.4		1.0		NA		NA		1.6		1.0	1.8	NA		NA	
pool bankfull cross-sectional area	A_{pool}	SF	NA		NA		9.4		9.4		7.1		NA		NA		9.6		45.0	76.5	NA		NA	
pool area ratio	A_{pool}/A_{bkf}		NA		NA		2.6		2.1		1.9		NA		NA		1.6		1.2	2.0	NA		NA	
Particle Size Distribution from			Reachwide Count		Reachwide Count		Riffle Count		Riffle Count		Reachwide Count		Reachwide Count		Reachwide Count		Reachwide Count		Reachwide Count					
		d_{50}	Coarse Sand		Very Coarse Sand		Very Coarse Gravel		Very Coarse Gravel		Coarse Gravel		Very Fine Gravel		Medium Gravel		Coarse Gravel		Coarse Gravel		NA		NA	
	d_{16}	mm	0.26		0.1		11.0		11.0		0.4		0.1		0.5		Silt Clay		6.9		NA		NA	
	d_{35}	mm	0.5		0.3		42.0		42.0		8.0		0.6		3.5		5.6		16.0		NA		NA	
	d_{50}	mm	0.91		1.2		59.0		59.0		19.0		2.0		6.5		20.1		31.0		NA		NA	
	d_{84}	mm	19		11.0		130.0		130.0		102.3		42.0		48.0		128.0		120.0		NA		NA	
	d_{95}	mm	97		24.0		170.0		170.0		257.0		94.0		83.0		322.5		230.0		NA		NA	
	d_{99}	mm	128		64.0		256.0		256.0		>2048		256.0		128.0		>2048		>230		NA		NA	

Reference Reach Descriptions for Cornbread

UT to Gap Branch

UT to Gap Branch is located in the Box Creek Wilderness in Union Mills, NC. This stream flows through a confined valley with an alluvial bottom.The overall stream slope is 6.8% and the width to depth ratio is 10.1. The entrenchment ratio is 3.4, and Rosgen classification for this reach is an A4/B4a. Available habitats at UT to Gap Branch include boulder/cobble steps, pools, rock riffles, runs, root mats, and undercut banks.

UT to South Fork Fishing Creek

UT to South Fork Fishing Creek reference reach is a small, locally steep (8.2%) B5a channel. It has a drainage area of approximately 0.02 square miles. UT to South Fork Fishing Creek is surrounded by a forested land cover. The bedform consists of bedrock slides and boulder steps at the tail of riffles that cascade into pools. The channel is confined so the banks are relatively high but well-vegetated.

Ironwood Tributary

The Ironwood Tributary reference reach is approximately 175 ft in length and is located outside of Wilkesboro, NC in the foothills. The reach is geomorphically described as a steep (11.4%) step-pool system and classifies as an A5a+ channel. It has a drainage area of 0.03 square miles and is surrounded by heavy canopy coverage. It has a channel sinuosity of 1.19 which is considerably high for a high gradient stream. Several long gravel/cobble riffles were observed that cascaded into pools over root mass, woody debris, or a boulder step at the tail of the riffles.

UT to Austin Branch (downstream)

UT to Austin Branch (downstream) is located approximately 100 feet downstream of the UT to Austin Branch (upstream) step-pool reference reach previously described. The increase in drainage area is nominal compared to the upstream reach, but the valley of this downstream reach becomes flatter, broader, and less confined. As a result, the channel transitions to more of meander pool system than a step-pool system. Channel slope decreases to 4%, or half that of the upstream reach, and sinuosity increases to 1.2. Land use is uniform with that from the upstream reach of UT to Austin Branch. This lower reach of UT to Austin Branch classifies as an A4/B4a type channel with a width to depth ratio of 8.8. Stream access to its adjacent flood-prone area is ample reporting an entrenchment ratio of 4.3. Habitats identified in UT to Austin Branch (downstream) include cobble riffles, boulder/cobble steps, plunge pools, and meander pools.

UT to Austin Branch (upstream)

Located in Buncombe County on the West Range of the Biltmore property, this reference reach is drained by a small forested watershed (0.12 square miles) that empties into Austin Branch which flows directly into the French Broad River. Most of the watershed is wooded except for narrow patches of open, lightly used pastureland located around the upper periphery of the watershed. Surrounding plant communities included various mature hardwoods (white oak, tulip poplar) and understory shrubs (rhododendron, American holly). UT to Austin Branch is a step-pool channel; it classifies as an A4/B4a stream with a channel slope of approximately 9.9%, a low sinuosity of 1.0, and a width to depth ratio of 12.8. The stream exhibited adequate access to its flood-prone area with an entrenchment ratio 2.6. Habitats identified in UT to Austin Branch include cobble riffles, boulder/cobble steps, and plunge pools.

Pilot Mountain Tributary

Pilot Mountain Tributary is a small, steep (3.8%) B4 stream channel in Surry County, NC. The stream flows through the northern side of Pilot Mountain State Park, just upstream of Black Mountain Road. The stream flows along the left valley wall, which is vegetated with rhododendron thickets, while the right valley has a single line of mature hardwoods with a maintained overhead utility easement corridor

beyond. The stream is relatively straight as it flows through the 4.0% valley, and bedform is diverse with steep riffles, boulder steps, and in-line pools formed near roots and in backwater areas between steps.

Shew Tributary A

Shew Tributary A reference reach is a small and steep headwater channel with a drainage area of 0.02 mi2. Shew Tributary A is located in Wilkes County just east of Wilkesboro. The project site is surrounded by a forested land cover. The reach has a slope of approximately 6.5% and a sinuosity of 1.1, which classifies this reach as an B5a channel. Several riffles were observed that cascaded into pools over root mass or woody debris.

Timber Tributary (mid-reach)

Timber Tributary Reference Reach is a 200 ft B4 classified channel in the north-western portion of the site. It has a drainage area of approximately 0.04 mi2. The stream meanders through confined valley surrounded by mature trees. The channel has a moderate slope of 3.2%, and a channel sinuosity of 1.12. This system supports varied habitats which included woody debris, rock riffles and meander pools.

Meadow Fork

Meadow Fork is located along the Blue Ridge Parkway in southern Alleghany County approximately fourteen miles southwest of the project site. The drainage area is 4.4 square miles with a mix of agricultural and forested land use. A cross section and a longitudinal water surface profile were surveyed and a reach-wide pebble count was conducted. The stream is an E4 stream type with a width to depth ratio of 10.2 and an entrenchment ratio greater than 2.2. The water surface slope is 1.0%. The D_{50} of the bed material is 31 mm. The estimated bankfull discharge is 224 cfs. The reach is located in a pasture with a narrow woody buffer and is connected to the floodplain near the top of bank. The bed form is an alternating riffle pool sequence with armored coarse riffle substrate. The stream does meander slightly but is relatively straight. The drainage area – discharge relationship, riffle cross section morphology, and riffle slope ratios were used in the selection of project design discharge and morphological parameters

Choga Creek

The reference reach evaluated for Choga Creek is located in the northwestern Macon County approximately 19 miles from Franklin, NC. Choga Creek drains a 4.6-square mile forested watershed at this location, which is entirely contained within the Nantahala National Forest before it empties into Nantahala Lake about 1,000 feet downstream of the reference reach. The reach was assessed using remote reconnaissance and QL1 LiDAR data in 2022 which provides good valley and channel characteristics, although the channel depth may be slightly underestimated. The reach has a slope of approximately 1.8 – 2% with slightly steeper reach upstream that has not been analyzed. Choga Creek was selected as a reference for valley and floodprone characteristics of large mountain streams flowing in wide valleys but with semi-confined channel characteristics. Reaches typically have a bankfull channel and benching that is typical of B-type streams, but a wider floodplain accessed by flows that are often in excess, and sometimes well in excess, of the 5-year event. Given the steep nature of these sites, typical calculation of entrenchment ratio at 2 x Dmax returns values that reflect the wider floodplain width rather than the more active floodplain width. As such, classification is subjective. With a typical width-depth ratio of 18.1, an entrenchment ratio of 6.3 and gravel to cobble sized bed material, Choga Creek has been classified as a B4/C4 stream type indicating that it behaves like a step-pool semi-confined B-type stream but with access to a wider floodplain which is accessible at flow depths of < 2 x Dmax. Pattern and sediment data have not been evaluated to date.

Upper Jones Creek (Upstream Reference Reach)

The reference reach evaluated for Jones Creek - Upstream is located in Macon County near Franklin, NC. Jones Creek - Upstream drains a 4.07-square mile, mostly forested watershed at this location. The reach was assessed using visual site reconnaissance and QL1 LiDAR data in 2021. QL1 LiDAR provides good valley and channel characteristics, although the channel depth may be slightly underestimated and cross section data has been hand-adjusted for the approximate actual channel depth. The reach has a slope of approximately 1.8%. Jones Creek - Upstream was selected as a reference for valley and floodprone characteristics of large mountain streams flowing in wide valleys but with semi-confined channel characteristics. Reaches typically have a bankfull channel and benching that is typical of B-type streams, but a wider floodplain accessed by flows that are often in excess, and sometimes well in excess, of the 5-year event. Given the steep nature of these sites, typical calculation of entrenchment ratio at 2 x Dmax returns values that reflect the wider floodplain width rather than the more active floodplain width. As such, classification is subjective. With a typical width-depth ratio of 17.5, an entrenchment ratio of >7.4 and cobble sized bed material, Jones Creek - Upstream has been classified as a B3/C3 stream type indicating that it behaves like a step-pool semi-confined B-type stream but with access to a wider floodplain which is accessible at flow depths of < 2 x Dmax. Pattern and sediment data have not been evaluated to date.

Boring ID	Soil Profile
B52	0-3": 10YR 3/3. 3-11": 95% 10YR 4/3, Redox 5% 5YR 4/6, 11-16" 80% 10YR 3/2, Redox 20% 7.5YR 4/6 loam
B27	0-3": 10YR 3/3, 3-15": 55% 10YR 4/1 Redox 45% 7.5YR 5/8 clay loam

Boring ID	Depth to Hydric Indicator
B1	Hydric @ 15”
B2	Hydric @ 13”
B3	Hydric @ 12"
B4	Non-Hydric Refusal @ 3”
B5	Hydric @ 3”
B6	Hydric @ 12”
B7	Hydric@ 12”
B8	Non-Hydric Refusal @ 12”
B9	Hydric Refusal @ 6”
B10	Hydric @ 0"
B11	Hydric @ 0"
B12	Hydric @ 14"
B13	Refusal @ 6”
B14	Non-Hydric Refusal @ 15"
B15	Hydric @ 0"
B16	Hydric @ 19"
B17	Hydric @ 0”
B18	Hydric @ 0”
B19	Hydric @ 0"
B20	Hydric @ 10”
B21	Hydric @ 0”
B22	Hydric @ 0”
B23	Hydric @ 2”
B24	Hydric @ 0”
B25	Hydric @ 9
B26	Hydric @ 6”
B27	Soil Profile 1
B28	Hydric @ 16"
B29	Non-Hydric @ 21”
B30	Non Hydric Refusal @ 11"
B31	Non Hydric Refusal @ 8”
B32	Hydric @ 7”
B33	Non-Hydric @ 19”
B34	Hydric @ 0”
B35	Hydric @ 0”
B36	Hydric @ 0”
B37	Hydric @ 16”
B38	Hydric @ 21”
B39	Non-Hydric Refusal @ 18”
B40	Hydric @ 9”
B41	Hydric @ 19”
B42	Hydric @ 8”
B43	Non-Hydric Refusal @ 7”
B44	Hydric @ 13”
B45	Hydric @ 10"
B46	Hydric @ 9"
B47	Hydric @ 0”
B48	Hydric @ 17”
B49	Hydric @ 15”
B50	Non-Hydric @ 14” Refusal
B51	Hydric @ 16”
B52	Soil Profile 2

Soil Borings and Observations
- Hydric
- Non-Hydric
- Soil Profile
- Project Location
- Proposed Conservation Easement

Proposed Wetlands
- Wetland Enhancement
- Wetland Reestablishment
- Wetland Rehabilitation
- Wetland Creation

Proposed Stream Mitigation Approach
- Stream Restoration
- Stream Enhancement II
- No Credit

- Non-Project Streams
- Topographic Contours (2')

UT3 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18 B19 B20 B21 B22 B23 B24 B25 B26 B27 Soil Profile 1 (B27)

Map Extent 1

UT2 UT2A N Jones Creek Rd B28 B29 B30 B31 B32 B33 B34 B35

Map Extent 2

UT1 UT1A B36 B37 B38 B39 B40 B41 B42 B43 B44 B45 B46 B47 B48 B49 B50 B51 B52 Soil Profile 2 (B52) 287 Jones Creek Rd Byrd Farm Rd Black Mountain Trl Jones Creek Acres Dr Jones Creek Rd Map Extent 1 Map Extent 2 Map Extent 3

Map Extent 3

WILDLANDS ENGINEERING

0 100 200 Feet

N

Cornbread Valley
Hydric Soils Investigation Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC



Date:	12.20.2022
Job Number:	----
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	JPM

Revisions:

1
Sheet

Cornbread Mitigation Site
Macon County, North Carolina

Wetland Grading Overview

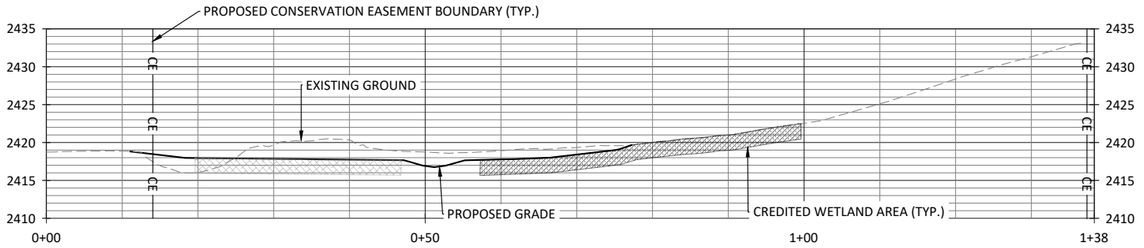
DRAFT

WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

December 20, 2022

WETLAND CROSS SECTION 1

0' 10' 20' 30'



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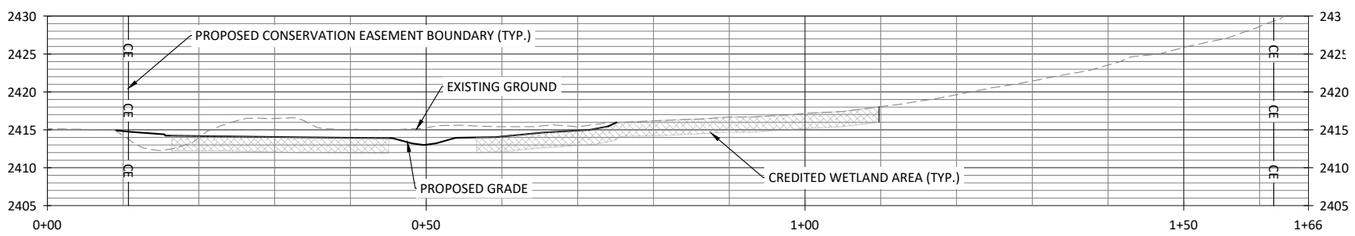

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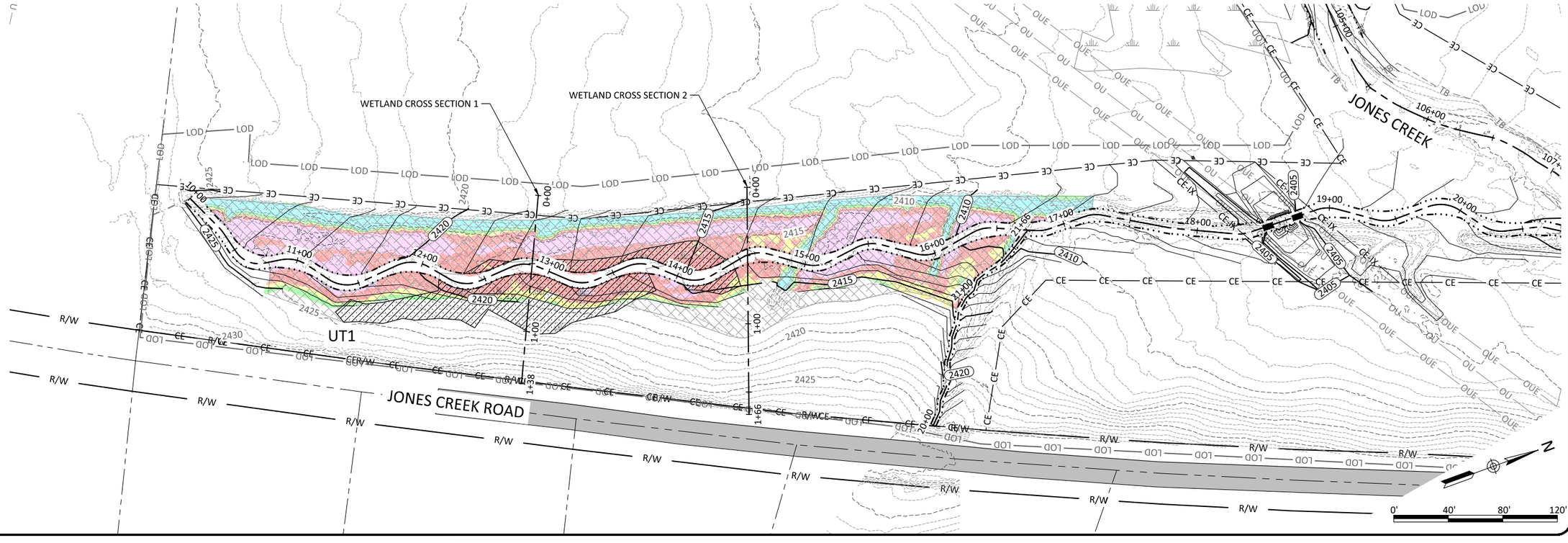
WETLAND CREATION
(3:1 CREDIT RATIO)



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Tel: 828.774.5547
License No. F-0831

DRAFT

Cornbread Mitigation Site
Macon County, North Carolina

Wetland A

Revisions:

Date:	12.20.2022
Job Number:	---
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	JPM

Sheet 2

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December 20, 2022

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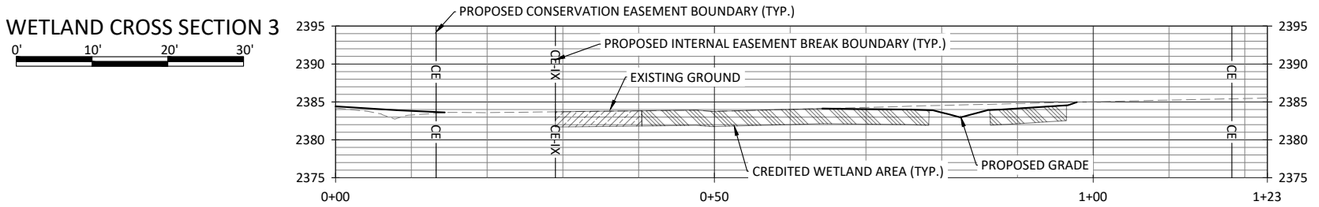

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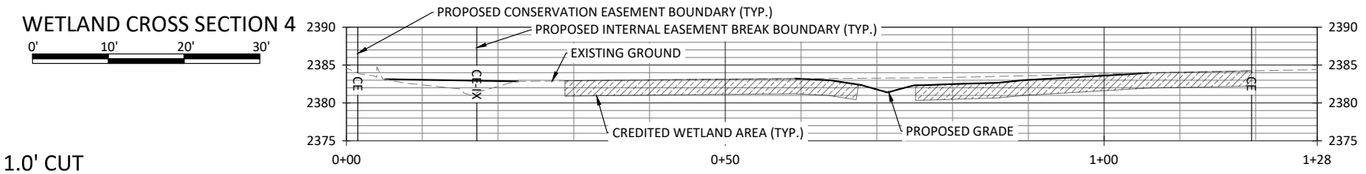

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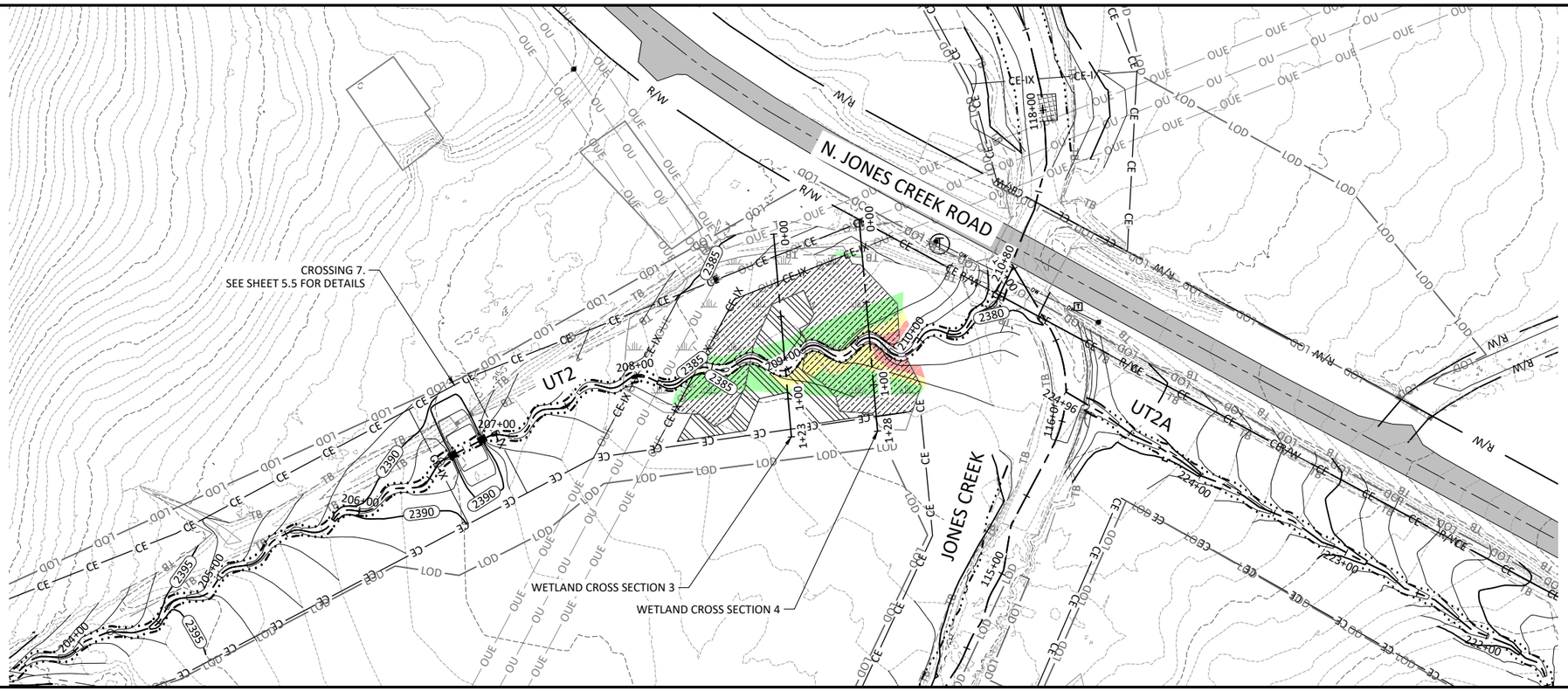
(1.5:1 CREDIT RATIO)

WETLAND RE-ESTABLISHMENT
(1:1 CREDIT RATIO)



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167-B Haywood Rd
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Tel: 828.774.5547
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Cornbread Mitigation Site
Macon County, North Carolina

Wetland B

Revisions:

Date:	12.20.2022
Job Number:	----
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	JPM

Sheet 3

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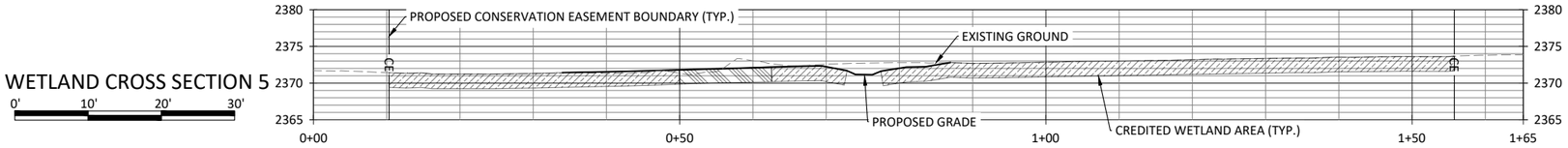

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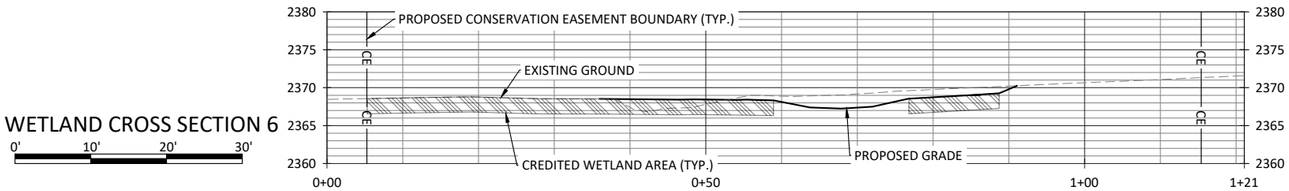

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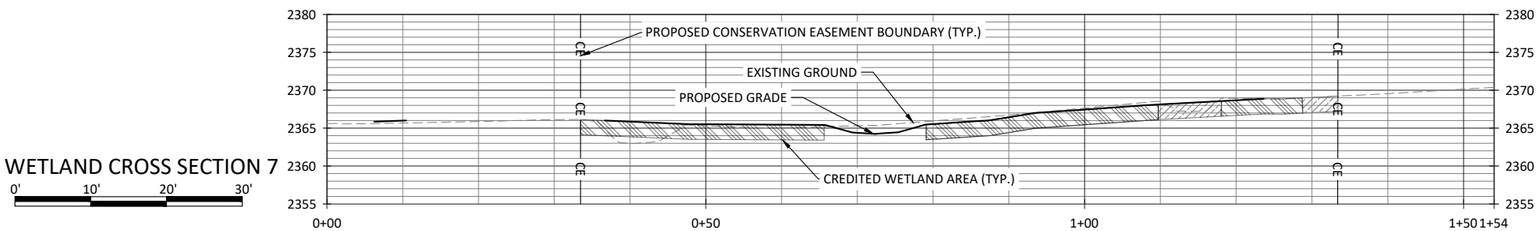

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WETLAND RE-ESTABLISHMENT (1:1 CREDIT RATIO)

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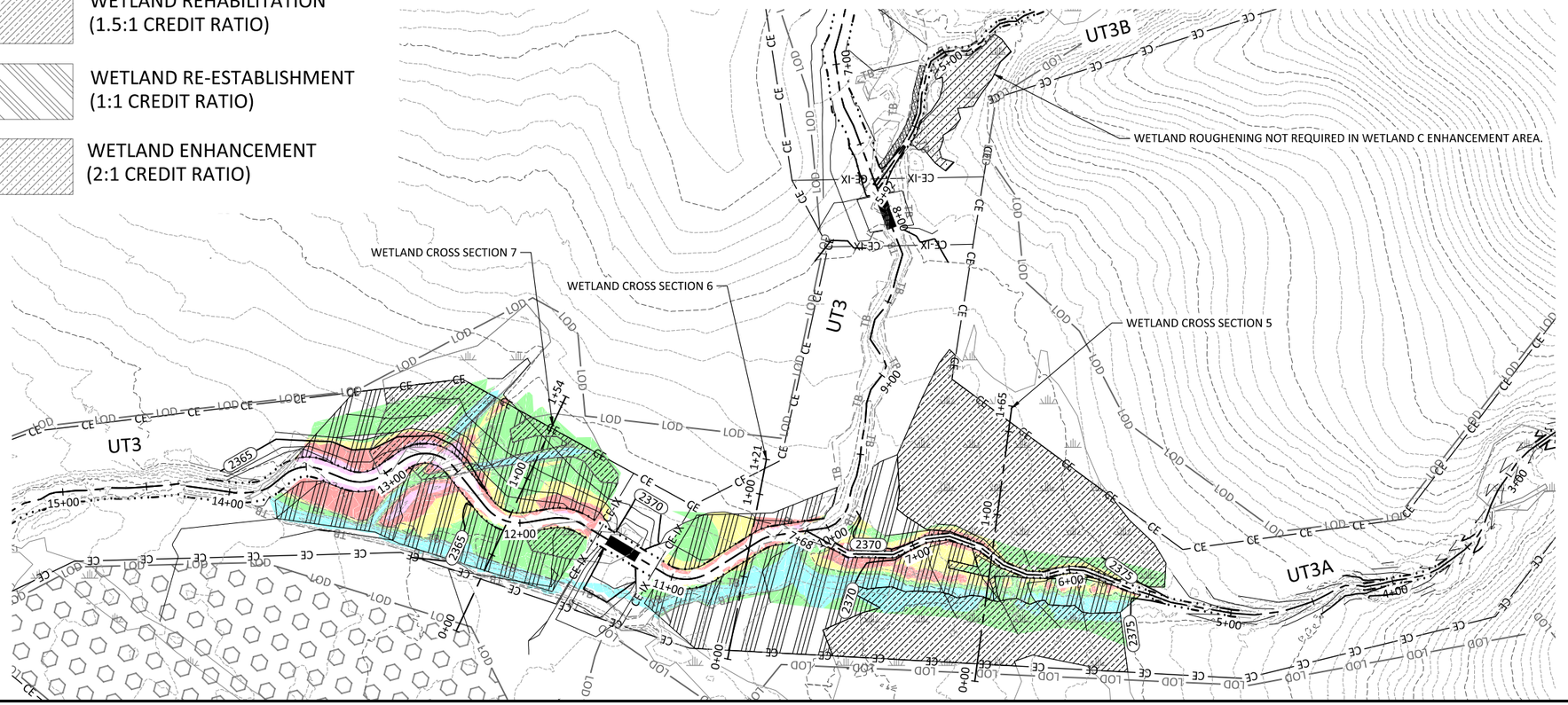

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167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

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Cornbread Mitigation Site
Macon County, North Carolina

Wetland C

Revisions:

Date:	12.20.2022
Job Number:	----
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	JPM

Sheet 4

APPENDIX 5 – Categorical Exclusion Checklist and Summary

Appendix A

Categorical Exclusion Form for Division of Mitigation Services Projects
Version 2

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Cornbread Valley Mitigation Site
County Name:	Macon
DMS Number:	100175
Project Sponsor:	Wildlands Engineering, Inc.
Project Contact Name:	Kirsten Gimbert
Project Contact Address:	1430 S. Mint Street, Suite 104, Charlotte, NC 28203
Project Contact E-mail:	kgimbert@wildlandseng.com
DMS Project Manager:	Paul Wiesner

Project Description

The Cornbread Valley Mitigation Site is being developed to provide stream mitigation in the Little Tennessee River Basin. The project will include restoration and enhancement on Jones Creek and six unnamed tributaries. The major goals of the stream mitigation project are to provide ecological and water quality enhancements to the broader Little Tennessee River Basin while creating these same benefits at the site level. This will be accomplished by excluding livestock from stream channels, stabilizing eroding stream banks, restoring and enhancing native floodplain, reconnecting incised streams to their floodplains, improving instream habitat, reducing sediment and fecal coliform input, and permanently protecting the site through establishing a conservation easement.

For Official Use Only

Reviewed By:

11/22/2021	Paul Wiesner
Date	**DMS Project Manager**

Conditional Approved By:

Date	**For Division Administrator FHWA**

☐ **Check this box if there are outstanding issues**

Final Approval By:

11-24-21	Donald W Brew
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

Cornbread Valley Mitigation Site
Categorical Exclusion

SUMMARY

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment.

As the Cornbread Valley Mitigation Site is a full-delivery project; an EDR Radius Map Report with Geocheck was ordered for the site through Environmental Data Resources, Inc on March 4, 2020. Neither the target property nor the adjacent properties were listed in any of the Federal, State, or Tribal environmental databases searched by the EDR.

The Executive Summary of the EDR report is included in the Appendix. The full report is available if needed.

National Historic Preservation Act (Section 106)

The National Historic Preservation Act declares a national policy of historic preservation to protect, rehabilitate, restore, and reuse districts, sites, buildings, structures, and objects significant in American architecture, history, archaeology, and culture, and Section 106 mandates that federal agencies take into account the effect of an undertaking on a property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

A scoping letter was submitted to the State Historic Preservation Office (SHPO) requesting comment on the Cornbread Valley Mitigation Site on February 11, 2021. SHPO responded on March 10, 2021 and requested an archaeological survey, which was completed in May 2021 and the archaeological report was submitted in June 2021. A contract amendment occurred to add an additional area to the mitigation site following the Archeological report submittal. Therefore, additional correspondence and figures were submitted to SHPO on July 19, 2021. SHPO concurred with the archeologists' suggestion that based on the findings of prior fieldwork in close proximity to the newly added area that minor expansion of the disturbance limits by 15-meters was unlikely to adversely affect site resources. SHPO also concurred with the approach to avoid particular identified sites as recommended by the archeologist, with the exception of allowing for planting bare root saplings by hand to create an erosion buffer within the conservation easement along site streams. Two additional bare root planting areas outside of the original project limits were identified in the July 19th correspondence. Please refer to the Appendix for additional details regarding SHPO correspondence and the archaeological report related to Section 106.

Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)

These acts, collectively known as the Uniform Act, provide for uniform and equitable treatment of persons displaced from their homes, businesses, non-profit associations, or farms by federal and federally-assisted programs, and establish uniform and equitable land acquisition policies.

Cornbread Valley Mitigation Site is a full-delivery project that includes land acquisition. Notification of the fair market value of the project property and the lack of condemnation authority by Wildlands was included in the signed Option Agreements for the project properties. A copy of the relevant section of each of the Option Agreements are included in the Appendix.

American Indian Religious Freedom Act (AIRFA)

The American Indian Religious Freedom Act provides for the protection and preservation of places of religious importance to American Indians, Eskimos, and Native Hawaiians. NCDMS requested

review and comment from the Cherokee Nation Tribal Historic Preservation Office (THPO), the Eastern Band of Cherokee Indians THPO and the United Keetoowah Band of Cherokee THPO with respect to any archeological or religious resources related to the Cornbread Valley Mitigation Site on August 30, 2021. A copy of the archaeological report and SHPO correspondence was included with the THPO correspondence letters.

On September 30, 2021, the Cherokee Nation responded does not object to the project proceeding as long as stipulations noted in their response letter are met. Specifically, the Cherokee Nation concurred with the archaeological report that the two identified sites (31MA873 and 31MA877) should be avoided throughout the course of the project, including direct and indirect activities. Wildlands will avoid these identified sites and clearly field mark the boundaries to avoid any impacts during project implementation and construction. In addition, the small area (~0.008 Ac) of site 31MA873 is located within the proposed conservation easement area and will not be planted per Cherokee Nation recommendation. The Cherokee Nation also requested that additional consultation occur if the nature of activities proposed were to change or any items of cultural significance are discovered during the course of the project. No comments have been received at this time from the Eastern Bank of Cherokee or the United Keetoowah Band of Cherokee. All correspondence related to AIRFA is included in the Appendix.

Endangered Species Act (ESA)

Section 7 of the ESA requires federal agencies, in consultation with and with the assistance of the Secretary of the Interior or of Commerce, as appropriate, to ensure that actions they authorize, fund or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species.

The United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation database (IPaC) list of endangered species for the site includes the following species: northern long-eared bat (*Myotis septentrionalis*), gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalist*), spotfin chub (*Erimonax monachus*), Appalachian elktoe (*Alasmidonta raveneliana*), littlewing pearlymussel (*Pegias fabula*), mountain sweet pitcher-plant (*Sarracenia rubra*), small whorled pogonia (*Isotria medeoloides*), swamp pink (*Helonias bullata*), Virginia spiraea (*Spiraea virginiana*), rock gnome lichen (*Gymnoderma lineare*), and the bog turtle (*Clemmys muhlenbergii*) by similarity of appearance. The USFWS does not currently list any Critical Habitat Designations for the Federally listed species within the project site.

Results from pedestrian surveys conducted on January 26, 2021 indicated that the project area provides areas of suitable habitat for the northern long-eared bat, the Indiana bat, the bog turtle, the small whorled pogonia, the swamp pink, the Virginia spiraea, and the mountain sweet pitcher-plant. No suitable habitat was identified for the gray bat, the spotfin chub, the littlewing pearlymussel, the Appalachian elktoe, or the rock gnome lichen. An additional pedestrian survey was conducted on May 27, 2021 during the optimal survey window for the plant species with suitable habitat found on site. No individual species were identified during either assessment.

To meet regulatory requirements, a scoping letter requesting comment from the USFWS was sent on February 2, 2021. USFWS responded on March 3, 2021 and provided recommendations for the project site pertaining to protecting federally threatened and endangered species, migratory birds, as well as fish, wildlife, and natural resources. Section 7 consultation was initiated on November 4, 2021 for the Indiana bat. Wildland's conclusions and determinations for species are noted below. Please refer to the Appendix for all USFWS correspondence.

Gray bat, Spotfin chub, Littlewing pearlymussel, Appalachian elktoe

No suitable habitat was identified, therefore, Wildlands determined that the project will have "no effect" on the gray bat, the spotfin chub, the littlewing pearlymussel, the Appalachian elktoe, or the rock gnome lichen.

NLEB

Forested habitats containing trees at least 3-inch dbh in the project area provide suitable habitat for NLEB. Due to the decline of the NLEB population from the White Nose Syndrome (WNS), the United States Fish and Wildlife Service (USFWS) has issued the finalization of a special rule under section 4(d) of the ESA that addresses the effects to the NLEB resulting from purposeful and incidental take based on the occurrence of WNS. Because the project is located within a WNS zone and will include the removal/clearing of trees, it is subject to the final 4(d) ruling. As previously stated, a review of NCNHP records did not indicate any known NLEB populations within 2.0 miles of the study area; therefore, the project is eligible to use the NLEB 4(d) Rule Streamlined Consultation Form to meet regulatory requirements for section 7(a)(2) compliance 4(d) consultation. The completed NLEB 4(d) Consultation Form was submitted to the USFWS by the Federal Highway Administration (FHWA) on February 12, 2021. USFWS responded on March 3, 2021 and concur that any incidental take that may result from associated activities with this project is exempt under the 4(d) rule. A FHWA signed 4(d) Consultation Form and the correspondence associated with the above determinations are included in the Appendix. In addition, USFWS recommendations include avoiding tree clearing during NLEB pup season and/or NLEB active season.

Indiana bat

Wildlands identified suitable habitat for the Indiana bat within the project area, however no populations resembling the species were found during the pedestrian survey. Field Surveys involved searching for the species as well as looking for suitable roosting or hibernacula sites, as indicated by caves (not present) or large trees. Suitable habitat identified on site consisted of scattered existing trees >3"dbh with exfoliating bark, crevices, and hollows. Final critical habitat has been determined for this species; however, the project is outside of this area. Per NCNHP data explorer, no known element occurrences exist within the proposed project area nor have any known occurrences been documented within 3 miles of the project area. Wildlands biological determination is that the project "may affect, not likely to adversely affect" the Indiana bat. To avoid any impacts to this species and its suitable habitat, Wildlands plans to conduct tree removal during the winter months to be completed no later than March 31st, prior to the start of the Indiana bat roosting season.

Bog Turtle

Bog turtle habitat consists of mud, grass and sphagnum moss of bogs, swamps, and marshy meadows. These wetlands are usually fed by cool springs flowing slowly over the land, creating the wet, muddy soil needed by the turtles (https://www.fws.gov/southeast/wildlife/reptiles/bog-turtle/#habitat-section). Wildlands identified suitable habitat within the project area, however no populations resembling the species were found during the pedestrian survey. Wildlands determined the project "may affect, not likely to adversely affect" the bog turtle; however, it is listed due to similarity of appearance and is not subject to Section 7 consultation.

Small whorled pogonia, Swamp pink, Virginia spiraea, Mountain sweet pitcher-plant

Wildlands identified suitable habitat for all four plant species within the project area, however no populations resembling the species were found during the pedestrian survey. Suitable habitat

identified for the small whorled pogonia consisted of a mixed-deciduous forest with canopy breaks. Suitable habitat identified for the swamp pink and the mountain sweet pitcher-plant consisted of marshy meadows and forested wetland habitat. Suitable habitat identified for the Virginia spiraea consisted of flood plains that experience high-velocity scouring floods. No critical habitat has been designated by USFWS for these species. Per NCNHP data explorer, no known element occurrences exist within the proposed project area. Thereby, Wildlands determined the project "may affect, not likely to adversely affect" the Small whorled pogonia, Swamp pink, Virginia spiraea, and Mountain sweet pitcher-plant.

Farmland Protection Policy Act (FPPA)

The FPPA requires that, before taking or approving any federal action that would result in conversion of farmland, the agency must examine the effects of the action using the criteria set forth in the FPPA, and, if there are adverse effects, must consider alternatives to lessen them.

Cornbread Valley Mitigation Site includes the conversion of prime farmland. As such, Form AD-1006 has been completed and submitted to the Natural Resources Conservation Service (NRCS). The completed form and correspondence documenting its submittal is included in the Appendix.

Fish and Wildlife Coordination Act (FWCA)

The FWCA requires consultation with the USFWS and the appropriate state wildlife agency on projects that alter or modify a water body. Reports and recommendations prepared by these agencies document project effects on wildlife and identify measures that may be adopted to prevent loss or damage to wildlife resources.

The Cornbread Valley Mitigation Site includes stream restoration and enhancement. Wildlands requested comment on the project from both the USFWS on February 2, 2021 and the North Carolina Wildlife Resources Commission (NCWRC) on February 2, 2021. The NCWRC responded on February 10, 2021 and offered the following recommendations: in-stream activities should be avoided during the trout moratorium (October 15-April 15), incorporate wetland restoration/enhancement, and establish wide buffers. USFWS responded on March 3, 2021 and provided general recommendations on behalf of natural resources. All correspondence with the two agencies is included in the appendix.

Migratory Bird Treaty Act (MBTA)

The MBTA makes it unlawful for anyone to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird. The indirect killing of birds by destroying their nests and eggs is covered by the MBTA, so construction in nesting areas during nesting seasons can constitute a taking.

Wildlands requested comment on the Cornbread Valley Mitigation Site from the USFWS in regard to migratory birds on February 2, 2021. USFWS responded on March 3, 2021 and provided general recommendations on behalf of natural resources. All correspondence with USFWS is included in the Appendix.

Cornbread Valley
124 Byrd Farm Rd
Franklin, NC 28734

Inquiry Number: 5996243.2s
March 04, 2020

The EDR Radius Map™ Report with GeoCheck®

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

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with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13), the ASTM Standard Practice for Environmental Site Assessments for Forestland or Rural Property (E 2247-16), the ASTM Standard Practice for Limited Environmental Due Diligence: Transaction Screen Process (E 1528-14) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

124 BYRD FARM RD
FRANKLIN, NC 28734

COORDINATES

Latitude (North):	35.1041070 - 35° 6' 14.78''
Longitude (West):	83.4547010 - 83° 27' 16.92''
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	276260.0
UTM Y (Meters):	3887147.5
Elevation:	2368 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	5946800 PRENTISS, NC
Version Date:	2013

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20141019
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
124 BYRD FARM RD
FRANKLIN, NC 28734

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL ---------- National Priority List
Proposed NPL ---------- Proposed National Priority List Sites
NPL LIENS ---------- Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL ---------- National Priority List Deletions

Federal CERCLIS list

FEDERAL FACILITY ---------- Federal Facility Site Information listing
SEMS ---------- Superfund Enterprise Management System

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE ---------- Superfund Enterprise Management System Archive

Federal RCRA CORRACTS facilities list

CORRACTS ---------- Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF ---------- RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG ---------- RCRA - Large Quantity Generators
RCRA-SQG ---------- RCRA - Small Quantity Generators
RCRA-VSQG ---------- RCRA - Very Small Quantity Generators (Formerly Conditionally Exempt Small Quantity Generators)

Federal institutional controls / engineering controls registries

LUCIS ---------- Land Use Control Information System

US ENG CONTROLS..... Engineering Controls Sites List
US INST CONTROL..... Sites with Institutional Controls

Federal ERNS list

ERNS..... Emergency Response Notification System

State- and tribal - equivalent NPL

NC HSDS..... Hazardous Substance Disposal Site

State- and tribal - equivalent CERCLIS

SHWS..... Inactive Hazardous Sites Inventory

State and tribal landfill and/or solid waste disposal site lists

SWF/LF..... List of Solid Waste Facilities
OLI..... Old Landfill Inventory
DEBRIS..... Solid Waste Active Disaster Debris Sites Listing
LCID..... Land-Clearing and Inert Debris (LCID) Landfill Notifications

State and tribal leaking storage tank lists

LUST..... Regional UST Database
LAST..... Leaking Aboveground Storage Tanks
INDIAN LUST..... Leaking Underground Storage Tanks on Indian Land
LUST TRUST..... State Trust Fund Database

State and tribal registered storage tank lists

FEMA UST..... Underground Storage Tank Listing
UST..... Petroleum Underground Storage Tank Database
AST..... AST Database
INDIAN UST..... Underground Storage Tanks on Indian Land

State and tribal institutional control / engineering control registries

INST CONTROL..... No Further Action Sites With Land Use Restrictions Monitoring

State and tribal voluntary cleanup sites

VCP..... Responsible Party Voluntary Action Sites
INDIAN VCP..... Voluntary Cleanup Priority Listing

State and tribal Brownfields sites

BROWNFIELDS..... Brownfields Projects Inventory

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS..... A Listing of Brownfields Sites

EXECUTIVE SUMMARY

Local Lists of Landfill / Solid Waste Disposal Sites

HIST LF	Solid Waste Facility Listing
SWRCY	Recycling Center Listing
INDIAN ODI	Report on the Status of Open Dumps on Indian Lands
ODI	Open Dump Inventory
DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations
IHS OPEN DUMPS	Open Dumps on Indian Land

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL	Delisted National Clandestine Laboratory Register
US CDL	National Clandestine Laboratory Register

Local Land Records

LIENS 2	CERCLA Lien Information

Records of Emergency Release Reports

HMIRS	Hazardous Materials Information Reporting System
SPILLS	Spills Incident Listing
IMD	Incident Management Database
SPILLS 90	SPILLS 90 data from FirstSearch
SPILLS 80	SPILLS 80 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR	RCRA - Non Generators / No Longer Regulated
FUDS	Formerly Used Defense Sites
DOD	Department of Defense Sites
SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing
US FIN ASSUR	Financial Assurance Information
EPA WATCH LIST	EPA WATCH LIST
2020 COR ACTION	2020 Corrective Action Program List
TSCA	Toxic Substances Control Act
TRIS	Toxic Chemical Release Inventory System
SSTS	Section 7 Tracking Systems
ROD	Records Of Decision
RMP	Risk Management Plans
RAATS	RCRA Administrative Action Tracking System
PRP	Potentially Responsible Parties
PADS	PCB Activity Database System
ICIS	Integrated Compliance Information System
FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
MLTS	Material Licensing Tracking System
COAL ASH DOE	Steam-Electric Plant Operation Data
COAL ASH EPA	Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER	PCB Transformer Registration Database
RADINFO	Radiation Information Database
HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing
DOT OPS	Incident and Accident Data
CONSENT	Superfund (CERCLA) Consent Decrees

INDIAN RESERV Indian Reservations
FUSRAP Formerly Utilized Sites Remedial Action Program
UMTRA Uranium Mill Tailings Sites
LEAD SMELTERS Lead Smelter Sites
US AIRS Aerometric Information Retrieval System Facility Subsystem
US MINES Mines Master Index File
ABANDONED MINES Abandoned Mines
FINDS Facility Index System/Facility Registry System
ECHO Enforcement & Compliance History Information
DOCKET HWC Hazardous Waste Compliance Docket Listing
UXO Unexploded Ordnance Sites
FUELS PROGRAM EPA Fuels Program Registered Listing
AIRS Air Quality Permit Listing
ASBESTOS ASBESTOS
COAL ASH Coal Ash Disposal Sites
DRYCLEANERS Drycleaning Sites
Financial Assurance Financial Assurance Information Listing
NPDES NPDES Facility Location Listing
UIC Underground Injection Wells Listing
AOP Animal Operation Permits Listing
SEPT HAULERS Permitted Septage Haulers Listing
CCB Coal Ash Structural Fills (CCB) Listing
PCSRP Petroleum-Contaminated Soil Remediation Permits
MINES MRDS Mineral Resources Data System

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP EDR Proprietary Manufactured Gas Plants
EDR Hist Auto EDR Exclusive Historical Auto Stations
EDR Hist Cleaner EDR Exclusive Historical Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA HWS Recovered Government Archive State Hazardous Waste Facilities List
RGA LF Recovered Government Archive Solid Waste Facilities List
RGA LUST Recovered Government Archive Leaking Underground Storage Tank

SURROUNDING SITES: SEARCH RESULTS

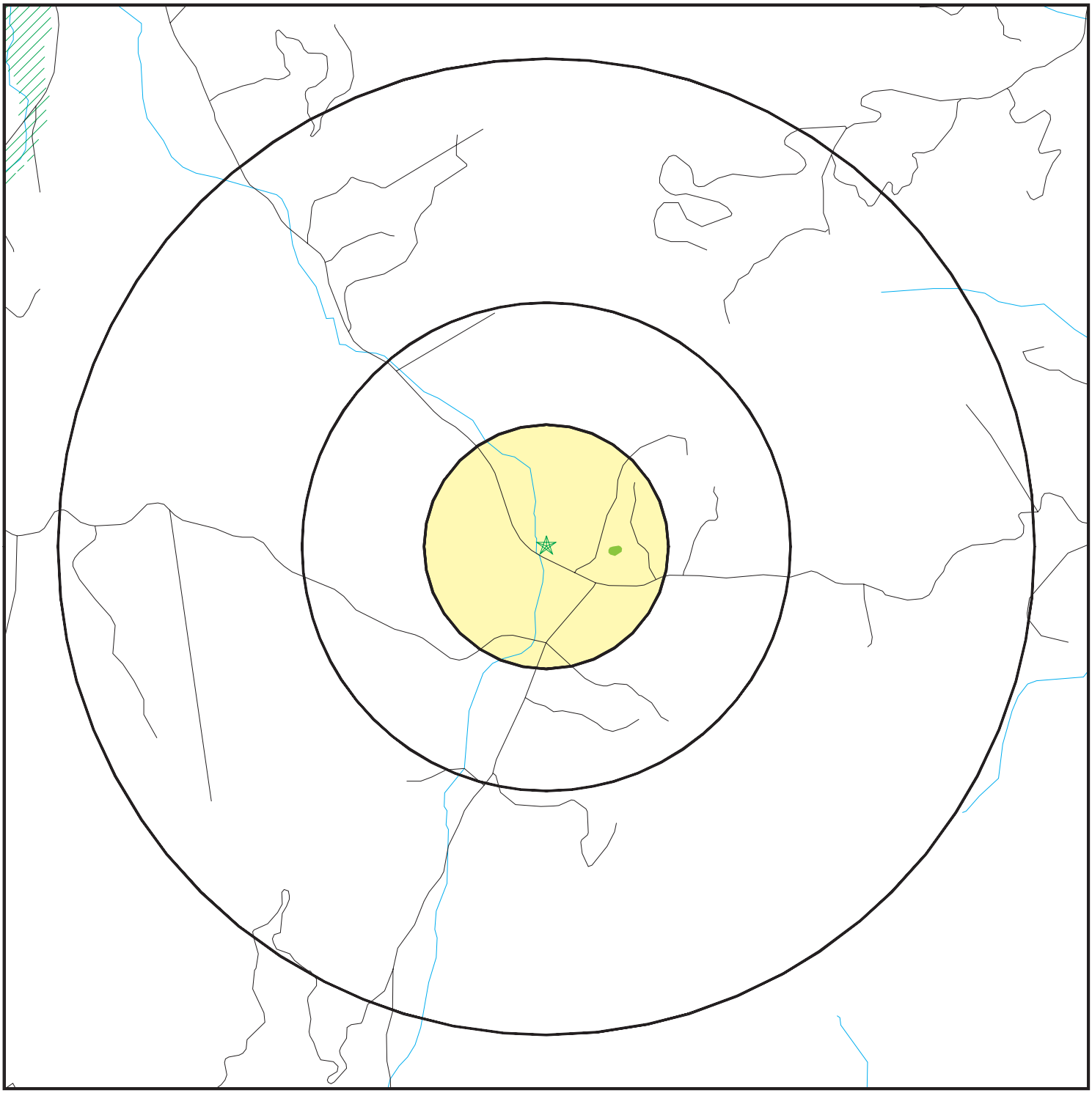
Surrounding sites were not identified.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

There were no unmapped sites in this report.

OVERVIEW MAP - 5996243.2S



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites

0 1/4 1/2 1 Miles

- Indian Reservations BIA
- Special Flood Hazard Area (1%)
- 0.2% Annual Chance Flood Hazard
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

N

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Cornbread Valley ADDRESS: 124 Byrd Farm Rd Franklin NC 28734 LAT/LONG: 35.104107 / 83.454701	CLIENT: Wildlands Eng, Inc. CONTACT: Phil Strickland INQUIRY #: 5996243.2s DATE: March 04, 2020 4:42 pm

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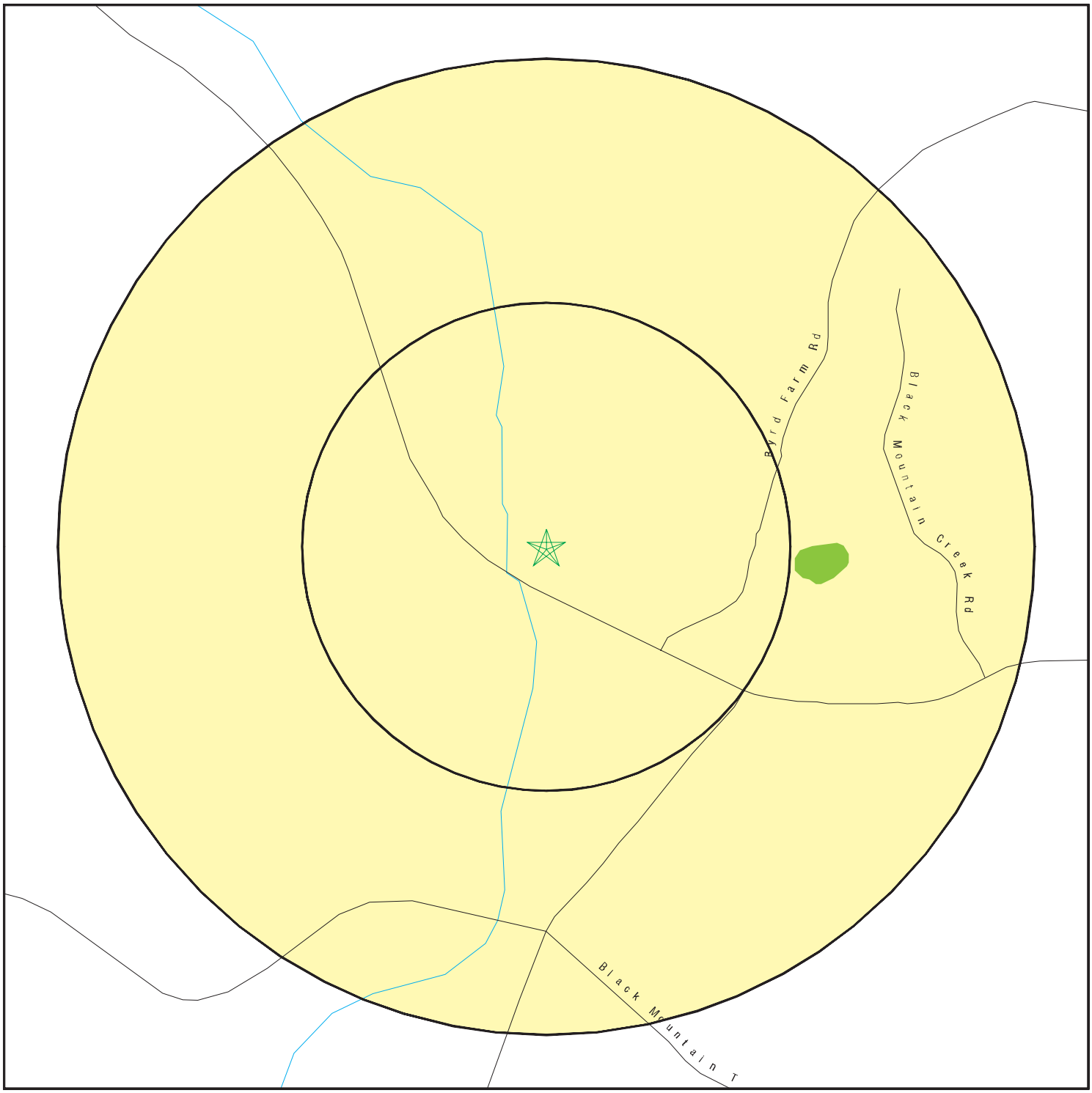
DETAIL MAP - 5996243.2S



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

0 1/16 1/8 1/4 Miles

N

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Cornbread Valley	CLIENT: Wildlands Eng, Inc.
ADDRESS: 124 Byrd Farm Rd Franklin NC 28734	CONTACT: Phil Strickland
LAT/LONG: 35.104107 / 83.454701	INQUIRY #: 5996243.2s DATE: March 04, 2020 4:45 pm

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	1.000		0	0	0	0	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site list								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-VSQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
NC HSDS	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.000		0	0	0	0	NR	0
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
OLI	0.500		0	0	0	NR	NR	0
DEBRIS	0.500		0	0	0	NR	NR	0
LCID	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
State and tribal leaking storage tank lists								
LUST	0.500		0	0	0	NR	NR	0
LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
LUST TRUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
FEMA UST	0.250		0	0	NR	NR	NR	0
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
HIST LF	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	TP		NR	NR	NR	NR	NR	0
US CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
SPILLS	TP		NR	NR	NR	NR	NR	0
IMD	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
SPILLS 90	TP		NR	NR	NR	NR	NR	0
SPILLS 80	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.250		0	0	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
ECHO	TP		NR	NR	NR	NR	NR	0
DOCKET HWC	TP		NR	NR	NR	NR	NR	0
UXO	1.000		0	0	0	0	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
AIRS	TP		NR	NR	NR	NR	NR	0
ASBESTOS	TP		NR	NR	NR	NR	NR	0
COAL ASH	0.500		0	0	0	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
AOP	TP		NR	NR	NR	NR	NR	0
SEPT HAULERS	TP		NR	NR	NR	NR	NR	0
CCB	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
PCSRP	0.500		0	0	0	NR	NR	0
MINES MRDS	TP		NR	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		0	NR	NR	NR	NR	0
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA HWS	TP		NR	NR	NR	NR	NR	0
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA LUST	TP		NR	NR	NR	NR	NR	0
- Totals --		0	0	0	0	0	0	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

February 11, 2021

Renee Gledhill-Earley
State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
Submitted via email: Environmental.Review@ncdcr.gov

Subject: Cornbread Valley Mitigation Site
Macon County, North Carolina

Dear Ms. Gledhill-Earley,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream restoration project on the Cornbread Valley Mitigation Site located in Macon County, NC. A Site Map and a USGS Topographic Map showing the approximate project area are enclosed. The topographic figure was prepared from the Prentiss 7.5-Minute USGS Topographic Quadrangle, and the site is located at latitude 35.1030 longitude -83.4544.

The Cornbread Valley Mitigation Site is being developed to provide stream mitigation within the Little Tennessee River Basin. The project will include restoration and enhancement of Jones Creek, as well as six unnamed tributaries to Jones Creek. The streams onsite are severely incised and eroded throughout and are routinely used by cattle for shade and water. Manmade ponds and levies have altered natural watershed hydrology, confining flood flows on multiple tributaries. Additionally, the absence of well-established riparian buffers contributes to sediment and nutrient loading in the watershed. Throughout the site, high quality habitat and refugia are fragmented by stream instability, poor buffer quality, and artificial barriers that impact aquatic organism passage.

The major goals of the stream mitigation project are to provide ecological and water quality enhancements to the Little Tennessee River Basin while creating a functional riparian corridor at the site level. This will be accomplished by excluding livestock from stream channels, stabilizing eroding stream banks, restoring and enhancing native floodplain vegetation, improving the stability of stream channels, improving instream habitat, implementing stormwater BMPs to reduce nutrient and sediment loads to streams, and permanently and preserving protecting the site through establishing a conservation easement.

No surveyed sites listed on the North Carolina State Historic Preservation Office (SHPO) are located within a mile of the Site. The closest National Register includes the Dr. Alexander C Brabson House (site ID MA0007), located approximately 4 miles east of the site. One managed area, Nantahala National Forest, is located approximately 0.3 miles from the project area. Three natural areas area located within one mile of the site include Lee Creek Seep, Foster Knob/Rockyface Mountain and LTN/Cartoogechaye Creek Aquatic Habitat. No other architectural structures or archaeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. We ask that you review the site based on the attached information to determine the presence of any historic properties.

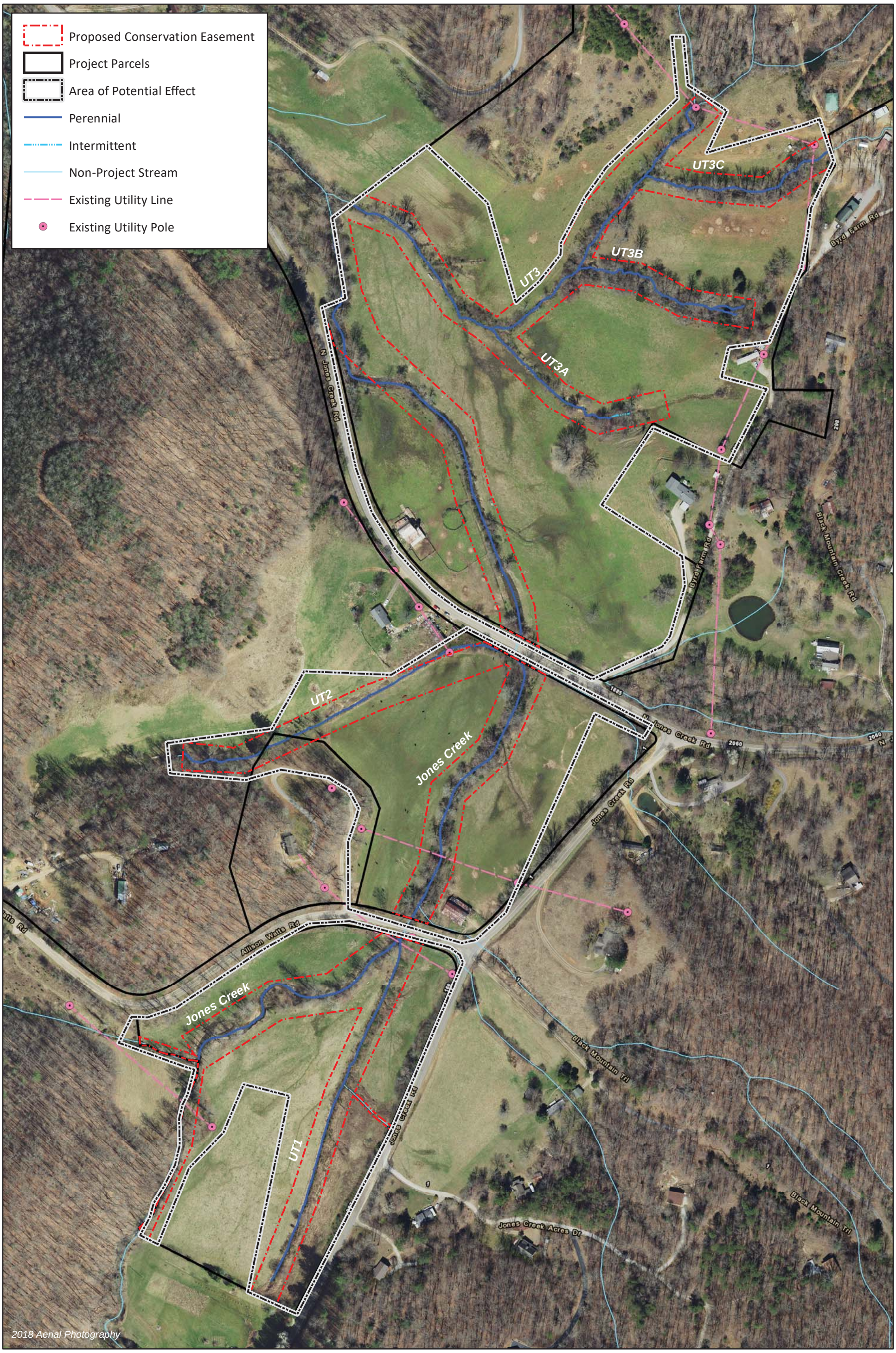
We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Kirsten G. Gimbert

Kirsten Gimbert, *Senior Environmental Scientist*
kgimbert@wildlandseng.com
704.941.9093

Attachments: Figure 1 Site Map and Figure 2 USGS Topographic Map

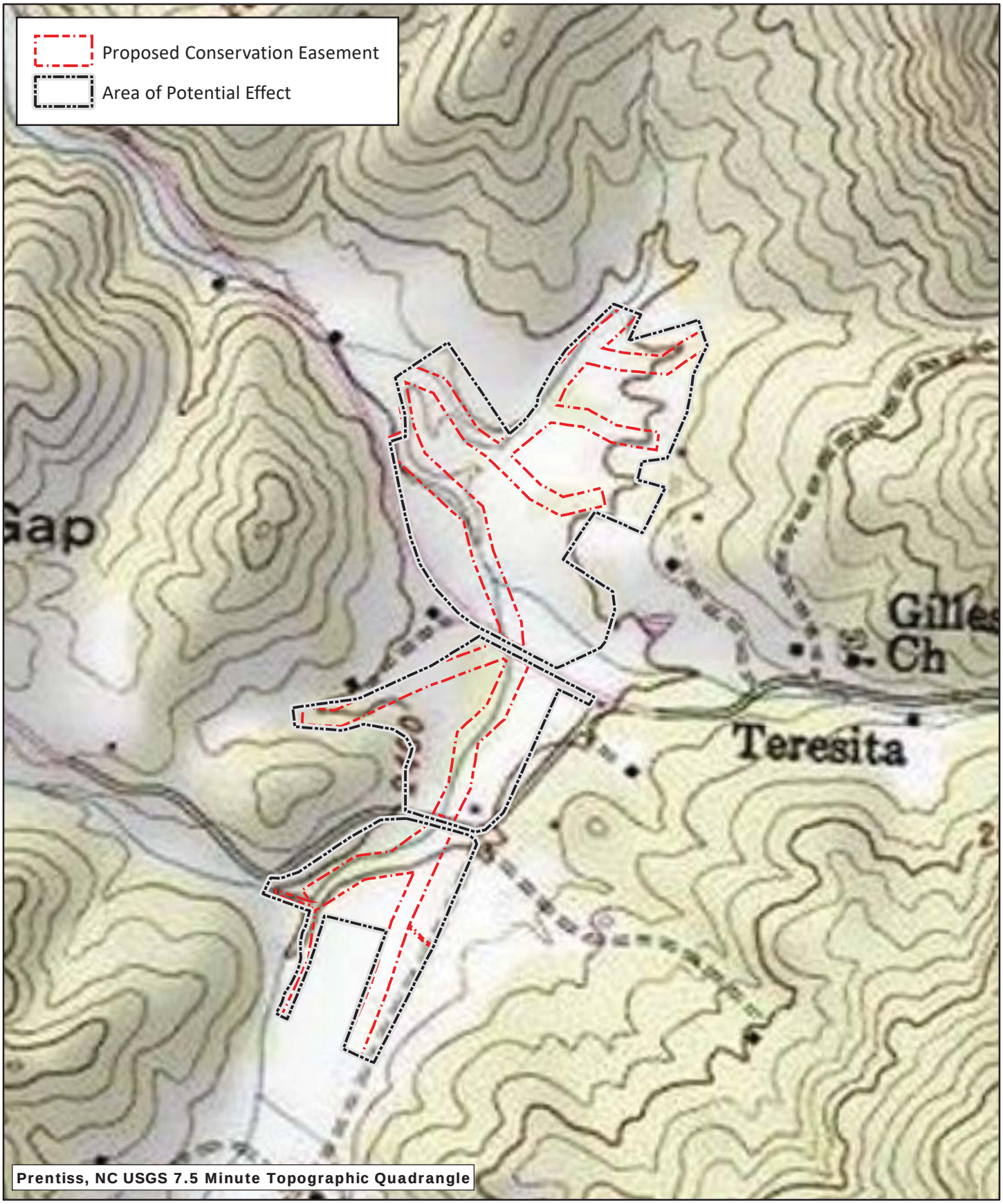


WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 1 Site Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC



WILDLANDS ENGINEERING

0 600 Feet

N

Figure 2 USGS Topographic Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC

North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Roy Cooper Secretary D. Reid Wilson

March 10, 2021

Kirsten Gimbert kgimbert@wildlandseng.com
Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Re: Cornbread Valley Mitigation Site in Macon County, ER 21-0519

Dear Ms. Gimbert:

Thank you for your submission of February 11, 2021, concerning the above-referenced project. We have reviewed the information provided and offer the following comments:

The area of potential effect (APE) for the Cornbread Valley Mitigation project along Jones Creek is located within 0.5 miles of two documented archaeological sites, and the hydrological and topographic characteristics of the location suggest that there may be significant cultural resources in the area. Because the proposed project involves modification of the soils along the streambanks and vegetation planting that may impact subsurface archaeological resources, we recommend that a systematic archaeological survey be conducted prior to the initiation of any ground disturbing activities.

The survey should cover the conservation easement delineated in your submission and include the furthest extent of the proposed ground disturbing activities on both sides of Jones Creek and the six unnamed tributaries within the project area. The purpose of the survey should be to locate archaeological sites and make recommendations regarding their eligibility for listing in the National Register of Historic Places.

The archaeological survey should be conducted by an experienced archaeologist who meets the Secretary of the Interior professional qualifications. A list of archaeological consultants, who have conducted or expressed an interest in contract work in North Carolina is available at https://archaeology.ncdcr.gov/archaeological-consultant-list. The archaeologists listed, or any other experienced archaeologist, may be contracted to conduct the recommended survey. **Our office requests that your consultant meet with the Office of State Archaeology Review Archaeologist to discuss the location and appropriate field methodologies prior to the archaeological field investigation.**

Two paper copies and one digital copy (PDF) of all resulting archaeological reports, as well as a digital copy (PDF) of the North Carolina Site Form for each site recorded, should be forwarded to the Office of State Archaeology (OSA) through this office for review and comment, as soon as they are available and in advance of any construction or ground disturbance activities. OSA's Archaeological Standards and Guidelines for Background Research, Field Methodologies, Technical Reports, and Curation can be found online at: https://files.nc.gov/dncr-arch/OSA_Guidelines_Dec2017.pdf.

We have determined that the project as proposed will not have an effect on any historic structures.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona Bartos, Deputy
State Historic Preservation Officer

705 Dogwood Rd.
Asheville, NC 28806

T 919.414.3418
TRCcompanies.com

June 7, 2021

Ms. Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
109 East Jones Street, Room 258
Raleigh, North Carolina 27601

RE: ER 21-0519 Cornbread Valley Mitigation Site – Draft Report

Dear Ms. Gledhill-Earley:

On behalf of Wildlands Engineering Inc., enclosed for your review please find hard and digital copies of the draft report for the archaeological survey of the Cornbread Valley Mitigation Site in Macon County, North Carolina (ER 21-0519). Shape files of the project Limits of Disturbance and the identified archaeological sites are also enclosed, along with digital copies of the associated site forms.

Thank you for your review of this report and your assistance with this project. Please do not hesitate to contact me at (919) 414-3418 / pwebb@trccompanies.com if you have any questions or require any additional information.

Sincerely,

Paul A. Webb
Cultural Resources Program Manager

Cc: Jake McLean, Wildlands Engineering, Inc.

ARCHAEOLOGICAL SURVEY OF THE CORNBREAD VALLEY MITIGATION SITE, MACON COUNTY, NORTH CAROLINA

DRAFT REPORT

TRC ENVIRONMENTAL CORPORATION

June 2021

ARCHAEOLOGICAL SURVEY OF THE CORNBREAD VALLEY MITIGATION SITE, MACON COUNTY, NORTH CAROLINA

DRAFT REPORT

ER 21-0519
USACE Action ID SAW-2020-02051

Submitted to:

WILDLANDS ENGINEERING, INC.
167-B Haywood Road
Asheville, North Carolina 28806

By:

TRC ENVIRONMENTAL CORPORATION
705 Dogwood Road
Asheville, North Carolina 28806

Authored by:

Bruce Idol and Paul Webb

June 2021

MANAGEMENT SUMMARY

TRC Environmental Corporation (TRC) has completed an archaeological survey of the Cornbread Valley Mitigation Site (Project) in Macon County, North Carolina. The work was conducted on behalf of Wildlands Engineering, Inc., as part of the permitting requirements for the proposed restoration and enhancement of approximately 7,312 linear feet of stream. This work took place in accordance with TRC's technical proposal for the Project.

The proposed Limits of Disturbance (LOD) for the mitigation work encompass about 36 acres (including approximately 15 acres of seasonal wetlands) in the Jones Creek drainage and include broad stream terraces on both sides of Jones Creek and adjacent ridge toe slopes. The LOD is bisected by North Jones Creek Road (SR 1128) and Allison Watts Road and is partially bounded by Jones Creek Road (SR 1130) and a private road (Byrd Farm Road) on the east side. The entire LOD is situated in pasture.

This study was conducted to produce information on any significant cultural resources that might be present within the LOD to comply with Section 106 of the National Historic Preservation Act and so that the information could be considered for planning purposes. The survey satisfies the requirements for an intensive archaeological survey as defined by the North Carolina Historic Preservation Office and Office of State Archaeology (HPO/OSA) and complies with the OSA's (2017) *Archaeological Investigation Standards and Guidelines*.

The archaeological fieldwork was directed by Bruce Idol of TRC, occurred from April 5–15, 2021, and required approximately 240 person-hours. The fieldwork included a systematic pedestrian reconnaissance of the entire LOD and systematic shovel testing at 20-m and 30-m intervals across all parts of the LOD except for visible wetland areas, areas of greater than 15% slope, or isolated areas of erosion or disturbance; supplemental shovel tests were excavated at 7.5- to 10-m intervals to delineate finds. A total of 439 shovel tests were excavated within the Project LOD.

The survey identified 16 archaeological sites within the LOD (31MA862–31MA877) (Table i.1). Two of these sites (31MA873 and 31MA877) are considered unassessed for National Register of Historic Places (NRHP) eligibility and would require additional testing prior to any ground disturbing activities. Site 31MA873 is a precontact Middle Archaic and Middle Woodland (Connestee phase) site situated on a terrace in the pasture east of Jones Creek Road and north of Allison Watts Road; it extends outside of the LOD to the east. Although 31MA873 is represented by relatively few artifacts, it contains a thin buried A horizon on the upper (eastern) part of the terrace, and it is possible that associated Connestee phase features are present. Given the limited extent of the survey within the LOD, the NRHP status of 31MA873 is considered unassessed, and avoidance during construction is recommended. Site 31MA877 is a low-density precontact lithic and postcontact 19th century site situated on a terrace at the base of a toe slope west of Jones Creek and south of North Jones Creek Road. A buried A horizon is present over much of the site. The presence of a few artifacts of early and potentially early 19th century manufacture suggests that the occupation may have begun by that time, and 19th century features are potentially present; while this site likely represents a Euro-American occupation, there is also some potential that it is associated with the 19th century Cherokee community of Sandtown. In the absence of more intensive testing, the NRHP status of 31MA877 is considered unassessed and avoidance during construction is recommended.

The remaining 14 sites (31MA862–31MA872 and 31MA874–31MA876) are dispersed low-density lithic scatters or isolated artifact finds that contain Early Archaic and unidentified Woodland (31MA862), Middle to Late Archaic (31MA876), unidentified Archaic (31MA871), unidentified Archaic and nondiagnostic ceramic (31MA872), nondiagnostic lithic (31MA863–31MA866, 31MA868–31MA870, 31MA874, and 31MA875), or nondiagnostic lithic and ceramic (31MA867) components. These sites appear to lack

research potential and are recommended not eligible for the NRHP under all four criteria as expressed within the LOD. No further archaeological investigations are recommended at these sites for the Project as currently defined.

Providing that 31MA873 and 31MA877 are avoided by all construction activities, no further archaeological investigations are recommended at the Cornbread Valley Mitigation Site as presently defined.

Table i.1. Archaeological Sites Identified by the Cornbread Valley Mitigation Site Survey.

Site	Component	NRHP Eligibility Recommendation
31MA862	Precontact: Early Archaic; Woodland	Not eligible
31MA863	Precontact: nondiagnostic lithic	Not eligible
31MA864	Precontact: nondiagnostic lithic	Not eligible
31MA865	Precontact: nondiagnostic lithic	Not eligible
31MA866	Precontact: nondiagnostic lithic	Not eligible
31MA867	Precontact: nondiagnostic lithic and ceramic	Not eligible
31MA868	Precontact: nondiagnostic lithic	Not eligible
31MA869	Precontact: nondiagnostic lithic	Not eligible
31MA870	Precontact: nondiagnostic lithic	Not eligible
31MA871	Precontact: nondiagnostic lithic	Not eligible
31MA872	Precontact: Archaic; nondiagnostic ceramic	Not eligible
31MA873	Precontact: Middle Archaic; Middle Woodland	Unassessed
31MA874	Precontact: nondiagnostic lithic	Not eligible
31MA875	Precontact: nondiagnostic lithic	Not eligible
31MA876	Precontact: Middle to Late Archaic	Not eligible
31MA877	Precontact: nondiagnostic lithic; Postcontact: early to late 19th century	Unassessed

ACKNOWLEDGMENTS

The authors would like to thank Jake McLean of Wildlands Engineering, Inc., and members of the Byrd family for facilitating the fieldwork.

For TRC, Paul Webb served as Principal Investigator. Bruce Idol directed the survey and was assisted by Mary Armstrong, Rachael Denton, and Lia Kitteringham. The artifacts were processed by Brenda Magouirk-Nelson. The lithic artifacts were analyzed by Belinda Cox; John Kesler analyzed the precontact ceramics; and the Euro-American artifacts were analyzed by Paul Webb. John Kesler took the artifact photographs; Belinda Cox produced the graphics; and the report was copyedited by Heather Millis.

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1. INTRODUCTION

This report documents the results of archaeological survey at the Cornbread Valley Mitigation Site in Macon County, North Carolina (Figures 1.1 and 1.2). The work was conducted by TRC on behalf of Wildlands Engineering, Inc., as part of the permitting requirements for the proposed restoration and enhancement of approximately 7,312 linear feet of stream. The proposed Limits of Disturbance (LOD) for the mitigation work encompass about 36 acres (including approximately 15 acres of seasonal wetlands) in the Jones Creek drainage and include broad stream terraces on both sides of Jones Creek and adjacent ridge toe slopes. The fieldwork was directed by Bruce Idol of TRC and occurred from April 5–15, 2021.

This study was conducted to produce information on any significant cultural resources that might be present in the LOD to comply with Section 106 of the National Historic Preservation Act and so that the information could be considered for planning purposes. The survey satisfies the requirements for an intensive archaeological survey as defined by the North Carolina Historic Preservation Office and Office of State Archaeology (HPO/OSA) and complies with the OSA's (2017) *Archaeological Investigation Standards and Guidelines*.

The remainder of this report contains the detailed results of this research. Chapters 2 and 3 provide environmental and cultural contexts for the area, followed by Chapter 4, which details the research goals and methods. Chapter 5 presents the results. Chapter 6 contains a summary and recommendations and is followed by a list of references cited in the text. Appendixes 1–3 contain the artifact catalogs. Digital archaeological site forms have been submitted under separate cover.

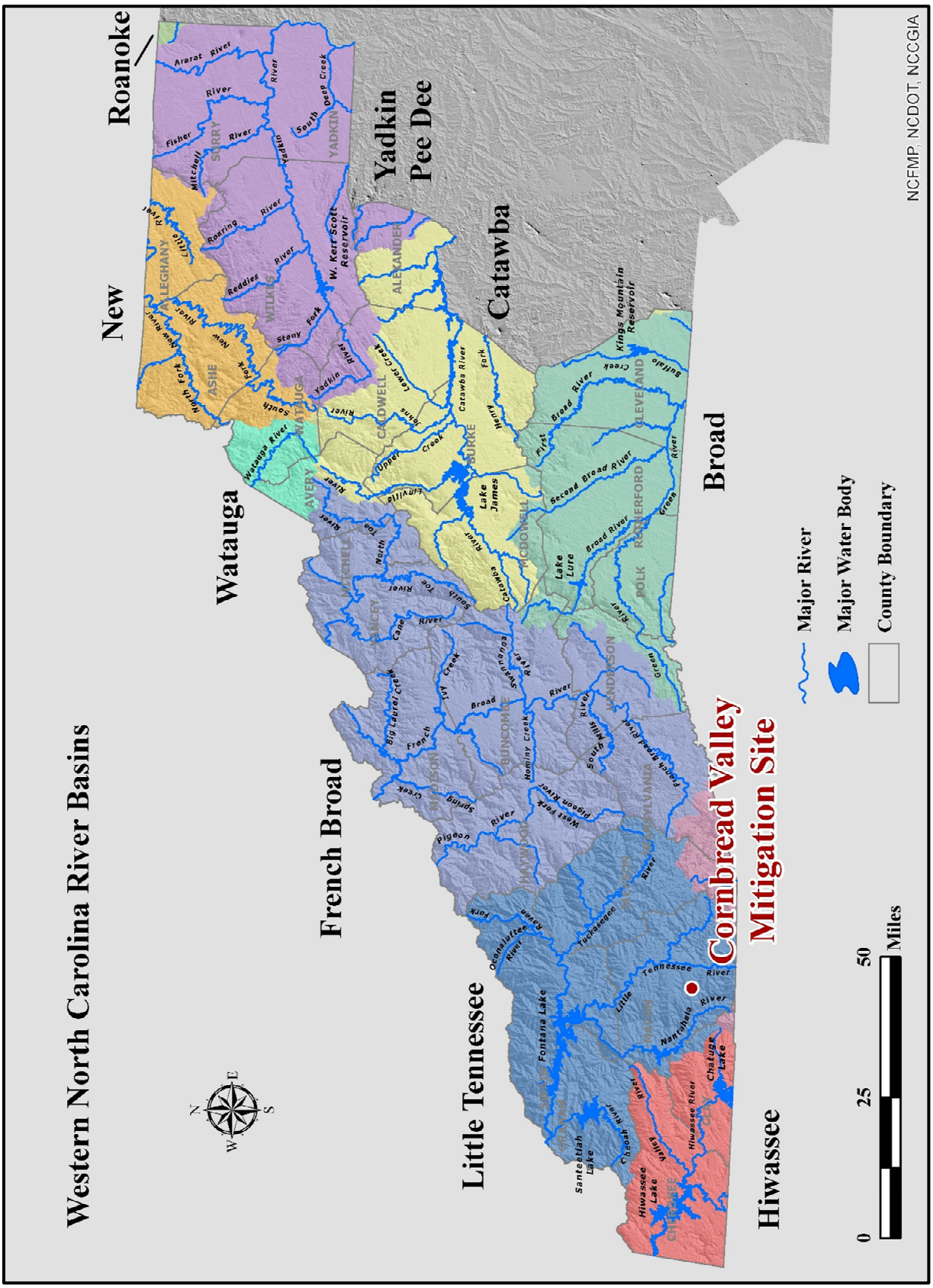

Figure 1.1. Location of the Cornbread Valley Mitigation Site in southwestern North Carolina.

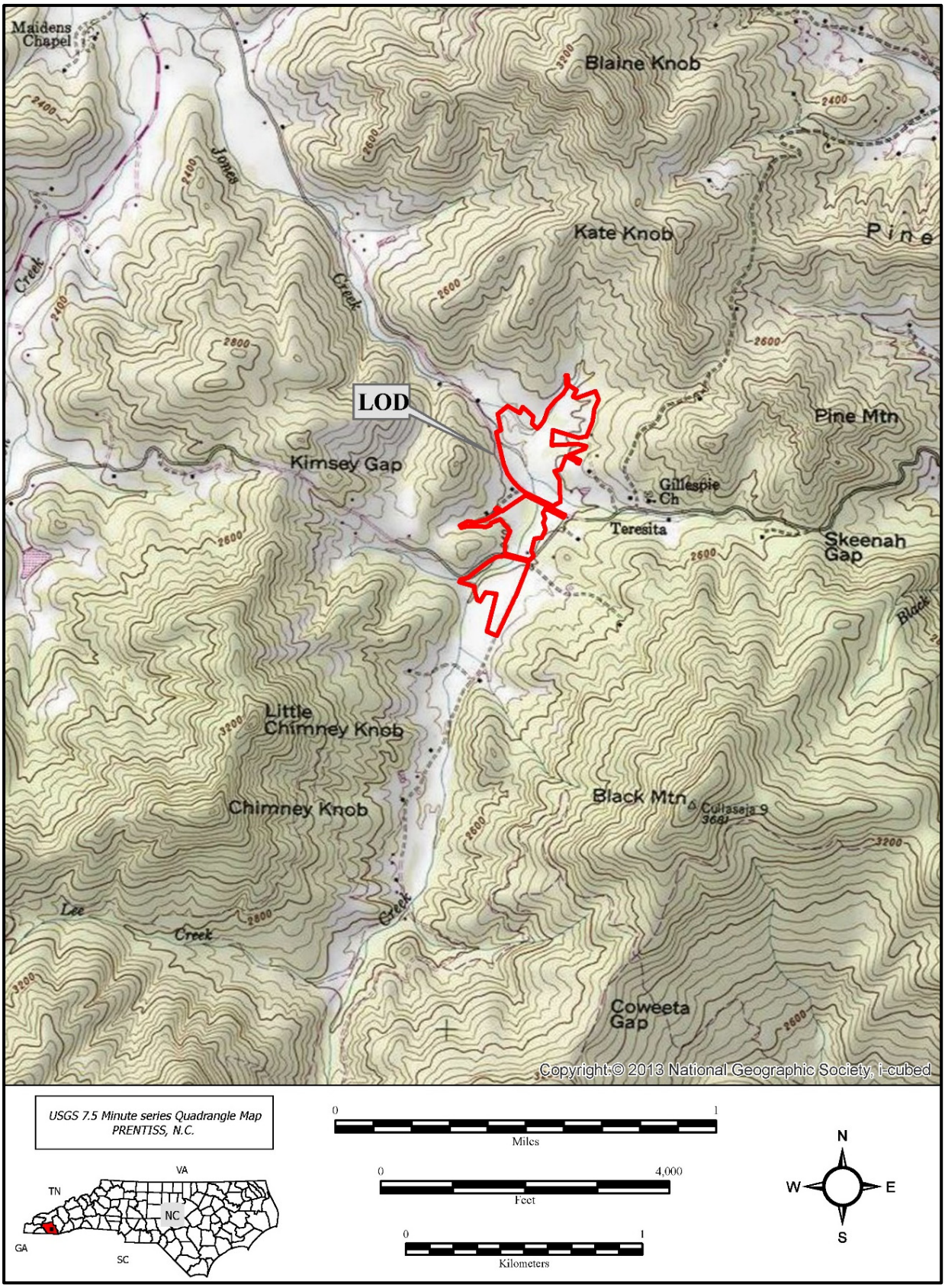

Figure 1.2. Location of the Cornbread Valley Mitigation Site LOD in Macon County, North Carolina.

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2. ENVIRONMENTAL SETTING

PROJECT SETTING

The Cornbread Valley Mitigation Site is situated in a broad intermontane valley drained by Jones Creek and its tributaries, near the Teresita community southwest of Franklin in Macon County. The Project LOD is bisected by North Jones Creek Road (SR 1128) and Allison Watts Road and is partially bounded by Jones Creek Road (SR 1130) and a private road (Byrd Farm Road) on the east side (see Figure 1.2). The Project LOD is irregular in shape and encompasses portions of ridge toes and alluvial and colluvial terraces; it is entirely in pasture (Figures 2.1–2.7). The alluvial terraces contain seasonal wetlands of varied size. Other than a sizeable area around a barn on the north side of North Jones Creek Road that has been severely churned by cattle, visible disturbance is limited to a few isolated, eroded areas at the margins of ridge toes and around barns.

PHYSIOGRAPHY, GEOLOGY, SOILS, AND HYDROLOGY

The study area is situated in the Blue Ridge Mountain physiographic region and the Blue Ridge geological belt, and lies within the Southern Crystalline Ridges and Mountains Level IV ecoregion, which is characterized by floristically diverse forested slopes, high gradients, and rugged terrain on primarily metamorphic bedrock (Griffith et al. 2002). The topography of the region varies from nearly level floodplains to almost vertical cliffs (Thomas 1996). Elevations in Macon County range from 1,840 to 5,500 feet above mean sea level (AMSL). Elevations within the Project LOD range from about 2,400 feet to 2,440 feet AMSL, while the surrounding ridges reach up to 3,680 feet AMSL in elevation.

The general soil unit mapped on the Project LOD is Evard-Cowee-Saunook, a unit composed of soils formed in residuum or colluvium that have a fine sandy loam, sandy loam, or gravelly loam surface layer and sandy clay loam or clay loam subsoil; associated soils are found on ridge tops, long side slopes, and drainageways in the low mountains and are generally moderately deep to very deep and well drained (Thomas 1996:10). Soils mapped in the LOD and nearby uplands include those of the Evard-Cowee complex on 8–15% (EvC) or 15–30% slopes (EvD), and Saunook loam on 2–8% slopes (ScB) and 8–15% slopes (ScC). The Evard-Cowee complex includes soils that are deep or moderately deep, well drained, and found on mountain slopes and ridges. These are formed in residuum weathered from biotite gneiss and/or amphibolite and are affected by soil creep in the upper solum (USDA NRCS 2021). Evard-Cowee complex soils are characterized by a brown fine sandy loam surface layer and strong brown clay loam or clay loam subsoil (Thomas 1996:72, 73). Saunook loam is found on coves, drainageways, and toe slopes in the low mountains (Thomas 1996:105, 106; USDA NRCS 2021). This is a deep, well-drained soil that is formed in colluvium derived from material weathered from felsic to mafic igneous and high-grade metamorphic rock, and has a surface layer of brown to dark brown loam that typically overlies a dark yellowish brown loam Bt horizon (USDA NRCS 2021).

The alluvial terraces bordering Jones Creek and its associated tributaries are mapped as Nikwasi fine sandy loam (NkA) and Dellwood gravelly loam, 0–5% slopes (DgB). Nikwasi fine sandy loam is a poorly to very poorly drained soil formed in loamy alluvium; it is largely encountered in low-lying areas on floodplains and is frequently flooded. This soil is formed in loamy alluvium and overlies gravelly sand. Dellwood gravelly loam is a moderately well-drained soil found on floodplains and is frequently flooded. Dellwood gravelly loam is found on uneven surfaces on floodplains and is formed in loamy alluvium, and has a very dark grayish brown surface layer that overlies dark yellowish brown cobbly sandy loam (Thomas 1996:57; USDA NRCS 2021).



Figure 2.1. Pasture on terrace north of North Jones Creek Road, facing southwest.



Figure 2.2. Terrace and toe slope between small stream tributaries, facing north.



Figure 2.3. Barn and poorly drained terrace area north of North Jones Creek Road, facing west.



Figure 2.4. Terrace north of Allison Watts Road and east of Jones Creek, facing north.



Figure 2.5. Pasture south of Allison Watts Road and east of Jones Creek, facing southwest.



Figure 2.6. Terrace south of Allison Watts Road and west of Jones Creek, facing south.



Figure 2.7. Terrace north of Allison Watts Road and west of Jones Creek, facing north.

Jones Creek flows northwest from the Project area and is joined by several similar streams to form Cartoogechaye Creek north of US 64, which flows generally eastward to join the Little Tennessee River south of Franklin. The Little Tennessee River flows north-northwest from the area to its Fontana Lake impoundment, and flows west through Fontana Lake into Tennessee, continuing through Calderwood, Chilhowee, and Tellico reservoirs before joining the Tennessee River west of Maryville, Tennessee. The Tennessee River flows west and south into Alabama and then turns north back into Tennessee, continuing north into Kentucky and eventually joining the Ohio River. The Ohio River flows west into the Mississippi River, which empties into the Gulf of Mexico to the south.

MODERN CLIMATE

The modern climate of Macon County is characterized by mild summers and wet, occasionally cold winters. Local weather conditions vary considerably with elevation and exposure (higher elevations experience lower temperatures and increased precipitation) (Thomas 1996:3). As historically recorded in Franklin, temperatures are generally moderate and usually do not exceed 85°F in the summer or drop below 10°F in the winter. Average summer temperature is about 72°F, with winter temperatures averaging 39°F. The county averages 160 frost-free days each year, and snowfall is usually light. Precipitation is consistent throughout the year, with an average annual precipitation of 52 inches in Franklin, with much of this falling during the growing season (Thomas 1996).

FLORA AND FAUNA

The study area is in the Broad Basins Level IV ecoregion, as defined by Griffith et al. (2002:14). This environment consists of intermountain basins with low mountains, rolling foothills, and moderately broad mountain valleys. Streams are moderate gradient and contain cobbles and boulders, while rivers are low to moderate gradient with sand and bedrock substrates. The ecoregion includes Appalachian oak forests and,

at higher elevations, northern hardwoods forest. Common tree species include a variety of oaks and pines, as well as silverbell (*Helesia tetraptera*), hemlock (*Tsuga canadensis*), tulip poplar (*Liriondendron tulipifera*), basswood (*Tilia americana*), buckeye (*Aesculus flava*), yellow birch (*Betula alleghaniensis*), and beech (*Fagus grandifolia*).

The Project area also falls in Braun's (1950) Southern Appalachians section of the Oak-Chestnut Forest region. Prior to the 1920s and the chestnut blight, chestnut (*Castanea dentata*) dominated the region, although such species as tulip poplar (*Liriodendron tulipifera*), ash (*Fraxinus* spp.), hemlock (*Tsuga* spp.), white basswood (*Tilia* spp.), buckeye (*Aesculus* spp.), oak (*Quercus* spp.), red maple (*Acer rubrum*), walnut (*Juglans nigra*), wild cherry (*Prunus serotina*), birch (*Betula* spp.), and beech (*Fagus grandifolia*) could be found in the valleys, coves, and along sheltered mountain slopes (Holmes 1911:38). Little or no primary forest vegetation remains in the region due to the blight, logging, and other human activity (see Braun 1950:199). Presently, oak and pine (*Pinus* spp.) are the most common species, with red maple, locust (*Gleditsia* spp.), black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), and dogwood (*Cornus* spp.) also common on the intermountain plateau (Orr and Stuart 2000:36–37). In addition to arboreal species, the forests supported a variety of undergrowth species. The latter included several varieties of edible berries, such as blackberries and raspberries (*Rubus* spp.) and huckleberries (*Gaylussacia* spp.), as well as rivercane and numerous other species used for tools, food, and medicinal purposes by both the Cherokee and later Euro-American settlers (Cozzo 2004; Foreman and Mahoney 2018; Hamel and Chiltoskey 1975; Mooney and Olbrechts 1932; Oliver 1989:29).

The varied forests in the area would have supported a substantial and diverse fauna during and prior to Euro-American settlement. Potential game species include white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), elk (*Cervus elaphus*), raccoon (*Procyon lotor*), opossum (*Didelphis marsupialis*), gray squirrel (*Sciurus carolinensis*), and fox squirrel (*Sciurus niger*). Other species present included beaver (*Castor canadensis*), gray fox (*Urocyon cinereoargenteus*), otter (*Lutra canadensis*), muskrat (*Ondatra zibethica*), mink (*Mustela vison*), wolf (*Canis* sp.), panther or mountain lion (*Felis concolor*), and bobcat (*Lynx rufus*) (Shelford 1963). Avian species of possible economic importance included turkey (*Meleagris gallopavo*) and smaller species; other species may have been valuable non-food resources as well. Large streams in the Little Tennessee drainage would have provided a variety of fish, including catfish (Ictaluridae), sunfish (Centrarchidae), largemouth (*Micropterus salmoides*) and smallmouth (*Micropterus dolomieui*) bass, and brook trout (*Salvelinus fontinalis*) (Altman 2006).

3. CULTURAL BACKGROUND

ARCHAEOLOGICAL OVERVIEW

This chapter presents an overview of the precontact and historic period occupations of Macon County and western North Carolina. Much of the earlier part of the cultural sequence for the region is based on Coe's (1964) investigations of the precontact cultures of North Carolina, coupled with later research elsewhere in North Carolina (e.g., Daniel 1998) and across the mountains in Tennessee (e.g., Davis 1990; Kimball 1985). Information on the later precontact and historic Cherokee occupations of western North Carolina is derived from a variety of sources, including Dickens (1976), Keel (1976), Purrington (1983), Riggs (1988, 1996, 1999), Riggs and Rodning (2002), Rodning (2004), Steere (2013), Ward and Davis (1999), and Wetmore (2002). Other data come from recent Cultural Resource Management (CRM) reports for projects in western North Carolina (e.g., Benyshek 2020; Benyshek and Webb 2008, 2009; Bissett et al. 2009; Idol 2016, 2017, 2018a, 2018b; Shumate and Kimball 2016).

The archaeological record of southwestern North Carolina can be divided into four basic time and cultural periods—Paleoindian, Archaic, Woodland, and Mississippian—that relate to both social and technological factors. Several authors (e.g., Dickens 1976:10; Keel 1976:18; Riggs and Rodning 2002; Ward and Davis 1999; Wetmore 2002) divide some or all of these periods into phases, some of which overlap in time and name but vary in precise definition (Table 3.1).

Table 3.1. Generalized Cultural Chronology for Southwestern North Carolina through 1838.

Period	Phase	Chronology
Historic Cherokee	Late Qualla	A.D. 1700–1838
Protohistoric	Middle Qualla	A.D. 1500–1700
Mississippian	Early Qualla	A.D. 1400–1500
	Late Pisgah*	A.D. 1200–1400
	Early Pisgah*	A.D. 1000–1200
Late Woodland	Undefined (Napier/Woodstock?)	A.D. 800–1000
	Undefined (Late Swift Creek/Cane Creek?)	A.D. 600–800
Middle Woodland	Connestee	A.D. 200–600 ↑
	Pigeon	200 B.C.–A.D. 200
Early Woodland	Swannanoa	1000?–200 B.C.
Late Archaic	Otarre	1500–1000 B.C.
	Savannah River	3000–1500 B.C.
Middle Archaic	Guilford	4000–3000 B.C.
	Morrow Mountain	6000–4000 B.C.
	Stanly	6000–5500 B.C.
Early Archaic	LeCroy	7000–6000 B.C.
	Kirk/Palmer	7500–7000 B.C. ↑
	Big Sandy	8000–7500 B.C.
Paleoindian	Undefined (Hardaway-Dalton?)	9000–8000 B.C.
	Clovis	10,500–9000 B.C.
Pre-Paleoindian	Undifferentiated	Unknown

↑ represents overlap into a later period. Adapted from multiple sources, including Riggs and Rodning (2002), Rodning (2004, 2008), Stanyard (2003), and Ward and Davis (1999). *The Hiwassee and upper Little Tennessee valleys contain Early and Middle Mississippian ceramic types that are more related to the Woodstock, Etowah, and Savannah cultural sequence of northern Georgia (see Benyshek 2020; Riggs and Kimball 1996).

Paleoindian Period (ca. 10,500–8000 B.C.)

The earliest broadly acknowledged human presence in the continental United States dates to approximately 12,500 B.P., during the Paleoindian period. The most well-known cultural manifestation of this occupation is called Clovis, which is represented by distinctive, fluted projectile points that have been found over a wide geographic area in the United States. But there is also an increasing number of sites that indicate (if not conclusively demonstrate) a pre-Clovis occupation in the Americas; such regional sites include Meadowcroft Rockshelter in Pennsylvania (Adovasio et al. 1990, 1999); Saltville in Virginia (McDonald 2000; Weisner 1996); Cactus Hill in Virginia (McAvoy and McAvoy 1997); Topper in South Carolina (Goodyear and Steffy 2003); and the Sloth Hole and Page-Ladson sites in Jefferson County, Florida (Dunbar 2002, 2006; Hemmings 1999, 2004). Although none of those sites is without controversy, those and other sites (e.g., Monte Verde in Chile [Meltzer et al. 1997]) have forced archaeologists to revisit their models for how and when people first arrived in the Americas (e.g., Anderson and Gillam 2000).

Most researchers believe that the human occupation of North America began with a migration of people from Asia across the Bering land bridge, which would have been exposed from 20,000 B.P. to perhaps as late as 10,000 B.P. due to lower sea levels associated with the Last Glacial Maximum (Anderson and Gillam 2000; Dixon 1999, 2001; Fladmark 1979; Hoffecker et al. 1993:48; Meltzer 1988, 2004; Smith 1986). Once in North America, the method and timing of migration south into the Americas remain issues of debate. Some researchers have argued that an ice-free corridor allowed for movement into the interior of the continent sometime after 11,000 B.P. (e.g., Haynes 1966, 1969, 1971), while others have suggested that early settlers, once having occupied Beringia, followed a coastal route to colonize the Americas (e.g., Dixon 1999; Faught 2008; Fiedel 2000; Fladmark 1979).

Based on a study of Paleoindian settlement patterns, Anderson and Gillam (2000:43) have developed a comprehensive model concerning the colonization of the Western Hemisphere. The study analyzed paths at a continental scale, to determine which routes would have afforded the least cost to traveling hunter-gatherers. Factors in the model included topographic relief, locations of ice sheets and pluvial lakes, and the location of known Paleoindian archaeological sites. The findings suggest that initial dispersal occurred in coastal and riverine settings and on plains, and that founding populations probably spread and diversified rapidly. The model also implies that now-submerged portions of the continental shelf may have been important for early dispersal, whether by foot or by boat (Erlandson et al. 2005). In eastern North America, this is reflected in the distribution of sites along the Atlantic Coastal Plain and the paucity of sites in the Appalachian Mountains, which were a barrier to mobility.

Diagnostic Paleoindian artifacts include fluted and unfluted lanceolate projectile points (such as Clovis and Cumberland points); flake tools such as endscrapers, gravers, retouched blades, and burins are also found. Almost all of the Paleoindian materials found in the Southeast have come from surface contexts, and as a result few data are available concerning regional subsistence or social organization (Anderson 1990). Hunting of late Pleistocene megafauna is inferred based on evidence from other areas, although direct evidence for use of animals of any kind is rare in the region. Most, if not all, Paleoindian populations probably relied extensively on other animal and plant foods as well. Paleoindian populations were generally highly mobile, and settlements are thought to have included small temporary camps and less common base camps that were occupied by loosely organized bands. Paleoindians selected high-quality lithic materials for tools, and many sites are linked to important source areas (e.g., Smallwood et al. 2018).

Paleoindian projectile points are relatively rare in the North Carolina mountains, reflecting their scarcity in the Appalachians as a whole. A 2005 compilation of data on known fluted points from North Carolina revealed only 27 specimens from 12 contiguous counties in southwestern North Carolina (Daniel 2005), although this number certainly understates the actual number of finds. The later Paleoindian phase appears

to include Dalton (Goodyear 1982) and perhaps Hardaway (Ward 1983) points and related cultures, although both types of artifacts are very rare in the region (Purrington 1983).

Archaic Period (ca. 8000–1000 B.C.)

The Archaic period began with the onset of Holocene, post-glacial climatic conditions in the East and has been subdivided into Early, Middle, and Late subperiods. Diagnostic projectile points are the primary criteria used to identify and date Archaic manifestations. As a whole, the Archaic may be seen as a relatively long and successful foraging adaptation, with subsistence based on hunting, fishing, and the collection of wild plant resources. The period is also marked by a general increase in the density and dispersal of archaeological remains, increased cultural diversity as reflected in more regionally distinct tool forms, and the increased use of locally available lithic raw materials. There is also evidence of long-distance exchange and regional-scale networks of social interaction, as well as status differentiation. Group size gradually increased during this period, culminating in larger populations by the end of the period (Anderson and Sassaman 2012). While Archaic groups certainly used a variety of materials to fashion utilitarian and other items, lithic artifacts are all that remain on most sites in the Southeast due to the lack of preservation in acidic soils. Architectural evidence is rare, suggesting that most structures were not substantial constructions; the Eastern Woodlands Household Archaeological Database Project lists only 97 potential Archaic period structural remains in the region (White and Steere 2014). An increasing number of Archaic sites have been the focus of intensive excavation in the North Carolina mountains (Benyshek and Webb i.p.; Bissett et al. 2009; Idol 2011b, 2016; Jorgenson et al. 2017; Purrington 1981; Shumate and Kimball 2016), and others have been investigated in eastern Tennessee in the Tellico area (e.g., Chapman 1977, 1981) and in the North Carolina Piedmont (Claggett and Cable 1982; Coe 1964).

Early Archaic (ca. 8000–6000 B.C.). During the Early Archaic period, the mixed coniferous forests present in much of the Southeast were replaced by mixed hardwood communities dominated by oak, hemlock, beech, and maple (Claggett and Cable 1982:212), and a modern faunal assemblage was in place following the extinction of the Pleistocene megafauna. Diagnostic markers of the Early Archaic period in western North Carolina and eastern Tennessee include side notched Big Sandy projectile points and later Palmer-Kirk projectile points (ca. 8000–6800 B.C.). Palmer-Kirk projectile points are fairly common and widespread occurrences in the area but are sparse compared to Middle and Late Archaic types. Bifurcate-based points such as the St. Albans, LeCroy, and Kanawha types (ca. 6900–5800 B.C.) are also found in the area (Kimball 1985). Although these appear to occur more rarely in the mountains than Kirk forms (Kimball 1996; Stanyard 2003), a long-term survey of sites near Asheville (Henry 1992) documented more bifurcate-based points than Kirks, perhaps a reflection of the intensive survey coverage up a smaller tributary (Kimball 1996). Other tools that occur on Early Archaic sites include knives, adzes, end and side scrapers, drills, perforators, and expedient tools (Stanyard 2003).

Low regional population densities and a continued high degree of group mobility are inferred for this subperiod in the mountains, where most known sites are located in high upland areas and over 90% of projectile points found are of non-local chert (Bass 1975). It is also possible, however, that site burial in the floodplains could be largely masking Early Archaic period use of these landforms (see Benyshek 2007a, 2009; Benyshek and Webb 2004, i.p.; Kimball 1991). The nature of more general land use patterns and strategies for technological organization remain the subjects of discussion. To the west in Tennessee, Kimball (1996) has proposed an ongoing change from logistical (relatively more permanent base camps from which a variety of other satellite camps and specialized use sites were accessed) to residential (wholesale moving frequently within zones to map onto resources) mobility patterns during the later Early Archaic period, perhaps as a result of the first signs of warming climatic conditions. Kimball (1996:173) notes that settlement patterns (and thus perhaps foraging strategies) for bifurcate and Kirk groups were different, with more bifurcate sites found on T1 terraces and islands compared to Kirk sites, which are more dispersed on various landforms, suggesting a change in foraging strategy in the later Early Archaic.

Middle Archaic (ca. 6000–4000 B.C.). During the Middle Archaic, the cool, moist conditions of the early Holocene are generally considered to have given way to the warmer, drier climate of the Mid-Holocene Hypsithermal interval, although there is increasing evidence that the Mountains may have seen increased rainfall during this period (e.g., Leigh 2002; Leigh and Webb 2006). Extensive estuarine marshes and riverine swamps began to emerge in coastal regions as sea levels ceased their post-Pleistocene rise by 3000 B.C. The northern hardwoods vegetation matrix in those regions was replaced by an oak-hickory forest, which was in turn replaced by a southern hardwoods-pine forest characterized by the species occupying the region today (Claggett and Cable 1982:212–216; Delcourt and Delcourt 1983, 1985). Subsistence economies became increasingly diversified, particularly evident in the Mid-South and lower Midwest during the Shell Mound Archaic, where riverine settings were chosen more often for occupation (Sassaman 1996).

The Middle Archaic witnessed the first substantial occupation of the Smoky Mountains (Bass 1975:109), and presumably of western North Carolina in general. Site file data indicate a marked increase in site numbers from the Early to the Middle Archaic in the Carolinas and Georgia (Anderson 1996), and Morrow Mountain projectile points increase markedly in frequency when compared to earlier types in western North Carolina (Leftwich 1999). Three subperiods recognized in most of North Carolina are identified by the presence of Stanly (ca. 6000–5000 B.C.), Morrow Mountain (ca. 5000–4200 B.C.), and Guilford (ca. 4200–3500 B.C.) projectile points, following the classic Archaic sequence first identified by Coe (1964), although more recent research demonstrates that additional projectile point forms were used as well (Shumate and Kimball 2016). Archaeologically, the transition from the Early to the Middle Archaic is characterized by the appearance of stemmed rather than notched projectile points and an increased incidence of groundstone tools. Sassaman (2010) suggests that the Morrow Mountain tradition may represent a migration of people from the west in response to global warming, based on the radical differences between Clovis-derived Early Archaic projectile point technology and similarities between Morrow Mountain types and the Cascade phase of the Old Cordilleran tradition. This model is still considered speculative but would help explain the technological discontinuities between the Early and Middle Archaic.

Reliance on locally available quartz and quartzite rather than higher quality non-local chert for stone tools increased in the Appalachian Summit as well as other parts of North Carolina, northern Georgia, and South Carolina. For example, a distributional study shows that over 77% of Middle Archaic projectile points from Mountain counties are made of quartz (McReynolds 2005:23). Atlatl weights make their first appearance in the archaeological record during the Middle Archaic, as do stone net sinkers. The use of a more expedient stone tool technology (see Binford 1977, 1979) predominates during the Middle Archaic (Stanyard 2003).

Based on studies in South Carolina, researchers have suggested that Morrow Mountain peoples were foragers who resided at a location until local resources were depleted (Blanton and Sassaman 1989; Sassaman 1983). This idea is consistent with an archaeological pattern characterized by local raw material utilization, the wide distribution of sites in various landscape settings and their small size, the lack of evidence for long-term occupations, and the absence of discernible substantial trade networks (Stanyard 2003:48–49). Morrow Mountain sites are frequently encountered in the uplands of western North Carolina (e.g., Purrington 1981), on smaller drainages (Yu 2001), and in floodplains of major rivers, and are sometimes buried (e.g., Benyshek and Webb 2004, i.p.; Benyshek 2007a). Bass (1975) found that half of the Middle Archaic sites he analyzed were in the uplands, with the others in valleys and coves.

Late Archaic (ca. 4000–1000 B.C.). Late Archaic sites are common in western North Carolina as elsewhere in the lower Southeast, suggesting region-wide population increase from the Middle Archaic (Anderson 1996). Late Archaic sites in a wide range of environmental zones, although most major settlements were in riverine or estuarine settings (Bass 1975; Ward 1983). The existence of formal base camps occupied seasonally or longer is inferred, together with a range of smaller resource-exploitation sites, such as hunting, fishing, or plant collecting stations (Claggett and Cable 1982; Ward 1983). In particular, many Late Archaic

sites in the Smoky Mountains appear to be situated near quartzite sources (Bass 1975:77; Shumate and Kimball 2016). Grinding implements, polished stone tools, and carved soapstone bowls became fairly common, suggesting increased use of plant resources, and possibly changes in subsistence strategies and cooking technologies. Although regional evidence is minimal, the first experiments with horticulture occurred at this time, with the cultivation of plants such as squash (*Cucurbita pepo*), sunflower (*Helianthus* sp.), and *Chenopodium* (Cowan 1985; Ford 1981; Gremillion 2018; Smith 2011).

Soapstone vessels appear to have been most widely used in the eastern United States between 1800 to 1000 B.C. (associated dates range from ca. 4000 B.C. to ca. A.D. 0) (Truncer 2004:505–506). The scarcity of earlier dates and wide gaps in geographical distribution suggest that soapstone bowl manufacture occurred continuously at "low levels of production," or was adopted and then discontinued in some areas (Truncer 2004:497). Although soapstone vessel use appears to have preceded ceramic vessel use in some areas, in the central Savannah River valley, South Carolina, and northeastern Florida, use of soapstone slabs and pottery precedes soapstone vessel use by up to 1000 years (Elliott et al. 1994; Sassaman 1997; Stanyard 2003:54). Soapstone vessels were apparently used for cooking certain plant or animal foods over a direct heat source (e.g., Kroeber 1925:527), and may not have afforded any advantage over alternative cooking methods.

Another innovation in Late Archaic cooking technology was the use of drilled or perforated soapstone slabs, presumably for use in stone boiling (Anderson et al. 1979; Dagenhardt 1972; Elliott 1981; Trinkley 1974; Wood et al. 1986). These artifacts are abundant at some Late Archaic sites in the Savannah River and Oconee valleys in the Georgia and South Carolina Piedmont to the Fall Zone (Claflin 1931:32; Elliott 1981; Wood et al. 1986), but appear rarely in North Carolina (e.g., Bissett et al. 2009; Idol 2016).

Late Archaic occupations in the Appalachian Summit region are marked by a variety of large- to small-stemmed points. The most prominent and recognizable of these is the Savannah River stemmed, a large, broad-bladed, square stemmed point that appeared ca. 3000 B.C. and lasted to ca. 1500 B.C. Subsequent Late Archaic sites frequently contain slightly smaller stemmed points of the Iddins Undifferentiated stemmed or, perhaps, the Otarre stemmed type (Ward and Davis 1999:71), although these general forms were produced during the Middle Archaic and Early Woodland periods as well and may not be exclusive to the Late Archaic period (Larry Kimball, personal communication 2010). Size reduction of stemmed forms is indicated over the course of the Late Archaic to Early Woodland periods in the region, however (Oliver 1981, 1985). The most common feature type during the Late Archaic is a shallow, rock-filled pit (Chapman 1981; Keel 1976). Toward the end of the Late Archaic, fiber tempered pottery appeared in the coastal regions (Sassaman 1993); although such pottery was found at the Ravensford site in Swain County (Benyshek and Webb 2017a; i.p.), it is a rare occurrence in the Appalachian Summit. There is increased evidence for trade during the Late Archaic period, as indicated by the presence of soapstone, slate, and other materials outside their source areas (Chapman 1985).

Woodland Period (ca. 1000 B.C.–A.D. 1000)

The Woodland period began as early as 1000 B.C. and continued until the appearance of the Mississippian adaptation around A.D. 1000. Across the eastern Woodlands, the period is marked by the appearance of widespread pottery use, the use of the bow and arrow for hunting and warfare, a greatly increased role for horticulture in subsistence economies, expanded evidence for complex trade and exchange networks, and an elaboration of mortuary ceremonialism, including the appearance of burial mounds (Anderson and Sassaman 2012; Carr and Case 2005; Smith and Yarnell 2009).

Early Woodland (ca. 1000–200 B.C.). Initial Woodland occupations are generally thought to reflect a largely unchanged continuation of Late Archaic lifeways coupled with the first widespread introduction of ceramics. The earliest Early Woodland manifestation in the Project region is the Swannanoa phase, which

dates ca. 1000–200 B.C. Regional radiocarbon dates for Swannanoa materials include a corrected, uncalibrated date of 2130±40 B.P. (representing a 2-sigma range of 260–100 B.C.) (Benyshek and Webb 2006) and a corrected, uncalibrated date of 2435±25 B.P. (representing a 2-sigma range of 535–435 B.C.) (Benyshek 2020).

The Early Woodland period is characterized by thick, crushed quartz or coarse sand tempered, fabric impressed ceramics; cordmarked, plain, check stamped and simple stamped wares are also thought to date to late in the Early Woodland period (Keel 1976:260–266; Ward and Davis 1999:140–143; Wetmore 2002:254–257). Vessel forms consist of unrestricted conical pots and simple bowls. Eastern Tennessee's Watts Bar and northern Georgia's Kellogg phases are similar stylistically to Swannanoa materials, as are Vinette ceramics from as far away as eastern New York (Ward and Davis 1999:142).

Early Woodland projectile points consist of smaller stemmed points, the terminal expressions of the large stemmed point tradition, along with large triangular varieties. The latter include the Transylvania and Garden Creek types, which are morphologically equivalent to Badin and Yadkin types in the Piedmont (Keel 1976; Oliver 1985). Although Swannanoa phase site distributions have not been thoroughly documented, it is apparent that the settlement pattern included large floodplain sites along with numerous small upland extractive camps. Direct evidence is lacking at present, but it seems likely that the Early Woodland inhabitants of the region were engaged in at least some degree of horticulture (Ward and Davis 1999:145). Based on evidence at Phipps Bend in eastern Tennessee, deer, elk, and turkey were the animals primarily hunted (Lafferty 1981). To date, no well-defined Early Woodland structure patterns have been identified in the region. The nearest examples of Early Woodland structures include a 10 × 7 meter rounded rectangular structure from the Banks III site (40CF108) in Coffee County, Tennessee, and three poorly-defined structures (two are arcs of posts and one is elliptical) from the Kellogg, Garfield, and Two Run Creek sites in Cherokee and Bartow counties, Georgia (Bacon 1982; Bowen 1989).

Middle Woodland (ca. 200 B.C.–A.D. 600). The Middle Woodland period in western North Carolina is divided into an earlier Pigeon phase (ca. 200 B.C.–A.D. 200) and a later Connestee phase (ca. A.D. 200–600), each associated with distinct ceramic styles. Pigeon phase occupations have been very difficult to isolate however, although a few sites (e.g., Magic Waters [Benyshek 2018a)] and 31SW74 [Webb 2002]) have yielded unmixed assemblages. Thus far, the Magic Waters site in Jackson County is the most extensively documented Pigeon phase domestic site, which contained a village delineated by circular structures and associated pit features.

Much more is known about the lifeways, architecture, and subsistence practices of the subsequent Connestee phase. The Connestee phase is characterized by mound construction and intensified long-distance trade, and it is apparent that some western North Carolina groups participated in the Hopewell exchange network (Chapman and Keel 1979; Keel 1976:157; Wetmore 2002:263; Wright 2013, 2019) in which raw materials and finished artifacts were traded over vast areas of eastern North America (Brose and Greber 1979; Carr and Case 2005; Seeman 1979). Regional sites with Middle Woodland components that have been the focus of intensive investigations include Garden Creek in Haywood County (Keel 1976; Wright 2013, 2019), Biltmore Mound in Buncombe County (Kimball and Shumate 2003; Kimball et al. 2004), Ela in Swain County (Wetmore 1989, 1996), Harshaw Bottom in Cherokee County (Robinson 1989), Tuckasegee in Jackson County (Keel 1976), the Tyler-Loughridge site in McDowell County (Robinson 1996), the Cherokee EMS site in Swain County (Benyshek 2007b), the Bent Creek site in Buncombe County (Shumate and Kimball 2006), the Iotla Site at Macon County Airport (Benyshek 2020), the Magic Waters Site in Jackson County (Benyshek 2018a), and the Icehouse Bottom site in Monroe County in eastern Tennessee (Chapman 1973; Cridlebaugh 1981).

Bass (1975:81) reports that while over 50% of Middle Woodland sites in his sample occurred on the floodplain, 40% were located above the valley in coves and on benches. Numerous large and small sites

dating to this period have been found, suggesting periodic aggregation and dispersion or some kind of settlement dichotomy. By Connestee times, however, sites have been demonstrated to occur most often in the floodplains, and a higher percentage are present on the first rise above the river than in the preceding Pigeon or Swannanoa phases (Wetmore et al. 2000). Across the Southeast, Middle Woodland settlements appear to have varied in size and scale, but people generally lived in dispersed communities and used sites with monumental architecture, such as Garden Creek and the Biltmore Mound site, as central places for social integration and important gatherings (Anderson and Sassaman 2012; Carr and Case 2005).

Horticulture is believed to have become increasingly important during this period, although mast resources remain the most visible dietary contributor. Possible late Middle Woodland cultigens in the region include maygrass (*Phalaris caroliniana*), little barley (*Hordeum pusillum*), sumpweed (*Iva annua*), sunflower (*Helianthus sp*.), maize (*Zea mays*), squash (*Cucurbita* sp.), gourd (*Lagenaria* sp.), and perhaps *Chenopodium* (Benyshek 2007b; Chapman and Crites 1987; Crites 2004; Gremillion 2018; Robinson 1989; Webb 2002). Evidence for the use of animal resources is scarce from Middle Woodland sites in the area, save Biltmore Mound where preservation is excellent. Faunal information from the Connestee phase mound area may not be representative of overall diet and utilization due to the probable ceremonial activities including feasting that took place there, but no information is available from the associated village to date. The assemblage is dominated by terrestrial species (white-tailed deer, turkey, box turtle, raccoon, squirrel) with aquatic resources (fish, mussels) used much less frequently (Whyte 2004).

Diagnostic early Middle Woodland ceramics in western North Carolina include the Pigeon series, which Keel (1976:256–260) defines as including check stamped, simple stamped, plain, brushed, and complicated stamped varieties with crushed quartz temper. Vessel forms include conical jars, hemispherical bowls, and tetrapodal and shouldered jars with flaring/everted rims. Pigeon ceramics are relatively common in the region but are generally found in mixed contexts (Ward and Davis 1999:146), perhaps indicative of stable populations inhabiting the same areas for long periods of time.

Subsequent Middle Woodland ceramics consist of the Connestee series, which are generally thinner, sand tempered wares most often plain or decorated with simple stamped, cordmarked, or brushed surfaces. Crushed quartz temper was added in small amounts. Fabric impressed and check stamped sherds are also included in the series. Plain necks are characteristic, with punctated shoulders rarely occurring (Keel 1976:247–255). Swift Creek ceramics are sometimes found as a minority ware on Middle Woodland sites in the area (Keel 1976:71; Kimball and Shumate 2003; Robinson 1989). Also found, but extremely rare, are Ohio Hopewellian ceramics (both non-local manufacture and locally made copies) and figurines (Keel 1976:118–119; 120–123; Kimball and Shumate 2003). Lithic artifacts characteristic of the late Middle Woodland consist of large triangular and side-notched projectile points (Garden Creek and Connestee triangulars, Pigeon side notched), bar gorgets, and a prismatic blade and polyhedral core technology that was probably ultimately derived from the Hopewellian Midwest (Chapman and Keel 1979:157). Copper is also found on Middle Woodland sites in the area but is rare (Benyshek 2007b; Chapman and Keel 1979; Setzler and Jennings 1941).

Connestee phase populations engaged in mound building, evidenced by such substructure mounds as Garden Creek No. 2 and the Biltmore Mound, and interacted with Hopewellian populations in the Midwest and elsewhere (Keel 1976; Kimball and Shumate 2003; Ward and Davis 1999:151–153; Wright 2013, 2014, 2019). Connestee series sherds are present on some Hopewellian sites, and small numbers of Hopewellian ceramics and bladelets made of chalcedony from Flint Ridge in Ohio are present at the Garden Creek site, at the Biltmore Mound site, and at Icehouse Bottom (Chapman 1973; Chapman and Keel 1979; Kimball and Shumate 2003; Moore 1984). Marine shell was also traded (Kimball et al. 2004). It has been hypothesized that western North Carolina was one source of the mica that was traded and used widely across the East during this period. Recent investigations at the Garden Creek site have recorded two subrectangular enclosures similar to those found in Midwestern Adena and Hopewell contexts; these appear

to result from earlier ritual use of the site and further illustrate the extent of the socio-economic ties developed between local and non-local populations during the Middle Woodland period (Wright 2013).

Increasing information concerning Connestee architecture has been developed over the last several decades. At Garden Creek Mound No. 2, at the base of the premound layer, a square structure measuring approximately 6 m across was identified and was attributed to the Connestee occupation (Keel 1976:95, 99). At Ela, at least eight circular structures 7–8 m in diameter were identified as representative of Connestee phase constructions (Wetmore 1989, 1996, 2002). More recent excavations at the Macon County Airport and Old Elementary School sites have also uncovered Connestee structures, both circular and square to rectangular (Benyshek 2016, 2020; Benyshek and Webb 2009; Steere 2017). These circular and square-with-rounded corner structures are at least superficially similar to shapes found in monumental Hopewell earthworks and may represent another way in which local Southern Appalachian people took part in cultural practices associated with the Hopewell Interaction Sphere (Wright 2013).

Late Woodland (ca. A.D. 600–1000). The Late Woodland period in much of the Southeast saw the emergence of sedentary village life and intensive maize horticulture and the development of complex tribal and chiefdom-level political structures. Certainly, by A.D. 1000, many interior Southeastern groups were producing substantial amounts of maize, which continued into the Mississippian period when wild food resources were supplemental to cultivated ones (Gremillion 2018; Scarry 2003:88–89). This change in agricultural practices coincided with the Medieval Warm Period of ca. A.D. 800 to 1100, which likely made corn agriculture more productive (Anderson 2001). While once largely overlooked for its "good gray cultures," the Late Woodland period is now better understood as a complex time when the broad interaction networks of the Middle Woodland period contracted, and the social landscape was marked by regionalism and increased evidence for warfare (Birch et al. 2016; Cobb and Garrow 1996). The regional diversity of Late Woodland ceramic traditions and use of palisades provide evidence of more inward-looking societies (Birch et al. 2016), while at the same time, a widespread tradition of simple stamped pottery across much of the Southern Appalachian region suggests that indigenous communities played a larger role in the development of the first large Mississippian centers than previously thought (Anderson 2017; Riggs et al. 2015).

The Late Woodland in the Appalachian Summit was once described as largely invisible (Wetmore 2002), and a similar lack of recognition of distinctive Late Woodland components has been described in northern Georgia (Rudolph 1991). Part of the problem may be the lack of specific diagnostic artifacts useful for unequivocally identifying sites of this period (as plain sherds and small triangular projectile points can be difficulty to qualify), but it is also possible that the Appalachian Summit region was more lightly populated during this time and small, dispersed sites were more typical (Rudolph 1991); such sites have been increasingly identified in the past two decades as a result of an increasing number of large-scale projects in the region. In addition, Robinson et al. (1994, 1996) have argued that the Connestee phase lasted into the Late Woodland period based on work at several sites. One Late Woodland manifestation was identified by Keel and Egloff (1984) at the Cane Creek site in Mitchell County; the distinctive, largely plain-surfaced assemblage from that site is similar to Connestee wares and associated with a single radiocarbon date of 1340±90 B.P. (uncorrected). Similarly, an AMS date from a Buncombe County site in an upland setting (31BN943) produced multiple 2-sigma ranges of Cal A.D. 690 to 900 and A.D. 920 to 950 associated with sand tempered plain ceramics (Idol 2010).

Scattered Napier and Late Swift Creek ceramics and sites (such as Cullowhee Valley School [31JK32] [Ashcraft 1996; Greene 1996:120–121; Moore 1992], Biltmore II [31BN175] [Hall and Baker 1993], Ravensford [31SW78/136] [Benyshek and Webb i.p.; Webb 2002; Wild 1994], Hominy Creek [31BN828] [Paré et al. 2007], Sneed [31JK466] [Benyshek 2008a], and Boundary Tree [31SW494] [Idol 2011a]) also occur in the region and reflect influences from the south during this period. A radiocarbon date obtained from Cullowhee Valley School is similar to those obtained from the Sneed site, which are calibrated at the

2-sigma level to A.D. 660–860 (Benyshek 2008a), to the one date from Boundary Tree (A.D. 654 to 769) (Idol 2011a), and two associated with a mixed Swift Creek and Napier assemblage (A.D. 716–883) in Buncombe County (Idol and Webb 2018). Mid- to late 8th century dates obtained from 31SW136 in association with Napier and/or Late Swift Creek ceramics are similar to these (Benyshek and Webb i.p.; Wild 1994). Rudolph (1991) suggests that increased regionalization of ceramic styles and site dispersal occurred during this period in northern Georgia, and this appears be the case for western North Carolina as well.

Mississippian Period (ca. A.D. 1000–1450)

The Mississippian period in the Southeast is marked by the increasing intensification of maize horticulture, the establishment of increasingly hierarchical social structures and settlement systems, an increase in ceremonialism expressed architecturally in the construction of flat-topped substructure mounds, and evidence for a shared set of religious and cosmological ideas (Anderson 2017; Knight 2006; Reilly and Garber 2007). Studies of relations between native chiefdoms and Spanish expeditions in the 16th century suggest that some type of supra-chiefdom level organization was maintained through a system in which paramount chiefs traveled from fief to fief, displaying royal powers and prerogative and receiving gifts and tribute from subservient chiefdoms (Smith and Hally 1992). Large-scale analyses of ceramic temper and surface decoration on pottery across the Southern Appalachians suggest that beginning around A.D. 1000, indigenous leaders drew on pre-existing social and political conditions to consolidate their power, and that while networks of chiefly interaction were unstable, other social networks and institutions were more durable (Birch et al. 2016; Lulewicz 2019). Settlement pattern studies suggest that boundaries between chiefdoms or other polities were maintained during the Mississippian period, but that individual chiefdoms rose and fell in cyclical patterns (Hally 2006). There is a general understanding that many of the core cultural patterns of the Mississippian period can be traced to religious and symbolic ideas and practices developed at Cahokia and spread throughout the region, but that "Mississippianization" played out very differently in different parts of the Southeast (Anderson 2017; Pauketat 2009).

The Pisgah phase (ca. A.D. 1000–1400) corresponds with the early centuries of the Mississippian period in at least parts of western North Carolina (Dickens 1976:13–14); sites with Etowah phase (ca. A.D. 1100–1300) components also are present in the Hiwassee (Riggs and Kimball 1996) and upper Little Tennessee valleys (Benyshek 2020). Sites with high percentages of Pisgah pottery are found primarily in the eastern and central parts of the Appalachian Summit region, and range from small sites such as Brunk (Moore 1979, 1981) to nucleated villages with substructure mounds such as Garden Creek (Ward and Davis 1999:160–161). Palisades have been recorded at the Garden Creek, Warren Wilson, Cane River, and Norton Field sites, suggesting that communities were concerned with defense and warfare (Idol et al. 2019; Keel 1976; Moore 2002). Pisgah pottery is also found in the western part of the summit region as well, however, and into northern South Carolina, southwestern Virginia, and northeastern Tennessee (Dickens 1976). Diagnostic Pisgah artifacts include small triangular projectile points and distinctive rectilinear complicated stamped vessels with collared, punctated rims. Dickens (1976) suggests that finer-lined complicated stamping and lack of rim elaboration characterize the earlier portion of the phase, and such materials have been documented from the Brunk, Ravensford, and other sites (Benyshek and Webb 2017a, 2017b, i.p.; Eastman 2016, 2017a; Moore 1981).

More recently, ceramics attributable to an early Pisgah subphase and associated structure evidence have been encountered at Ravensford (Benyshek and Webb 2017a, i.p.) and other nearby sites (e.g., Benyshek 2016). Sherds from Early Pisgah contexts include the common rectilinear "ladder" stamped variety as well as those with surfaces resembling woven or "reed" impressions, unidentifiable "woven" surfaces that initially resembles off-set or irregular checking, those with partially smoothed rectilinear stamped surfaces as well as other partly smoothed (or burnished) plain surfaces (cf. Benyshek and Webb 2017a, n.d.; Eastman 2017a, 2017b; Idol 2018a). Associated rim samples include a few "collared" rims, but are largely

characterized by vessel lips that are thickened and decorated, usually with oblique notches or slash-marks, and occasionally with a single deep groove on the surface of the lip (Benyshek and Webb 2017a, n.d.; Idol 2018a:216). Similar sherds were also found at the Brunk site (Moore 1979, 1981) and may be masked within other Pisgah assemblages elsewhere.

Early Pisgah phase structure patterns encountered are of flexed-pole construction and variously square or rectangular with rounded ends; such buildings have now been encountered at the Ravensford (Benyshek and Webb 2009, i.p.), Norton Field (Idol et al. 2019, 2020); Riverbend (Shumate et al. 2009), Ocona Valley (Benyshek 2008b), Old Elementary School (Benyshek 2016), Tuckasegee (Tippett et al. 2014), Cullowhee Mound and Village (Benyshek et al. 2018b), and Magic Waters (Benyshek 2018a) sites. This pattern of domestic architecture is markedly different from the wall trench structures that were common in the Central Mississippi Valley during the same time period and is more closely aligned with house patterns in the South Appalachian regions from contemporaneous occupations at sites such as Hiwassee Island and Etowah (Cobb and King 2005:169; Steere 2017:36-41). Later Pisgah structures more closely approximate the typical Southern Appalachian Mississippian forms (Dickens 1976; Steere 2017). Maize and other crops were important sources of food, but floral and faunal remains document the persistence of wild resources as major components of the diet (Ward and Davis 1999:171). Warren Wilson is the most extensively explored Pisgah village to date, and work there over several field seasons documented at least seven palisade lines and 17 structures (Dickens 1976; Moore 2002; Ward 1986). Garden Creek Mound and Village also contains a Pisgah component, and the main mound (Mound No. 1) there was constructed during the Pisgah phase (Dickens 1976).

Toward the mid-1200s and early 1300s, the Medieval Warm Period (A.D. 950–1250) ended and the Little Ice Age (A.D. 1300–1850) began (Mann et al. 2009). This climate event resulted in cooler temperatures and increasingly unpredictable weather, both of which would have affected subsistence economies. The climate shift of the Little Ice Age has been associated with changes in settlement patterns in other South Appalachian cultures (Anderson 1994; Hally 1994; Rodning 2004; Whyte 2003) and with migration of people out of a large section of the mid-continent, from the Ohio River to the Mississippi River and as far south as northern Mississippi (Cobb and Butler 2002; Sullivan 2018). These large-scale changes in climate and human interaction certainly played some role in the changes in material culture observed in the 14th and 15th centuries.

The subsequent Qualla phase reflects a close association between the Cherokee and the Appalachian Summit region. Although elements of the material culture, belief systems, place names, and social structure of Mississippian society lingered in the region well into the 19th century (and in some cases to the present day), the Qualla phase is largely one of social change and adaptation due to increasing Euro-American intrusion and settlement.

HISTORIC CHEROKEE OCCUPATION

Pre-Removal Cherokee Occupations

The first Euro-American intrusion into western North Carolina took place in 1540, when Hernando de Soto's expedition passed through the area. Several different reconstructions of de Soto's route have been proposed, with some early scholars (e.g., Swanton 1985:201–202) suggesting that he crossed Cherokee country by way of the Hiwassee Valley. A later reconstruction (Hudson et al. 1984) proposed that de Soto crossed the Blue Ridge farther to the north at Swannanoa Gap and then continued along the French Broad River into Tennessee; more recently, Beck (1997) and Hudson (1997:193) agreed that the expedition probably followed a more northerly route along the Toe River. The route through the Swannanoa Gap may have been taken by Juan Pardo, however, who was a Spanish explorer who traversed much of the same area from 1567–1568 (Beck 1997:167; Hudson 1990:27–46, 1997:193). The accounts of the Pardo expedition

suggest that at least two important Cherokee mother towns, Nikwasi and Kituwah, were well established by 1568. In a summary of 16th century place names recorded in the Pardo accounts, Booker et al. (1992:407) note that: "Quetua was Kittowa (Kituhwa), an 18th century town on the Tuckasegee River, and that Nequase was Naquasse (Nikwasi), another 18th century Cherokee town."

Whatever the precise routes of these explorers, it is clear that the ancestral Cherokees' first encounter with Europeans occurred in the mid-16th century (and that the Spanish were unlikely to have traversed the present Project area). These encounters were to have dramatic effects. The introduction of European diseases to which the native populations had little resistance caused a major reduction in Native American population levels and extensive changes in political organization, including the creation of coalescent societies which developed new institutions from deep shared cultural traditions (Ethridge 2006; Kowalewski 2006). Elsewhere in the Southeast, the fragmentation and reformation of political groups resulted in major changes in political organization and the total disappearance of some precontact societies (Ethridge 2006; Smith 1987). But although substantial disruption occurred, the Cherokee managed to retain control of portions of their homeland.

The historic-period Cherokee occupation of western North Carolina is known archaeologically as the Qualla phase (ca. A.D. 1450–1838). Although early formulations of the phase (Dickens 1976) divided it into two segments (Early Qualla, ca. A.D. 1450–1650; and Late Qualla, ca. A.D. 1650–1838), more recent analysts (Riggs and Rodning 2002; Rodning 2004, 2008; Ward and Davis 1999) utilize a tripartite division. Following this latter scheme, the early Qualla phase predates A.D. 1500, and thus was likely contemporaneous with at least the later part of the Pisgah occupations in the region. These authors suggest that the Qualla phase represents an *in situ* development in the Upper Little Tennessee and Hiwassee basins and likely is not a direct derivative of the Pisgah phase, although the presence of large platform mounds at the Nikwasi and Peachtree sites and the occurrence of Middle Cumberland Region negative painted ceramics at the Jasper Allen and Peachtree mounds also suggest interaction between indigenous communities and people to the west, possibly a result of the depopulation of the "Vacant Quarter" at the end of the 14th century (Keel 2019; Steere 2019; Sullivan 2018). Early Qualla phase ceramics show affinities to the more southern Savannah and Wilbanks styles, and samples from Coweeta Creek and 31SW291 are characterized by grit tempered, primarily rectilinear complicated stamped wares (Riggs and Rodning 2002:39), sometimes with "sawtooth" rims. Red filming also occurs (Rodning 2004). Pisgah collared and punctated rims are not an uncommon occurrence with these Early Qualla wares, however, and Early and Late Pisgah ceramics have been identified at Ravensford (Benyshek and Webb 2017a). Domestic structure forms during the Early Qualla phase are the same as Late Pisgah forms and are similar to Lamar phase houses in Georgia and Dallas and Mouse Creek phase houses in eastern Tennessee (Benyshek and Webb 2009, i.p.; Steere 2017).

Subsequent Middle Qualla phase (ca. A.D. 1500–1700) ceramics are characterized by jar forms with notched appliqué, or more often, folded and notched everted to flared rims, and also by the presence of carinated or cazuela bowls with incised designs. Curvilinear complicated stamping predominates, although rectilinear designs are also present (Rodning 2004). By the Late Qualla phase (post-A.D. 1700), some variations occurred; incised ceramics became much less common, while rectilinear stamped designs, rims with notched appliqué strips or fillets, and check stamping are more common in later, pre-Removal (pre-1838) assemblages.

The Qualla phase subsistence base was mixed, and included cultivation of corn, beans, and other foods as well as wild plant gathering, hunting, and fishing (Dickens 1976:14; VanDerwarker et al. 2013). The Late Qualla phase is marked by the increasing appearance of European goods at Cherokee sites. Although small triangular projectile points are found in Early and Middle Qualla phase assemblages, their manufacture (and most other stone tools) decreased rapidly with the increasing prevalence of European firearms after A.D. 1700 and widespread access to iron tools (Riggs 1999:52). During this time, Cherokee settlements became

increasingly less nucleated, often appearing as a linear array of dispersed houses along streams, and agricultural fields were maintained closer to residential areas. European domesticated animals (especially pigs and chickens) and garden crops (notably sweet potatoes) were adopted by the mid-18th century. By this time and in the years after, traditional Cherokee life was increasingly disrupted by depopulation and demographic changes, and alterations to the traditional economies (Hatley 2006).

Structure forms varied throughout the Qualla phase. Early Qualla phase structures documented at Ravensford include winter-type structures, rounded squares of rigid post construction typically constructed in basins, with central support posts and wall trench entryways. These were accompanied by (but not closely paired with) square to rectangular houses of less regular construction, which lacked central support posts and entryway trenches (Benyshek and Webb 2009, i.p.). These domestic structures generally mimic the patterns documented at several late precontact sites in the southern Appalachians (e.g., Hally 1988, 1994, 2008; Moore 2002; Polhemus 1987; Rodning 2009a; Steere 2017; Sullivan 1987). A few rounder 15th-century domestic structures were encountered at Coweeta Creek (Rodning 2009a:13). Larger, rectangular structures of more substantial construction appear to represent contemporaneous public buildings at Ravensford (Benyshek and Webb 2009, i.p.).

Middle Qualla phase architecture, known from the Coweeta Creek, Macon County Airport (MCA), and McCoy Bridge sites among others, was also similar to late Mississippian (and Early Qualla phase). Domestic structures are typically square with rounded corners and exhibit side or corner entrances and central hearths flanked by four central support posts (Benyshek 2010, 2020; Benyshek and Webb 2009, i.p.; Idol 2017, 2018c; Rodning 2009a:11). At MCA these were associated with rectangular summer houses and storage facilities (Benyshek 2020). Smaller auxiliary buildings that likely functioned as storehouses are present by the late 17th and early 18th centuries (Benyshek 2020; Benyshek and Webb 2009; Idol 2016; Shumate et al. 2005). By the end of the Middle Qualla phase (if not before), mounds associated with the cyclical demolishment and reconstruction of public townhouses were a prominent feature of many Cherokee villages and towns (Rodning 2002, 2009b; Steere 2015; Townsend et al. 2020). Contemporary domestic structures in part appear to have been modelled after the designs of the much larger townhouses (Rodning 2009a).

Townhouses and their associated mounds were, and still are, an important part of the ancestral Cherokee landscape (Steere 2015; Townsend et al. 2020). By approximately A.D. 1600 and into the late 18th century in western North Carolina, townhouses replaced mounds as the primary form of public architecture (Rodning 2009b, 2010). Townhouses measured between 10 to 20 meters in diameter and were often rebuilt in place over time. This process gradually formed a low mound and created an elevated base for new townhouse construction. In some cases, Cherokee communities constructed townhouses on top of existing platform mounds built centuries earlier.

The Cherokee townhouse at the Coweeta Creek site (31MA34) is one of the best preserved and archaeologically understood examples of these structures (Rodning 2002, 2004, 2009b). This large public building had at least six successive stages and was used from the 1600s to the late 1700s (Rodning 2010:59). In contrast to platform mounds, which literally and metaphorically elevated the chief above other community members, townhouses were public structures that likely functioned as an architectural symbol of the Cherokee town, emphasizing the importance of community identity over individual leadership (Rodning 2016).

During the historic period, a sacred fire was kept burning in Cherokee townhouses, and once a year, all the hearths in the village were extinguished and then ceremonially rekindled from this sacred fire (Mooney 1900:396). Based on traditional Cherokee beliefs, sacred fires continue to burn at places like Kituwah (Duncan and Riggs 2003:146–148; Mooney 1900:396). Cherokee stories also suggest that mounds were the home of the *Nunnehi*, immortal spirit buildings, and that mounds and townhouses are symbolically

associated with mountains (Mooney 1900:335–337; Rodning 2009, 2010). According to Cherokee oral tradition, the Kituwah mound marks the center of the first Cherokee village and the ancestral home of the Cherokee people (Duncan and Riggs 2003:73–74). Thus, in addition to serving as hubs for social and political activities, townhouses created a link between the built environment and sacred aspects of the natural landscape.

By the end of the 17th century into the 18th century, rectangular summer houses were closely paired with and sometimes connected to winter houses, which were typically octagonal (e.g., Benyshek 2020; Benyshek and Webb 2009; Cable et al. 1997; Marcoux 2008, 2010; Nelson et al. 2016; Shumate et al. 2005; Webb and Benyshek 2008b). The late 18th century witnessed a shift toward more European-style architecture (Dickens 1976:15); a final shift from traditional post-in-ground architecture to horizontal cribbed log cabin construction occurred in the 1790s (Riggs 1999:515; Riggs and Belt 2019).

The roughly 170-year period between the founding of Charleston in 1670 and the Removal in 1838 was marked by increasing Euro-American penetration into the Cherokee homeland, first by traders and military officials and then by settlers, and by increasing deleterious effects on the health and lifeways of the native peoples (see Marcoux 2010:3–19 for a summary of the English Contact period [1670–1740]). Although the period was marked by frequently changing social, economic, and military relationships among the colonies (and later states), the Cherokees and other American Indian groups, by the end of this period the Cherokees were to lose most of their lands in what is now North Carolina.

The early 18th century Cherokees occupied 60 or more named towns (Goodwin 1977:44; Gragson and Bolstad 2007:443; Smith 1979; Thornton 1990:24–25), which were distributed across a 14,000 square kilometer area (Gragson and Bolstad 2007:2) along the upper Savannah, Little Tennessee, and Hiwassee drainages in what is now northwestern South Carolina, western North Carolina, northeastern Georgia, and eastern Tennessee (Gragson and Bolstad 2007; Lee 2004; Schroedl 2000). Individual towns are believed to have covered from 10 to 80 hectares and contained from 100 to 600 individuals, distributed into about 10 to 60 households (Gragson and Bolstad 2007:443; Schroedl 2000). Taken together, it is likely that the early 18th century Cherokees had a total population of around 10,000 to 12,000, which likely represented a substantial decline from that of the late 17th century (Thornton 1990:210).

These towns are frequently grouped into four or five clusters based on geography (e.g., Goodwin 1977:38; Schroedl 2000) and corresponding at least to some extent to linguistic differences and groupings recognized by the Cherokees themselves. The Lower Towns were along the Keowee River and other tributaries of the upper Savannah, in present-day South Carolina and northeastern Georgia. To the northwest were the Valley Towns, primarily along the Hiwassee and its tributaries; farther northwest across the Appalachians were the Overhill Towns. East of the Valley Towns along the upper Little Tennessee River were the Middle Towns, and northeast of the Middle Towns, along the Tuckasegee and its tributaries, were a small group of towns sometimes referred to as the Out Towns. The Out Towns were separated from the Middle Towns by the Cowee Mountains (Greene 1996:38).

The Project area lies within the Middle Towns. Given their relative proximity to the Anglo-American settlements in South Carolina and Georgia, the Middle Towns had early and frequent interactions with traders and other sanctioned and unsanctioned interlopers. The Middle Towns were at the heart of the Anglo-Cherokee war of 1760–1761, when troops under Lt. Colonel James Grant burned some 15 towns, destroying approximately 580 houses and 1,330 acres of corn (Tortora 2015:151). The Middle Towns were again subjected to similar attack by General Rutherford's North Carolina Militia in 1776 (Corkran 1962; Dean 2012; Dickens 1967; French 1977; Grant 1933; King and Evans 1977; Rogers 2009:37), resulting in catastrophic dislocation and privation.

With the signing of the Treaty of Hopewell in 1785, the Cherokee lost their remaining lands east of the Blue Ridge (Mooney 1900:61–62). A subsequent treaty in 1791 resulted in additional cessions but failed to stop Euro-American incursions into Cherokee lands and the resulting conflicts (Mooney 1900:68–77). A third treaty signed in 1798 ceded additional land in North Carolina (Riggs 1988:171).

Treaties signed in 1817 and 1819 resulted in the cession of much of the remainder of present-day Macon, Swain, and Jackson counties to the U.S. Government (Royce 1884, 1887). The Calhoun Treaty of 1819 resulted in the cession of large areas of Cherokee lands in what is now Macon and adjacent counties (Jurgelski 2004:26; Royce 1884, 1887), but although these treaties were intended to encourage Cherokees to migrate west to Arkansas, they allowed any Cherokee head of family residing within the ceded lands who wished to become a U.S. citizen to apply for a life reservation of 640 acres. Ninety-one individuals in western North Carolina applied for reservations, and 49 life estates and two fee-simple reservations were deeded (Douthat 1993; Jurgelski 2004:147; Riggs 1988:15, 25; Royce 1887). The cession boundary ran along the Little Tennessee River, with the area to the north and east passing to the U.S. and the area to the south and west remaining in the Cherokee nation.

Much of the Cherokee lands were surveyed prior to sale by the State of North Carolina in 1820 by teams under the direction of Robert Love, who laid out 656 individual tracts covering approximately 70,000 acres (Jurgelski 2004:181–186). Most of the tracts were in the major river valleys, but tracts were also surveyed along tributaries, such as Iotla Creek. As the State of North Carolina did not recognize the validity of the Citizen Cherokee Reservations, some tracts also overlapped previously surveyed reservations.

Most of the remaining Cherokee land claims in North Carolina were abolished with the signing of the Treaty of New Echota in 1835, which set in motion the forced removal of most of the remaining Cherokee to lands in present-day Oklahoma (Mooney 1900:123–133). The cruelty of this march, known as the Trail of Tears, has been well documented. The early 19th century witnessed the increasing acculturation of many Cherokee, largely as a result of increasing contact and intermarriage with white traders and settlers. Other Cherokee resisted changes to their traditional lifestyles, however, especially those residing in the Out and Middle Towns (Riggs 1988:10–11). Accounts by contemporary observers indicate that the population of the mountainous area of western North Carolina (along with some other areas) was strongly traditionalist and contained a high proportion of full-bloods (McLoughlin and Conser 1984:224–225).

Post-Removal Cherokee Occupations

Despite the Treaty of New Echota and the Trail of Tears, however, some Cherokee remained in their former lands. A sizeable population living along the Oconaluftee and nearby was allowed to remain as a result of their assistance in the Tsali affair. Other Cherokees remained in the vicinity of Cheoah (along Buffalo Creek in present-day Graham County), primarily due to the difficulty in removing them along poor roads (Duggan 1998); in the Valley River area (Greene 2009); and along Cartoogechaye Creek north of the present Project (Alexis 1852). Although the Cherokees were officially dispossessed of their Cartoogechaye lands by the 1819 treaty, William Siler sheltered a sizeable Cherokee community on lands he controlled along Muskrat Branch and Cartoogechaye Creek. By the 1850s this Cherokee community was known as Sandtown and had a population of about 113 (Alexis 1852; Jurgelski 2004:256; Riggs and Duncan 2003:164–165; M. Siler 1980:13–20; A. Siler 1987:23), and in 1870 it reportedly consisted of some seven families (Martin 1998:26). Although some Cherokees remained in Sandtown well into the late 19th century, most of the surviving population had moved to the Qualla Boundary by the 1950s (Riggs and Duncan 2003:165).

Other Cherokees managed to evade the Army, escaped during the Removal, or, like Junaluska, returned from the Arkansas territory soon afterward. These groups became the nucleus of the Eastern Band of Cherokee (King 1979). After the death of Chief Yonagusta in 1839, they were increasingly assisted by William H. Thomas, a white merchant who was Yonagusta's adopted son. Thomas worked on the Cherokees' behalf for the next 40 years, acquiring land for both individual Cherokees and the tribe. Thomas eventually acquired some 73,000 acres for these communities, mostly within the present-day Qualla Boundary.

The mid-19th through 20th century social and political history of the Eastern Band has been described in detail by Finger (1984, 1991), Hill (1997), Mooney (1900), and others. By 1840, Thomas had assisted the Quallatown residents into organizing into three towns, including Paint Town, Wolf Town, and Bird Town. Two other towns, Big Cove and Yellow Town, were later added to these three (Finger 1984:67). By 1851 approximately 883 Cherokees were living in three towns in the Quallatown area. The Cherokees' rights to the lands bought by Thomas were confirmed by a federal court decision in 1874, providing some measure of security to the local population. In 1889, the Cherokees in North Carolina were officially incorporated under state law as the Eastern Band of Cherokee Indians (Finger 1984). Most Cherokees continued to practice a farming economy throughout the 19th century, although hunting, fishing, and gathering wild plant foods were also important subsistence activities.

The Euro-American settlement of the region began in full force in the late 1830s, shortly after the Cherokee Removal. Settlers had begun to populate the area that was to become Macon County immediately after the Treaty of 1819 opened up the area. Macon County was formed in 1828 from Haywood County, and Franklin was made the county seat. Macon County contained parts of Swain, Jackson, and Transylvania counties at the time of its formation (Hall and McRae 1998).

Most of the area that is now Macon County was surveyed in the early 1820s. Four hundred acres were set aside for the county seat and the best lands were surveyed in parcels of 50 to 300 acres, which would each contain some timber and some former Cherokee farmland; prices ranged from four dollars to 50 cents an acre depending on the quality. The state opened up all lands west of the Meigs and Freeman line to claim and entry in 1852 and lowered the price per acre; land was sold at five and 10 dollars per hundred acres. Areas to be claimed were to be surveyed and marked, after which some improvements to the land were required. If no disputes occurred within 12 months, the claimed land could be purchased, and a state grant would be issued (Sutton 1987).

The greater Cartoogechaye Valley area remained agricultural throughout the 19th and 20th centuries, with homes and farm buildings situated on the ridge toes and lower slopes surrounding the valley. Topographic and other maps dating from 1897 through 1946 depict few changes in the valley, apart from the development of road networks and the gradual increase in the number of residences.

PREVIOUS ARCHAEOLOGICAL RESEARCH

Western North Carolina has been the subject of archaeological research for over a century, and most trends in the history of North American archaeology are reflected in the region. As early as the 1880s, workers from the Valentine Museum in Richmond investigated several mound sites in the region (Dickens 1976:7), and other early investigations were carried out by the Osbornes (Keel 1976). The museum's work was primarily oriented toward recovering artifacts, although in some cases the resulting data have been useful in addressing present-day research questions (e.g., Dickens 1976:91). Also in the 1880s, researchers from the Smithsonian Institution's Bureau of Ethnology excavated sites in Buncombe and Henderson counties as part of their investigations into the origin of the "Mound Builders" (Thomas 1894). That research was instrumental in demonstrating that the mounds in western North Carolina and elsewhere had in fact been built by American Indians and were not the products of a mysterious, vanished race.

Early 20th century work in western North Carolina continued to focus on mound explorations. Between 1915 and 1919, George Heye and associates excavated at the Garden Creek site in Haywood County and at other nearby sites (Harrington 1922; Heye 1919; Heye et al. 1918). Although that work was designed to gather artifacts for Heye's Museum of the American Indian in New York, it did provide some data on the antiquity of the Cherokees in the region (Dickens 1976:7–8). Subsequent work in 1933 and 1934 by the Smithsonian Institution at the Peachtree Mound and Village in Cherokee County was also designed to investigate the relationship between the Cherokees and precontact cultures in the area (Setzler and Jennings 1941). Also in the 1930s, George MacPherson (1936a, 1936b) and Hiram Wilburn conducted surveys of numerous sites in Great Smoky Mountains National Park. Although many of their data were to be incorporated into later research (Bass 1975), at the time their work had little impact on the understanding of the region's prehistory.

The 1940s and 1950s witnessed relatively little research in the Appalachian Summit region, and intensive, systematic work did not begin until 1964, when the University of North Carolina instituted the Cherokee Archaeological Project. This project lasted until 1971 and included large-scale surveys as well as excavations of late precontact and historic Cherokee sites (Purrington 1983:98–99). Data from this project have been reported in several theses, dissertations, and other publications (e.g., Dickens 1976; Egloff 1967; Keel 1976), and provide much of the background information on the Appalachian Summit region. As part of that project, substantial work was conducted at the Coweeta Creek site in Macon County on the Little Tennessee River, south of Franklin. That work resulted in the documentation of Cherokee occupations from the 1400s to the early 1700s; several Qualla phase domestic structures were identified along with a townhouse demonstrated to have been rebuilt a number of times and used into the early 18th century (Rodning 2004, 2009). Other sites in Macon County that were the subject of more limited excavations include Cowee and Nequassee (Nikwasi) in downtown Franklin. Surveys from the project resulted in the recordation of many other sites in the county.

Beginning in the 1970s, the establishment of Federal cultural resources legislation and management procedures resulted in an increasing number of archaeological projects, primarily surveys, in Macon County and the rest of western North Carolina. Substantive projects in the county include survey, testing, and data recovery excavations at the Macon County Airport and proposed expansions (Ayers 1991; Benyshek 2020; Benyshek and Webb 2009; Idol and Webb 2010; Trinkley 2000a, 2000b), transportation improvements (Idol 2017; Nelson 2017, 2021), a proposed industrial park nearby (Southerlin et al. 1996), improvements to the Macon County K-4 North School (Idol et al. 2010) and South Macon Elementary School (Govaerts and Hansen 2009), and excavations at the Macon County Industrial Park (Wetmore et al. 1996) and Parker Meadows sites (Nelson and Webb 2013; Nelson et al. 2016) along Cartoogechaye Creek.

4. RESEARCH GOALS AND METHODS

RESEARCH OBJECTIVES

The goal of the survey was to systematically gather data on any archaeological resources present within the Cornbread Valley Mitigation Site. If significant resources were encountered, the archaeological field data were to be combined with information obtained in the background research to address the nature of the precontact, contact, and/or post-contact period occupations of the area.

RESEARCH METHODS

Background Research

Background literature review was conducted to gather information on any known cultural resources on and adjacent to the Project area and included examination of the following materials:

- Architectural surveys and National Register files at the North Carolina State Historic Preservation Office in Asheville;
- Archaeological site files, reports, and data on file at the North Carolina Office of State Archaeology in Asheville; and
- Maps and other data available online, at the UNC Research Laboratories of Archaeology, in the UNC-Chapel Hill North Carolina Collection, and in TRC's collection.

Field Methods

The archaeological survey complied with all pertinent state and federal regulations, including the North Carolina Office of State Archaeology's (OSA) *Archaeological Investigation Standards and Guidelines* (OSA 2017). The field surveys and evaluation studies were conducted by a team of from three to four, consisting of the Field Director and up to three Archaeological Technicians.

The fieldwork included a systematic pedestrian walkover of the entire LOD and systematic subsurface shovel testing at 20-m intervals across all parts of the LOD except for visible wetland areas, areas of greater than 15% slope, or isolated areas of erosion or disturbance; supplemental shovel tests were also excavated at 10-m intervals to delineate finds. Limited shovel testing at 30-m intervals was performed in areas that contained poorly drained soils or that appeared to contain historic-aged, cobbly alluvium.

Each shovel test measured 30 to 35 cm in diameter and was excavated to sterile subsoil. All removed soil (excluding obvious fill) was screened through ¼-inch mesh for uniform artifact recovery. Each shovel test was described in terms of depth, soil texture, Munsell soil color, and artifact recovery. All shovel test locations were recorded using a hand-held Trimble Geo7X Global Positioning System (GPS) in NAD 83 coordinates and drawn on the Project map.

Laboratory Methods

All artifacts were returned to the TRC Asheville facility for processing. Upon arrival in the laboratory, all artifact and sample bags were checked against provenience data from field records prior to processing. Artifacts were washed and air-dried, then sorted for analysis. The following laboratory methods were employed.

Precontact Ceramic Analysis. Precontact ceramic sherds were sorted into fragments greater and less than 2 cm, and only sherds (fragments ≥2 cm in size) were analyzed fully. The sample of small (residual) sherds was scanned for the presence of pipe fragments or other unusual ceramic artifacts but was not otherwise analyzed. Sherd size was determined by diameter templates measuring 2 cm, 2–4 cm, 4–6 cm, etc. Other attributes recorded for sherds include vessel portion, temper type, exterior surface treatment, rim form, and decoration. Individual ceramic sherds were assigned to formal types when possible following type descriptions presented by Egloff (1967), Keel (1976), Riggs and Rodning (2002), and others.

Lithic Artifact Analysis. Lithic artifacts were first sorted into general categories, including chipped stone tool and debitage.

*Tool*s. Lithic tools were described according to form, type (when possible) and raw material.

Debitage. Debitage fragments are the byproduct of lithic tool manufacture. Counts, weight, raw material, and size category were recorded for debitage fragments.

Raw Material Identification. Raw stone materials were identified based on macroscopic characteristics. Categories recognized in the assemblage include chert, quartz, quartzite, and metavolcanic/metasiltstone.

Postcontact Artifacts Analysis. Postcontact artifacts were classified where possible according to published artifact descriptions. Glass items were classified according to function or shape and color. Rim and base fragments were identified. Any additional detail evident was noted, such as embossing or labeling. Ceramic artifacts were classified according to type (i.e. stoneware, whiteware), and any decoration present was described. Other postcontact period artifacts recovered were classified by form, composition, and function wherever possible. Metal objects were classified by function where possible.

Curation

All artifacts, field notes, photographs, and other Project materials are temporarily stored at the TRC facility in Asheville, North Carolina. At the conclusion of the Project, the recovered artifacts will be returned to the landowner.

NRHP Eligibility Evaluation

The NRHP eligibility of the archaeological sites encountered by the Project was considered in light of the NRHP *Eligibility Criteria* as outlined in 36 CFR 60.4 (USDOI 1997). The NRHP Eligibility Criteria state:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association.
>
> (a). That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b). That are associated with the lives of persons significant in our past; or
>
> (c). That embody the distinctive characteristics of a type, period, or method of construction; or that represent the work of a master, or that possess high artistic values; or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d). That have yielded, or may be likely to yield, information important in prehistory or history.

Several factors were considered in assessing site significance and research potential under Criterion D, including artifact variety and quantity, site clarity and integrity, and environmental context (Glassow 1977).

5. RESULTS

PREVIOUSLY IDENTIFIED RESOURCES

Archaeological Sites

Review of files and records at the Office of State Archaeology (OSA) indicated that there have been no systematic surveys and there are no previously recorded sites within or adjacent to the Cornbread Valley Mitigation Site. There are 19 previously recorded archaeological sites within a one-mile radius of the Project, however (Table 5.1). Site 31MA158 is a multicomponent site recorded as part of the UNC Cherokee project and is situated on a stream terrace along an unnamed Jones Creek tributary west of the Project area. The site contains unspecified Archaic and Qualla phase components and remains unassessed for NRHP eligibility. The other sites were recorded during compliance surveys conducted in the Nantahala National Forest, Wayah Ranger District, and consist largely of nondiagnostic lithic scatters.

Table 5.1. Previously Recorded Archaeological Sites within One Mile of the Project.

Site No.	Description	NRHP Status	Reference
31MA158	Precontact: Archaic, Late Mississippian, Qualla phase	Unassessed	*UNC RLA 1971*
31MA217	Precontact: nondiagnostic lithic	Not Eligible	Snedeker 1986a
31MA218	Precontact: Middle Archaic	Eligible	Snedeker 1986a; Bass 1987
31MA219	Precontact: nondiagnostic lithic	Not Eligible	Snedeker 1986a
31MA220	Precontact: nondiagnostic lithic	Not Eligible	Snedeker 1986a
31MA221	Precontact: nondiagnostic lithic	Not Eligible	Snedeker 1986a
31MA222	Precontact: nondiagnostic lithic	Not Eligible	Snedeker 1986a
31MA223	Precontact: nondiagnostic lithic	Not Eligible	Snedeker 1986a
31MA224	Precontact: nondiagnostic lithic	Not Eligible	Snedeker 1986a
31MA228	Postcontact: late 19th to 20th century?	Not Eligible	Snedeker 1986b
31MA300	Precontact: nondiagnostic lithic; Postcontact: late 19th to 20th century	Not Eligible	Webb 1990
31MA303	Precontact: nondiagnostic lithic	Not Eligible	Webb 1990
31MA395	Precontact: nondiagnostic lithic	Not Eligible	Dyson and Snedeker 1992
31MA399	Precontact: nondiagnostic lithic	Not Eligible	Dyson and Snedeker 1992
31MA703	Precontact: nondiagnostic lithic	Not Eligible	Noel 2007
31MA709	Precontact: nondiagnostic lithic	Not Eligible	Noel 2007
31MA710	Precontact: nondiagnostic lithic	Not Eligible	Noel 2007
31MA711	Precontact: nondiagnostic lithic	Not Eligible	Noel 2007
31MA719	Precontact: nondiagnostic lithic	Not Eligible	Ashcraft 2008

* reference in italics is a site form.

Historic Structures

There are no historic structures recorded within or immediately adjacent to the Project LOD. The nearest recorded structures include the Joe Hastings House (MA0301) and Joe Hastings Mill (MA0314), both located northwest of the Project LOD; the Joe Watts House (MA0344), located to the south; and the Gillespie Chapel (MA0299) and Gillespie Chapel Parsonage (MA0313), located along North Jones Creek Road to the east. Based on their locations, there is no potential for any archaeological remains associated with those structures within the Project LOD.

Cemeteries

There are no cemeteries depicted within or adjacent to the Project LOD on historic maps (see below) or listed in available databases (e.g., https://www.findagrave.com/cemetery-browse/USA/North-Carolina/Macon-County?id=county_1707; http://www.ncgenweb.us/macon/cemeteries.htm); the nearest such cemetery is associated with Gillespie Chapel and is situated approximately 300 m to the east.

HISTORY AND MAP DEPICTIONS OF THE PROJECT AREA

There are no known 18th century maps that provide sufficient detail to potentially show Cherokee towns in along Jones Creek, although the 1760 Kitchin map does suggest that at least three named settlements (Tunanutte, Cuttagochi, and Cunnaer) were situated along Cartoogechaye Creek (Figure 5.1); Cherokee towns also were mapped in the general area by Stuart in 1761 following the Grant expedition (Figure 5.2). Given the scale and imprecision of these maps, however, it is impossible to determine the precise locations of those settlements.

The Calhoun Treaty of 1819 resulted in the cession of large portions of Cherokee lands in what is now Jackson, Macon, Swain, and Transylvania counties (Jurgelski 2004:26; Royce 1884, 1887). A substantial Cherokee population was certainly resident in the Cartoogechaye Valley at the time, as a total of 46 claims (involving 127 cabins, 337.9 improved acres, and 443 fruit trees) were subsequently filed by valley inhabitants for losses suffered as a result of the treaty (Riggs 1988:Appendix 2).

The 1819 treaty included provisions allowing any Cherokee head of family residing within the ceded lands who wished to become a U.S. citizen to apply for a life reservation of 640 acres. Ninety-one heads of family in western North Carolina applied for reservations, and 49 life estates and two fee-simple reservations were actually deeded (Jurgelski 2004:147; Riggs 1988:15, 25; Royce 1887). Although a few reservations were claimed along Cartoogechaye Creek (Riggs 1998:Appendix 1), none of those appear to have been surveyed or deeded.

Portions of the Cherokee lands were surveyed prior to sale by the State of North Carolina in 1820, by survey teams under the direction of Robert Love (Jurgelski 2004:181–186). The surveyors eventually laid out 656 individual tracts or "sections," which covered "approximately 70,000 acres, or about one-tenth of the area of the Treaty Lands" (Jurgelski 2004:183). Most of those sections were situated in the major river valleys, such as the Tennessee and Tuckasegee drainages (Jurgelski 2004:185).

The Cornbread Valley Mitigation Site lies within Love's Survey District 15 and includes portions of District 15 Sections 65, 66, and 67 (Love 1911) (Figure 5.3). These tracts cover 149, 159, and 70 acres, respectively; all are described as third quality lands. The original plats for these tracts have not been examined, but Jurgelski (2004:165, Appendixes B and C) indicates that all three tracts were unoccupied at the time of Love's 1820 survey. No detailed search for associated land records has been made, but readily available records indicate that the northernmost of the three tracts, Section 65, was obtained by Macon County Sheriff Eli McKee in 1839 via State Grant 556 (McRae 1991:79; https://www.nclandgrants.com/frame/?fdr=87&frm=661). The original owners for Sections 66 and 67 have not been determined.

As the area had already passed out of Cherokee control by the 1830s, it is not included on the 1838 U.S. Army map showing Cherokee settlements in western North Carolina (Williams 1838). As noted above, the 19th century Cherokee community of Sandtown was situated along Cartoogechaye Creek north and northeast of the Project LOD, at least primarily on lands controlled by the Siler family, but is not known to have extended into the Jones Creek drainage (Brett Riggs, personal communication 2021).

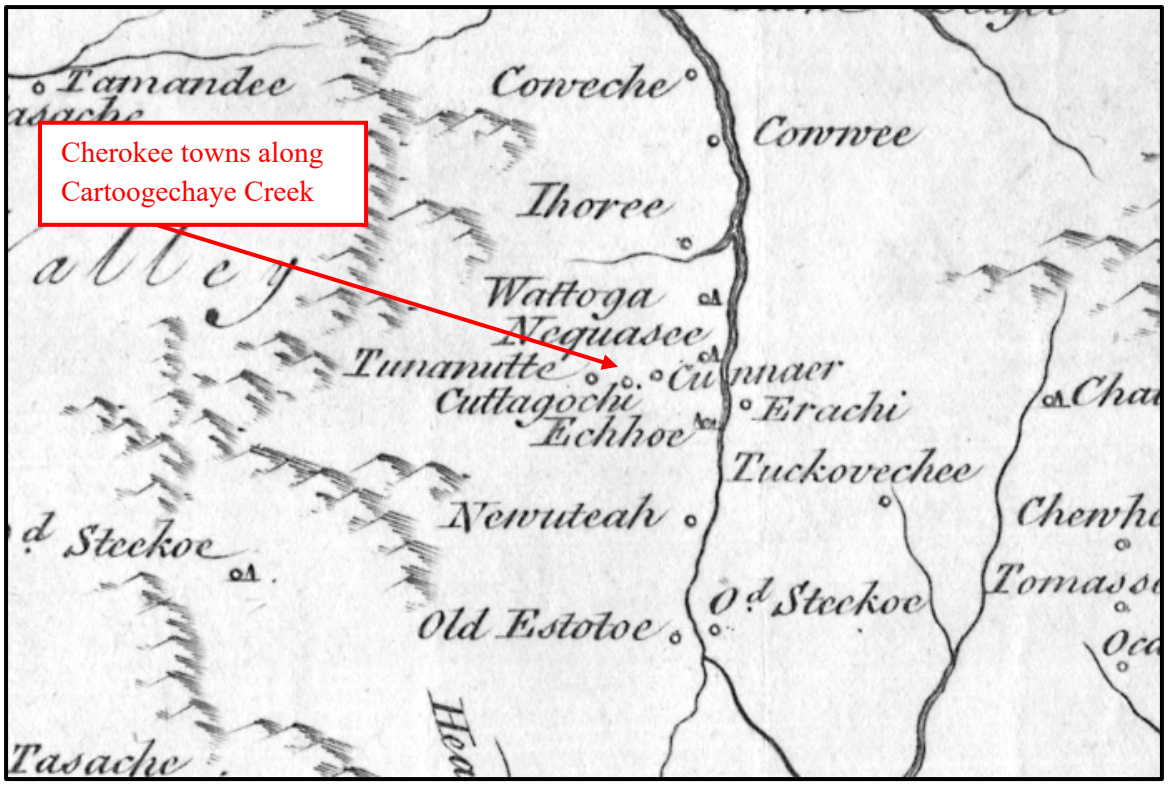

Figure 5.1. Cherokee towns in the Cartoogechaye Creek vicinity as depicted by Kitchin (1760).

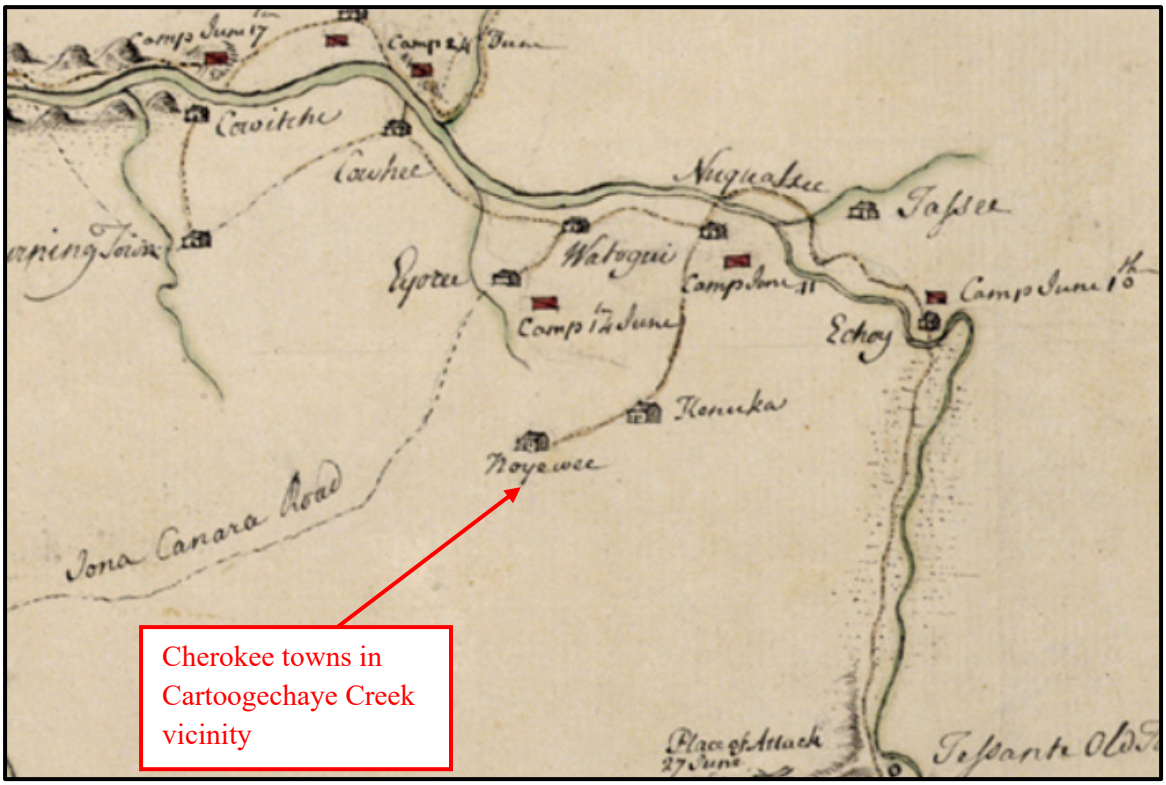

Figure 5.2. Cherokee towns in the Cartoogechaye Creek vicinity as depicted by Stuart (1761).

The earliest USGS topographic map of the area is the 1886 Cowee (1:125,000) topographic map (USGS 1886), which shows no structures or other developments in the Project vicinity (and few in general) (Figure 5.4). The 1897 version of that map (USGS 1897) shows more detail, including roads entering the area from the northwest and east, as well as scattered houses in or near the northern part of the Project LOD (Figure 5.5). The 1907 map (USGS 1907) shows more accurate topographic details, as well as additional houses along Jones Creek and the adjacent roads (Figure 5.6); the 1929 soils map (Devereaux et al. 1933) shows a similar pattern of development (Figure 5.7). The 1935 and 1946 USGS maps (USGS 1935, 1946) are the first maps that allow accurate georeferencing; both maps indicate that 19th to 20th century structures in and near the Jones Creek valley were situated primarily on higher ground adjacent to the valley, and not in the creek bottoms (Figures 5.8 and 5.9).

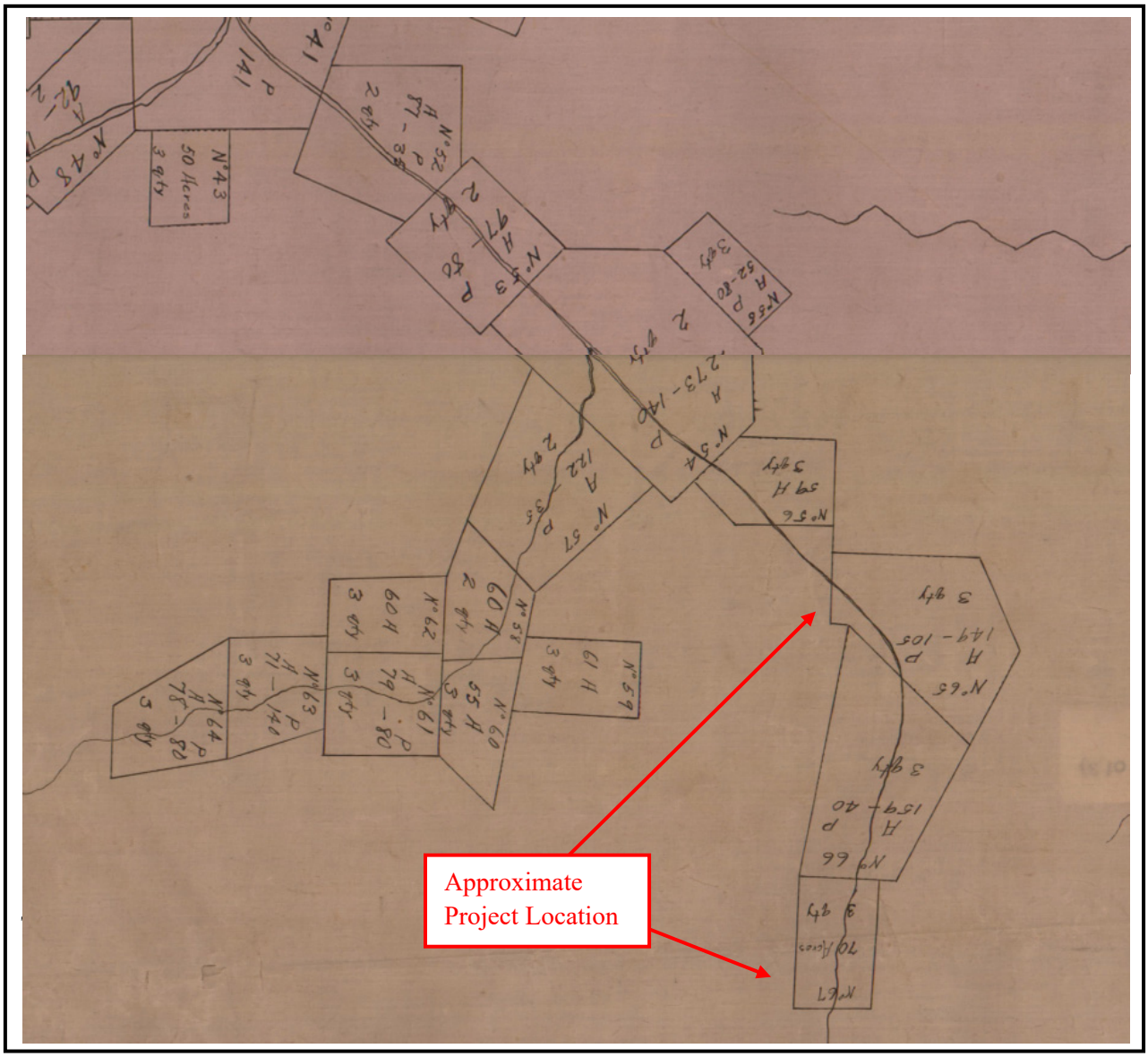

Figure 5.3. The Cornbread Valley Mitigation Site vicinity as surveyed by Robert Love in 1820.

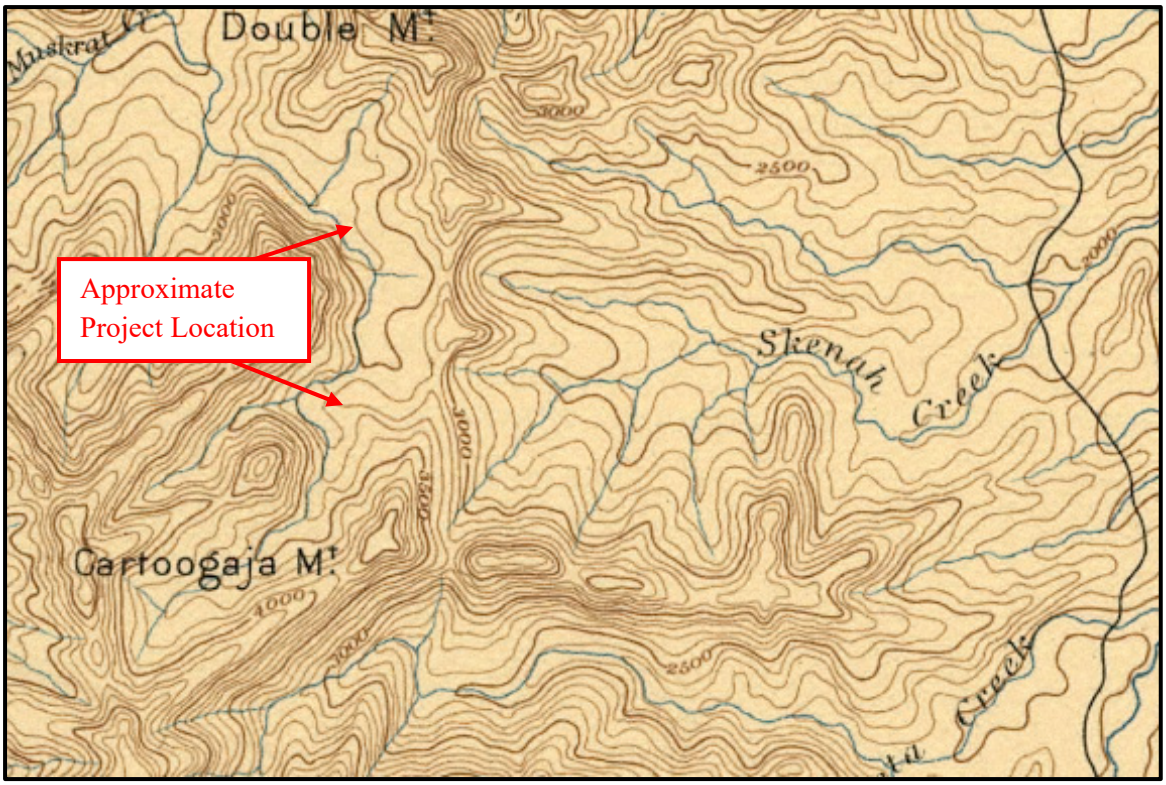

Figure 5.4. The Project vicinity as shown on the 1886 Cowee 1:125,000-scale topographic quadrangle.

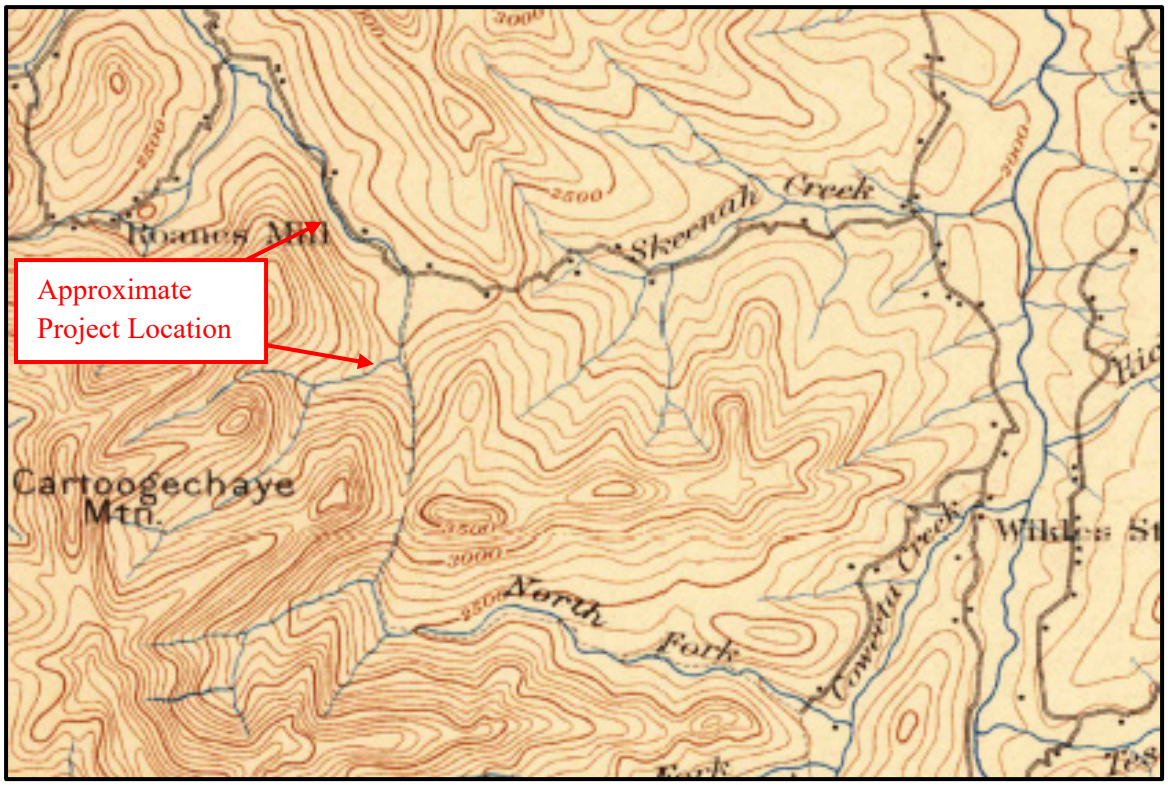

Figure 5.5. The Project vicinity as shown on the 1897 Cowee 1:125,000-scale topographic quadrangle.

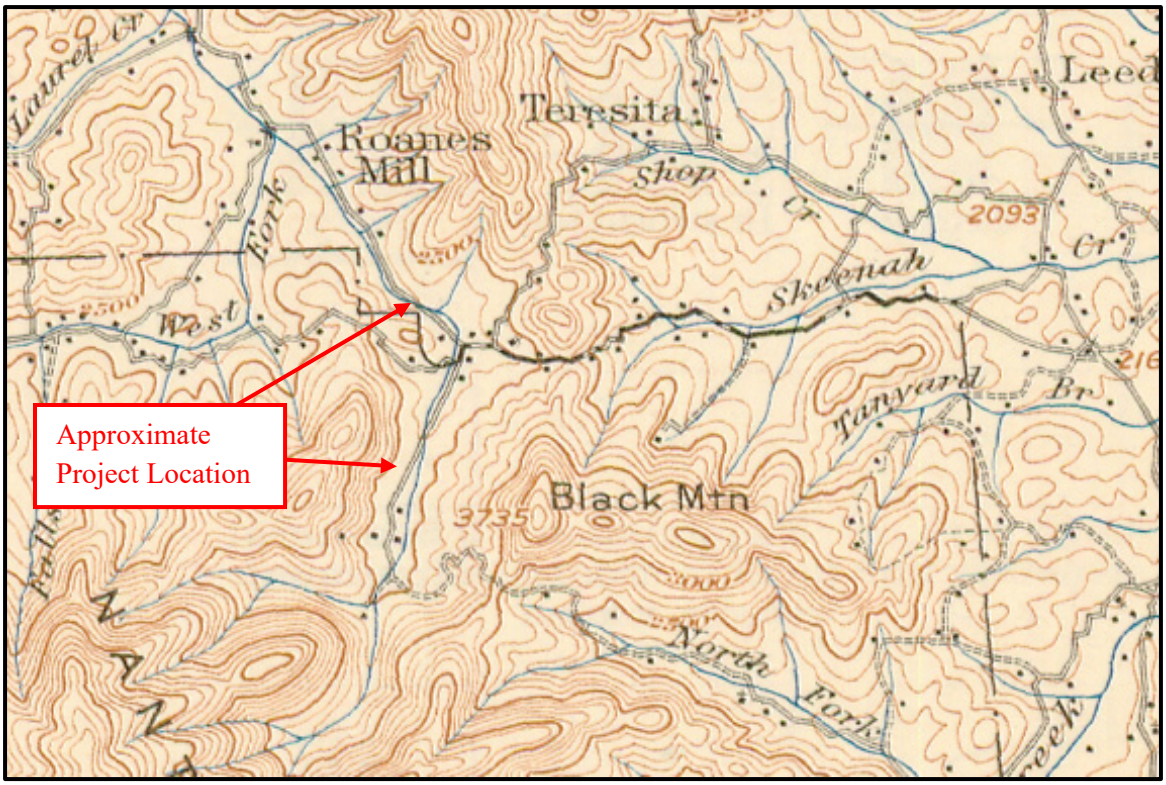

Figure 5.6. The Project vicinity as shown on the 1907 Cowee 1:125,000-scale topographic quadrangle.

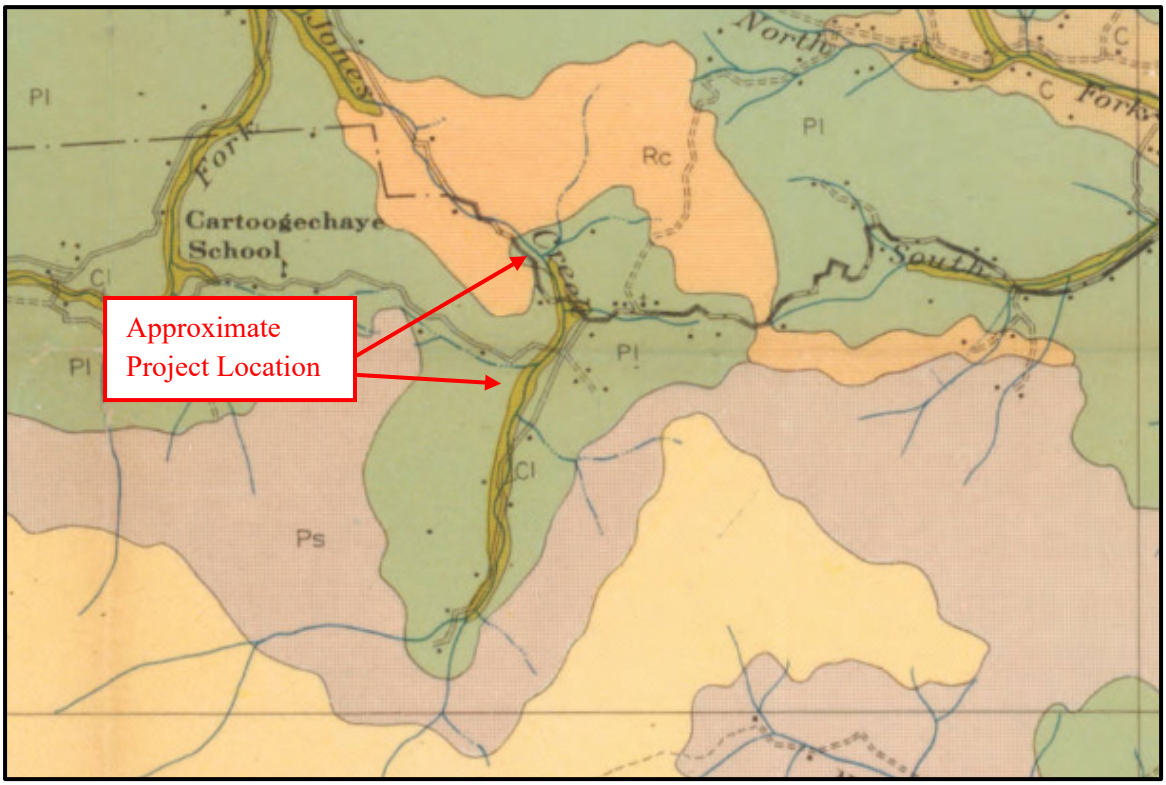

Figure 5.7. The Project vicinity as shown on the 1929 Macon County soils map (Devereaux et al. 1933).

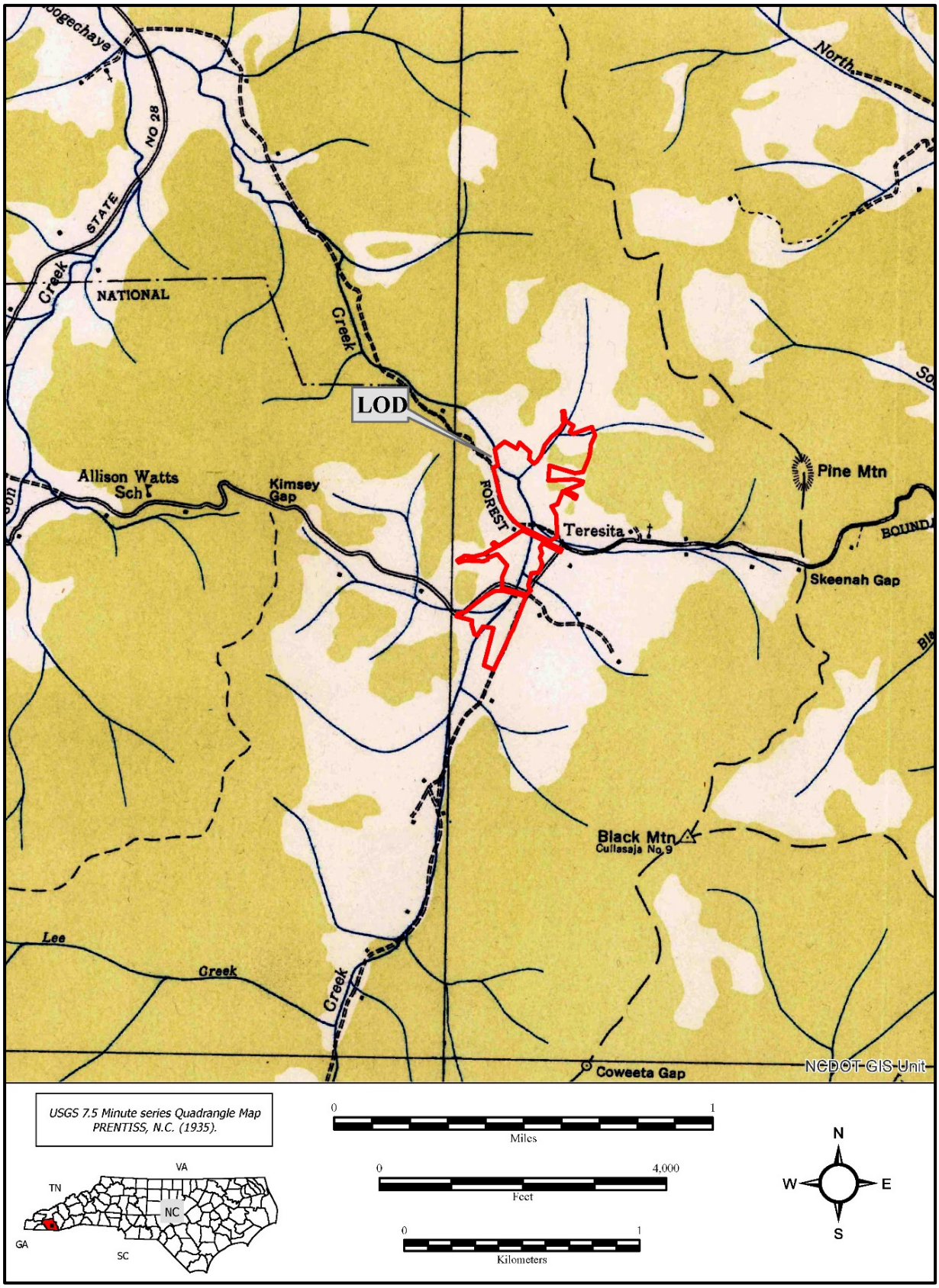

Figure 5.8. The LOD and vicinity as shown on the 1935 USGS planimetric quadrangle.

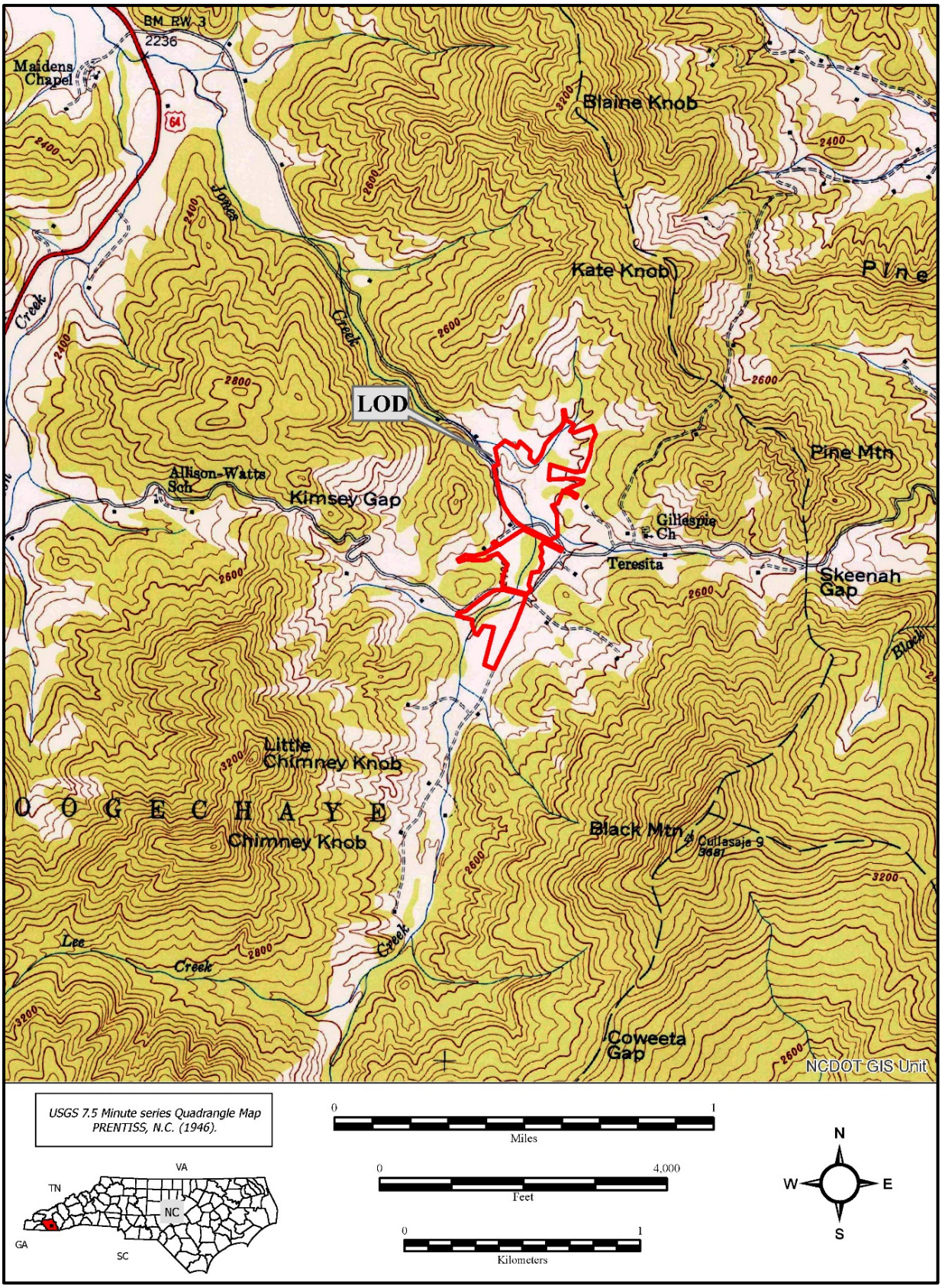

Figure 5.9. The LOD and vicinity as shown on the 1946 USGS topographic quadrangle.

FIELD SURVEY RESULTS

The Cornbread Valley Mitigation Site archaeological survey included excavation of a total of 439 shovel tests, including tests excavated at 20-m intervals along survey transects as well as 10-m interval site delineation tests. The shovel test transects were oriented with the LOD and its constituent landforms, and in several instances, survey shovel test transects were aligned to accommodate those elevated (dry) areas between seasonal wetlands that were present within much broader terrace settings.

The survey identified 16 new archaeological sites (31MA862–31MA877) (Figures 5.10 and 5.11; Table 5.2). Four of these resources (31MA862, 31MA863, 31MA872, and 31MA873) were not totally defined by the survey and potentially extend outside the LOD; the remaining 12 sites appear to be totally delineated within the LOD.

31MA862

Component(s):	Precontact: Early Archaic, Woodland (?)
Site Dimensions:	255 m NE–SW × 45+ m NW–SE* (approximate)
UTMs (NAD 83):	E276283 N3887594
Landform:	Stream Terrace
Elevation:	ca. 2,300 ft AMSL
Soil Type(s):	Saunook loam, 8–15% slopes (ScC); Nikwasi fine sandy loam, 0–2% slopes, frequently flooded (NkA)
Recommendation:	Not Eligible with LOD (all four NRHP criteria); Unassessed outside LOD

*Site measurements based on artifact distribution within the LOD; site likely extends outside LOD to the west.

Description. Site 31MA862 is a precontact Early Archaic and Woodland period site situated on a terrace north and west of two intersecting unnamed tributaries of Jones Creek in the northwestern part of the LOD (Figures 5.12–5.14). The site measures 255 m northeast-southwest by at least 45 m northwest-southeast and is bounded by consecutive negative shovel tests to the north, by stream channels to the south and the east, and by the LOD limits to the west. The site likely extends west to occupy the rest of the landform.

The soils at 31MA862 are mapped as Saunook loam, 8–15% slopes (ScC), in the northern and central portions and Nikwasi fine sandy loam, 0–2% slopes (NkA), in the southern portion. Saunook loam is found over most of the site, and is a well-drained soil found in coves or foot slopes; it originates in colluvium derived from igneous and metamorphic rock (USDA NRCS 2021). The southern part of the site, which borders wetland areas, is mapped as Nikwasi fine sandy loam, 0–2% slopes (NkA). Nikwasi fine sandy loam is a very poorly drained soil formed in loamy alluvium; it is largely encountered in low-lying areas on floodplains and is frequently flooded (USDA NRCS 2021). Soil sequences encountered in the northern to central portions of the site generally consisted of a 33 to 45 cm thick reddish brown (5YR 3/3) sandy loam A or Ap horizon stratum (any discrete plowzone has presumably been blurred by historic period colluvial deposition) overlying a dark yellowish brown (10YR 3/6) or strong brown (7.5YR 5/8) sandy clay loam B horizon. This typical A/B soil horizon sequence is consistent with Saunook loam. A few tests encountered impenetrable cobble or gravel deposits within this area at depths of 33 to 41 cm.

Some shovel tests in that area (e.g., from ST 6 to 15) encountered an intermediate stratum (from eight to 19 cm thick, at depths ranging from 24 to 45 cm at its top to 32 to 60 cm at its base. This intermediate stratum appeared rather sporadically within this area, and was most prominently expressed in ST 6, which encountered a 19 cm thick stratum characterized as multicolored, dark reddish brown (5YR 2.5/2), very dark gray (5YR 3/3), and black (5YR 2.5/1) sandy loam to loamy sand, extending from 38 to 57 cm, to the top of the B horizon subsoil and the current water table (Figure 5.15). A somewhat similar (but less well expressed) stratum was also encountered in STs 9, 10, 13, 15, and 33, but was identifiable in all shovel tests

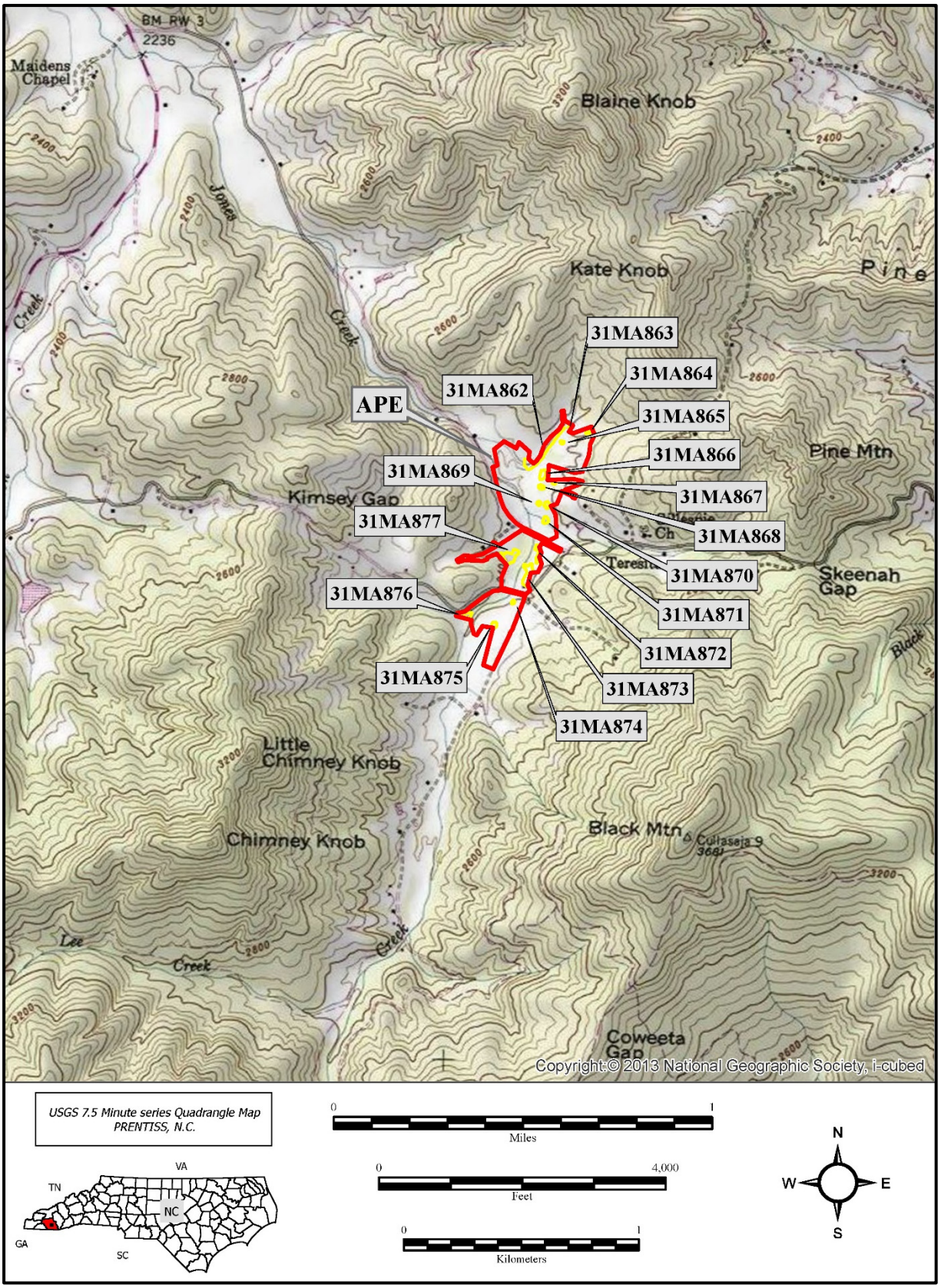

Figure 5.10. Cornbread Valley Mitigation Site archaeological sites.

Figure 5.11. Aerial map showing shovel tests and archaeological sites.

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Table 5.2. Cornbread Velley Mitigation Site Archaeological Sites.

		Shovel Tests			Artifacts				NRHP
Site #	Component(s)	Total*	Pre.	Hist.	Cer.	Lith.	Hist.	Total	Recommendation
31MA862	Precontact: Early Archaic; Woodland	40	21	0	2	49	0	51	Not Eligible (within LOD)
31MA863	Precontact: nondiagnostic lithic	10	5	0	0	10	0	10	Not Eligible (within LOD)
31MA864	Precontact: nondiagnostic lithic	6	1	0	0	1	0	1	Not Eligible
31MA865	Precontact: nondiagnostic lithic	5	1	0	0	1	0	1	Not Eligible
31MA866	Precontact: nondiagnostic lithic	15	6	0	0	10	0	10	Not Eligible
31MA867	Precontact: nondiagnostic lithic and ceramic	6	1	0	1	2	0	3	Not Eligible
31MA868	Precontact: nondiagnostic lithic	7	2	0	0	6	0	6	Not Eligible
31MA869	Precontact: nondiagnostic lithic	8	2	0	0	2	0	2	Not Eligible
31MA870	Precontact: nondiagnostic lithic	5	3	0	0	3	0	3	Not Eligible
31MA871	Precontact: nondiagnostic lithic	12	3	0	0	10	0	10	Not Eligible
31MA872	Precontact: Archaic; nondiagnostic ceramic	21	7	1	1	20	1	22	Not Eligible (within LOD)
31MA873	Precontact: Middle Archaic; Middle Woodland	34	16	1	9	27	2	38	Unassessed (also extends outside LOD)
31MA874	Precontact: nondiagnostic lithic	9	3	0	0	4	0	4	Not Eligible
31MA875	Precontact: nondiagnostic lithic	9	2	0	0	2	0	2	Not Eligible
31MA876	Precontact: Middle to Late Archaic	16	4	0	0	5	0	5	Not Eligible
31MA877	Precontact: nondiagnostic lithic; Postcontact: early to late 19th century	47	3	12	0	3	27	30	Unassessed

* Includes all shovel tests within 20 m of positive tests and not separated from the site by wetlands.

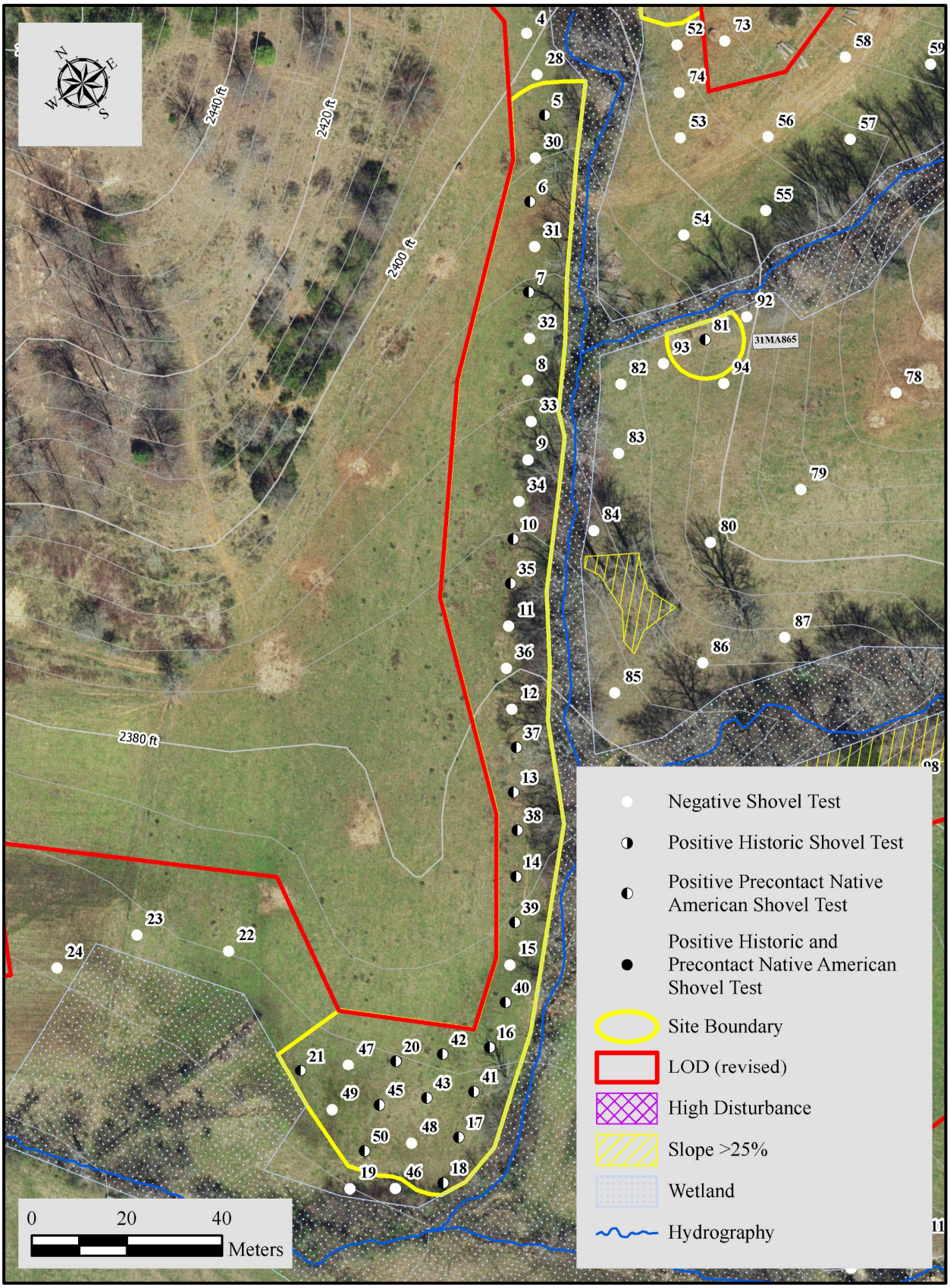

Figure 5.12. Map of 31MA862.



Figure 5.13. Site 31MA862, facing southwest.



Figure 5.14. Site 31MA862, facing northeast.



Figure 5.15. Shovel Test 6 at 31MA862.

in the area. Artifacts associated with this Ab horizon stratum in this part of the site were limited to ST 6, which generated the only ceramic artifacts from the site.

Shovel tests on the southern part of the terrace encountered variable soils depending on location. Some encountered typical A/B horizon soil sequences consisting of a 13 to 26 cm thick, dark yellowish brown (10YR 3/4) sandy loam plowzone overlying strong brown (7.5YR 5/8) clay loam. ST 16 encountered a 43 cm thick top stratum that graded to mottled, hydric soils to a depth of 55 cm. A thin, very dark grayish brown (10YR 3/2) silt loam Ab horizon that overlay hydric soils was encountered in ST 42. Impenetrable cobbles were encountered at a depth of 18 cm in ST 43.

Shovel Tests. Forty shovel tests were excavated at 10- and 20-m intervals across the area (including all transect and delineation tests situated within 20 m), and 21 of these generated a total of 51 precontact period artifacts (see Figure 5.12). The 21 positive shovel tests produced from two to five artifacts, and all but three artifacts were found in the A/Ap horizon. The artifacts were confined to the upper A or Ap horizon stratum with the exception of two ceramic sherds found in the Ab horizon of ST 6 and a nondiagnostic lithic artifact from the thin Ab horizon in ST 42. There were no indications of substantial intact cultural deposits or of cultural features.

Artifacts. Fifty-one precontact artifacts (two ceramic sherds and 49 lithic artifacts) were recovered from shovel tests at 31MA862. The two ceramic sherds are sand tempered with eroded and unidentified stamped exterior surfaces, and are most likely of Woodland origin (Figure 5.16b). These are mendable and derive from a single vessel. The lithic artifacts include one fragmentary Early Archaic Palmer/Kirk corner notched projectile point made of quartz (Figure 5.16a; Table 5.3). The rest of the assemblage consists of 48 pieces of unmodified lithic debitage (36 quartz, six quartzite, six chert).

Table 5.3. Lithic Artifacts from 31MA862.

Description	Chert	Quartz	Quartzite	Total
Chipped Stone Tool				
Palmer/Kirk corner notched		1		**1**
Subtotal		*1*		***1***
Chipped Stone Debitage				
Flake/Shatter	6	36	6	**48**
Subtotal	*6*	*36*	*6*	***48***
Chipped Stone Total	*6*	*37*	*6*	***49***
Chipped Stone Percentage	12.2	75.5	12.2	**100.0**

Summary and Recommendations. Site 31MA862 is a precontact period site situated on the terrace between two small stream tributaries of Jones Creek. An Early Archaic component is represented by a Palmer corner notched projectile point, and two ceramic sherds represent an additional, unknown (but likely Woodland) component. The remainder of the artifacts consist of lithic debitage that could be associated with these or other components. Although it is possible that isolated features can be associated with low ceramic densities (or Archaic period occupations), the low artifact density at 31MA682 suggests that no intensive habitation occurred within the LOD. Based on these data, site 31MA862 represents a low density, multicomponent precontact period artifact deposit characteristic of many in western North Carolina and lacks evidence of meaningful artifact concentrations that would suggest the presence of associated features or any other intact aspects of site structure and integrity. The portion of the site within the LOD has little potential to provide substantial information on the prehistory of the area and is recommended not eligible for the NRHP under Criterion D; this part of the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.



Figure 5.16. Selected precontact artifacts from 31MA862. a: quartz Palmer/Kirk PPK, ST 17; b: unidentified plain sherds, ST 6

Any portion of 31MA862 that may extend outside the LOD to the west is considered unassessed for NRHP eligibility, however, and additional site delineation and assessment would be required should the LOD be expanded in that direction.

31MA863

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	20 m N–S* × 20 m E-W* (approximate)
UTMs (NAD 83):	E276455 N3887756
Landform:	Ridge toe
Elevation:	ca. 2,404 ft AMSL
Soil Type(s):	Evard-Cowee complex, 15–30% slopes (EvD)
Recommendation:	Not Eligible within LOD (all four NRHP criteria); Unassessed outside LOD

*Site measurements based on artifact distribution within the LOD; site extends outside LOD to the east and north.

Description. Site 31MA863 is a small precontact period site located on a descending ridge toe east of an unnamed tributary of Jones Creek (Figures 5.17 and 5.18; see Figures 5.10 and 5.11). The site boundaries are defined to the west by the stream channel and to the south by negative shovel tests; the site clearly extends outside the LOD to the east and to the north.

The soils at 31MA863 are mapped as Evard-Cowee complex, 15–30% slopes (EvD). This is a well-drained, residual soil found on mountain slopes (USDA NRCS 2021). Soil profiles documented in shovel tests consisted of an 18–36 cm thick A horizon/plowzone of dark reddish brown (5YR 3/3) sandy loam, which conformably overlies a strong brown (7.5YR 5/8) sandy clay loam B horizon (Figure 5.19).

Shovel Tests. Five of the 10 shovel tests excavated across the area (including all transect and delineation tests situated within 20 m) produced a total of 10 precontact artifacts, all from the A/Ap horizon.

Artifacts. Ten nondiagnostic lithic artifacts were recovered from shovel tests at 31MA863. These include the distal portion of a late stage biface or projectile point preform made of quartzite (Figure 5.20a) and nine pieces of quartz debitage.

Summary and Recommendations. Site 31MA863 is a low-density precontact period artifact scatter located on a sloped ridge toe adjacent to a stream. Shovel tests produced no diagnostic artifacts, and the representative artifacts were dispersed, confined to the upper A/Ap horizon, and suggest ephemeral occupation. Consequently, the portion of 31MA863 within the LOD is unlikely to provide any significant or new information concerning precontact occupations in the area and is recommended not eligible for the NRHP under Criterion D; this part of the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

The portion of 31MA863 that extends outside the LOD to the north and east is considered unassessed for NRHP eligibility, however, and additional site delineation and assessment would be required should the LOD be expanded in either of those directions.

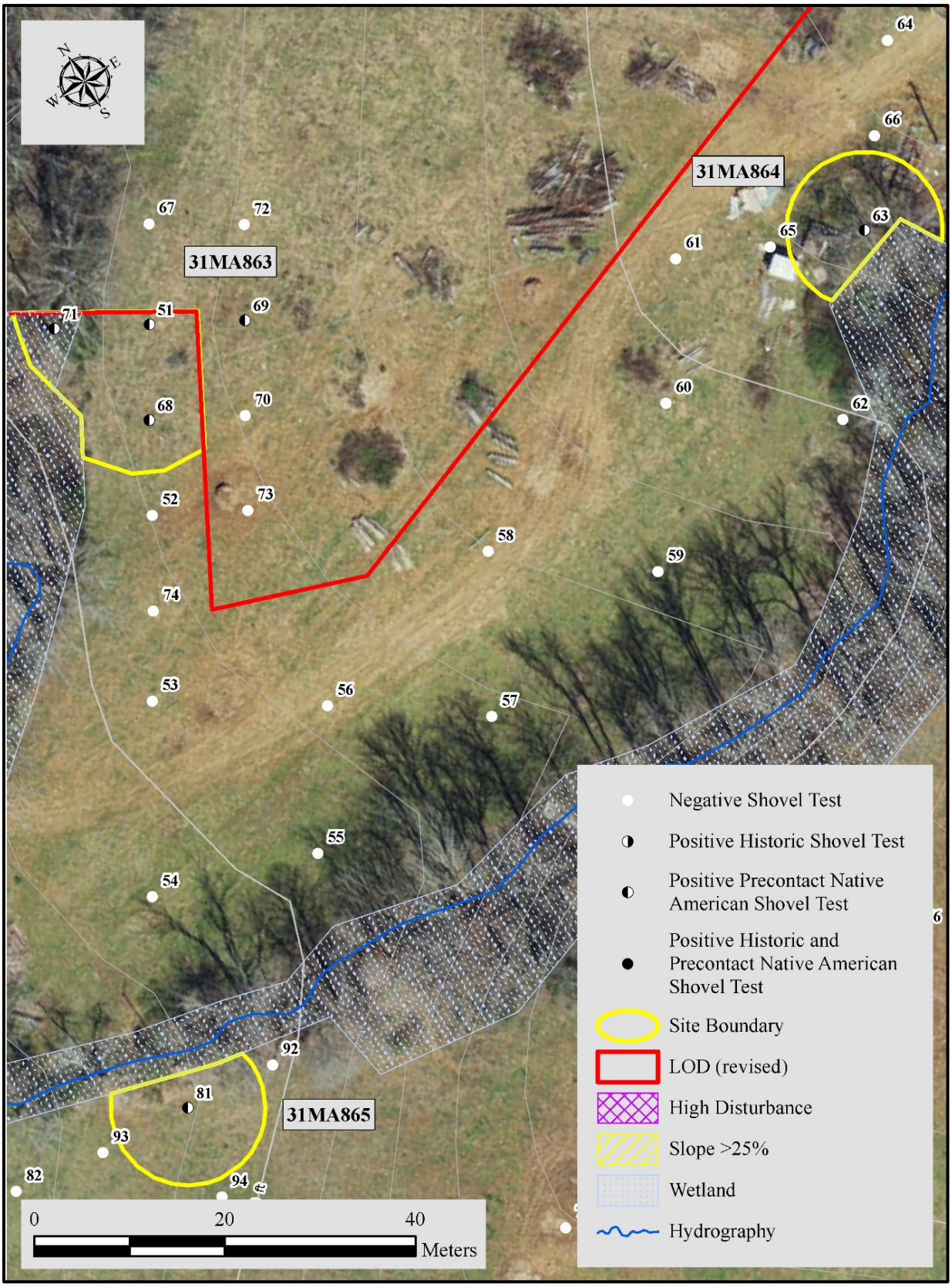

Figure 5.17. Map of 31MA863, 31MA864, and 31MA865.



Figure 5.18. Site 31MA863, facing northeast.



Figure 5.19. Shovel Test 68 at 31MA863.

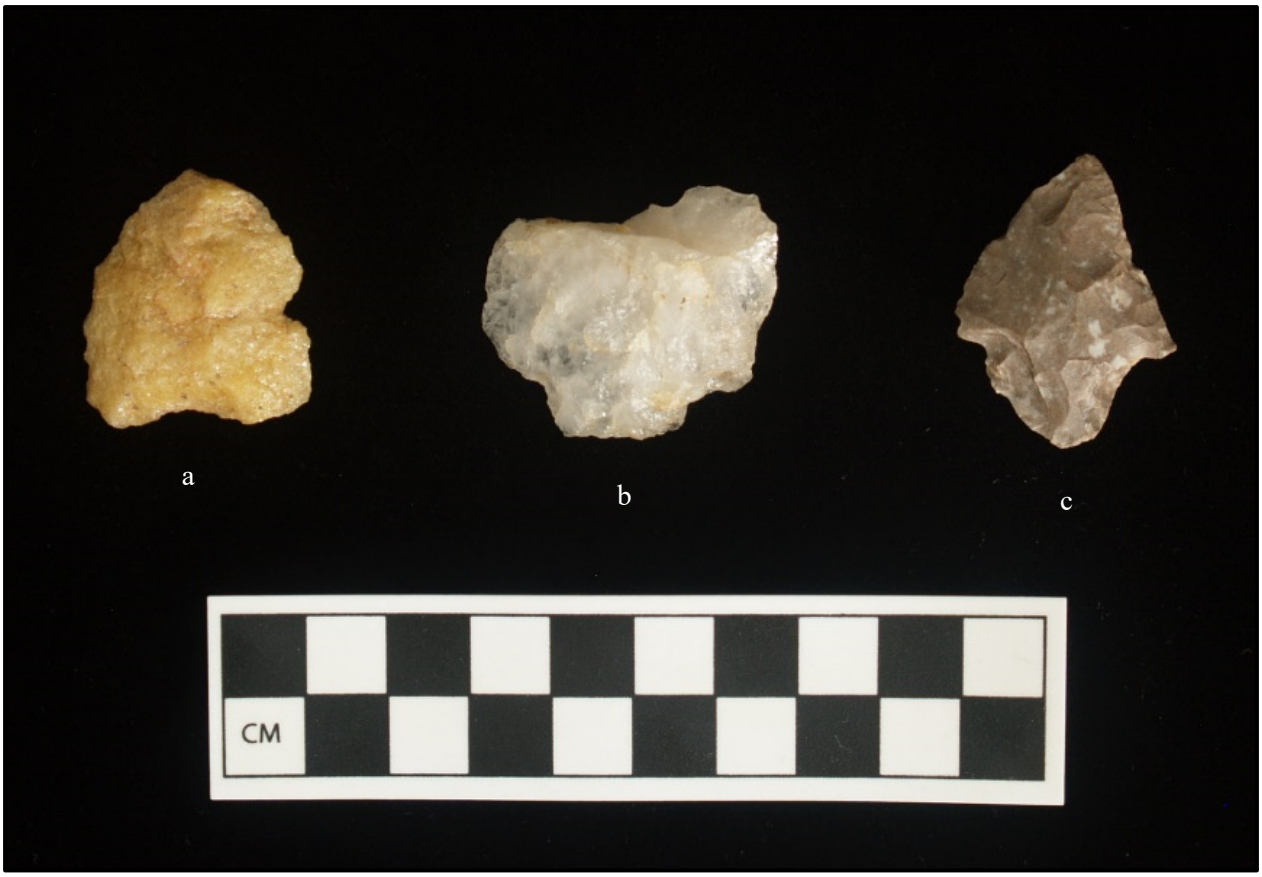

Figure 5.20. Selected lithic artifacts from 31MA863, 31MA864, and 31MA871. a: quartzite biface fragment, 31MA863 ST 69; b; quartz unidentified stemmed PPK, 31MA864 ST 63; c: chert unidentified stemmed PPK, 31MA871 ST 176

31MA864

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	15 m E–W × 15 m N–S
UTMs (NAD 83):	E276524 N3887724
Landform:	Toe Slope
Elevation:	ca. 2,424 ft AMSL
Soil Type(s):	Evard-Cowee complex, 15–30% slopes (EvD)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA864 is represented by a single nondiagnostic lithic artifact that was discovered on a descending ridge toe immediately west of a Jones Creek tributary branch (Figure 5.21; see Figures 5.11 and 5.17). The site is scoured into the B horizon to the north and defined by negative shovel tests to the west, by the stream and its associated seasonal wetlands to the east, and by a negative shovel test and slope to the south. Discarded agricultural and domestic debris cover part of the site.

The soils at 31MA864 are mapped as Evard-Cowee complex, 15–30% slopes (EvD), a well-drained, residual soil found on mountain slopes (USDA NRCS 2021). Shovel tests in undisturbed areas encountered a ca. 20 cm thick A or Ap horizon of dark reddish brown (5YR 3/3) or dark brown (7.5YR 3/3) sandy loam overlying yellowish red (5YR 4/6) or strong brown (7.5YR 4/6) clay loam, unless impenetrable cobbles were encountered near the base of the A horizon (Figure 5.22).



Figure 5.21. Site 31MA864, facing northeast.


Figure 5.22. Shovel Test 66 at 31MA864.

Shovel Tests. Six shovel tests were excavated across the area (including all transect and delineation tests situated within 20 m) at 10- and 20-m intervals (some areas were eroded to the B horizon or effectively blocked by debris); one of these produced a precontact period lithic artifact from the A/Ap horizon.

Artifacts. The single artifact is a fragmentary projectile point or preform (see Figure 5.20b). The artifact is made of quartz and represents the medial portion of an unidentified stemmed projectile point, which is most similar to broad-bladed Late Archaic varieties.

Summary and Recommendations. Site 31MA864 is a nondiagnostic lithic site on an upland landform and is represented by a single fragmentary and nondiagnostic projectile point fragment from the A/Ap horizon. This site is unlikely to provide any significant or new information concerning precontact occupations in the area and is recommended not eligible for the NRHP under Criterion D; the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

31MA865

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	15 m N-S × 15 m E-W
UTMs (NAD 83):	E276414 N3887685
Landform:	Stream Terrace
Elevation:	ca. 1,956 ft AMSL
Soil Type(s):	Saunook loam, 8–15% slopes (ScC)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA865 is represented by an isolated nondiagnostic lithic artifact that was recovered from a low and cobbly stream terrace situated at the base of an upland ridge toe between multiple tributaries of Jones Creek (Figure 5.23; see Figures 5.11 and 5.17). The site is bounded to the north and west by Jones Creek, to the south by negative shovel tests and a wetland area, and to the east by steep slope.

The soils at 31MA865 are mapped as Saunook loam, 8–15% slopes (ScC), a well-drained soil formed in colluvium (USDA NRCS 2021). Soils encountered in shovel tests were excessively rocky, and consisted of a 20 to 30 cm thick reddish brown (5YR 3/3) sandy loam A or Ap horizon stratum (any discernibly discrete plowzone has presumably been blurred by historic period colluvial deposition) overlying strong brown (7.5YR 5/8) sandy clay loam (Figure 5.24). The B horizon was not reached in some tests due to the presence of impenetrable cobbles.

Shovel Tests. One lithic artifact was recovered from one of five shovel tests excavated across the area (including all transect and delineation tests situated within 20 m). The artifact was found in the A/Ap horizon.

Artifacts. The single artifact from 31MA865 is a nondiagnostic quartz debitage fragment.

Summary and Recommendations. Site 31MA865 is a nondiagnostic lithic site on a narrow stream terrace and is represented by an isolated piece of unmodified debitage from the A/Ap horizon. Given its setting, it is possible that the artifact was redeposited from alluvial or colluvial processes. This site is unlikely to provide any significant or new information concerning precontact occupations in the area and is recommended not eligible for the NRHP under Criterion D; the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.



Figure 5.23. Site 31MA865, facing west.



Figure 5.24. Shovel Test 81 at 31MA865.

31MA866

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	40 m N–S × 25 m E–W
UTMs (NAD 83):	E276330 N3887549
Landform:	Ridge Toe
Elevation:	ca. 2,380 ft AMSL
Soil Type(s):	Evard-Cowee complex, 8–30% slopes (EvC, EvD)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA866 is a low-density precontact period site situated on the level base of a ridge toe that rises above a stream tributary of Jones Creek and its associated seasonal wetlands to the west (Figures 5.25 and 5.26; see Figure 5.11). The site is bounded to the west by seasonal wetlands, to the south and north by negative shovel tests, and to the east by slope and the LOD limits.

The soils at 31MA866 are mapped as Evard-Cowee complex, 8–15% (EvC) and 15–30% slopes (EvD), which are well-drained, residual soils (USDA NRCS 2021). Shovel tests encountered a 15–33 cm thick A or Ap horizon of dark reddish brown (5YR 3/3) sandy loam that overlay yellowish red (5YR 4/6) clay loam (Figure 5.27).

Shovel Tests. Ten lithic artifacts were recovered from six of the 15 shovel tests that were excavated across the area (including all transect and delineation tests situated within 20 m); the six tests produced from one to three artifacts each from the A/Ap horizon.

Artifacts. The assemblage is limited to 10 pieces of unmodified debitage, including five of chert, four of quartz, and one of quartzite.

Summary and Recommendations. Site 31MA866 is a nondiagnostic precontact lithic site situated at the base of a toe slope overlooking seasonal wetlands associated with a stream. It is characterized by low artifact densities and lacks evidence of substantial artifact concentrations or intact artifact deposits. Site 31MA866 appears to have little potential to provide substantial information on the prehistory of the area and is recommended not eligible for the NRHP under Criterion D; it also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

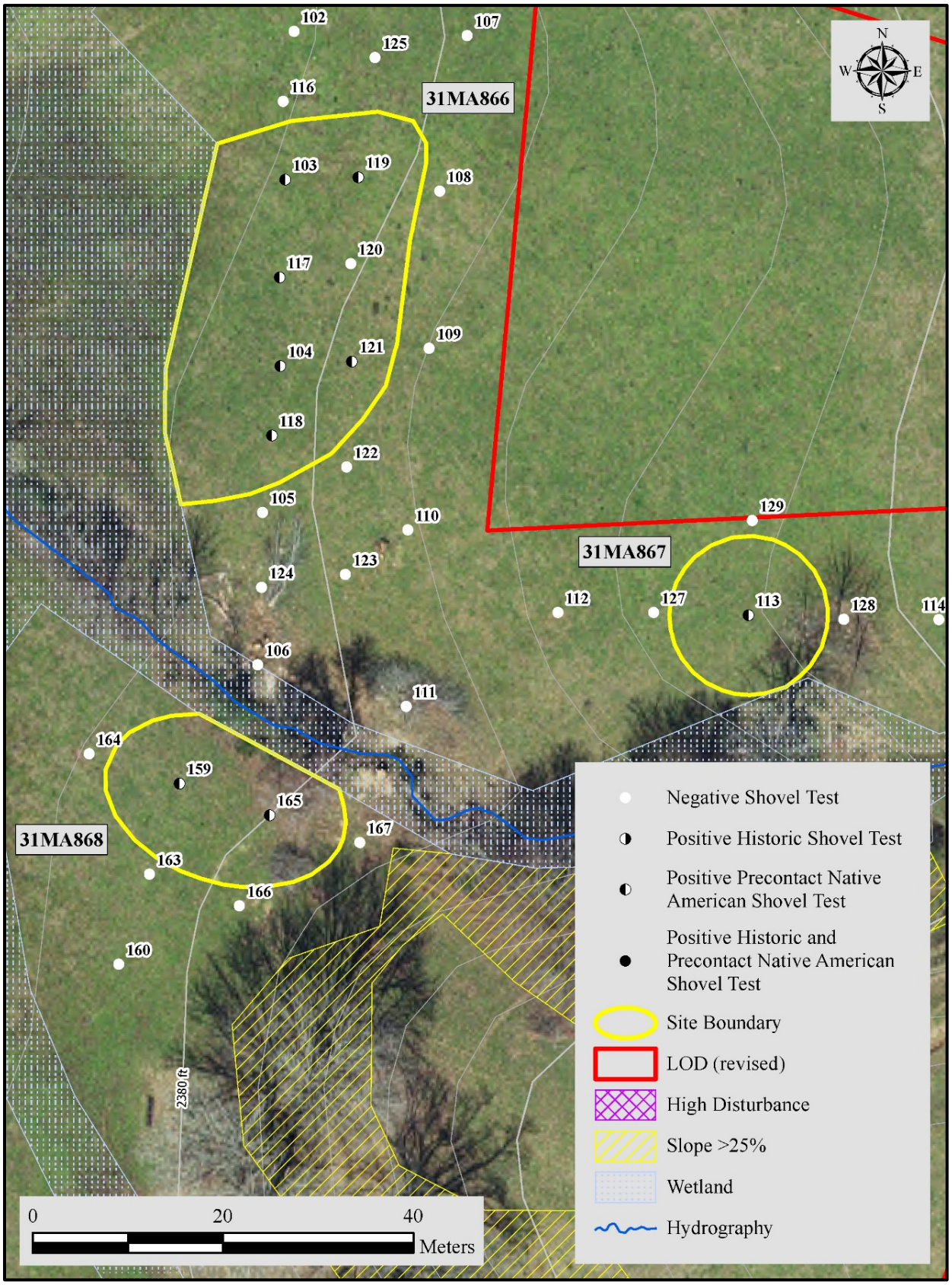

Figure 5.25. Map of 31MA866, 31MA867, and 31MA868.



Figure 5.26. Site 31MA866, facing south.



Figure 5.27. Shovel Test 118 at 31MA866.

31MA867

Component(s):	Precontact: nondiagnostic ceramic, lithic
Site Dimensions:	15 m N-S × 15 m E-W
UTMs (NAD 83):	E276379 N3887513
Landform:	Ridge Toe
Elevation:	ca. 2,396 ft AMSL
Soil Type(s):	Evard-Cowee complex, 15–30% slopes (EvD)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA867 is a small precontact period site located on a small rise on a descending ridge toe north of a tributary branch of Jones Creek (Figure 5.28; see Figures 5.11 and 5.25). It is bounded to the north, east. and west by negative shovel tests, and to the south by Jones Creek and its associated slope. The site appears to occupy a discrete micro-landform on the ridge toe.

The soils at 31MA867 are mapped as Evard-Cowee complex, 15–30% slopes (EvD), a well-drained, residual soil found on mountain slopes (USDA NRCS 2021). The single artifact-producing shovel test encountered a 25 cm thick A or Ap horizon of dark reddish brown (5YR 3/3) sandy loam that overlay yellowish red (5YR 4/6) clay loam (Figure 5.29). Part of the small landform was disturbed by a burned refuse pile.

Shovel Tests. Two lithic artifacts and one ceramic artifact were recovered from one of six shovel tests excavated on the landform at 10- to 20-m intervals. The artifacts were found within the A/Ap horizon.

Artifacts. The three precontact artifacts include a very small (<2 cm) and unidentifiable residual ceramic sherd and two pieces of unmodified debitage (one quartz, one quartzite).

Summary and Recommendations. Site 31MA867 is a small precontact period site with indeterminate lithic and ceramic components located on a small, upland landform. The site is represented by three artifacts from a single shovel test, and there is no evidence of artifact concentrations or intact artifact deposits. Consequently, 31MA867 is considered to have little potential to provide substantial information on regional prehistory and is recommended not eligible for the NRHP under Criterion D; the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.



Figure 5.28. Site 31MA867, facing west.



Figure 5.29. Shovel Test 127 at 31MA867.

31MA868

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	25 m E–W × 15 m N–S
UTMs (NAD 83):	E276319 N3887495
Landform:	Stream Terrace
Elevation:	ca. 2,380 ft AMSL
Soil Type(s):	Nikwasi fine sandy loam, 0–2% slopes, frequently flooded (NkA)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA868 is a low-density subsurface lithic scatter situated on a slightly elevated landform south of a Jones Creek tributary and west of an adjacent ridge toe slope (Figure 5.30; see Figures 5.11 and 5.25). The site is bounded to the west by hydric, poorly drained soils, to the north by the stream channel, by negative shovel tests and the ridge side slope to the east, and by negative shovel tests and hydric areas to the south.

The soils at 31MA868 are mapped as Nikwasi fine sandy loam, 0–2% slopes (NkA), a very poorly drained and frequently flooded soil formed in loamy alluvium (USDA NRCS 2021). Typical shovel tests encountered a 15–25 cm thick A or Ap horizon of dark brown (7.5YR 3/3) silt loam overlying yellowish red (5YR 4/6) clay loam, which is dissimilar to the mapped soil type and more typical of Saunook and other residual type soils (Figure 5.31).

Shovel Tests. Seven shovel tests were excavated across the area at 10- and 20-m intervals (including all transect and delineation tests situated within 20 m), and two of these yielded a total of six precontact period lithic artifacts. The artifacts were confined to the A/Ap horizon.

Artifacts. Six pieces of unmodified quartz debitage were recovered from 31MA868.

Summary and Recommendations. Site 31MA868 is a nondiagnostic lithic site on part of a stream terrace at the base of an upland ridge toe. The site lacks evidence of substantial artifact concentrations, intact deposits, or cultural features. Site 31MA868 has little potential to provide substantial information on the prehistory of the area and is recommended not eligible for the NRHP under Criterion D; the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.



Figure 5.30. Site 31MA868, facing southeast.



Figure 5.31. Shovel Test 167 at 31MA868.

31MA869

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	15 m N–S × 15 m E–W
UTMs (NAD 83):	E276313 N3887424
Landform:	Stream Terrace
Elevation:	ca. 2,380 ft AMSL
Soil Type(s):	Nikwasi fine sandy loam, 0–2% slopes, frequently flooded (NkA)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA869 is one of four small precontact period sites situated on the broad stream terrace north of Jones Creek on slightly elevated areas between seasonal wetlands or along the edge of the ridge side slope (Figures 5.32 and 5.33; see Figure 5.11). Site 31MA869 occupies a slightly elevated landform south of an adjacent ridge toe slope, and immediately north of surrounding poorly drained, hydric soils. The site is bounded to the south by poorly drained, hydric soils, to the north by the ridge side slope, and to the east and west by negative shovel tests.

The soils at 31MA869 are mapped as Nikwasi fine sandy loam, 0–2% slopes (NkA), a very poorly drained soil formed in loamy alluvium (USDA NRCS 2021). As at nearby 31MA869, shovel tests encountered a 15–25 cm thick A or Ap horizon of dark brown (7.5YR 3/3) silt loam overlying yellowish red (5YR 4/6) clay loam (Figure 5.34), which is dissimilar to the mapped soil type and more typical of Saunook and other non-accretional soils.

Shovel Tests. Two lithic artifacts were recovered from one of eight shovel tests excavated across the area (including all transect and delineation tests situated within 20 m). The artifacts were encountered within the A/Ap horizon.

Artifacts. The artifacts consist of two pieces of unmodified quartz debitage (including one of crystalline quartz).

Summary and Recommendations. Site 31MA869 is a small, nondiagnostic lithic site located on a broad terrace represented by two pieces of unmodified debitage. The site lacks evidence of substantial artifact concentrations, intact deposits, or cultural features. Site 31MA869 has little potential to provide substantial information on the prehistory of the area and is recommended not eligible for the NRHP under Criterion D; the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

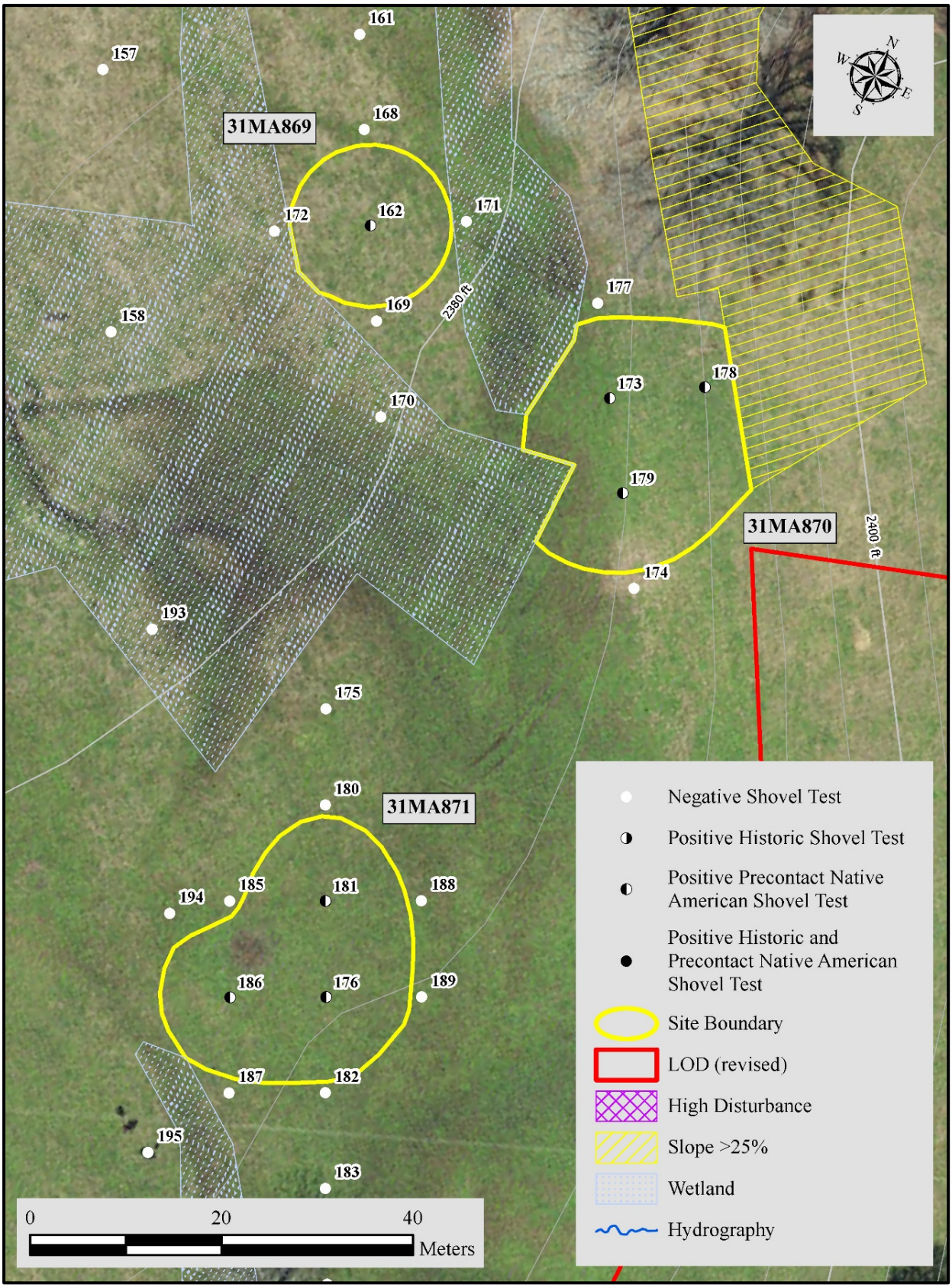

Figure 5.32. Map of 31MA869, 31MA870, and 31MA871.



Figure 5.33. Site 31MA869, facing northwest.



Figure 5.34. Shovel Test 168 at 31MA869.

31MA870

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	20 m N–S × 20 m E–W
UTMs (NAD 83):	E276343 N3887419
Landform:	Stream Terrace and Bench
Elevation:	ca. 2,384 ft AMSL
Soil Type(s):	Nikwasi fine sandy loam, 0–2% slopes, frequently flooded (NkA); Evard-Cowee complex, 15–30% slopes (EvD)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA870 is a low-density precontact period site situated on the broad stream terrace and an adjacent, narrow bench north of Jones Creek and west of Byrd Farm Road (Figure 5.35; see Figures 5.11 and 5.32). The site is bounded to the south by poorly drained, hydric soils, to the north by steep side slope, and to the east and west by negative shovel tests.

The soils on the terrace portion of 31MA870 are mapped as Nikwasi fine sandy loam, 0–2% slopes (NkA), a very poorly drained and frequently flooded soil formed in loamy alluvium (USDA NRCS 2021), while those on the upland bench and adjacent slope are mapped as Evard-Cowee complex, 15–30% slopes (EvD), a well-drained, residual soil (USDA NRCS 2021). Most shovel tests on the terrace encountered a 15–25 cm thick A or Ap horizon of dark brown (10YR 3/3) silt loam overlying yellowish brown (10YR 5/6) clay loam (Figure 5.36). One shovel test (ST 173) encountered a 30 cm thick buried A horizon (capped by a 20 cm thick layer of colluvium) overlying dark yellowish brown (10YR 4/6) clay loam. A much thinner Ab horizon was encountered in ST 179, which also underlay colluvium. This deposit appears to represent a buried plowzone capped by colluvium and produced a single lithic artifact in ST 173. A representative shovel test on the upland bench encountered a 37 cm thick top stratum of dark reddish brown (5YR 3/3) sandy loam overlying yellowish red (5YR 4/6) clay loam.

Shovel Tests. Five shovel tests were excavated across the area at 20- and 10-m intervals (including all transect and delineation tests situated within 20 m). Three of these tests generated totals of three lithic artifacts, including two from the upper A/Ap horizon and one from a buried plowzone (ApB horizon).

Artifacts. Associated artifacts are limited to three pieces of nondiagnostic lithic debitage (one of chert and two of quartz).

Summary and Recommendations. Site 31MA870 is a low-density, precontact period artifact scatter located on the broad terrace north of Jones Creek and an adjacent upland bench. The site has produced no diagnostic artifacts, and the representative artifacts are dispersed and suggest only ephemeral occupation. For this reason, 31MA870 is unlikely to provide any significant or new information concerning precontact occupations in the area, and it is recommended not eligible for the NRHP under all Criterion D. The site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.



Figure 5.35. Site 31MA870, facing southeast.



Figure 5.36. Shovel Test 173 at 31MA870.

31MA871

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	30 m N–S × 30 m E–W
UTMs (NAD 83):	E276345 N3887350
Landform:	Stream Terrace
Elevation:	ca. 2,384 ft AMSL
Soil Type(s):	Nikwasi fine sandy loam, 0–2% slopes, frequently flooded (NkA)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA871 is a precontact period site of unknown component affiliation located on a low rise on the broad terrace north of Jones Creek, north of North Jones Creek Road, and west of Byrd Farm Road (Figure 5.37; see Figures 5.11 and 5.32). The site is bounded on all sides by seasonal wetlands (with and without standing water).

The soils on the terrace are mapped as Nikwasi fine sandy loam, 0–2% slopes (NkA), a very poorly drained and frequently flooded alluvial soil (USDA NRCS 2021). Shovel tests on the low rise encountered a 15–20 cm thick A/Ap horizon of dark reddish brown (5YR 3/3) sandy loam overlying yellowish red (5YR 4/6) clay loam (Figure 5.38). Other shovel tests along the edge of the low rise encountered hydric soils more typical of the soil type description.

Shovel Tests. Ten lithic artifacts were recovered from three of 12 shovel tests excavated across the area at 20- and 10-m intervals (including all transect and delineation tests situated within 20 m). The three positive shovel tests produced from two to five artifacts each from the A/Ap horizon.

Artifacts. The assemblage includes one nearly complete projectile point made of chert and nine pieces of debitage (five of quartz, three of quartzite, and one of chert). The projectile point exhibits a slightly contracting stem with a convex base and horizontal shoulders (see Figure 5.20c) but has not been assigned to a specific type.

Summary and Recommendations. Site 31MA871 is a precontact site situated on a low rise between seasonal wetlands on the broad terrace north of Jones Creek. It is represented by nine pieces of unmodified debitage and an unidentified stemmed projectile point. The presence of few artifacts is consistent with short-term occupation(s) on this part of the terrace, and there is no evidence of intact cultural deposits or features. Site 31MA871 is unlikely to provide any new or significant information concerning the precontact period occupations in the region and is recommended not eligible for the NRHP under all Criterion D; the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.



Figure 5.37. Site 31MA871, facing east.



Figure 5.38. Shovel Test 181 at 31MA871.

31MA872

Component(s):	Precontact: UD Archaic, nondiagnostic ceramic
Site Dimensions:	70 m N–S × 40 m N–S* (approximate)
UTMs (NAD 83):	E276303 N3887228
Landform:	Stream Terrace
Elevation:	ca. 2,388 ft AMSL
Soil Type(s):	Dellwood gravelly fine sandy loam, 0–5% slopes, frequently flooded (DgB); Saunook loam, 2–8% slopes (ScB)
Recommendation:	Not Eligible (all four NRHP criteria)

*Site measurements based on artifact distribution within the LOD; site extends outside LOD to the east.

Description. Site 31MA872 is a precontact period site of unknown component affiliation located on the stream terrace east of Jones Creek and west of Jones Creek Road (Figures 5.39 and 5.40; see Figure 5.11). The site is bounded to the north by negative shovel tests, to the south by wetland soils, to the west by Jones Creek, and to the east by the limits of the LOD.

Most soils at 31MA872 are mapped as Dellwood gravelly fine sandy loam, 0–5% slopes (DgB), a moderately well-drained and frequently flooded soil found on floodplains (USDA NRCS 2021). The site slightly overlaps an area mapped as Saunook loam, 2–8% slopes (ScB), a well-drained soil formed in colluvium (USDA NRCS 2021). Most shovel tests encountered a 25–35 cm thick plowzone (Ap horizon) composed of dark brown (10YR 3/3) silt loam overlying dark yellowish brown (10YR 4/6) or strong brown (7.5YR 4/6) clay loam (Figure 5.41).

Shovel Tests. Twenty-one precontact artifacts and one artifact of Euro-American manufacture were recovered from seven of the 21 shovel tests excavated in this area (including all transect and delineation tests situated within 20 m). The positive shovel tests produced from one to six precontact artifacts each from the A/Ap horizon.

Artifacts. The precontact artifact assemblage includes 20 lithic artifacts and one ceramic sherd (Table 5.4). The ceramic sherd is curvilinear complicated stamped and sand tempered but eroded (Figure 5.42b), and could not be reliably assigned to a particular series type. The lithic assemblage includes a fragmentary quartz stemmed projectile point (Figure 5.42a) that resembles a provisional corner removed variety (after Shumate and Kimball 2016, and others),which has been encountered in dated late Middle Archaic contexts in western North Carolina at the Coontree and Cold Canyon sites. The 19 pieces of unmodified debitage include 15 of quartz (including one of crystalline quartz), two of chert, one of metavolcanic material or metasiltstone, and one of quartzite. The postcontact artifact is a refined earthenware sherd that is too small to reliably identify.

Table 5.4. Lithic Artifacts from 31MA872.

Description	Chert	Metavolcanic	Quartz	Quartzite	Total
Chipped Stone Tool					
Untyped stemmed			1		**1**
Subtotal			*1*		***1***
Chipped Stone Debitage					
Flake/Shatter	2	1	15	1	**19**
Subtotal	*2*	*1*	*15*	*1*	***19***
Chipped Stone Total	*2*	*1*	*16*	*1*	***20***
Chipped Stone Percentage	10.0	5.0	80.0	5.0	**100.0**

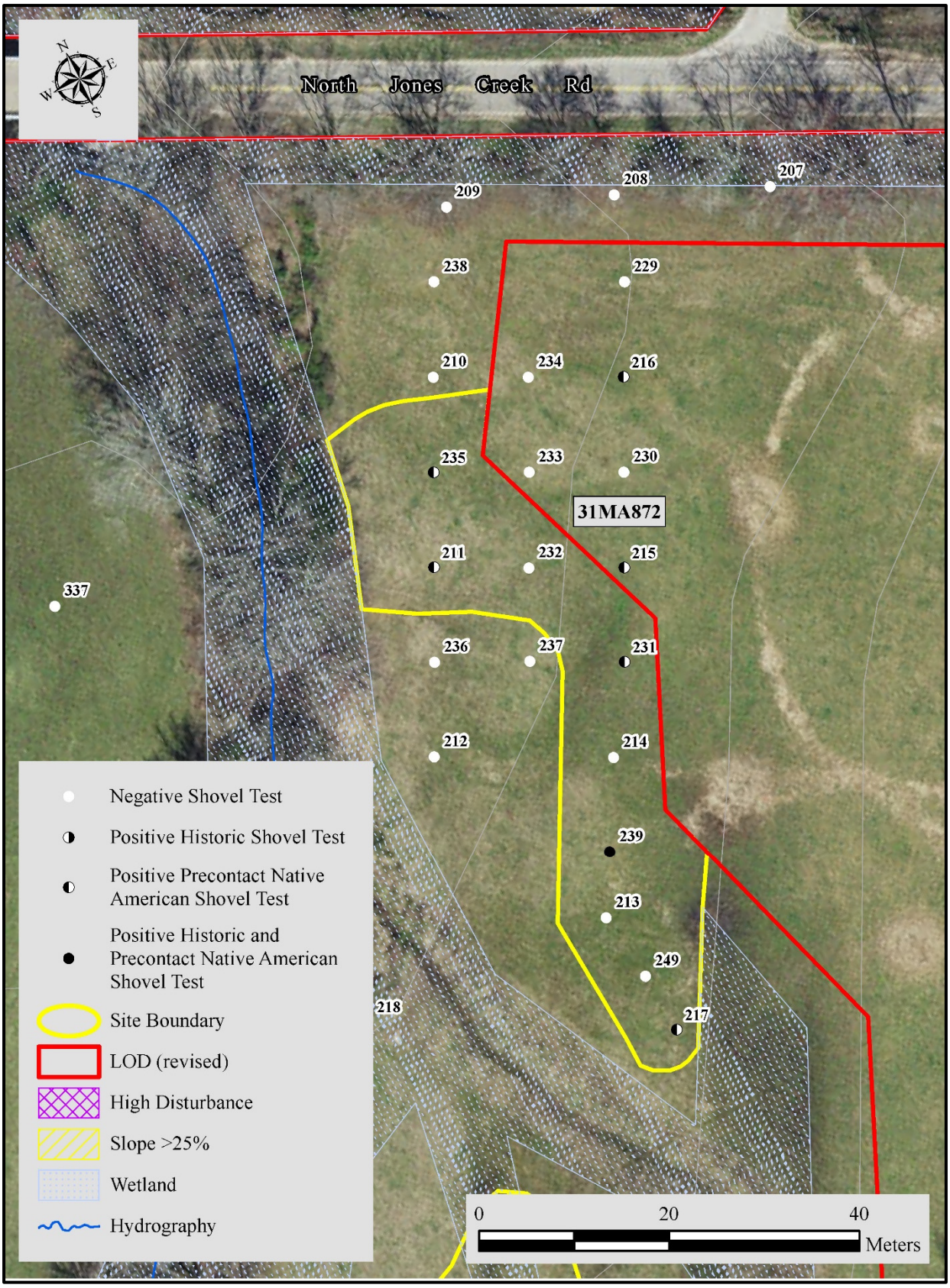

Figure 5.39. Map of 31MA872.



Figure 5.40. Site 31MA872, facing northwest.



Figure 5.41. Shovel Test 231 at 31MA872.



Figure 5.42. Selected precontact artifacts from 31MA872. a: unidentified quartz stemmed PPK, ST 231; b: unidentified curvilinear complicated stamped sherd, ST 244

Summary and Recommendations. Site 31MA872 is a multicomponent artifact scatter located on a stream terrace east of Jones Creek. The associated artifacts include an ambiguous projectile point (possibly of late Middle Archaic manufacture) and an untyped curvilinear complicated stamped ceramic sherd that could date from the Middle Woodland period through the Qualla phase. The low artifact density and lack of indications of cultural features suggests that no intensive habitation occurred within the LOD. Site 31MA872 appears to represent a low-density, multicomponent precontact period artifact deposit characteristic of many in western North Carolina and lacks indications of meaningful artifact concentrations that would suggest the presence of associated features. As defined within the LOD, site 31MA872 has little potential to provide substantial information on the prehistory of the area and is recommended not eligible for the NRHP under Criterion D; this part of the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

The portion of 31MA872 extending outside the LOD to the east is considered unassessed for NRHP eligibility, however, and additional site delineation and assessment would be required should the LOD be expanded in that direction.

31MA873

Component(s):	Precontact: Middle Archaic; Middle Woodland
Site Dimensions:	80 m N-S × 40+ m E-W* (approximate)
UTMs (NAD 83):	E276256 N3887107
Landform:	Stream Terrace and Toe Slope
Elevation:	ca. 2,400 ft AMSL
Soil Type(s):	Dellwood gravelly fine sandy loam, 0–5% slopes, frequently flooded (DgB); Saunook loam, 2–8% slopes (ScB)
Recommendation:	Unassessed (both within and outside LOD)

*Site measurements based on artifact distribution within the LOD; site likely extends outside LOD to the east.

Description. Site 31MA873 is a multicomponent site (minimally representing Middle Archaic and Middle Woodland Connestee phase occupations) located on a terrace and upland side slope east of Jones Creek and west of Jones Creek Road (Figures 5.43–5.45; see Figure 511). A 20th century barn is located to the south between the site and Allison Watts Road. The site is bounded to the west by Jones Creek, to the north by negative shovel tests and wetland soils, and to the south by negative shovel tests and fill associated with the barn. The site appears to extend outside of the LOD to the east toward Jones Creek Road.

Most of 31MA873 is underlain by Dellwood gravelly fine sandy loam, 0–5% slopes (DgB), an alluvial soil, but Saunook loam, 2–8% slopes (ScB) is found on the higher part of the terrace and is formed in colluvium (USDA NRCS 2021). Two different soil sequences were documented within the main site area. Most shovel tests encountered a typical A/B soil horizon sequence defined by a 20–30 cm thick plowzone of brown (7.5YR 4/3) sandy loam, overlying strong brown (7.5YR 4/6) or yellowish red (5YR 4/6) clay loam (and rock) (Figure 5.46). Two shovel tests (STs 383 and 384) on the higher part of the terrace (or upland slope base) in the eastern portion of the site encountered an intermediate buried A (Ab) horizon. This was a 7–12 cm thick layer of dark brown (7.5YR 3/2) sandy loam encountered at depths of 18 to 36 cm and appears to represent a relict plowzone (ApB horizon).

Shovel Tests. Twenty-seven lithic artifacts, nine precontact ceramic sherds, and two Euro-American artifacts were recovered from 16 of the 34 shovel tests excavated in this area. The 16 positive shovel tests produced from one to seven precontact period artifacts each; seven of these (all on the higher part of the terrace) produced ceramic sherds. The artifacts were found in the plowzone, with the exception of one ceramic sherd found in the buried A (ApB) horizon. The two postcontact artifacts were recovered from a single shovel test (that also produced precontact materials) along the eastern edge of the LOD.

Artifacts. The assemblage includes nine precontact ceramic artifacts; these include one typed sherd (Connestee plain, from the Ab horizon in ST 384) (Figure 5.47a); two thin sherds with unidentified stamped surfaces (Figures 5.47b and c), which probably also date to the Middle Woodland period; two eroded sherds (e.g., Figure 5.47d); and four small residual sherds. None of the sherds resembles Mississippian or Qualla phase materials. The 27 lithic artifacts (Table 5.5) include five projectile points, including an asymmetrical Morrow Mountain I stemmed projectile point made of quartz (Figure 5.47e); an unfinished untyped stemmed projectile point with a straight stem and ovate blade made of quartz (Figure 5.47f); a triangular projectile point made of metasiltstone (Figure 5.47g); a quartz medial fragment (Figure 5.47h); and a quartzite distal tip. The triangular point exhibits a concave base and resembles the Connestee triangular type (Keel 1976:131) or small variants of the Yadkin large triangular (Coe 1964:45, 47) or Camp Creek (Lewis and Kneberg 1957) types. The other artifacts consist of 22 pieces of unmodified debitage, including 14 of quartz, five of quartzite, and three of chert. Morrow Mountain points are diagnostic of the Middle Archaic period in western North Carolina, and most of the other projectile points appear to represent unspecified Archaic components. The nearly complete triangular point reflects the Middle Woodland occupation.

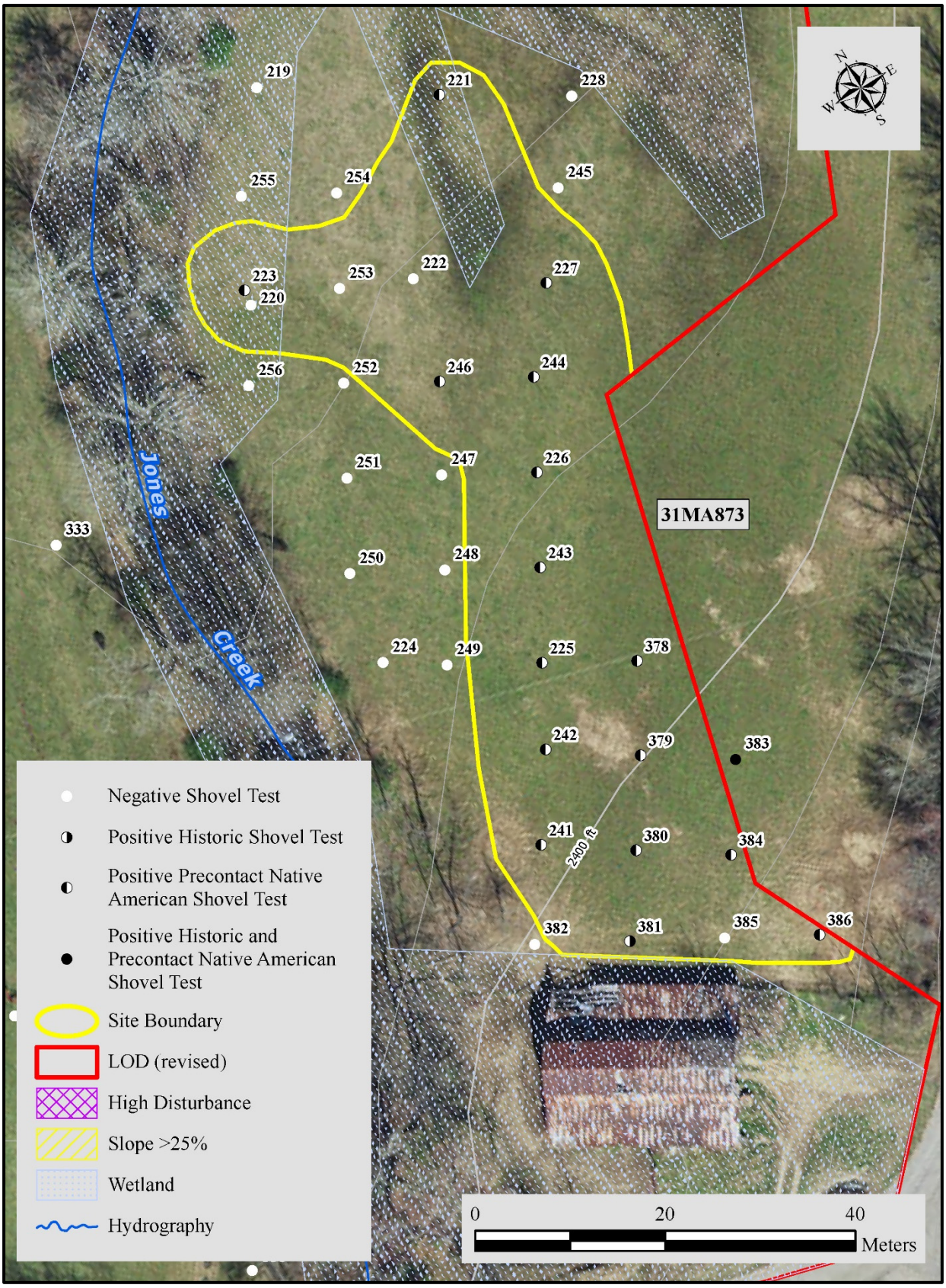

Figure 5.43. Map of 31MA873.



Figure 5.44. Site 31MA873, facing south.



Figure 5.45. Site 31MA873, facing north.



Figure 5.46. Shovel Test 378 at 31MA873.

Two postcontact artifacts (one wire nail and one cut nail with a missing head) are likely related to the nearby 20th century barn or activities there, and do not appear to represent a substantial component.

Summary and Recommendations. Site 31MA873 is a multicomponent site located on a stream terrace and adjacent toe slope east of Jones Creek and west of Jones Creek Road; the site extends outside the LOD to the east. Middle Archaic and Middle Woodland phase components were identified during the present work. Of the nine ceramic sherds, one is attributable to the Connestee phase of the Middle Woodland period; the other sherds likely represent a Middle Woodland occupation as well. All of the ceramics were found on the upper part of the terrace. Most projectile points are attributable to Archaic occupation, including a Morrow Mountain stemmed point that represents the Middle Archaic period; the triangular projectile point is likely associated with the Middle Woodland occupation.

Although that portion of the site within the LOD is characterized by low artifact density and no intact deposits (or cultural features) were identified, it is possible that the Woodland component is associated with interpretable structure patterns and intact features. Other than a potential for features associated with Woodland period occupations, however, there is no evidence for any deep or discrete Archaic-related deposits. Given the potential for Woodland period features and the limited intensity of the work conducted for this Project, 31MA873 is considered unassessed for NRHP eligibility under Criterion D; the site appears unlikely to possess the characteristics necessary for eligibility under Criteria A–C, however.

TRC recommends that the portion of 31MA873 with the LOD be avoided and protected from ground disturbance during construction of the Cornbread Valley Mitigation Site; assuming that this can be accomplished, no further investigations are recommended at 31MA873 in connection with the Project. If the site cannot be avoided, additional investigations (including test unit excavation and limited topsoil stripping) are recommended to assess the site's significance.



Figure 5.47. Selected ceramic and lithic artifacts from 31MA873. a: Connestee plain, ST 384; b: unidentified stamped, ST 225; c: unidentified stamped, ST 244; d: unidentified eroded, ST 379; e: quartz Morrow Mountain PPK, ST 223; f: quartz unidentified stemmed PPK, ST 383; g: metasandstone Woodland triangular PPK, ST 244; h: quartz biface fragment, ST 378

Table 5.5. Lithic Artifacts from 31MA873.

Description	Chert	Metasiltstone	Quartz	Quartzite	Total
Chipped Stone Tool					
Morrow Mountain I stemmed PPK			1		**1**
Untyped stemmed PPK			1		**1**
Woodland triangular PPK		1			**1**
Untyped medial PPK fragment			1		**1**
Untyped distal PPK tip				1	**1**
Subtotal		*1*	*3*	*1*	***5***
Chipped Stone Debitage					
Flake/Shatter	3		14	5	**22**
Subtotal	*3*		*14*	*5*	***22***
Chipped Stone Total	*3*	*1*	*17*	*6*	***27***
Chipped Stone Percentage	11.1	3.7	63.0	22.2	**100.0**

31MA874

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	20 m N–S × 15 m E–W
UTMs (NAD 83):	E276200 N3887005
Landform:	Stream Terrace
Elevation:	ca. 2,404 ft AMSL
Soil Type(s):	Dellwood gravelly fine sandy loam, 0–5% slopes, frequently flooded (DgB)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA874 is a small precontact site situated on a stream terrace east of Jones Creek and south of Allison Watts Road (Figures 5.48 and 5.49; see Figure 5.11). The site is bounded to the north by negative shovel tests, to the south and east by wetlands, and to the west by a branch of Jones Creek.

The soils at 31MA874 are mapped as Dellwood gravelly fine sandy loam, 0–5% slopes (DgB), a moderately well-drained soil found on floodplains and derived from gravelly and cobbly alluvium (USDA NRCS 2021). Shovel tests encountered a 9–18 cm thick plowzone (Ap horizon) of dark yellowish brown (10YR 4/4) silt loam overlying brownish yellow (10YR 6/8) clay loam (Figure 5.50).

Shovel Tests. Four lithic artifacts were recovered from three of nine shovel tests excavated at 7.5- to 20-m intervals; all artifacts were encountered within the plowzone.

Artifacts. Four pieces of nondiagnostic lithic debitage (three of chert and one of quartz) were recovered from 31MA874.

Summary and Recommendations. Site 31MA874 is represented by four pieces of unmodified quartz debitage found in the plowzone. This site is a low-density artifact scatter that produced no diagnostic artifacts and is unlikely to provide any new or significant information concerning the precontact period occupations in the region. The site is recommended not eligible for the NRHP under all Criterion D and appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

31MA875

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	20 m N-S × 15 m E-W
UTMs (NAD 83):	E276117 N3886902
Landform:	Stream Terrace
Elevation:	ca. 2,412 ft AMSL
Soil Type(s):	Dellwood gravelly fine sandy loam, 0–5% slopes, frequently flooded (DgB)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA875 is a low-density, nondiagnostic lithic site located on a low rise on the terrace east of Jones Creek and south of Allison Watts Road (Figures 5.51 and 5.52; see Figure 5.11). The site is bounded to the north, east, and west by seasonal wetlands, while the southern boundary is defined by shovel tests.

The soils at 31MA875 are mapped as Dellwood gravelly fine sandy loam, 0–5% slopes (DgB). Shovel tests on the low rise encountered a 20–25 cm thick plowzone of dark brown (10YR 3/3) or brown (10YR 4/3) silt loam that overlay strong brown (7.5YR 4/6) or dark yellowish brown (10YR 4/6) sandy clay loam (Figure 5.53). Some tests encountered cobbles within the B horizon, and some tests along the landform margins encountered strong brown gravelly sand and gravels below the shallow plowzone.

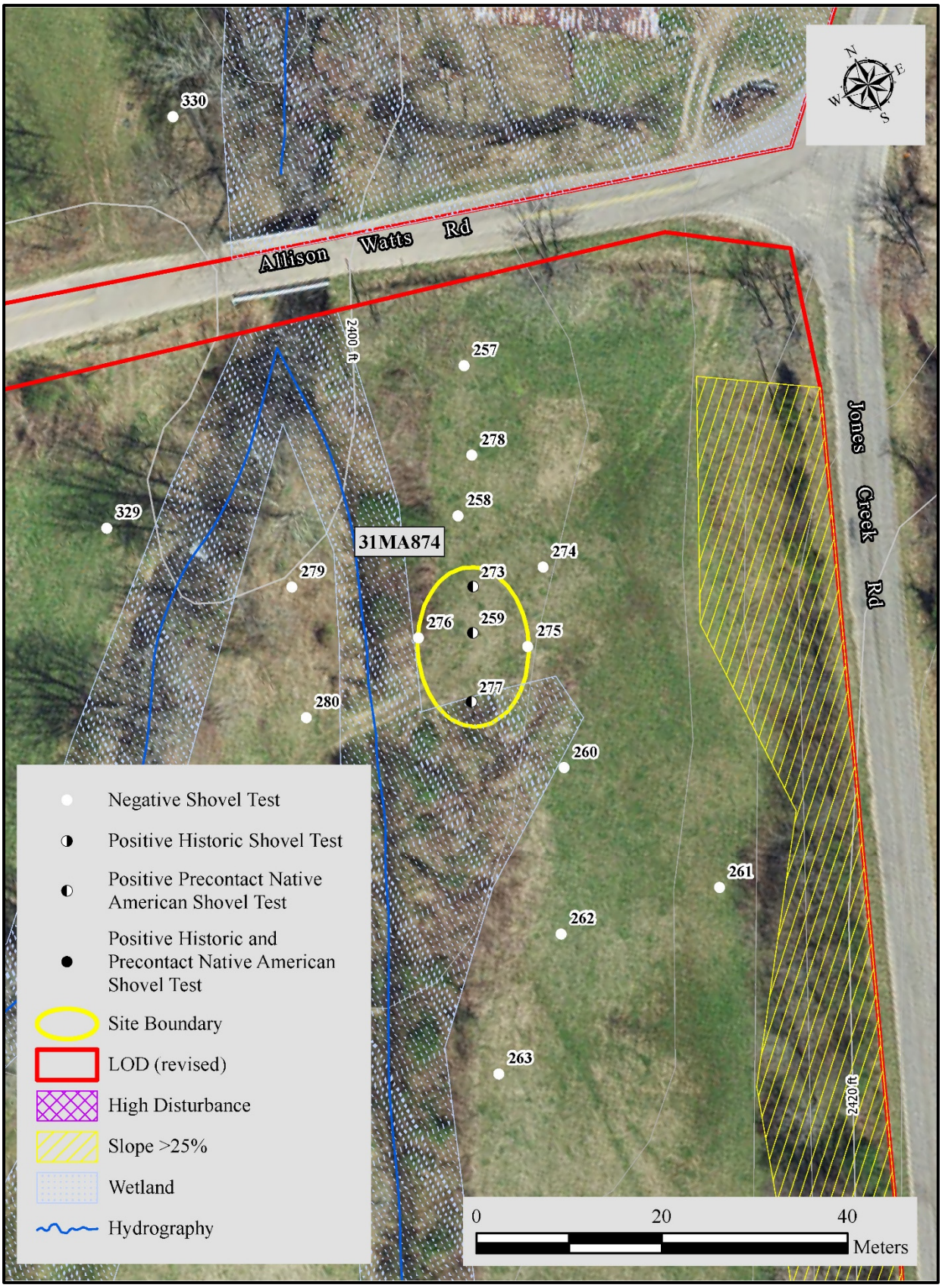

Figure 5.48. Map of 31MA874.



Figure 5.49. Site 31MA874, facing southwest.



Figure 5.50. Shovel Test 273 at 31MA874.

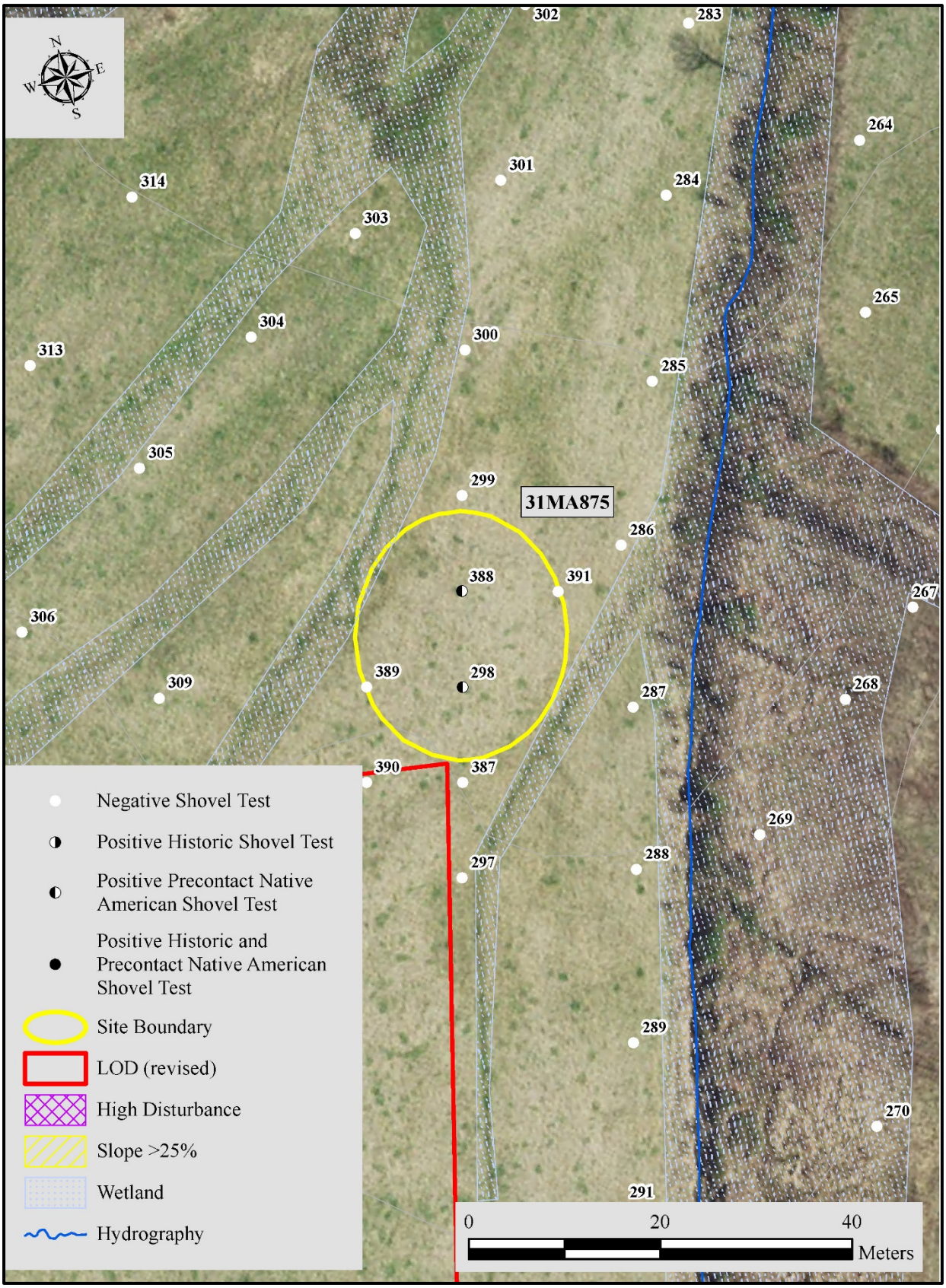

Figure 5.51. Map of 31MA875.



Figure 5.52. Site 31MA875, facing north.



Figure 5.53. Shovel Test 388 at 31MA875.

Shovel Tests and Test Units. Two lithic artifacts were recovered from two of eight shovel tests excavated on the micro-landform at 20- and 10-m intervals. All artifacts were encountered within the plowzone (Ap horizon).

Artifacts. The assemblage consists of two pieces of unmodified chert debitage.

Summary and Recommendations. Site 31MA875 is represented by two nondiagnostic chert artifacts found on a low rise on a stream terrace. This site is a low-density artifact scatter that produced no diagnostic artifacts and is unlikely to provide any new or significant information concerning the precontact period occupations in the region. Site 31MA875 is recommended not eligible for the NRHP under all Criterion D and appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

31MA876

Component(s):	Precontact: Middle to Late Archaic
Site Dimensions:	25 m NE–SW × 40 m NW-SE
UTMs (NAD 83):	E276009 N3886951
Landform:	Stream Terrace
Elevation:	ca. 2,416 ft AMSL
Soil Type(s):	Dellwood gravelly fine sandy loam, 0–5% slopes, frequently flooded (DgB)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31MA876 is a low-density precontact site with a Middle Archaic component situated on a stream terrace near the confluence of two branches of Jones Creek, south of Allison Watts Road (Figures 5.54 and 5.55; see Figure 5.11). The site is bounded to the north by negative shovel tests and upland slope, and to the south, east, and west by the stream channels.

The soil type at 31MA876 is mapped as Dellwood gravelly fine sandy loam, 0–5% slopes (DgB) (USDA NRCS 2021). Soil sequences varied within the site area, but most shovel tests encountered a 20–30 cm thick plowzone of brown (7.5YR 4/3) sandy loam that overlay semi-hydric, interlayered strong brown (7.5YR 4/6) and brown (7.5YR 4/3) sandy clay loam (Figure 5.56). Some tests near the stream banks encountered a cobbly upper stratum overlying hydric, grayish brown (10YR 5/2) clay loam.

Shovel Tests. Five lithic artifacts were recovered from four of 16 shovel tests excavated across the landform at 20- and 10-m intervals. All artifacts were encountered within the plowzone (Ap horizon).

Artifacts. The five lithic artifacts include a quartz Morrow Mountain stemmed projectile point (Figure 5.57) and four pieces of unmodified debitage (one chert, two quartz, one quartzite). The Morrow Mountain stemmed type is diagnostic of the Middle Archaic period in western North Carolina.

Summary and Recommendations. Site 31MA876 is a small site with a Middle Archaic component located on a stream terrace. The few associated artifacts were found in relatively shallow (and formerly plowed) subsurface contexts. The associated artifact types are not typically correlated with subsurface features and were not found in any intact context. Site 31MA876 is unlikely to provide any significant or new information concerning precontact occupations in the area and is recommended not eligible for the NRHP under all Criterion D; the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

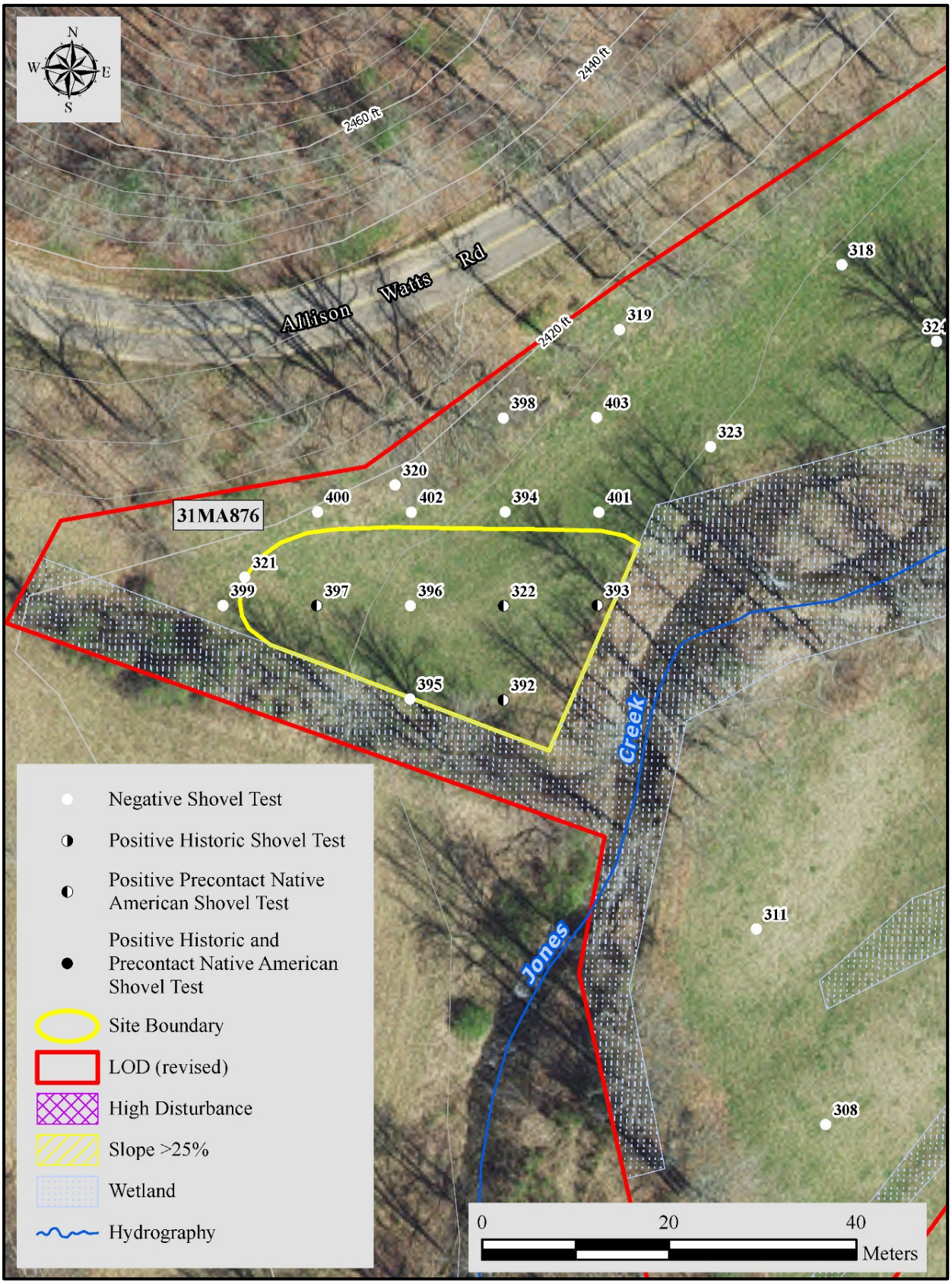

Figure 5.54. Map of 31MA876.



Figure 5.55. Site 31MA876, facing southwest.



Figure 5.56. Shovel Test 397 at 31MA876.



Figure 5.57. Stemmed PPK from 31MA876. ST 392

31MA877

Component(s):	Precontact: nondiagnostic lithic; Postcontact: early to late 19th century
Site Dimensions:	70 m N-S × 70 m E-W
UTMs (NAD 83):	E276181 N3887196
Landform:	Stream Terrace and Toe Slope Base
Elevation:	ca. 2,392 ft AMSL
Soil Type(s):	Dellwood gravelly fine sandy loam, 0–5% slopes, frequently flooded (DgB); Saunook loam, 2–8% slopes (ScB)
Recommendation:	Unassessed

Description. Site 31MA877 is a multicomponent precontact and postcontact site situated on a high stream terrace at the base of a toe slope between the branches of Jones Creek, south of North Jones Creek Road and north of Allison Watts Road (Figures 5.58 and 5.59; see Figure 5.11). The site is bounded to the north and south by negative shovel tests, to the east by negative tests and low, wetland areas, and to the west by negative tests, hydric wetland areas, and upland slope.

The soils at 31MA877 are mapped as Dellwood gravelly fine sandy loam, 0–5% slopes (DgB), an alluvial soil with varied drainage properties, and Saunook loam, 2–8% slopes (ScB), which is formed in colluvium at the base of toe slopes (USDA NRCS 2021). Soils varied throughout the site, mainly due to different local drainage characteristics, but most encountered one of two sequences. The first of these is a typical A/B soil horizon sequence consisting of a 20–35 cm thick brown (10YR 4/3) or dark yellowish brown (10YR 3/4) plowzone overlying dark yellowish brown (10YR 3/6), brown (7.5YR 4/4), strong brown (7.5YR 4/6), or yellowish red (5YR 4/6) clay loam. An intermediate buried A horizon (Ab horizon) was encountered in 18 shovel tests (STs 354, 360–362, 371, 417, 420–427, and 430–433) within the site (Figure 5.60) and is interpreted as a remnant buried plowzone (ApB horizon). That deposit appears to span both mapped soil types but was predominately located in the area mapped as Saunook loam. The silt loam ApB horizon varied from 10 to 29 cm in thickness and from dark brown (10YR 3/3) to very dark brown (10YR 2/2) to black (10YR 2/1) in color.

Shovel Tests. Three lithic artifacts and 27 postcontact artifacts were recovered from 15 of 49 shovel tests excavated at 20- and 10-m intervals (including all transect and delineation tests situated within 20 m). Three shovel tests produced precontact artifacts, while 12 tests produced postcontact artifacts. Although most artifacts were found within the plowzone (Ap horizon), seven of the 27 postcontact period artifacts were found in the ApB horizon.

Artifacts. The precontact assemblage from 31MA877 is not substantial; the three lithic artifacts include the tip of an unidentifiable quartz projectile point and two pieces of unmodified debitage (one chert, one quartz). The postcontact assemblage includes 12 ceramic artifacts, 14 architectural-related artifacts, and a small artifact that is either earthenware or brick (Table 5.6). The ceramic artifacts include a molded blue shell edged fragment of pearlware or early whiteware (Figure 5.61f) that is of early 19th century manufacture (Hunter and Miller 1994), a fragment of later 19th century blue edged whiteware (Figure 5.61g), an unusual polychrome handpainted whiteware sherd (Figure 5.61k), six undecorated whiteware sherds (e.g., Figures 5.61h–j), a salt glazed stoneware sherd (Figure 5.61c), and two alkaline glazed stoneware sherds (Figures 5.61d and e). The other historic artifacts include six cut nails (e.g., Figure 5.61a–b), two unidentified nails, six small eroded brick fragments, and a fragment of brick or unglazed earthenware.

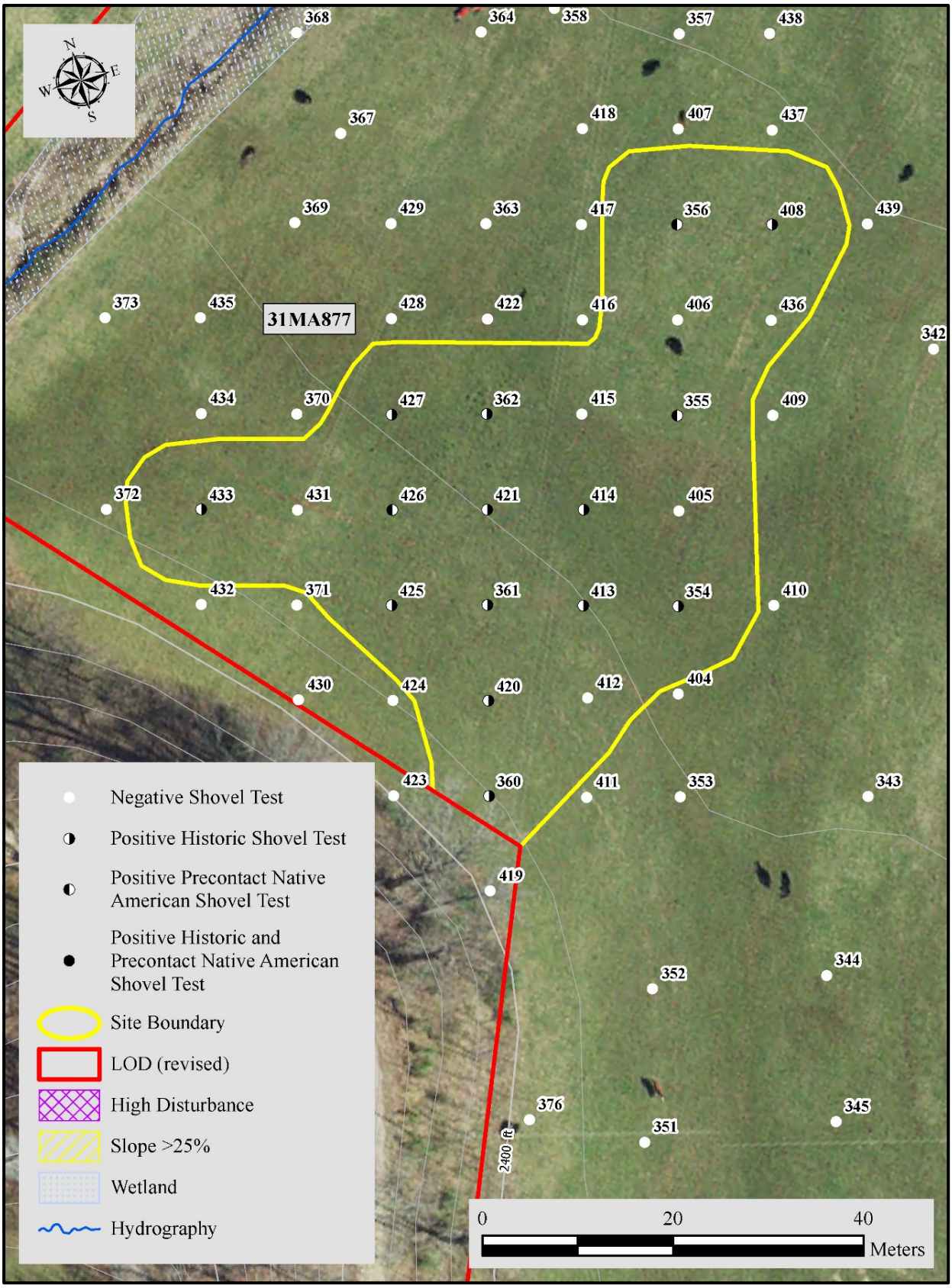

Figure 5.58. Map of 31MA877.



Figure 5.59. Site 31MA877, facing south.



Figure 5.60. Shovel Test 425 at 31MA877.

Table 5.6. Postcontact (Historic Period) Artifacts from 31MA877.

Description	Count
Kitchen Group	
Stoneware, salt glazed	1
Stoneware, alkaline glazed	2
Whiteware, blue edged	1
Whiteware, handpainted	1
Whiteware, undecorated	6
Unidentified refined earthenware, molded, blue shell edged	1
Group Subtotal	*12*
Architectural Group	
Brick fragment	6
Nail, cut	6
Nail, unidentified	2
Group Subtotal	*14*
Miscellaneous	
UD (earthenware or brick)	1
Group Subtotal	1
Total	**27**

The postcontact artifacts appear attributable to a former 19th century domestic occupation located on the high terrace at the base of the toe slope. No structures are shown at this location on the historic maps examined, and the nature of the artifact assemblage suggests that the occupation did not extend into the 20th century. There is no surface evidence of a former structure in the pasture, although scattered daffodils or jonquils are present within the site area and extend beyond its limits. A pushpile at the base of the toe slope appears relatively recent and was found to incorporate impenetrable barbed wire.

The ethnicity of the sites' occupants is uncertain. While it is most likely that the site represents an early Euro-American occupation, it is possible that it is associated with the 19th century Cherokee occupation at Sandtown. Although the Cherokees were officially dispossessed of their Cartoogechaye lands by the 1819 treaty, local resident William Siler sheltered a sizeable Cherokee community on lands he controlled along Muskrat Branch and Cartoogechaye Creek, a few miles north of the Cornbread Valley Mitigation Site. Although there is presently no known evidence that Sandtown extended into the Project vicinity (Brett Riggs, personal communication 2021), there remains some potential that site 31MA877 reflects a 19th century Cherokee or Anglo-Cherokee occupation.



Figure 5.61. Selected postcontact (historic period) artifacts from 31MA877. a: cut nail, ST 425; b: cut nail, ST 354; c: salt glazed stoneware, ST 361; d: alkaline glazed stoneware, ST 413; e: alkaline glazed stoneware, ST 421; f: blue molded shell edge refined earthenware, ST 422; g: blue edged whiteware, ST 420; h: undecorated whiteware, ST 354; i–j: undecorated whiteware, ST 413; k: handpainted whiteware, ST 421

Summary and Recommendations. Site 31MA877 is a nondiagnostic lithic and 19th century site situated on a high stream terrace at the base of a toe slope between branches of Jones Creek. The precontact lithic component is represented by few artifacts and is unlikely to provide any significant or new information concerning the prehistory of the area. Although no intact deposits were encountered and postcontact artifact density was low, the postcontact artifacts appear to represent an unmixed 19th century occupation, which is relatively unusual in southwestern North Carolina where many preferred home sites were occupied well into the 20th century if not later. Although it is most likely that the site represents 19th century Euro-American occupation of the valley, it could instead represent a Cherokee or Anglo-Cherokee occupation associated with the community of Sandtown.

Given the limited intensity of the survey, the NRHP eligibility of 31MA877 is considered unassessed. Accordingly, TRC recommends that 31MA877 be avoided and protected from ground disturbance during construction of the Cornbread Valley Mitigation Site. Assuming that this can be accomplished, no further investigations are recommended at 31MA877 in connection with the Project. If the site cannot be avoided, additional investigations (including documentary research, test unit excavation, and limited topsoil stripping) would be recommended to assess the site's significance.

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6. SUMMARY AND RECOMMENDATIONS

TRC has completed an archaeological survey of the Cornbread Valley Mitigation Site in Macon County, North Carolina. The work was conducted on behalf of Wildlands Engineering, Inc., as part of the permitting requirements for the proposed restoration and enhancement of approximately 7,312 linear feet of stream. This work took place in accordance with TRC's technical proposal for the Project. The proposed LOD for the mitigation work encompasses about 36 acres (including approximately 15 acres of seasonal wetlands) in the Jones Creek drainage and includes broad stream terraces on both sides of Jones Creek and adjacent ridge toe slopes. The Project area is bisected by North Jones Creek Road (SR 1128) and Allison Watts Road and is partially bounded by Jones Creek Road (SR 1130) and a private road (Byrd Farm Road) on the east side. The entire LOD is situated in pasture.

The archaeological fieldwork was directed by Bruce Idol of TRC, occurred from April 5–15, 2021, and required approximately 240 person-hours. The fieldwork included a systematic pedestrian reconnaissance of the entire LOD and systematic shovel testing at 20-m and 30-m intervals across all parts of the LOD except for visible wetland areas, areas of greater than 15% slope, or isolated areas of erosion or disturbance; supplemental shovel tests were excavated at 7.5- and 10-m intervals to delineate finds. A total of 439 shovel tests were excavated within the Project LOD.

The survey identified 16 archaeological sites within the Project LOD (31MA862–31MA877) (Table 6.1). Two of these sites (31MA873 and 31MA877) are considered unassessed for NRHP eligibility and would require additional testing prior to any ground disturbing activities. Site 31MA873 is a precontact Middle Archaic and Middle Woodland (Connestee phase) site situated on a terrace in the pasture east of Jones Creek Road and north of Allison Watts Road; it extends outside of the LOD to the east. Although 31MA873 is represented by relatively few artifacts, it contains a thin buried A horizon on the upper (eastern) part of the terrace, and it is possible that associated Connestee phase features are present. Given the limited extent of the survey within the LOD, the NRHP status of 31MA873 is considered unassessed, and avoidance during construction is recommended. Site 31MA877 is a low-density precontact lithic and postcontact 19th century site situated on a terrace at the base of a toe slope west of Jones Creek and south of North Jones Creek Road. A buried A horizon is present over much of the site. The presence of a few artifacts of early 19th century manufacture suggests that the occupation may have begun by that time, and 19th century features are potentially present; while this site likely represents a Euro-American occupation, there is also some potential that it is associated with the 19th century Cherokee community of Sandtown. In the absence of more intensive testing, the NRHP status of 31MA877 is considered unassessed, and avoidance during construction is recommended.

The remaining 14 sites (31MA862–31MA872 and 31MA874–31MA876) are dispersed low-density lithic scatters or isolated artifact finds that contain Early Archaic and unidentified Woodland (31MA862), Middle to Late Archaic (31MA876), unidentified Archaic (31MA871), unidentified Archaic and nondiagnostic ceramic (31MA872), nondiagnostic lithic (31MA863–31MA866, 31MA868–31MA870, 31MA874, and 31MA875), or nondiagnostic lithic and ceramic (31MA867) components. These sites appear to lack research potential and are recommended not eligible for the NRHP under all four criteria as expressed within the LOD. No further archaeological investigations are recommended at these sites for the Project as currently defined.

Providing that 31MA873 and 31MA877 are avoided by all construction activities, no further archaeological investigations are recommended at the Cornbread Valley Mitigation Site as presently defined.

Table 6.1. Archaeological Sites Identified by the Cornbread Valley Mitigation Site Survey.

Site	Component	NRHP Eligibility Recommendation
31MA862	Precontact: Early Archaic; Woodland	Not eligible
31MA863	Precontact: nondiagnostic lithic	Not eligible
31MA864	Precontact: nondiagnostic lithic	Not eligible
31MA865	Precontact: nondiagnostic lithic	Not eligible
31MA866	Precontact: nondiagnostic lithic	Not eligible
31MA867	Precontact: nondiagnostic lithic and ceramic	Not eligible
31MA868	Precontact: nondiagnostic lithic	Not eligible
31MA869	Precontact: nondiagnostic lithic	Not eligible
31MA870	Precontact: nondiagnostic lithic	Not eligible
31MA871	Precontact: nondiagnostic lithic	Not eligible
31MA872	Precontact: Archaic; nondiagnostic ceramic	Not eligible
31MA873	Precontact: Middle Archaic; Middle Woodland	Unassessed
31MA874	Precontact: nondiagnostic lithic	Not eligible
31MA875	Precontact: nondiagnostic lithic	Not eligible
31MA876	Precontact: Middle to Late Archaic	Not eligible
31MA877	Precontact: nondiagnostic lithic; Postcontact: early to late 19th century	Unassessed

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APPENDIX 1: PRECONTACT CERAMIC ARTIFACT CATALOG

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Appendix 1. Precontact Ceramic Artifacts Catalog.

Site	Bag#	ST	Strat	Horizon	Depth	Type	Uni#	Part	Surf 1	Temper	Interior	Series	Count	Comments
31MA862	3	6	II	Ab	38-57	PCER	p1	Body	erode				1	mends with p2, Woodland
31MA862	3	6	II	Ab	38-57	PCER	p2	Body	Uid S	C Sand	erode		1	mends with p2, Woodland
31MA867	36	113	I	Ap	0-15	PCER	p1		<2cm				1	
31MA872	50	231	I	Ap	0-50	PCER	p1	Body	CCS	C Sand	none		1	
31MA873	54	225	I	Ap	0-26	PCER	p1	Body	Uid S	C Sand	none		1	thin
31MA873	55	226	I	Ap	0-22	PCER	p1		<2cm				1	
31MA873	55	226	I	Ap	0-22	PCER	p2	Body	erode				1	
31MA873	57	241	I	Ap	0-28	PCER	p1		<2cm				1	
31MA873	60	244	I	Ap	0-27	PCER	p1	Body	Uid S	C Sand	Smoothed		1	thin
31MA873	75	378	I	Ap	0-26	PCER	p1		<2cm				1	
31MA873	76	379	I	Ap	0-10	PCER	p1	Body	erode				1	
31MA873	80	384	I	Ap	0-18	PCER	p1		<2cm				1	
31MA873	81	384	II	Ab	18-25	PCER	p1	Neck	Pln	C Sand	none	Connestee	1	

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APPENDIX 2: PRECONTACT LITHIC ARTIFACT CATALOG

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Appendix 2. Precontact Lithic Artifacts Catalog.

Site	Bag#	Uni#	ST	Strat	Horizon	Depth (cmbs)	ArtType	RawMat	Cortex?	ToolType	Type	Count	Wt (g)	Comments
31MA862	1	L1	5	I	Ap	0-35	LDEB	Qz	N			1	0.4	
31MA862	1	L2	5	I	Ap	0-35	LDEB	Qzite	N			1	0.2	
31MA862	2	L1	6	I	Ap	0-38	LDEB	Qz	N			2	6.2	
31MA862	2	L2	6	I	Ap	0-38	LDEB	Qzite	N			1	0.5	
31MA862	4	L1	7	I	Ap	0-10	LDEB	Che	N			1	0.5	
31MA862	5	L1	10	I	Ap	0-12	LDEB	Che	N			1	0.7	
31MA862	6	L1	13	I	Ap	0-35	LDEB	Qz	N			2	3.2	
31MA862	6	L2	13	I	Ap	0-35	LDEB	Qzite	N			2	10.2	
31MA862	7	L1	14	I	Ap	0-23	LDEB	Qz	N			1	0.1	
31MA862	7	L2	14	I	Ap	0-23	LDEB	Che	N			1	0.1	white
31MA862	8	L1	16	I	Ap	0-20	LDEB	Qz	N			1	1.7	
31MA862	9	L1	17	I	Ap	0-10	LDEB	Che	N			1	0.4	
31MA862	9	L2	17	I	Ap	0-10	LDEB	Qz	N			2	1.4	
31MA862	9	LT1	17	I	Ap	0-10	LTFL	Qz	N	PPK-CN	Kirk/Palmer	1	3.1	serrated edges; irreg convex base; missing distal tip
31MA862	10	L1	18	I	Ap	0-22	LDEB	Qz	N			1	1.9	
31MA862	11	L1	20	I	Ap	0-23	LDEB	Qz	N			3	1.6	
31MA862	12	L1	21	I	Ap	0-39	LDEB	Qz	N			1	0.7	
31MA862	13	L1	35	I	Ap	0-35	LDEB	Che	N			1	0.1	
31MA862	13	L2	35	I	Ap	0-35	LDEB	Qz	N			1	0.5	
31MA862	13	L3	35	I	Ap	0-35	LDEB	Qzite	Y			1	14.9	
31MA862	14	L1	37	I	Ap	0-49	LDEB	Qz	N			5	1.5	
31MA862	15	L1	38	I	Ap	10-20	LDEB	Qz	N			3	2.4	
31MA862	16	L1	39	I	Ap	0-52	LDEB	Qz	N			5	4	
31MA862	17	L1	40	I	Ap	0-33	LDEB	Qz	N			3	3	
31MA862	17	L2	40	I	Ap	0-33	LDEB	Qzite	N			1	9.3	
31MA862	18	L1	41	I	Ap	0-10	LDEB	Qz	N			2	0.5	
31MA862	19	L1	42	II	Ab	27-36	LDEB	Qz	N			1	0.9	
31MA862	20	L1	43	I	Ap	0-18	LDEB	Qz	N			1	0.3	
31MA862	21	L1	45	I	Ap	0-22	LDEB	Qz	N			1	0.1	
31MA862	22	L2	50	I	Ap	0-25	LDEB	Che	N			1	0.2	
31MA863	23	L1	51	I	Ap	0-18	LDEB	Qz	N			3	2.5	
31MA863	25	L1	67	I	Ap	0-20	LDEB	Qz	N			2	1.5	
31MA863	26	L1	68	I	Ap	0-10	LDEB	Qz	N			1	0.2	
31MA863	27	L1	69	I	Ap	0-20	LDEB	Qz	N			1	0.2	
31MA863	27	LT1	69	I	Ap	0-20	LTFL	Qzite	N	Preform-Frag		1	8.1	distal frag; minimally worked; biconvex x-section
31MA863	28	L1	71	I	Ap	0-25	LDEB	Qz	N			2	1.0	
31MA864	24	LT1	63	I	Ap	0-10	LTFL	Qz	N	PPK-Frag		1	11.5	medial frag; distal end of haft exhibits bifacial corner-removal; Preform or PPK Frag
31MA865	29	L1	81	I	Ap	0-22	LDEB	Qz	N			1	0.3	
31MA866	30	L1	103	I	Ap	0-35	LDEB	Che	N			1	0.1	
31MA866	30	L2	103	I	Ap	0-35	LDEB	Qz	N			1	0.8	
31MA866	31	L1	104	I	Ap	10-20	LDEB	Che	N			1	0.1	
31MA866	32	L1	117	I	Ap	0-24	LDEB	Che	N			2	0.3	
31MA866	32	L2	117	I	Ap	0-24	LDEB	Qzite	N			1	2.0	
31MA866	33	L1	118	I	Ap	0-10	LDEB	Qz	N			1	0.5	
31MA866	34	L1	119	I	Ap	0-10	LDEB	Che	N			1	0.4	
31MA866	34	L2	119	I	Ap	0-10	LDEB	Qz	N			1	0.1	
31MA866	35	L1	121	I	Ap	0-15	LDEB	Qz	N			1	0.6	
31MA867	36	L1	113	I	Ap	0-15	LDEB	Qz	N			1	0.3	
31MA867	36	L2	113	I	Ap	0-15	LDEB	Qzite	N			1	0.3	
31MA868	37	L1	159	I	Ap	0-20	LDEB	Qz	N			5	5.4	
31MA868	38	L1	165	I	Ap	0-15	LDEB	Qz	N			1	0.9	
31MA869	39	L1	162	I	Ap	0-17	LDEB	Qz	N			1	0.2	
31MA869	39	L2	162	I	Ap	0-17	LDEB	CQz	N			1	0.9	smoky
31MA870	40	L1	173	II	Ab	20-30	LDEB	Che	N			1	0.1	
31MA870	41	L1	178	I	Ap	0-25	LDEB	Qz	N			1	0.4	
31MA870	42	L1	179	I	Ap	0-30	LDEB	Qz	N			1	0.1	

Appendix 2. Precontact Lithic Artifacts Catalog.

Site	Bag#	Uni#	ST	Strat	Horizon	Depth (cmbs)	ArtType	RawMat	Cortex?	ToolType	Type	Count	Wt (g)	Comments
31MA871	43	L1	176	I	Ap	10-20	LDEB	Qz	N			2	6.1	one poss modified
31MA871	43	LT1	176	I	Ap	10-20	LTFL	Che	N	PPK-Stem		1	5.7	n.c.; one excurv edge, one incurv; horiz shldrs; sl contract stem w/ convex base- missing one edge; broad tip; lent x-section
31MA871	44	L1	181	I	Ap	0-15	LDEB	Che	N			1	0.3	
31MA871	44	L2	181	I	Ap	0-15	LDEB	Qz	N			1	0.3	
31MA871	44	L3	181	I	Ap	0-15	LDEB	Qzite	N			3	14.1	
31MA871	45	L1	186	I	Ap	0-15	LDEB	Qz	N			2	0.3	
31MA872	46	L1	211	I	Ap	0-25	LDEB	Che	N			1	0.1	
31MA872	46	L2	211	I	Ap	0-25	LDEB	MV	N			1	0.2	
31MA872	47	L1	215	I	Ap	0-27	LDEB	Qz	N			5	9.0	
31MA872	47	L2	215	I	Ap	0-27	LDEB	Qzite	N			1	0.2	
31MA872	48	L1	216	I	Ap	0-28	LDEB	Qz	N			2	0.3	
31MA872	48	L2	216	I	Ap	0-28	LDEB	CQz	N			1	0.2	
31MA872	49	L1	217	I	Ap	0-25	LDEB	Che	N			1	0.1	
31MA872	50	L1	231	I	Ap	0-50	LDEB	Qz	N			4	4.4	
31MA872	50	LT1	231	I	Ap	0-50	LTFL	Qz	N	PPK-Stem		1	11.8	prox frag; one horiz-taper shldr, one narrow, taper; long, str stem w/ str base; plano-convex x-section; LBC
31MA872	51	L1	235	I	Ap	0-10	LDEB	Qz	N			1	3.2	
31MA872	52	L1	239	I	Ap	0-19	LDEB	Qz	N			2	0.2	
31MA873	53	L1	223	I	Ap	10-22	LDEB	Qzite	N			1	143.4	
31MA873	53	LT1	223	I	Ap	10-22	LTFL	Qz	N	PPK-Stem	Morrow Mtn.	1	6.3	n.c.; one incurv, one excurv edge; one exp shldr- opposing nonexistent; pointed stem; missing extreme distal tip; plano-median ridged; util as Scraper?
31MA873	54	L1	225	I	Ap	0-26	LDEB	Qzite	N			1	20.2	
31MA873	55	L1	226	I	Ap	0-22	LDEB	Qz	N			1	0.1	
31MA873	56	L1	227	I	Ap	0-25	LDEB	Qz	N			1	0.1	
31MA873	57	L1	241	I	Ap	0-28	LDEB	Qz	N			2	3.5	
31MA873	57	LT1	241	I	Ap	0-28	LTFL	Qzite	N	PPK-Frag		1	0.8	distal tip only
31MA873	58	L1	242	I	Ap	10-20	LDEB	Che	N			1	0.1	
31MA873	59	L1	243	I	Ap	0-19	LDEB	Qz	N			1	0.1	
31MA873	59	L2	243	I	Ap	0-19	LDEB	CQz	N			1	0.2	
31MA873	60	LT1	244	I	Ap	0-27	LTFL	MSa	N	PPK-Triang	Woodland (Yadkin?)	1	7.7	n.c.; str edges; concave base; missing one ear & distal tip; plano-median ridged x-section
31MA873	61	L1	246	I	Ap	0-28	LDEB	Qz	N			2	2.7	
31MA873	61	L2	246	I	Ap	0-28	LDEB	Qzite	N			1	5.9	
31MA873	75	L1	378	I	Ap	0-26	LDEB	Qz	N			4	6.6	
31MA873	75	L2	378	I	Ap	0-26	LDEB	Qzite	Y			1	1.7	may just be fcr, instead
31MA873	75	LT1	378	I	Ap	0-26	LTFL	Qz	N	Preform-Frag		1	5.9	medial frag
31MA873	76	L1	379	I	Ap	0-10	LDEB	Che	N			1	0.1	
31MA873	77	L1	380	I	Ap	0-25	LDEB	Che	Y			1	0.3	
31MA873	77	L2	380	I	Ap	0-25	LDEB	Qz	N			1	3.8	
31MA873	79	L1	383	I	Ap	0-24	LDEB	Qz	N			1	0.4	
31MA873	79	L2	383	I	Ap	0-24	LDEB	Qzite	N			1	0.4	
31MA873	79	LT1	383	I	Ap	0-24	LTFL	Qz	N	PPK-Stem		1	16.5	ovate blade w/ irreg, excurv edges- part of one missing; str stem; irreg distal end
31MA874	62	L1	259	I	Ap	10-15	LDEB	Che	N			1	0.1	
31MA874	63	L1	273	I	Ap	0-10	LDEB	Che	N			1	0.2	
31MA874	63	L2	273	I	Ap	0-10	LDEB	Qz	N			1	1.0	
31MA874	64	L1	277	I	Ap	0-15	LDEB	Che	Y			1	0.1	
31MA875	65	L1	298	I	Ap	0-20	LDEB	Che	N			1	0.1	
31MA875	83	L1	388	I	Ap	10-20	LDEB	Che	N			1	0.7	
31MA876	66	L1	322	I	Ap	0-30	LDEB	Qz	N			2	0.5	

Appendix 2. Precontact Lithic Artifacts Catalog.

Site	Bag#	Uni#	ST	Strat	Horizon	Depth (cmbs)	ArtType	RawMat	Cortex?	ToolType	Type	Count	Wt (g)	Comments
31MA876	84	LT1	392	I	Ap	10-20	LTFL	Qz	N	PPK-Stem		1	13.9	complete or n.c.; excurv edges; contracted stem w/ (snapped?) sloped base; acute tip; biconvex x-section
31MA876	85	L1	393	I	Ap	0-25	LDEB	Qzite	N			1	0.5	
31MA876	86	L1	397	I	Ap	0-29	LDEB	Che	N			1	0.1	
31MA877	69	L1	355	I	Ap	0-35	LDEB	Che	N			1	0.1	
31MA877	70	L1	356	I	Ap	0-10	LDEB	Qz	N			1	0.7	
31MA877	96	LT1	426	II	Ab	20-30	LTFL	Qz	N	PPK-Frag		1	1.6	distal tip only; biconvex x-section

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APPENDIX 3: POSTCONTACT ARTIFACT CATALOG

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Appendix 3. Postcontact Artifact Catalog.

Site#	FS#	Bag#	Transect#	Prov	Strat	Horizon	Depth	MatClass	PrimClass	ArtifactType	Finish/Decoration	Qty	Comments
31MA872	FS11	52	T6	ST239	I	Ap	0-19	HIST	CERM	ud. refined earthenware	undecorated	1	small, poss. Bluish tint but uncertain
31MA873	FS12	78		ST381	I	Ap	0-10	HIST	METL	wire nail		1	
31MA873	FS12	79		ST383	I	Ap	0-24	HIST	METL	cut nail		1	missing head
31MA877	FS16	67		ST354	I	Ap	0-29	HIST	CERM	whiteware	undecorated	1	
31MA877	FS16	68		ST354	II	Apb	29-41	HIST	BRICK			1	small frag
31MA877	FS16	68		ST354	II	Apb	29-41	HIST	METL	cut nail		1	machine cut nail
31MA877	FS16	71		ST360	I	Ap	0-26	HIST	METL	cut nail		1	machine cut nail
31MA877	FS16	71		ST360	I	Ap	0-26	HIST	BRICK			1	small frag
31MA877	FS16	72		ST361	II		20-30	HIST	CERM	stoneware	salt glazed	1	
31MA877	FS16	73		ST362	I	Ap	0-17	HIST	BRICK			2	
31MA877	FS16	74		ST362	II		17-37	HIST	CERM	whiteware	undecorated	1	
31MA877	FS16	87		ST498	I	Ap	0-25	HIST	METL	cut nail		1	small machine cut nail
31MA877	FS16	87		ST498	I	Ap	0-25	HIST	METL	ud		1	poss nail frag
31MA877	FS16	88		ST413	II	Ap	10-20	HIST	CERM	whiteware	undecorated	2	1 is bowl or cup rim. Other could have remnant decoration
31MA877	FS16	88		ST413	II	Ap	10-20	HIST	CERM	stoneware	Alk. Glazed?	1	
31MA877	FS16	89	T9	ST414	I	Ap	0-33	HIST	CERM	whiteware	hand painted	1	not typical polychrome; late 19th to 20th?
31MA877	FS16	89	T9	ST414	I	Ap	0-33	HIST	METL	ud		1	poss nail frag
31MA877	FS16	90	T9	ST420	I	Ap	0-20	HIST	BRICK			1	
31MA877	FS16	91	T9	ST420	I	Ap	20-30	HIST	CERM	whiteware	blue edge ware	1	blue-edge, not molded, small
31MA877	FS16	92		ST421	I	Ap	0-32	HIST	BRICK			1	
31MA877	FS16	92		ST421	I	Ap	0-32	HIST	METL	cut nail		1	
31MA877	FS16	92		ST421	I	Ap	0-32	HIST	CERM	stoneware	Alk. Glazed	1	
31MA877	FS16	92		ST421	I	Ap	0-32	HIST	CERM	whiteware	undecorated	1	
31MA877	FS16	93		ST422			17-33	HIST	CERM	ud. ref. earthenware	blue shell edged	1	molded, early 19th c.
31MA877	FS16	94		ST425	I	Ap	0-25	HIST	METL	cut nail		1	
31MA877	FS16	95		ST425	II	Ab	25-38	HIST	METL	cut nail		1	machine cut nail
31MA877	FS16	97		ST427	I		25-30	HIST	CERM	earthenware?		1	poss unglazed earthenware; could be brick
31MA877	FS16	98		ST433	I		10-20	HIST	CERM	whiteware	undecorated	1	

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North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Roy Cooper Secretary D. Reid Wilson

July 6, 2021

Paul Webb PWebb@trccompanies.com
TRC Companies, Inc.
705 Dogwood Road
Asheville, NC 28806

Re: Archaeological Survey of the Cornbread Valley Mitigation Site, Macon County, ER 21-0519

Dear Mr. Webb:

Thank you for your letter of June 9, 2021, transmitting the draft report and site forms for the above-referenced project. We have reviewed the report and offer the following comments:

Sixteen archaeological sites (31MA862-31MA877) were identified and assessed through this survey prior to the initiation of ground-disturbing activities related to the proposed streambank stabilization project along two branches of James Creek. Of the sites identified, TRC concludes that fourteen (31MA862-31MA872 and 31MA874-31MA876) are not eligible for listing in the National Register of Historic Places (NRHP) due to limited research potential and stratigraphic integrity. No further investigation is necessary at these sites prior to construction activities. Based on the information provided, our office concurs with this recommendation.

The report also recommends that two sites (31MA873 and 31MA877) remain unassessed for NRHP eligibility pending further archaeological investigation and that these sites should be avoided by the proposed construction activities. Portions of site 31MA873 extend beyond the limits of disturbance for the project and may contain intact cultural features potentially eligible under Criterion D, and site 31MA877 includes intact 19th century cultural features that may possibly be associated with the historic Cherokee community of Sandtown. We concur with these recommendations and reiterate that if avoidance of these sites is impossible, additional archaeological investigation should be undertaken to mitigate adverse effects in collaboration with this office and the Tribal Historic Preservation Offices of the culturally affiliated tribes.

This report meets the Office of State Archaeology's Archaeological Investigation Standards and Guidelines for Background Research, Field Methodologies, Technical Reports, and Curation and those of the Secretary of the Interior.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona Bartos, Deputy
State Historic Preservation Officer

cc: Jake McLean, Wildlands Engineering, Inc. jmclean@wildlandseng.com

705 Dogwood Rd.
Asheville, NC 28806

T 919.414.3418
TRCcompanies.com

July 19, 2021

Ms. Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
109 East Jones Street, Room 258
Raleigh, North Carolina 27601

RE: Cornbread Valley Mitigation Site, Macon County, North Carolina. ER 21-0519

Dear Ms. Gledhill-Earley:

On behalf of Wildlands Engineering, thank you for your recent comment letter regarding the Cornbread Valley Mitigation Site archeological survey.

As Jake McLean of Wildlands and I discussed with Dylan Clark of the OSA recently, Wildlands is proposing some minor changes to the configuration of the Project, as shown on the attached figures. These proposed changes are as follows:

1. Wildlands now proposes to conduct limited grading southeast of the North Jones Creek and Jones Creek roads intersection in the vicinity of 31MA872, which will extend the Limits of Disturbance (LOD) approximately 15 m farther to the south over a ca. 75 m area extending east-west (Figure 1).

2. Wildlands now proposes to conduct bare root planting (which is conducted by hand, by placing a bare root sapling in a hole that is created by inserting and rocking a metal bar) in a small area extending outside the previously defined LOD northwest of 31MA862; similar planting may also take place in a narrow corridor southwest of 31MA875 (Figure 1).

3. Wildlands now proposes to conduct bare root planting along the western and northern edges of 31MA873, which is considered unassessed (Figures 1 and 2). In this regard, we have now updated the 31MA873 site map to correctly show that Shovel Test 221 was negative, and have modified the site boundary in that area. Also, Shovel Test 223, which is included in the planting area, produced only a Morrow Mountain (Middle Archaic) projectile point/knife and a piece of quartz debitage, and that part of the site is not considered to have research potential.

Based on our review of these proposed changes, it is TRC's recommendation that the specified activities have very low potential to affect significant archaeological resources, and we recommend that no further archaeological investigations be conducted for the project as redefined.

Thank you for your review of this information. Please do not hesitate to contact me at (919) 414-3418 / pwebb@trccompanies.com if you have any questions or require any additional information.

Sincerely,

Paul A. Webb
Cultural Resources Program Manager

cc: Jake McLean, Wildlands Engineering

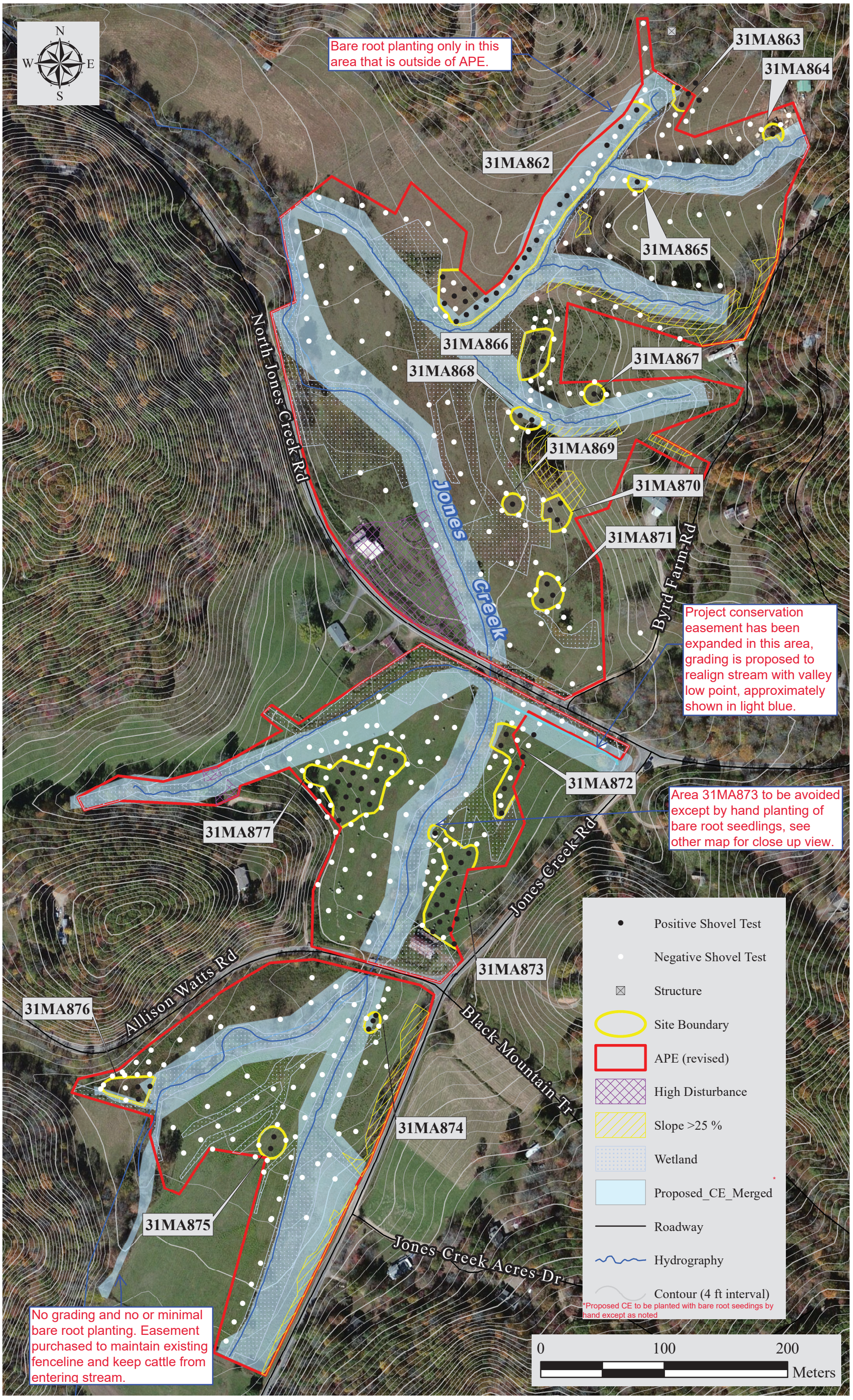

Figure 1. Revised project map showing proposed locations of bare root plantings (light blue shading).

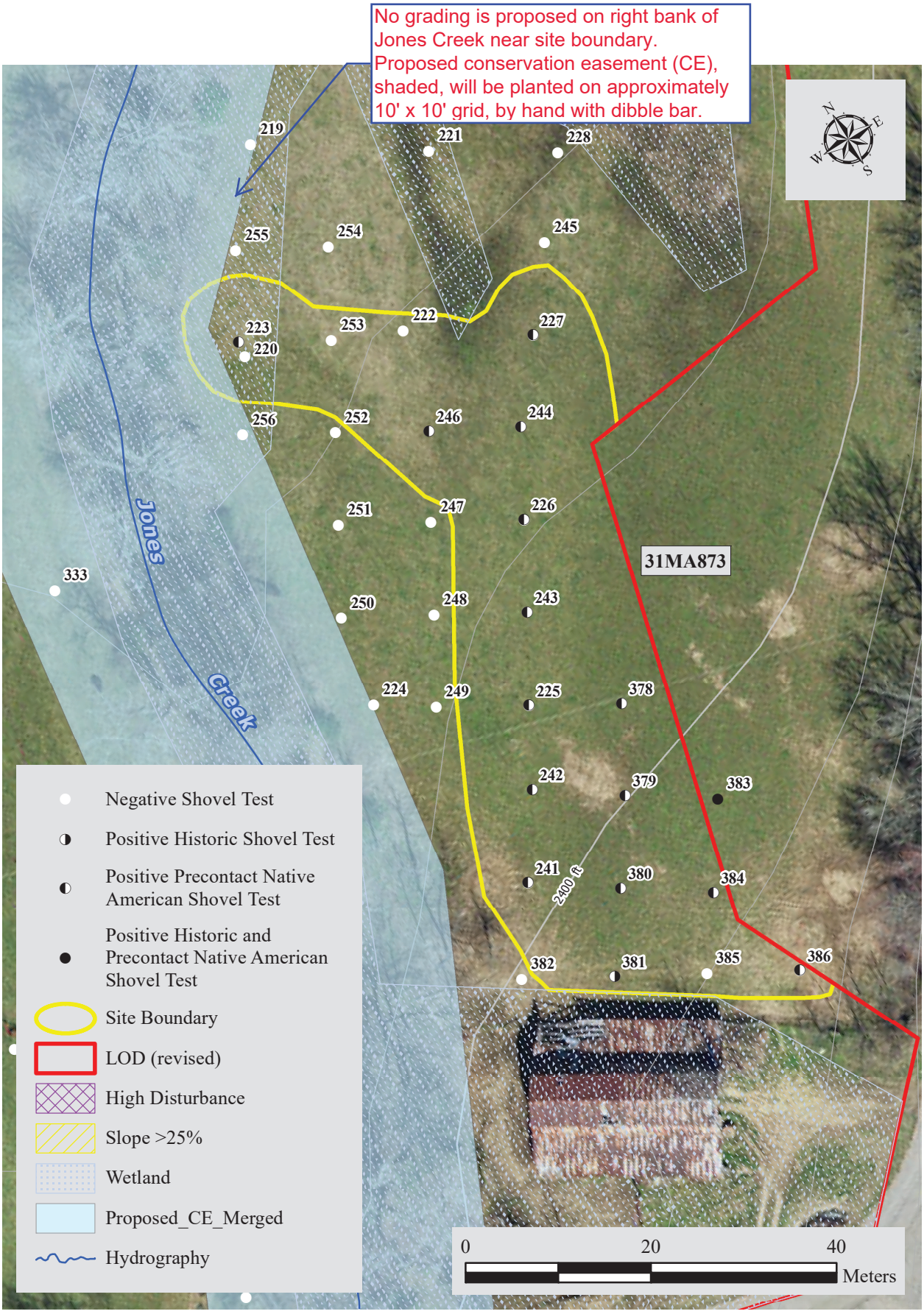

Figure 2. 31MA873 revised map showing extent of bare root planing (light blue shading).

North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Roy Cooper Secretary D. Reid Wilson

August 23, 2021

Kirsten Gimbert kgimbert@wildlandseng.com
Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Re: Archaeological Survey of the Cornbread Valley Mitigation Site, Macon County, ER 21-0519

Dear Ms. Gimbert:

Thank you for your letter of July 20, 2021, detailing the proposed changes to the above-referenced project. We have reviewed the information provided and offer the following comments:

After the recent archaeological survey conducted by TRC Environmental ahead of the streambank stabilization project along James Creek, Wildlands Engineering is proposing to extend the limits of disturbance (LOD) where grading will take place by 15 meters south of N. Jones Creek Road. The closest recorded archaeological site to this portion of the LOD is 31MA872, which was determined not eligible for listing in the National Register of Historic Places (NRHP) based on the recent survey. Because the additional grading remains north of the delineated site boundary, we agree that it is unlikely these activities will adversely affect the site and no further archaeological investigation is necessary in this area.

Wildlands is also proposing bare root planting of saplings to create an erosion buffer along the stream in a small area to the northwest of site 31MA862 and southwest of 31MA875. These sites were also determined to be not eligible for the NRHP, and we concur that the proposed planting will not impact any intact, significant archaeological resources in these locations.

Archaeological site 31MA873 is considered unassessed for inclusion in the NRHP, and additional limited bare root planting is also proposed along the western and northern edges of the site. In the recent archaeological survey, only one artifact was recovered from a shovel test in the location where planting will take place, and this resource would not contribute to the research potential and eligibility of the Woodland component of the site which located 30-40 meters to the southeast. TRC recommends that the proposed planting is unlikely to affect the unassessed archaeological resources and no further investigation is needed. Based on the information provided, we concur with these recommendations. Should the LOD as redefined change again to include more areas that intersect with site 31MA873, additional archaeological investigations should be undertaken in collaboration with this office and the Tribal Historic Preservation Offices of the culturally affiliated tribes.

We appreciate you keeping us updated on the proposed changes to the project area and undertaking.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona Bartos, Deputy
State Historic Preservation Officer

cc: Jake McLean, Wildlands Engineering, Inc. jmclean@wildlandseng.com
Paul Webb, TRC PWebb@trccompanies.com

this section 3.4. The addresses of the parties to receive notices are as follows:

TO BUYER: Wildlands Engineering, Inc.
1430 S. Mint Street, Suite 104
Charlotte, North Carolina 28203
Attention: Robert W. Bugg
Email: rbugg@wildlandseng.com

TO SELLER: Steven Byrd
69 Allison Watts Road
Franklin, North Carolina 28734
Email: stevenbyrd@gmail.com

Notice of change of address shall be given by written notice in the manner described in this paragraph.

3.5 **Assignment.** Buyer has the right to assign this agreement without the consent of Seller. No assignment shall be effective unless the assignee has delivered to Seller a written assumption of Buyer's obligations under this agreement. Seller hereby releases Buyer from any obligations under this agreement arising after the effective date of any assignment of this agreement by Buyer.

3.6 **Value of Conservation Easement; No Power of Eminent Domain.** In accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Buyer hereby notifies Seller that: (i) Buyer believes that the fair market value of the Conservation Easement is an amount equal to the Purchase Price; and (ii) Buyer does not have the power of eminent domain.

3.7 **Modification; Waiver.** No amendment of this agreement will be effective unless it is in writing and signed by the parties. No waiver of satisfaction of a condition or failure to comply with an obligation under this agreement will be effective unless it is in writing and signed by the party granting the waiver, and no such waiver will constitute a waiver of satisfaction of any other condition or failure to comply with any other obligation.

3.8 **Attorneys' Fees.** If either party commences an action against the other to interpret or enforce any of the terms of this agreement or because of the breach by the other party of any of the terms of this agreement, the losing party shall pay to the prevailing party reasonable attorneys' fees, expenses, court costs, litigation costs and any other expenses incurred in connection with the prosecution or defense of such action, whether or not the action is prosecuted to a final judgment.

3.9 **Memorandum of Option Agreement.** Concurrently with the signing of this agreement, Buyer and Seller agree to sign a Memorandum of Option that will be recorded against the Property in the Register of Deeds in the County stated in paragraph A within five days after the Effective Date.

3.10 **Tax Deferred Exchange**. If Seller desires to effect a tax-deferred exchange (the "**Exchange**") in connection with Buyer's purchase of the Conservation Easement, the parties agree to cooperate in effecting the Exchange. Seller is responsible for all additional costs associated with the Exchange and Buyer shall not have any additional liability with respect to the Exchange. The parties will execute any additional documents required for the Exchange at no cost to Buyer.

3.11 **Brokers**. Shawn D. Wilkerson, Robert W. Bugg and Ian Hazelhoff are North Carolina Real Estate

Buyer
SB Seller

3.3 **Construction Contractor**. Buyer agrees to use Penland Contracting Co. Inc. as general contractor for the stream and wetland mitigation project and Property Improvements. This paragraph survives Closing.

3.4 **Liquidated Damages.** Buyer recognizes that the Project Area will be removed by Seller from the market during the term of the agreement. If the purchase of the Conservation Easement is not consummated due to Buyer's default, the parties have determined and agreed that the actual amount of damages that would be suffered by Seller as a result of that default would be very difficult or impracticable to estimate on the date of this agreement. As a result, the parties agree that the Option Consideration as of the date of Buyer's default is sufficient to cover any estimated damages that may be incurred by Seller. For these reasons, the parties agree that if the purchase of the Conservation Easement is not consummated because of Buyer's default, Seller may retain the Option Consideration paid by Buyer as of the date of Buyer's default as its sole remedy, and Seller waives any and all right to seek other rights or remedies against Buyer, including without limitation, specific performance. Nothing stated in this section 3.1 shall preclude any action under any indemnification or defense provision in this agreement, nor for the award of attorney's fees and costs in conjunction with any action relating to this agreement.

3.5 **Notices.** All notices required by this agreement shall be in writing, shall be given only in accordance with the provisions of this Section, shall be addressed to the Parties in the manner stated below, and shall be conclusively deemed properly delivered: (a) upon receipt when hand delivered during normal business hours; (b) upon the day of delivery if the notice has been deposited in an authorized receptacle of the United States Postal Service as first-class, registered or certified mail, postage prepaid, with a return receipt requested; (c) one business day after the notice has been deposited with either FedEx or United Parcel Service to be delivered by overnight delivery; or (d) if sent by email, upon receipt of an acknowledgement email sent to the sender's email address in which the party receiving the email notice acknowledges having received that email. An automatic "read receipt" is not acknowledgement for purposes of this section 3.5. The addresses of the parties to receive notices are as follows:

TO BUYER:
Wildlands Engineering, Inc.
1430 S. Mint Street, Suite 104
Charlotte, North Carolina 28203
Attention: Robert W. Bugg
Email: rbugg@wildlandseng.com

TO SELLER:
Rita Byrd
124 Byrd Farm Road
Franklin, NC 28734
Email: stevenbyrd@gmail.com

Notice of change of address shall be given by written notice in the manner described in this paragraph.

3.6 **Assignment.** Buyer has the right to assign this agreement without the consent of Seller. No assignment shall be effective unless the assignee has delivered to Seller a written assumption of Buyer's obligations under this agreement. Seller hereby releases Buyer from any obligations under this agreement arising after the effective date of any assignment of this agreement by Buyer.

3.7 **Value of Conservation Easement; No Power of Eminent Domain.** In accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Buyer hereby notifies Seller that: (i) Buyer believes that the fair market value of the Conservation Easement is an amount equal to the Purchase Price; and (ii) Buyer does not have the power of eminent domain.

Buyer
Seller

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
TIM BAUMGARTNER
Director

NORTH CAROLINA
Environmental Quality

Elizabeth Toombs
Cherokee Nation
Tribal Historic Preservation Office
P.O. Box 948
Tahlequah, OK 74465
elizabeth-toombs@cherokee.org

8/30/2021

Dear Ms. Toombs,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed stream restoration project on the Cornbread Valley Mitigation Site. The Federal Highway Administration (FHWA) is the lead federal agency for this proposed mitigation project. A scoping letter was submitted to the State Historic Preservation Office (SHPO) requesting comment on the Cornbread Valley Mitigation Site on February 11, 2021. SHPO responded on March 10, 2021 and requested an archaeological survey, which was completed in May 2021 and the archaeological report was submitted in June 2021. A contract amendment occurred to add an additional area to the mitigation site following the Archeological report submittal. Therefore, additional correspondence and figures were submitted to SHPO on July 19, 2021. SHPO concurred with the archeologists' suggestion that based on the findings of prior fieldwork in close proximity to the newly added area that minor expansion of the disturbance limits by 15-meters was unlikely to adversely affect site resources. SHPO also concurred with the approach to avoid particular identified sites as recommended by the archeologist, with the exception of allowing for planting bare root saplings by hand to create an erosion buffer within the conservation easement along site streams. Two additional bare root planting areas outside of the original project limits were identified in the July 19th correspondence. Please refer to attached correspondence for additional details regarding SHPO correspondence and the archaeological report.

A USGS Topographic Map and a proposed project conceptual map showing the project area are enclosed. The topographic figure was prepared from the Prentiss 7.5-Minute USGS Topographic Quadrangle. The project location (Latitude and Longitude) is as follows: 35.1030, -83.4544.

The Cornbread Valley Mitigation Site is being developed to provide stream mitigation in the Little Tennessee River Basin. The project will include restoration and enhancement of Jones Creek (also referred to as James Creek), as well as six unnamed tributaries to Jones Creek. The area surrounding the streams and channels proposed for stream mitigation is currently maintained for livestock pasture and represents a significant portion of the grazed lands

within the Jones Creek subwatershed, one of two primary watersheds to the Cartoogechaye Creek. The major goals of the stream mitigation project are to provide ecological and water quality enhancements to the Little Tennessee River Basin while creating a functional riparian corridor at the site level. This will be accomplished by excluding livestock from stream channels, restoring and enhancing native floodplain vegetation, improving the stability of stream channels, improving instream habitat, and permanently protecting and preserving the project site through establishing a conservation easement. These actions will reduce fecal, nutrient, and sediment inputs to project streams, and ultimately to the Little Tennessee River, as well as reconnect instream and terrestrial habitat on the project site.

We ask that you review this site based on the attached information to determine the presence of any known historic properties. We respectfully request a response within 30 days of receipt of this letter/ email in an effort to implement this necessary stream restoration/ mitigation project.

Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

Attachments:
Figure 1: USGS Topographic Map
Figure 2: Proposed Project Conceptual Map
Archaeological Report
SHPO Correspondence

cc: Donnie Brew, FHWA

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
TIM BAUMGARTNER
Director

NORTH CAROLINA
Environmental Quality

8/30/2021

Russell Townsend
Tribal Historic Preservation Officer
Tribal Historic Preservation Office
Eastern Band of the Cherokee Indians
russtown@nc-cherokee.com

Stephen Yerka
Historic Preservation Specialist
Tribal Historic Preservation Office
Eastern Band of the Cherokee Indians
syerka@nc-cherokee.com

Dear Mr. Townsend and Mr. Yerka,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed stream restoration project on the Cornbread Valley Mitigation Site. The Federal Highway Administration (FHWA) is the lead federal agency for this proposed mitigation project. A scoping letter was submitted to the State Historic Preservation Office (SHPO) requesting comment on the Cornbread Valley Mitigation Site on February 11, 2021. SHPO responded on March 10, 2021 and requested an archaeological survey, which was completed in May 2021 and the archaeological report was submitted in June 2021. A contract amendment occurred to add an additional area to the mitigation site following the Archeological report submittal. Therefore, additional correspondence and figures were submitted to SHPO on July 19, 2021. SHPO concurred with the archeologists' suggestion that based on the findings of prior fieldwork in close proximity to the newly added area that minor expansion of the disturbance limits by 15-meters was unlikely to adversely affect site resources. SHPO also concurred with the approach to avoid particular identified sites as recommended by the archeologist, with the exception of allowing for planting bare root saplings by hand to create an erosion buffer within the conservation easement along site streams. Two additional bare root planting areas outside of the original project limits were identified in the July 19th correspondence. Please refer to attached correspondence for additional details regarding SHPO correspondence and the archaeological report.

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Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

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cc: Donnie Brew, FHWA

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
TIM BAUMGARTNER
Director

NORTH CAROLINA
Environmental Quality

8/30/2021

Ms. Whitney Warrior
Environmental Services & Historic Preservation Director
Tribal Historic Preservation Office
United Keetoowah Band of Cherokee Indians in Oklahoma
P. O. Box 746
Tahlequah, OK 74465
wwarrior@ukb-nsn.gov
CC: kpritchett@ukb-nsn.gov

Dear Ms. Warrior,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed stream restoration project on the Cornbread Valley Mitigation Site. The Federal Highway Administration (FHWA) is the lead federal agency for this proposed mitigation project. A scoping letter was submitted to the State Historic Preservation Office (SHPO) requesting comment on the Cornbread Valley Mitigation Site on February 11, 2021. SHPO responded on March 10, 2021 and requested an archaeological survey, which was completed in May 2021 and the archaeological report was submitted in June 2021. A contract amendment occurred to add an additional area to the mitigation site following the Archeological report submittal. Therefore, additional correspondence and figures were submitted to SHPO on July 19, 2021. SHPO concurred with the archeologists' suggestion that based on the findings of prior fieldwork in close proximity to the newly added area that minor expansion of the disturbance limits by 15-meters was unlikely to adversely affect site resources. SHPO also concurred with the approach to avoid particular identified sites as recommended by the archeologist, with the exception of allowing for planting bare root saplings by hand to create an erosion buffer within the conservation easement along site streams. Two additional bare root planting areas outside of the original project limits were identified in the July 19th correspondence. Please refer to attached correspondence for additional details regarding SHPO correspondence and the archaeological report.

A USGS Topographic Map and a proposed project conceptual map showing the project area are enclosed. The topographic figure was prepared from the Prentiss 7.5-Minute USGS Topographic Quadrangle. The project location (Latitude and Longitude) is as follows: 35.1030, -83.4544.

The Cornbread Valley Mitigation Site is being developed to provide stream mitigation in the Little Tennessee River Basin. The project will include restoration and enhancement of Jones Creek (also referred to as James Creek), as well as six unnamed tributaries to Jones Creek.

The area surrounding the streams and channels proposed for stream mitigation is currently maintained for livestock pasture and represents a significant portion of the grazed lands within the Jones Creek subwatershed, one of two primary watersheds to the Cartoogechaye Creek. The major goals of the stream mitigation project are to provide ecological and water quality enhancements to the Little Tennessee River Basin while creating a functional riparian corridor at the site level. This will be accomplished by excluding livestock from stream channels, restoring and enhancing native floodplain vegetation, improving the stability of stream channels, improving instream habitat, and permanently protecting and preserving the project site through establishing a conservation easement. These actions will reduce fecal, nutrient, and sediment inputs to project streams, and ultimately to the Little Tennessee River, as well as reconnect instream and terrestrial habitat on the project site.

We ask that you review this site based on the attached information to determine the presence of any known historic properties. We respectfully request a response within 30 days of receipt of this letter/ email in an effort to implement this necessary stream restoration/ mitigation project.

Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

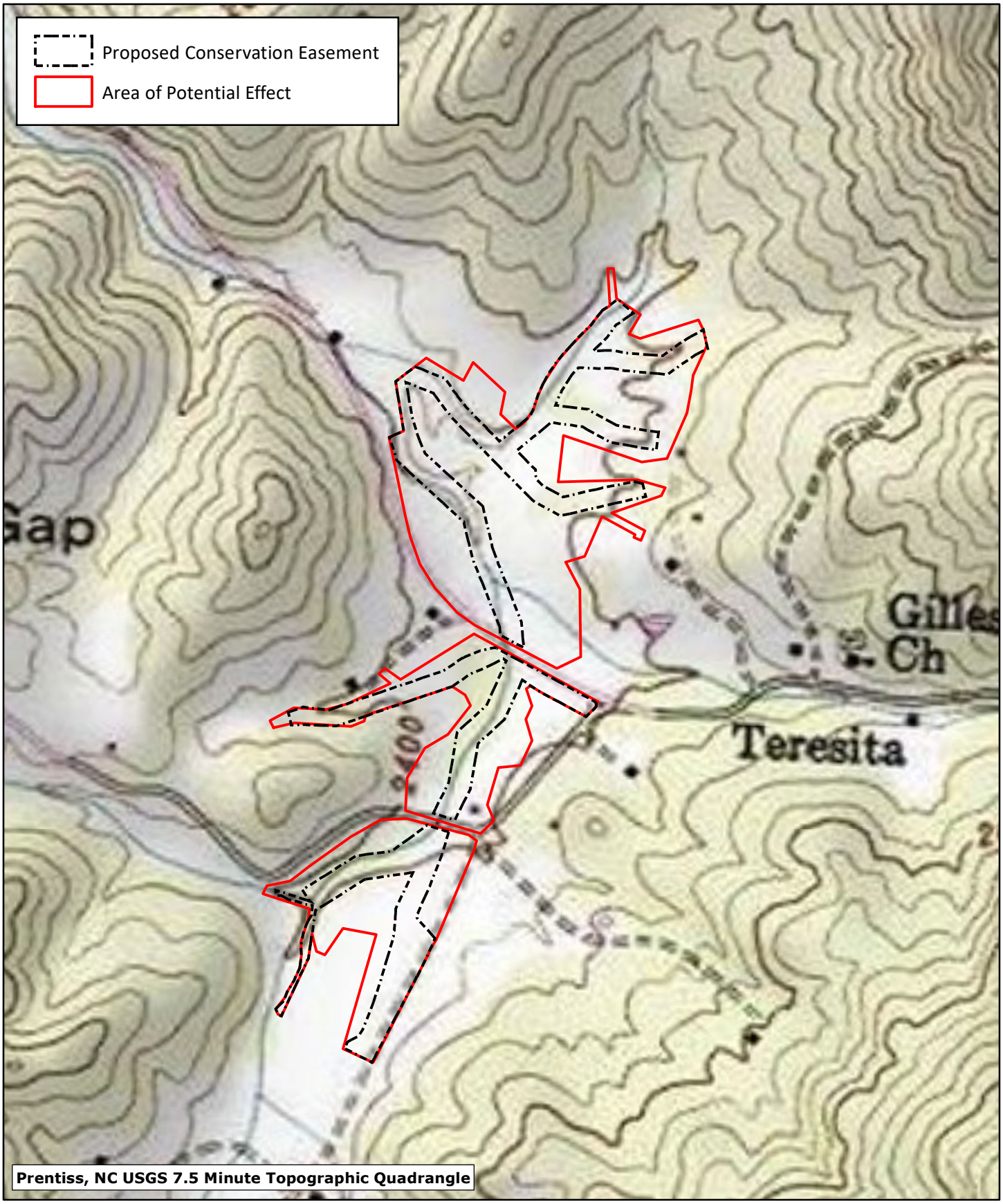
Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

Attachments:
Figure 1: USGS Topographic Map
Figure 2: Proposed Project Conceptual Map
Archaeological Report
SHPO Correspondence

cc: Donnie Brew, FHWA



WILDLANDS ENGINEERING

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Figure 1 USGS Topographic Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC

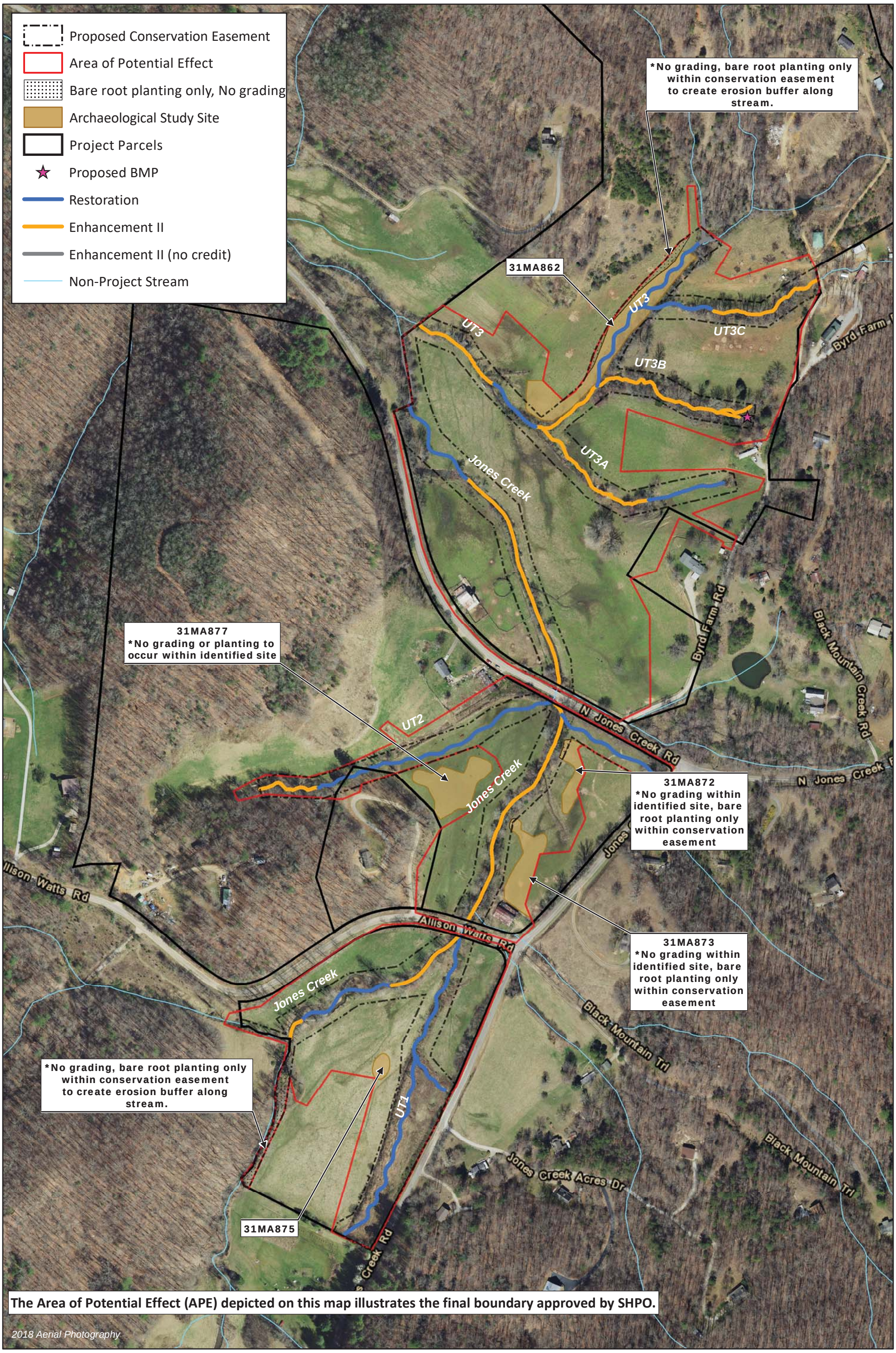

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Figure 2 Proposed Project Conceptual Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC

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P.O. Box 948 • Tahlequah, OK 74465-0948
918-453-5000 • www.cherokee.org

Chuck Hoskin Jr.
Principal Chief
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Bryan Warner
Deputy Principal Chief
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September 30, 2021

Paul Wiesner
North Carolina Department of Environmental Quality
Western DMS Field Office
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

Re: Proposed Cornbread Valley Mitigation Site

Mr. Paul Wiesner:

The Cherokee Nation (Nation) is in receipt of your correspondence about and related report for the **Proposed Cornbread Valley Mitigation Site**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed project.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office reviewed this project, cross referenced the project's legal description against our information, and found instances where this project intersects or adjoins such resources. This Office, however, does not object to the project proceeding as long as the following stipulations are observed:

1) The Nation concurs with the provided report that Sites 31MA873 and 31MA877 should be avoided throughout the course of this project, including direct and indirect activities, such as borrow pits and equipment staging. This Office respectfully requests additional consultation if these aforementioned sites cannot be avoided;

2) The Nation requests that North Carolina Department of Environmental Quality (NCDEQ) re-contact this Office for additional consultation if there are any changes to the scope of or activities within the APE;

3) The Nation requests that NCDEQ halt all project activities immediately and re-contact our Offices for further consultation if items of cultural significance are discovered during the course of this project; and

4) The Nation requests that NCDEQ conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,



Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

February 2, 2021

Holland Youngman
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801
Submitted via email: holland_youngman@fws.gov

Subject: Cornbread Valley Mitigation Site
Macon County, North Carolina

Dear Ms. Youngman,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources associated with a potential stream restoration project on the Cornbread Valley Mitigation Site located in Macon County, NC. A Site Map and a USGS Topographic Map showing the approximate project area are enclosed. The topographic figure was prepared from the Prentiss 7.5-Minute USGS Topographic Quadrangle, and the site is located at 35.1030 longitude -83.4544.

The Cornbread Valley Mitigation Site is being developed to provide stream mitigation within the Little Tennessee River Basin. The project will include restoration and enhancement of Jones Creek, as well as six unnamed tributaries to Jones Creek. Currently, the streams throughout the site are severely incised and eroded and are routinely used by cattle for shade and water. The primary stressors to Site streams are livestock access, stream incision and lateral bank erosion, lack of stabilizing stream bank and riparian vegetation, barriers to hydrology and aquatic organism passage, and low to absent bedform diversity. The major goals of the stream mitigation project are to provide ecological and water quality enhancements to the Little Tennessee River Basin while creating a functional riparian corridor at the site level. This will be accomplished by removing livestock access from stream channels, restoring and enhancing native floodplain vegetation, creating stable stream banks, improving stream habitat, treating concentrated pasture runoff with BMPs and protecting the site in perpetuity through establishing a conservation easement.

According to your Information for Planning and Consultation database (IPaC), the threatened or endangered species listed within the project area located in Macon County, NC consists of twelve species: the northern long-eared bat (*Myotis septentrionalis*), the gray bat (*Myotis grisescens*), the Indiana bat (*Myotis sodalist*), the spotfin chub (*Erimonax monachus*), the Appalachian elktoe (*Alasmidonta raveneliana*), the littlewing pearlymussel (*Pegias fabula*), mountain sweet pitcher-plant (*Sarracenia rubra*), small whorled pogonia (*Isotria medeoloides*), swamp pink (*Helonias bullata*), Virginia spiraea (*Spiraea virginiana*), rock gnome lichen (*Gymnoderma lineare*), and the bog turtle (*Clemmys muhlenbergii*) for similarity of appearance. If we have not heard from you in 30 days, we will assume that you do not have any comments regarding associated laws and that you do not have any information relevant to this project at the current time.

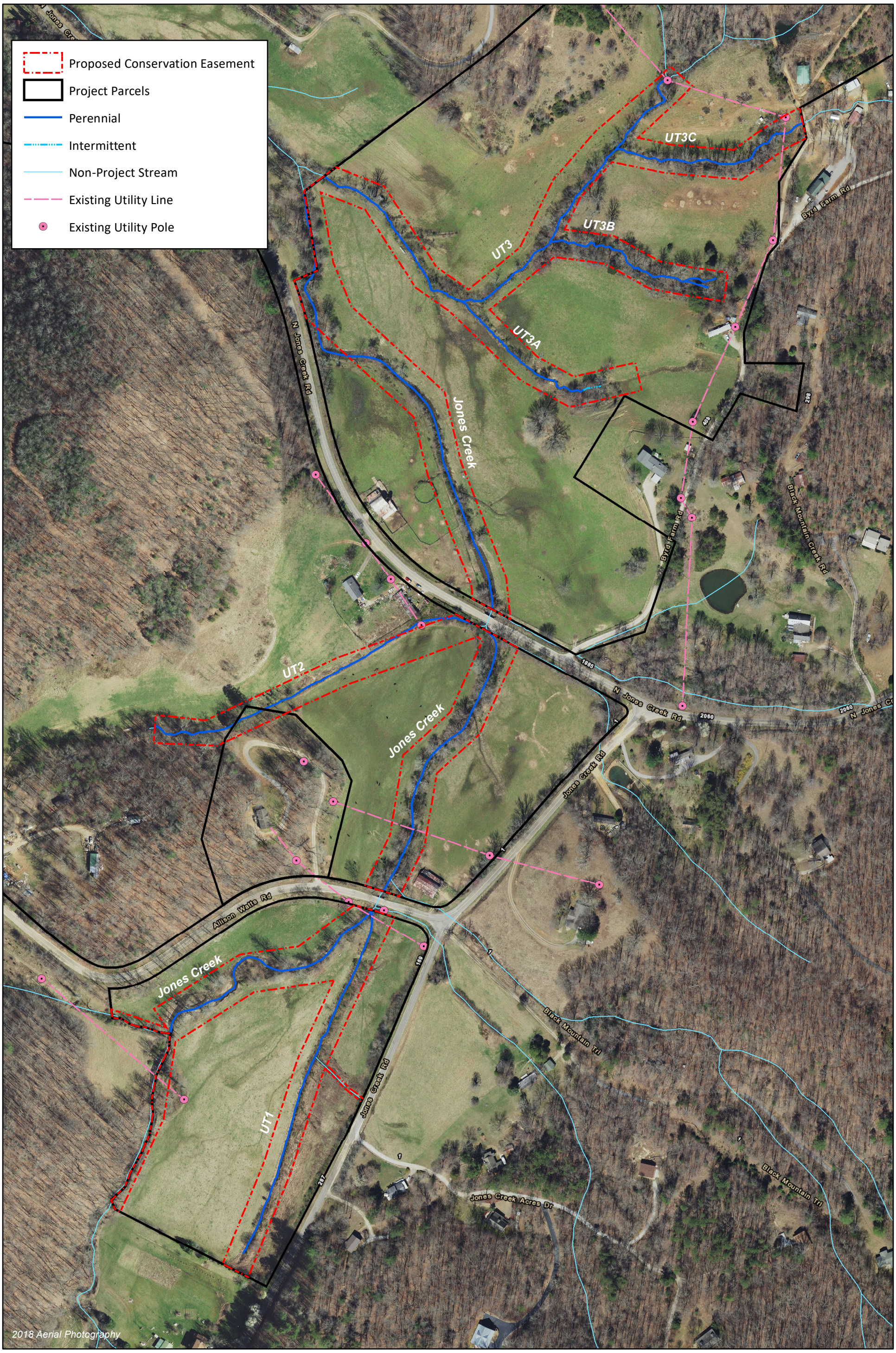
We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Kirsten Y. Gimbert

Kirsten Gimbert, *Senior Environmental Scientist*
kgimbert@wildlandseng.com
704.941.9093

Attachment:
Figure 1 Site Map, Figure 2 USGS Topographic Map



WILDLANDS ENGINEERING

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Figure 1 Site Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC

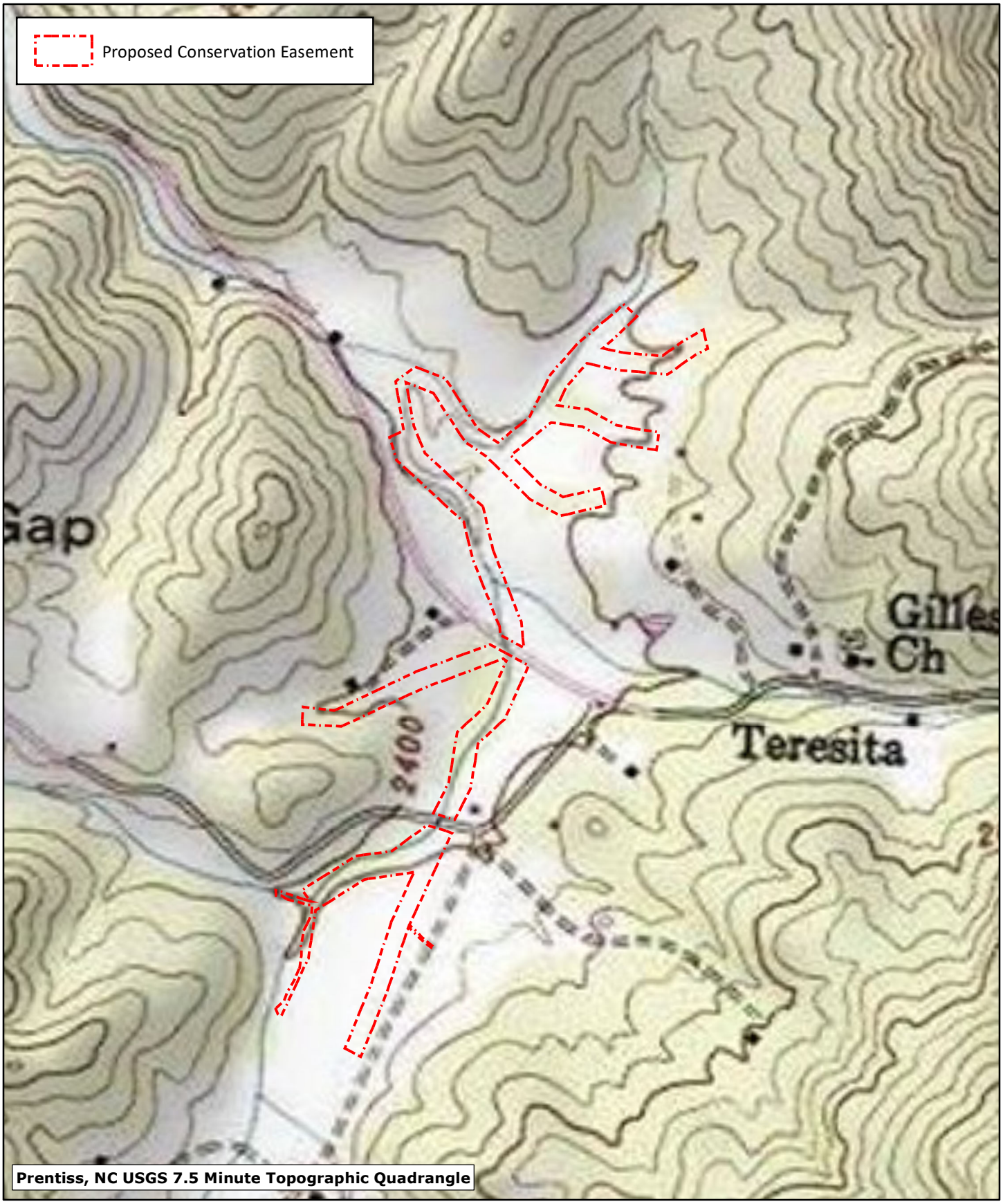

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Figure 2 USGS Topographic Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street Suite B
Asheville, North Carolina 28801

March 3, 2021

Kirsten Gimbert
Wildlands Engineering, Inc.
1430 South Mint Street, Ste. 104
Charlotte, NC 28203
kgimbert@wildlandseng.com

Subject: Proposed Stream Mitigation in Jones Creek and Unnamed Tributaries in Macon County, North Carolina

Dear Ms. Gimbert,

The U.S. Fish and Wildlife Service (Service) has reviewed the information provided in your email correspondence dated February 2, 2021, wherein you solicit our comments regarding project-mediated impacts to federally protected species. We submit the following comments in accordance with the provisions of the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661667e); the National Environmental Policy Act (42 U.S.C. §4321 *et seq*.); and section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 15311543) (Act).

Project Summary

Wildlands Engineering proposes to conduct stream restoration and enhancement activities on a portion of Jones Creek and six unnamed tributaries to Jones Creek in Macon County, North Carolina. This, along with aerial and topographic maps of the project area, was the only information provided.

We offer the following recommendations in the interest of protecting federally threatened and endangered species, migratory birds, as well as other fish, wildlife, and natural resources.

Federally Listed Endangered and Threatened Species

Suitable summer roosting habitat may be present in the project area for the federally threatened northern long-eared bat (*Myotis septentrionalis*). However, the final 4(d) rule (effective as of February 16, 2016), exempts incidental take of northern long-eared bat associated with activities that occur greater than 0.25 miles from a known hibernation site, and greater than 150 feet from a known, occupied maternity roost during the pup season (June 1 – July 31). Based on the information provided, the project would occur at a location where any incidental take that may result from associated activities is exempt under the 4(d) rule. **Although not required, we encourage you to conduct any tree clearing activities outside the pup season (June 1 to July**

31) and/or active season (April 1 to October 15) to reduce the chance of impacting unidentified maternity roosts.

In accordance with section 7 (a)(2) of the Act and 50 CFR Part 402.01, before any federal authorization/permits or funding can be issued for this project, **it is the responsibility of the appropriate federal regulatory/permitting and/or funding agency(ies) to determine whether the project may affect any federally endangered or threatened species (listed species) or designated critical habitat.** A species list for counties in North Carolina can be found online here: https://www.fws.gov/raleigh/species/cntylist/nc_counties.html. If it is determined that this project may affect any listed species or designated critical habitat, you must initiate section 7 consultation with this office. Species of concern are not legally protected under the Act and are not subject to any of its provisions, including section 7, unless they are formally proposed or listed as endangered or threatened.

We offer the following general recommendations on behalf of natural resources:

Smoky Dace and Little Tennessee River Crayfish
Receiving waters directly below the project waters (Jones Creek) support smoky dace (*Clinostomus sp.*) and Little Tennessee River Crayfish (*Cambarus georgiae*). These species are not currently afforded legal protection under the Act, but are designated as species of North Carolina Special Concern. Threats to these species are associated with sedimentation resulting from development and poor land management practices. We encourage you to solicit comments from the North Carolina Wildlife Resources Commission regarding potential project-mediated impacts to state-protected natural resources.

Migratory Birds
The MBTA (16 §U.S.C. 703-712) prohibits the intentional taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. To avoid impacts to migratory birds, we recommend conducting a visual inspection of any migratory bird nesting habitat within the project area during the migratory bird nesting season of March through September and avoiding impacting the nests during the migratory bird nesting season. If birds are discovered nesting near the project area during years prior to the proposed construction date, we recommend that you and the NCDOT, in consultation with US Fish and Wildlife Service, develop measures to discourage birds from establishing nests within the project area by means that will not result in the take of birds or eggs; or avoid construction activities during the nesting period.

Stream Channel and Bank Restoration
Adequate measures to control sediment and erosion must be implemented prior to any ground-disturbing activities in order to minimize effects on downstream aquatic resources. In North Carolina, non-cohesive and erosion prone soils are most common in the felsic-crystalline terrains of the mountain and upper piedmont regions. Therefore, reconstruction work should be staged such that disturbed areas would be stabilized with seeding, mulch, and/or biodegradable (coir) erosion-control matting prior to the end of each workday. **No erosion-control matting or blankets should contain synthetic (netting) materials as they trap animals and can persist in the environment beyond their intended purpose.** Matting should be secured in place with

staples; stakes; or, wherever possible, live stakes of native trees. If rain is expected prior to temporary seed establishment, additional measures should be implemented to protect water quality along slopes and overburden stockpiles (for example, stockpiles may be covered with plastic or other geotextile material and surrounded with silt fencing).

Erosion and Sedimentation Control

Construction activities near streams, rivers, and lakes have the potential to cause water pollution and stream degradation if measures to control site runoff are not properly installed and maintained. In order to effectively reduce erosion and sedimentation impacts, best management practices specific to the extent and type of construction should be designed and installed during land disturbing activities and should be maintained until the project is complete and appropriate stormwater conveyances and vegetation are reestablished on the site.

A complete design manual, which provides extensive details and procedures for developing site specific plans to control erosion and sediment and is consistent with the requirements of the North Carolina Sedimentation and Pollution Control Act and Administrative Rules, is available at:

http://portal.ncdenr.org/web/lr/publications

For maximum benefits to water quality and bank stabilization, riparian areas should be forested; however, if the areas are maintained in grass, they should not be mowed. We recommend planting disturbed areas with native riparian species. The U.S. Fish and Wildlife Service can provide information on potential sources of plant material upon request.

If you have questions about these comments please contact Ms. Holland Youngman at Holland_Youngman@fws.gov. In any future correspondence concerning these projects, please reference our Log Number 4-2-21-152.

Sincerely,

Janet Mizzi
Field Supervisor

November 11, 2021

Holland Youngman
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801
Submitted via email: holland_youngman@fws.gov

Subject: Cornbread Valley Mitigation Site
USFWS Log # 4-2-21-152
Macon County, North Carolina

Dear Ms. Youngman,

On behalf of Donnie Brew with the Federal Highway Administration (FHWA), Wildlands Engineering, Inc. (Wildlands) respectfully requests ESA Section 7 consultation with US Fish and Wildlife Service (USFWS) for concurrence on the federally listed species identified below with suitable habitat within the Cornbread Valley Mitigation Site located in Macon County, NC. FHWA is the lead agency for this North Carolina Division of Mitigation Services (NCDMS) full-delivery project and has requested that Wildlands correspond with USFWS directly regarding Section 7 consultation. An initial scoping letter was submitted to USFWS on February 2, 2021 and a response was received from USFWS on March 3, 2021. Based on USFWS responses and findings from Wildlands' pedestrian surveys conducted on January 26, 2021 and May 27, 2021, additional consultation is required to obtain USFWS concurrence on the project impacts to the federally listed species as described below.

According to USFWS Information for Planning and Consultation database (IPaC), the threatened or endangered species listed within the project area consists of twelve species: The northern long-eared bat (*Myotis septentrionalis*), the gray bat (*Myotis grisescens*), the Indiana bat (*Myotis sodalist*), the spotfin chub (*Erimonax monachus*), the Appalachian elktoe (*Alasmidonta raveneliana*), the littlewing pearlymussel (*Pegias fabula*), mountain sweet pitcher-plant (*Sarracenia rubra*), small whorled pogonia (*Isotria medeoloides*), swamp pink (*Helonias bullata*), Virginia spiraea (*Spiraea virginiana*), rock gnome lichen (*Gymnoderma lineare*), and the bog turtle (*Clemmys muhlenbergii*) for similarity of appearance.

Results from pedestrian surveys indicated that the project area provides areas of suitable habitat for the northern long-eared bat, the Indiana bat, the bog turtle, the small whorled pogonia, the swamp pink, the Virginia spiraea, and the mountain sweet pitcher-plant. No suitable habitat was identified for the gray bat, the spotfin chub, the littlewing pearlymussel, the Appalachian elktoe, or the rock gnome lichen. No individual species were identified during either field assessment. Wildlands biological determination is that the project will have **"no effect" on the gray bat, the spotfin chub, the littlewing pearlymussel, the Appalachian elktoe, or the rock gnome lichen.**

A NLEB 4(d) Consultation Form was submitted to the USFWS by the Federal Highway Administration (FHWA) on February 12, 2021. USFWS responded on March 3, 2021 and concur that any incidental take that may result from associated activities with this project is exempt under the 4(d) rule. **No further consultation is required for the NLEB**. Bog turtle suitable habitat was identified within the project area, however no populations resembling the species were found during the pedestrian survey. Wildlands biological determination is that the project **"may affect, not likely to adversely affect" the bog turtle;** however, it is listed due to similarity of appearance and is not subject to Section 7 consultation.

Thereby, Wildland's requests ESA Section 7 consultation and USFWS concurrence regarding the Indiana bat, the mountain sweet pitcher-plant, the small whorled pogonia, the swamp pink, and the Virginia spiraea.

Indiana bat

Wildlands identified suitable habitat for the Indiana bat within the project area, however no populations resembling the species were found during the pedestrian survey. Field Surveys involved searching for the species as well as looking for suitable roosting or hibernacula sites, as indicated by caves (not present) or large trees. Suitable habitat identified consisted of scattered existing trees >3"dbh with exfoliating bark, crevices, and hollows. Final critical habitat has been determined for this species; however, the project is outside of this area. Per NCNHP data explorer, no known element occurrences exist within the proposed project area nor have any known occurrences been documented within three miles of the project area. Wildlands biological determination is that the project **"may affect, not likely to adversely affect" the Indiana bat.** To avoid any impacts to this species and its suitable habitat, Wildlands plans to conduct tree removal during the winter months to be completed no later than March 31st, prior to the start of the Indiana bat roosting season.

Small whorled pogonia, Swamp pink, Virginia spiraea, Mountain sweet pitcher-plant

Wildlands identified suitable habitat for all four plant species within the project area, however no populations resembling the species were found during the pedestrian survey. Suitable habitat identified for the small whorled pogonia consisted of a mixed-deciduous forest with canopy breaks. Suitable habitat identified for the swamp pink and the mountain sweet pitcher-plant consisted of marshy meadows and forested wetland habitat. Suitable habitat identified for the Virginia spiraea consisted of flood plains that experience high-velocity scouring floods. No critical habitat has been designated by USFWS for these species. Per NCNHP data explorer, no known element occurrences exist within the proposed project area. Thereby, Wildlands determined the project "**may affect, not likely to adversely affect" the Small whorled pogonia, Swamp pink, Virginia spiraea, and Mountain sweet pitcher-plant.**

Under section 7 of the Endangered Species Act, Wildlands will reconsider the above determinations if new information reveals impacts that may affect listed species or critical habitat in a manner not previously considered. We thank you in advance for your timely response and cooperation. If we have not heard from you within 30 days, we will assume you concur with the above ESA Section 7 determinations. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

Kirsten Y. Gimbert

Kirsten Gimbert, Senior Environmental Scientist
kgimbert@wildlandseng.com
704.941.9093

Cc: Donnie Brew. FHWA
Paul Wiesner, NCDMS
Jake McLean, Wildlands

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street Suite B
Asheville, North Carolina 28801

November 19, 2021

Kirsten Gimbert
Wildlands Engineering, Inc.
1430 South Mint Street, Ste. 104
Charlotte, North Carolina 28203
kgimbert@wildlandseng.com

Subject: Informal Consultation for Cornbread Valley Stream Mitigation Site, Macon County, North Carolina

Dear Ms. Gimbert:

On November 5, 2021, we received (via e-mail) your request for informal consultation and section 7 concurrence on effects the subject project may have on federally listed species. We have reviewed the submitted information along with additional information shared via email on November 15, 2021 and the following comments are provided in accordance with the provisions of the National Environmental Policy Act (42 U.S.C.§ 4321 et seq.); the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661 - 667e); and section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 - 1543) (Act).

Project Description

According to the information provided, Wildlands Engineering (Wildlands), via North Carolina Department of Mitigation Services funding, is proposing to conduct stream restoration and enhancement activities on a portion of Jones Creek and six unnamed tributaries to Jones Creek in Macon County, North Carolina. Activities will involve in-water work, tree clearing and grading. Botanical surveys were conducted on May 27, 2021, a date falling within the optimal survey window for the federally listed plant species with suitable habitat on site (species listed below), and results were negative. A scoping response letter for the subject project was issued from this office on March 3, 2021 which provided conservation recommendations on behalf of natural resources.

Wildlands has committed to the following conservation measures:

1. Trees will be removed from October 15 – April 1 outside of the bat active season for tree-roosting species.
2. No artificial lighting will be added to the action area.
3. No night work will occur.

Federally Listed Species

Based on the information provided with the informal consultation request stating that no suitable habitat is present within the project area, we would agree that the project will have no effect on the following species:

Common Name	Scientific Name	Federal Status[1]
Appalachian elktoe	*Alasmidonta raveneliana*	E
Gray bat	*Myotis grisescens*	E
Littlewing pearlymussel	*Pegias fabula*	E
Rock gnome lichen	*Gymnoderma lineare*	E
Spotfin chub	*Erimonax monachus*	T

[1]E = Endangered; T = Threatened

Based on the information provided and the commitment to the conservation measures described above, we would concur with a "may affect, not likely to adversely affect" (NLAA) determination from the lead federal action agency for the following species:

Common Name	Scientific Name	Federal Status[1]
Indiana bat	*Myotis sodalis*	E
Mountain sweet pitcher-plant	*Sarracenia rubra ssp. Jonesii*	E
Small whorled pogonia	*Isotria medeoloides*	T
Swamp pink	*Helonias bullata*	T
Virginia spiraea	*Spiraea virginiana*	T

[1]E = Endangered; T = Threatened

The southern population of bog turtles (*Glyptemys muhlenbergii*) is listed as "threatened due to similarity of appearance" (to the federally listed northern population) and is therefore not subject to section 7 consultation requirements. We encourage consideration of bog turtles if project activities will occur in wetlands; and advise coordination of the project with the North Carolina Wildlife Resources Commission and this office should the species be detected in the project vicinity.

The project area is not located within a 12-digit hydrologic unit, which contain hibernacula or maternity roosts for the federally threatened northern long-eared bat (*Myotis septentrionalis*, NLEB). This project is consistent with the final section 4(d) rule, codified at 50 C.F.R. § 17.40(o) and effective February 16, 2016 for NLEB. This rule exempts take of this species for any tree cutting activity that occurs more than 0.5 mile from a known hibernation site or more than 150 feet from a known maternity roost during the pup rearing season (June 1 - July 31). Because this project meets the "exempt" criteria, any take associated with the project has already been addressed in the Biological Opinion for the 4(d) rule, and no further action under section 7 of the Act is required for this species. We would also concur with a NLAA determination for this species for this project, given the commitment to winter tree clearing.

We believe the requirements under section 7 of the Act are fulfilled for the federally listed species discussed above. However, obligations under section 7 must be reconsidered if: (1) new information reveals impacts of this proposed action may affect listed species or critical habitat in a manner not previously considered, (2) this proposed action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the proposed action.

We appreciate the opportunity to provide these comments. Please contact Ms. Holland Youngman of our staff at holland_youngman@fws.gov if you have any questions. In any future correspondence concerning this project, please reference our Log Number 21-152.

Sincerely,

Janet Mizzi
Field Supervisor

Kirsten Gimbert

From: Kirsten Gimbert
Sent: Friday, February 12, 2021 11:37 AM
To: Donnie.Brew@dot.gov
Cc: Jake McLean
Subject: Cornbread Valley Mitigation Site - 4(d) Rule Streamlined Consultation Form
Attachments: Cornbread Valley- NLEB Consultation Form.docx; Cornbread Fig 1_USGS Map.pdf; Cornbread_Fig 2 Site Map.pdf

Mr. Brew,

Wildlands is working on the Cornbread Valley Mitigation project located in Macon County that has the NLEB as a listed species. We have conducted a T&E site walk and determined that there is suitable NLEB habitat on site; however, the mitigation site is approximately 1.5 miles from the closest hibernaculum. A general scoping letter was submitted to USFWS on 2/2/2021, but we have not received a response at this time. Please find attached to this email the NLEB consultation form for your review along with a concept map and a USGS topographic map for your reference.

Thank you for your time and consideration on this mitigation project. Please let me know if you have any questions or need additional information.

Sincerely,
Kirsten Gimbert

Kirsten Gimbert | *Senior Environmental Scientist*
M: 704.941.9093

Wildlands Engineering, Inc.
1430 S. Mint St, Suite 104
Charlotte, NC 28203

Kirsten Gimbert

From: Brew, Donnie (FHWA) <Donnie.Brew@dot.gov>
Sent: Wednesday, February 17, 2021 1:51 PM
To: lauren_wilson@fws.gov; holland_youngman@fws.gov
Cc: paul.wiesner@ncdenr.gov; Kirsten Gimbert; Jake McLean
Subject: NLEB 4(d) rule consultation - Cornbread Valley Mitigation Site - Macon County
Attachments: Cornbread Valley- NLEB Consultation Form.pdf; Cornbread Fig 1_USGS Map.pdf; Cornbread_Fig 2 Site Map.pdf

Good afternoon Lauren, Holland,

The purpose of this message is to notify your office that FHWA will use the streamlined consultation framework for the Cornbread Valley mitigation site in Macon County, NC.

Attached is a completed NLEB 4(d) Rule Streamlined Consultation form in addition to site maps/figures.

Thank you,

Donnie

Notifying the Service Under the Framework
Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form
Federal agencies (or designated non-federal representatives) should use the Northern Long-Eared Bat 4(d) Rule Streamlined Consultation form to notify the Service of their project and meet the requirements of the framework.

Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form (Word document)

Information requested in the Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form serves to

(1) notify the field office that an action agency will use the streamlined framework;

(2) describe the project with sufficient detail to support the required determination; and

(3) enable the USFWS to track effects and determine if reinitiation of consultation for the 4(d) rule is required. This form requests the minimum amount of information required for the Service to be able to track this information.

Providing information in the Streamlined Consultation Form does not address section 7(a)(2) compliance for any other listed species.

Donnie Brew
Preconstruction & Environment Engineer
Federal Highway Administration

310 New Bern Ave, Suite 410
Raleigh, NC 27601
donnie.brew@dot.gov
919-747-7017

Please consider the environment before printing this email.

Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form

Federal agencies should use this form for the optional streamlined consultation framework for the northern long-eared bat (NLEB). This framework allows federal agencies to rely upon the U.S. Fish and Wildlife Service's (USFWS) January 5, 2016, intra-Service Programmatic Biological Opinion (BO) on the final 4(d) rule for the NLEB for section 7(a)(2) compliance by: (1) notifying the USFWS that an action agency will use the streamlined framework; (2) describing the project with sufficient detail to support the required determination; and (3) enabling the USFWS to track effects and determine if reinitiation of consultation is required per 50 CFR 402.16.

This form is not necessary if an agency determines that a proposed action will have no effect to the NLEB or if the USFWS has concurred in writing with an agency's determination that a proposed action may affect, but is not likely to adversely affect the NLEB (i.e., the standard informal consultation process). Actions that may cause prohibited incidental take require separate formal consultation. Providing this information does not address section 7(a)(2) compliance for any other listed species.

Information to Determine 4(d) Rule Compliance:	**YES**	**NO**
1. Does the project occur wholly outside of the WNS Zone[1]?	☐	☒
2. Have you contacted the appropriate agency[2] to determine if your project is near known hibernacula or maternity roost trees?	☒	☐
3. Could the project disturb hibernating NLEBs in a known hibernaculum?	☐	☒
4. Could the project alter the entrance or interior environment of a known hibernaculum?	☐	☒
5. Does the project remove any trees within 0.25 miles of a known hibernaculum at any time of year?	☐	☒
6. Would the project cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot radius from the maternity roost tree from June 1 through July 31.	☐	☒

You are eligible to use this form if you have answered yes to question #1 **or** yes to question #2 **and** no to questions 3, 4, 5 and 6. The remainder of the form will be used by the USFWS to track our assumptions in the BO.

Agency and Applicant[3] (Name, Email, Phone No.): FHWA, Donnie Brew, Donnie.brew@dot.gov, 919-747-7017

Project Name: Cornbread Valley Mitigation Site

Project Location (include coordinates if known): latitude 35.103, longitude -83.454

Basic Project Description (provide narrative below or attach additional information):

The Cornbread Valley Mitigation Site is being developed to provide stream mitigation in the Little Tennessee River Basin. The project will include restoration and enhancement of Jones Creek, as well as six unnamed tributaries to Jones Creek. The area surrounding the streams and channels proposed for stream mitigation is currently maintained for livestock pasture and represents a significant portion of the grazed lands within the Jones Creek subwatershed, one of two primary watersheds to the Cartoogechaye Creek. The major goals of the stream mitigation project are to provide ecological and water quality enhancements to the Little Tennessee River Basin while creating a functional riparian corridor at the site level. This will be accomplished by excluding livestock from stream channels, restoring and enhancing native floodplain vegetation, improving the stability of stream channels, improving instream habitat, and permanently protecting and preserving the project site through establishing a conservation easement. These actions will reduce fecal, nutrient, and sediment inputs to project streams, and ultimately to the Little Tennessee River, as well as reconnect instream and terrestrial habitats on the project site.

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[1] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf

[2] See http://www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html

[3] If applicable - only needed for federal actions with applicants (e.g., for a permit, etc.) who are party to the consultation.

General Project Information	YES	NO
Does the project occur within 0.25 miles of a known hibernaculum? (1.5 miles)	☐	☒
Does the project occur within 150 feet of a known maternity roost tree?	☐	☒
Does the project include forest conversion[4]? (if yes, report acreage below)	☒	☐
Estimated total acres of forest conversion	5.88 ac	
If known, estimated acres[5] of forest conversion from April 1 to October 31		
If known, estimated acres of forest conversion from June 1 to July 31[6]		
Does the project include timber harvest? (if yes, report acreage below)	☐	☒
Estimated total acres of timber harvest		
If known, estimated acres of timber harvest from April 1 to October 31		
If known, estimated acres of timber harvest from June 1 to July 31		
Does the project include prescribed fire? (if yes, report acreage below)	☐	☒
Estimated total acres of prescribed fire		
If known, estimated acres of prescribed fire from April 1 to October 31		
If known, estimated acres of prescribed fire from June 1 to July 31		
Does the project install new wind turbines? (if yes, report capacity in MW below)	☐	☒
Estimated wind capacity (MW)		

Agency Determination:

By signing this form, the action agency determines that this project may affect the NLEB, but that any resulting incidental take of the NLEB is not prohibited by the final 4(d) rule.

If the USFWS does not respond within 30 days from submittal of this form, the action agency may presume that its determination is informed by the best available information and that its project responsibilities under 7(a)(2) with respect to the NLEB are fulfilled through the USFWS January 5, 2016, Programmatic BO. The action agency will update this determination annually for multi-year activities.

The action agency understands that the USFWS presumes that all activities are implemented as described herein. The action agency will promptly report any departures from the described activities to the appropriate USFWS Field Office. The action agency will provide the appropriate USFWS Field Office with the results of any surveys conducted for the NLEB. Involved parties will promptly notify the appropriate USFWS Field Office upon finding a dead, injured, or sick NLEB.

Signature: Donald W. Brew Date Submitted: 2-16-21

[4] Any activity that temporarily or permanently removes suitable forested habitat, including, but not limited to, tree removal from development, energy production and transmission, mining, agriculture, etc. (see page 48 of the BO).
[5] If the project removes less than 10 trees and the acreage is unknown, report the acreage as less than 0.1 acre.
[6] If the activity includes tree clearing in June and July, also include those acreage in April to October.

United States Department of Agriculture

Natural Resources
Conservation Service

North Carolina
State Office

4407 Bland Rd.
Suite 117
Raleigh
North Carolina 27609
Voice (704) 680-3541
Fax (844) 325-2156

February 19, 2021

Kirsten Gimbert
Senior Environmental Scientist
Wildlands Engineering Inc.
1430 S Mint Street, Suite 104
Charlotte, NC 28203

Dear Kirsten Gimbert.

The following information is in response to your request soliciting comments regarding the Cornbread Valley Mitigation Site in Macon County, NC.

Projects are subject to Farmland Protection Policy Act (FPPA) requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency.

For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land. Farmland means prime or unique farmlands as defined in section 1540(c)(1) of the Act or farmland that is determined by the appropriate state or unit of local government agency or agencies with concurrence of the Secretary to be farmland of statewide of local importance.

“Farmland" does not include land already in or committed to urban development or water storage. Farmland ``already in" urban development or water storage includes all such land with a density of 30 structures per 40-acre area. Farmland already in urban development also includes lands identified as ``urbanized area" (UA) on the Census Bureau Map, or as urban area mapped with a ``tint overprint" on the USGS topographical maps, or as ``urban-built-up" on the USDA Important Farmland Maps. See over for more information.

The area in question includes land classified as Prime Farmland. In accordance with the Code of Federal Regulations 7CFR 658, Farmland Protection Policy Act, the AD-1006 was initiated. NRCS Completed Parts II, IV, V of the form and returned for completion by the requesting agency.

If you have any questions, please feel free to call me at (704) 680-3541 office or (704) 754-6734 cell.

Sincerely,

Kristin L May

Kristin L May
Acting State Soil Scientist

cc:
Jeffrey Epps, supervisory soil conservationist, NRCS, Franklin, NC

The Natural Resources Conservation Service
is an agency of the Department of Agriculture's
Farm Production and Conservation (FPAC).

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U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 12/29/20
Name Of Project Cornbread Valley Mitigation Site	Federal Agency Involved FHWA
Proposed Land Use Stream Restoration	County And State Macon County, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 1/28/21

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☑	No ☐	Acres Irrigated None	Average Farm Size 69
Major Crop(s) Corn	Farmable Land In Govt. Jurisdiction Acres: 76558	% 23	Amount Of Farmland As Defined in FPPA Acres: 76558	% 23
Name Of Land Evaluation System Used Macon Co. LESA	Name Of Local Site Assessment System NA		Date Land Evaluation Returned By NRCS 2/19/2021	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	16.3			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	16.3	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	0.6			
B. Total Acres Statewide And Local Important Farmland	4.5			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.0067			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	9.3			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	51	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	0			
3. Percent Of Site Being Farmed	20	4			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	15			
6. Distance To Urban Support Services	15	10			
7. Size Of Present Farm Unit Compared To Average	10	3			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	4			
10. On-Farm Investments	20	2			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	73	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	51	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	73	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	124	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side)

This form was electronically produced by National Production Services Staff

Clear Form

Form AD-1006 (10-83)

Kirsten Gimbert

From: Kirsten Gimbert
Sent: Thursday, September 16, 2021 12:01 PM
To: May, Kristin - NRCS, Salisbury, NC
Cc: Epps, Jeffrey - NRCS, Franklin, NC
Subject: RE: FPPA_AD1006 Form-Cornbread Valley Mitigation Site
Attachments: AD-1006 Cornbread_USDA.pdf

Hi Kristin,

Attached is the final FPPA form for the Cornbread Valley Mitigation Site located in Macon County, NC. Please let me know if you have any questions.

Sincerely,
Kirsten Gimbert | *Senior Environmental Scientist*
M: 704.941.9093

From: May, Kristin - NRCS, Salisbury, NC <kristin.may@usda.gov>
Sent: Friday, February 19, 2021 2:39 PM
To: Kirsten Gimbert <kgimbert@wildlandseng.com>
Cc: Epps, Jeffrey - NRCS, Franklin, NC <jeffrey.epps@usda.gov>
Subject: RE: FPPA_AD1006 Form-Cornbread Valley Mitigation Site

Afternoon Kirsten –

Attached is the completed AD-1006.

Please let me know if you have any questions or need any additional information.

Thanks.

Kristin May
Acting State Soil Scientist
United States Department of Agriculture
Natural Resource Conservation Service
(704) 680-3541
(704) 754-6734 cell
Kristin.May@usda.gov

From: Kirsten Gimbert <kgimbert@wildlandseng.com>
Sent: Thursday, January 28, 2021 9:33 AM
To: May, Kristin - NRCS, Salisbury, NC <kristin.may@usda.gov>
Subject: FW: FPPA_AD1006 Form-Cornbread Valley Mitigation Site

Here is the first one submitted. Three more to come 😊 Again, please let me know if you have additional questions on these.

Kirsten Gimbert | *Senior Environmental Scientist*
M: 704.941.9093

From: Kirsten Gimbert
Sent: Tuesday, December 29, 2020 2:46 PM
To: Cortes, Milton - NRCS, Raleigh, NC <milton.cortes@usda.gov>
Subject: FPPA_AD1006 Form-Cornbread Valley Mitigation Site

Milton,

Please find attached to the email the completed FPPA AD1006 Form for the Cornbread Valley Mitigation Site in Macon County, NC.

Thank You and Happy Holidays!
Kirsten Gimbert | *Senior Environmental Scientist*
M: 704.941.9093

Wildlands Engineering, Inc.
1430 S. Mint St, Suite 104
Charlotte, NC 28203

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February 2, 2021

Andrea Leslie
North Carolina Wildlife Resource Commission
Mountain Coordinator
645 Fish Hatchery Rd
Marion, NC 28752
Submitted via email: andrea.leslie@ncwildlife.org

Subject: Cornbread Valley Mitigation Site
Macon County, North Carolina

Dear Ms. Leslie,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with a potential stream restoration project on the Cornbread Valley Mitigation Site located in Macon County, NC. A Site Map and a USGS Topographic Map showing the approximate project area are enclosed. The topographic figure was prepared from the Prentiss 7.5-Minute USGS Topographic Quadrangle, and the site is located at 35.1030 longitude -83.4544.

The Cornbread Valley Mitigation Site is being developed to provide stream mitigation within the Little Tennessee River Basin. The project will include restoration and enhancement of Jones Creek, as well as six unnamed tributaries to Jones Creek. The streams onsite are severely incised and eroded throughout and are routinely used by cattle for shade and water. Manmade ponds and levies have altered natural watershed hydrology, confining flood flows on multiple tributaries. Additionally, the absence of well-established riparian buffers contributes to sediment and nutrient loading in the watershed. Throughout the site, high quality habitat and refugia are fragmented by stream instability, poor buffer quality, and artificial barriers that impact aquatic organism passage.

The major goals of the stream mitigation project are to provide ecological and water quality enhancements to the Little Tennessee River Basin while creating a functional riparian corridor at the site level. This will be accomplished by removing livestock access from stream channels, restoring and enhancing native floodplain vegetation, creating stable stream banks, improving stream habitat, treating concentrated agricultural runoff with BMPs and protecting the site in perpetuity through establishing a conservation easement.

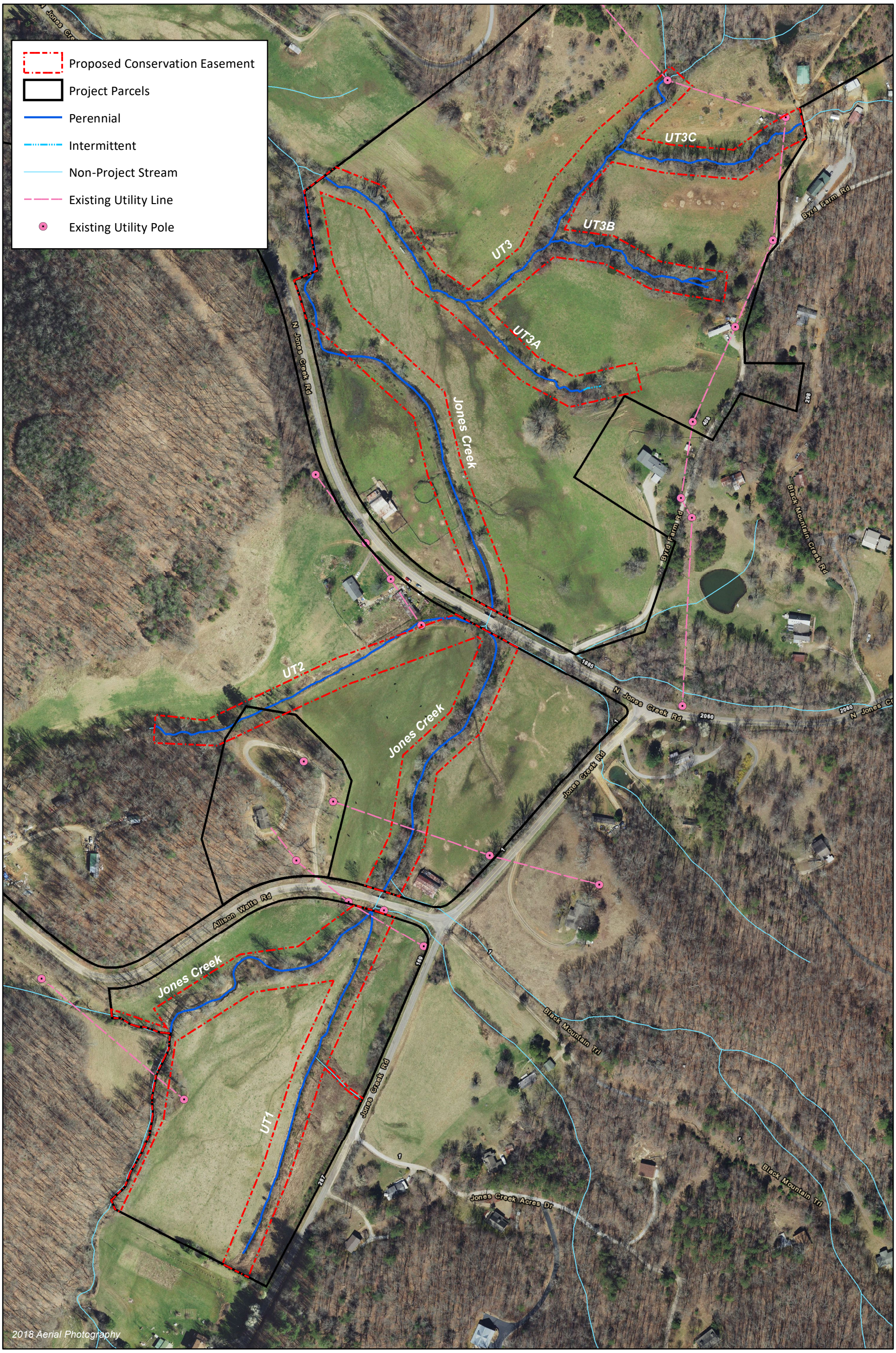
We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Kirsten J. Gimbert

Kirsten Gimbert, *Senior Environmental Scientist*
kgimbert@wildlandseng.com
704.941.9093

Attachments: Figure 1 Site Map and Figure 2 USGS Topographic Map

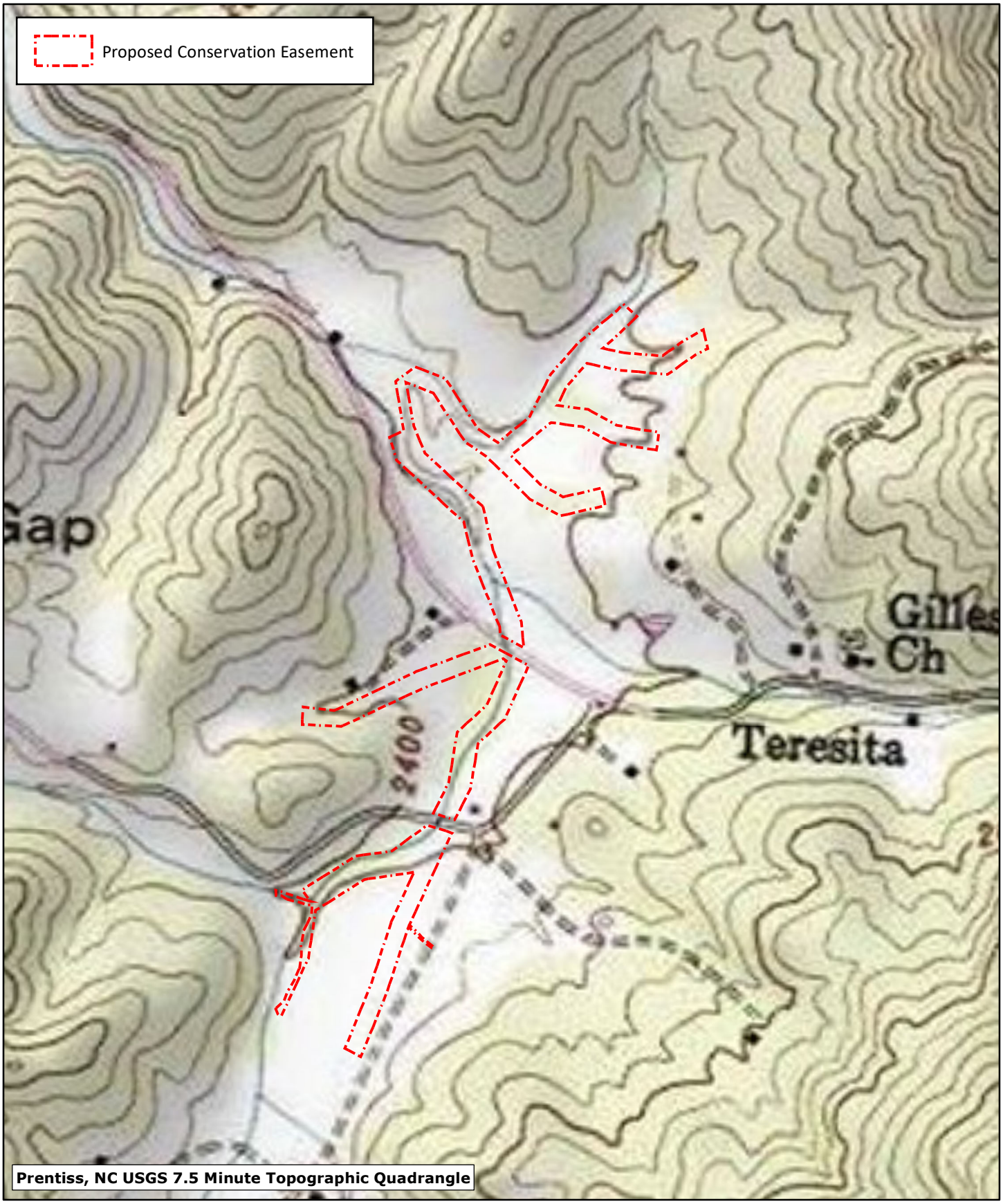


WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 1 Site Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC



WILDLANDS ENGINEERING

0 300 600 Feet

N

Figure 2 USGS Topographic Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC



North Carolina Wildlife Resources Commission

Cameron Ingram, Executive Director

February 10, 2021

Kirsten Gimbert
Wildlands Engineering, Inc.
1430 S. Mint St, Suite 104
Charlotte, NC 28203

SUBJECT: Cornbread Valley Mitigation Site

Dear Ms. Gimbert:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) received your February 2, 2021 letter regarding plans for a stream mitigation project on Jones Creek and six unnamed tributaries in Macon County. I visited the site on January 26, 2021. You requested that we review and comment on any possible issues that might emerge with respect to fish and wildlife from the potential restoration project. Our comments on this project are offered for your consideration under provisions of the Clean Water Act of 1977 (33 U.S.C. 466 et. seq.) and Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

According to project documents received before the site visit, the project is proposed as a mitigation project and will involve restoration/enhancement on nearly 4,250 ft of stream. Livestock will be excluded, riparian vegetation established, best management practices installed to control agricultural runoff, and various strategies to improve bank stability and in-stream habitat will be used.

There are wild Brown Trout and Rainbow Trout in the project vicinity, and in-stream activities should be avoided during the trout moratorium of October 15 to April 15. This project is just upstream of the Cartoogechaye Creek Aquatic Habitat, a natural area rated as High by the NC Natural Heritage Program due to the richness of aquatic species it supports. Near the site, Jones Creek supports Eastern Hellbender [*Cryptobranchus alleganiensis*, US Federal Species of Concern (FSC), NC Special Concern (SC)], Little Tennessee River Crayfish (C*ambarus georgiae*, US FSC, NC SC), and Smoky Dace (*Clinostomus* sp., US FSC, NC SC). The project has the potential to benefit this important stream community, but it is especially important to use excellent erosion and sediment control on the site to minimize impacts to the same community.

We recommend incorporating any wetland restoration/enhancement possible into the project. In addition, we recommend establishing buffers as wide as possible to maximize buffer benefits such as bank stability, stream shading, treatment of overland runoff, and wildlife habitat.

Thank you for the opportunity to review and comment on this project. Please contact me at (828) 400-4223 if you have any questions about these comments.

Sincerely,

Andrea Leslie
Mountain Region Coordinator
Habitat Conservation Program

APPENDIX 6 – IRT Communications

WILDLANDS
ENGINEERING

MEMORANDUM

TO: Paul Wiesner, NC DMS

FROM: Jacob McLean, PE, CFM

DATE: September 2, 2022

RE: Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202
Macon County, NC
DMS ID No. 100175
DEQ Contract Number 0304-01
RFP Number 16-20190304
SAW-2020-02051
Response to NCDMS Mitigation Plan Comments

This memo documents NCDMS's initial Draft Mitigation Plan review comments (*in italics*) received from Paul Wiesner's letter dated 8/12/2022, the project team's responses (in blue), and where the revisions have been included in the final Mitigation Plan.

Mitigation Plan Comments:

General:

- ***General:*** *Several issues discussed during the Tuesday January 26, 2021, post contract IRT site visit (and documented in the meeting minutes) are not fully addressed in the draft mitigation plan. As an example, the USACE indicated that biological monitoring should be considered on the upper portion of UT3A. At the meeting wrap-up, the USACE indicated that this may entail monitoring for macroinvertebrates with no specific standards or thresholds being required except to report findings to document if the restored stream was supporting macroinvertebrates. NCWRC had concerns about the concentrated livestock use at the barn on left floodplain of Jones Creek Reach*
  3. Please review the IRT post contract meeting minutes provided in Appendix 6 and update the mitigation plan to address and resolve issues discussed at the 2021 on-site IRT meeting.

Response: Wildlands has added macroinvertebrate sampling on UT3A to Table 41. Reachwide sampling in year 2 or 3 is proposed to evaluate for the presence of macroinvertebrates. Resampling is proposed in later years only if no macroinvertebrates are found during the initial sampling event.

Consistent with note 10, Wildlands investigated ways to treat runoff in the area near the barn. Wildlands requested the landowner sell additional land to implement a BMP within the easement; however, they are unwilling to sell additional land in this area. Wildlands ultimately decided that the best approach was to plant dense herbaceous vegetation in this area and roughen the flow path as

much as possible to improve buffer function so that the buffer would serve as a more effective filter strip for runoff.

- ***General:*** *Drain tiles are mentioned throughout the plan as being present on the site. Does WEI know the location of the tiles? Project aerials indicate the areas currently being used as pasture are in low lying wet areas and landowners are concerned with increased wetness due to the project. Does WEI have concerns with hydrologic trespass as drain tiles are removed/broken within the conservation easement? Please verify hydrologic trespass has been evaluated and resolved for all modifications proposed on site.*

Response: Drain tiles are present on specific reaches (UT3A Reach 1, UT1) and these areas have been evaluated with respect to drain tile removal and do not pose a concern for hydrologic trespass. One field drain that will remain in the field left of UT1 can be left without affecting the easement and without the project affecting the field. All infrastructure will be removed from the easement. Hydrologic trespass issue have been resolved for all proposed site modifications.

- ***General:*** *Jones Creek Reach 4: Livestock use the bridge opening for access to the upstream pasture and an existing riffle below the bridge is used as a ford to move livestock to the feeding area near the barn. Will livestock continue to use the bridge opening following construction? How often do livestock utilize this crossing and are the cattle allowed to congregate in the stream? Are there restrictions in place to prevent this from occurring after construction?*

Response: No, livestock will no longer use the bridge as a crossing between fields. The landowner understands the requirement that livestock be restricted. Fencing is proposed to provide a livestock barrier upstream and downstream of the proposed ford crossing.

- ***General:*** *Will proposed waterlines be installed prior to or during construction? The contractor should be made of aware of conservation easement boundaries and instructed to keep all infrastructure out of conservation easement areas.*

Response: The landowner is being encouraged to install all waterlines prior to or during construction. If any waterline crossings are proposed to be installed post-construction, Wildlands will sleeve any future waterline crossings in order to facilitate installation without disturbance to streams. The landowner has been instructed that infrastructure is prohibited in the conservation easement, except where explicitly allowed by internal breaks for stream crossings or utility corridors.

- ***General:*** *Was DOT consulted to determine if any roadway/culvert improvements projects are planned for Allison Watts Road or N. Jones Creek Road? Future road improvements should be considered as part of the mitigation plan and property conservation easement development.*

Response: Wildlands has reached out to the NCDOT Division 14 engineer and bridge maintenance engineer and they have indicated that they rebuilt the N. Jones Creek Road bridge after storm damage a couple of years back and have no future plans for replacement of either structure at this time. NCDOT maintains a 60-foot ROW on both of these roads to facilitate any future work. Wildlands can furnish correspondence with NCDOT if requested.

- ***Report Cover:*** *Please also include the issuance date of the RFP on the cover: RFP 16-20190304 (Issued 12/20/2019).*

Response: The RFP date has been added.

- ***Table of Contents:*** *Figure 6 Reference Reach Vicinity Map was not included in draft submittal. Please review, QA/QC and update accordingly.*

Response: The map has been included in the updated version.

- ***Section 3.2.1 Geology:*** *The statement "The absence of bedrock has contributed to stream downcutting…" is oddly stated and somewhat inaccurate. More accurately, the presence of bedrock is limiting incision. Please revise for accuracy.*

  Flood prone width does not typically apply to steeper streams, i.e., headwater and/or colluvial streams. Please review and revise for accuracy.

Response: The text in the first paragraph of Section 3.2.1. has been revised to address the site geologic and geomorphic conditions more accurately.

- ***Section 3.3.1 Existing Streams_UT2 Reach 1****: "The spring box area has been left out of the easement area but can be included with an exception to allow the spring box and piping if preferred by DMS.". The spring box noted, and any associated waterlines or infrastructure should be left out of or removed from the conservation easement during construction. Please update and confirm in the revised mitigation plan.*

Response: This text has been revised to indicate that the spring box and all associated waterlines will be left out of the easement. No waterlines exist within the proposed easement and it is understood that all infrastructure must be removed or excluded from the easement.

- ***Section 3.3.2 Existing Wetlands:*** *This section states that the USACE Wetland Determination Sheets are included in Appendix 2; these were missing from the DRAFT submission. Given that most of the soils onsite are not mapped as hydric soils, inclusion of these determination sheets along with the existing wetlands layer is necessary. Please update the mitigation plan accordingly.*

Response: The sheets have been added to Appendix 2.

- ***Section - 3.5 Site Constraints to Functional Uplift; Section 6.7 Wetland Design & Preliminary Plan Set/ Wetland Grading Plan: "****In many cases, rehabilitation wetlands have hydric soils at the existing ground surface but must be graded down 12-24" in order to blend to target floodplain elevations.". If an existing wetland area is proposed for wetland rehabilitation but is being graded 12-24 inches, it will likely not be considered for mitigation credit by the NC IRT. Please explain how significant grading of an existing wetland area provides function uplift and wetland rehabilitation of these areas. Further, removal of 12 inches or greater of soil from a wetland reestablishment area would be considered Wetland Creation at a 3:1 mitigation ratio.*

Response: The mitigation text has been revised to discuss the specific areas where grading exceeds 12". Only two areas within the site have wetland grading proposed in excess of 12".

The first area, along UT1, is in the vicinity of an existing, unforested 0.21-acre wetland where water ponds on the backside of a spoil levy. This area is impacted by cattle, invasive species, and ditching. After a transition of roughly 150' at the top of UT1 due to a low incoming pipe, the stream is being raised one foot or more along the remainder of UT1 as part of Priority 1.5 grading. Grading in existing wetland areas is less than 12" over more than half of the existing area and greater than 12" in the other half, some of which overlaps with edge of berm spoil piles. Grading in existing wetland areas has been kept as minimal as possible.

Based on the comment, crediting of this area has been modified from rehabilitation to enhancement at 2:1 for existing wetlands. This ratio reflects uplift from planting, removal of livestock, removal of spoil piles and raising the streambed elevation, as well as treatment of non-native invasive species.

Originally proposed reestablishment areas include greater cuts through 3' berm spoil piles. The crediting approach has been adjusted to creation and extended across the abandoned UT1 channel which is being filled to the prevailing design grade.

All grading along UT2 & UT3A/UT3 Reach 2 involve less than 12" of wetland grading.

Along UT3 Reach 3 below the proposed crossing, Wildlands was able to revisit and reduce the existing wetland grading on the right floodplain to achieve an average of 3" with only minimal grading over 12". The existing conditions in this 0.14-acre area are highly manipulated with two ditches totaling 250' in ditch length and berm spoil piles through the wetland. On the left side of UT3 Reach 3, reestablishment is proposed with 15% of the reestablishment area at 12-18" of grading to remove a spoil berm on either side of the existing ditch near proposed station 13+00.

- *It is unclear why UT1 and UT2 are unable to be designed with a Priority I restoration approach. There appears to be plenty of length along both reaches to reconnect to the floodplain and transition back down to the confluence with Jones Creek. Are landowner concerns of hydrologic trespass driving this decision? Can WEI provide additional information? Please review, respond, and update the mitigation plan and plan set accordingly.*

Response: Both channels are steeper than 2% and running through the floodplain of the larger Jones Creek through the majority of their lengths where this comment applies. Both channels are being raised to promote greater wetland interaction but are also being designed as B-type or hybrid B/C channels. In both cases, limited connectivity with the wider floodplain on Jones Creek was deemed appropriate based on stream type and associated design targets for entrenchment ratio to achieve the desired level of moderate confinement. Design profiles were checked to ensure that hydrologic trespass conditions would not ensue.

- ***General; Section 3.5 Site Constraints to Functional Uplift; 6.10 Project Risk and Uncertainties and project plan set:*** *Wildlands notes that; "The active livestock operation at the Site is possibly the biggest risk to the project and the conservation easement integrity." Further, excluding livestock from the stream channels and wetland resources is the 1st project goal identified. Due*

to concerns over the active livestock operation on the site and discussions with Wildlands regarding the current project landowners, DMS highly recommends installing livestock exclusion fencing around the entire project easement to avoid encroachment issues during the monitoring term and once transferred to DEQ Stewardship. Relying on landowners to install fencing if livestock return to the site has been problematic on DMS sites in the past. Please update the mitigation plan and discuss the type of fencing and locations to be installed. Please include fencing specifications, include fence locations on figures and plan sheets and include access gates. Due to numerous issues on other projects, DMS highly discourages the use of high tensile electric fencing on mitigation projects.

Response: The mitigation plan text, mitigation plan figures, and project plan sheets have been updated to include: (1) fence location, intended type and specifications, and (2) intended location of access gates. To avoid cluttering figures and legends with detailed information, the gates and intended fence types are shown on the plans only. Wildlands reserves the right to adjust the size and location of access gates or the type of fence used and will document any changes in the as built. DMS fencing preferences are noted.

- ***Section 3.5 Site Constraints & project plan set:*** *Berms are discussed as part of the design for Jones Creek. Please include approximate locations of the proposed berms on figures and plan sheets. Please add call outs or use specific symbols to represent proposed berms. The use of berms is an atypical approach for mitigation projects and has been discouraged in the past by the IRT. Is this approach only being proposed for Jones Creek Reach 5? Recommend further discussion of how, why and where this approach is being proposed.*

Response: The designs for Jones Creek include an approach to incorporate a natural vegetated river levy along the low bank where confinement of the channel is lost on this side of the channel. This approach is only secondary to the primary approach which is to adjust channel dimension and slope through these reaches. Natural floodplain levies are generally being kept to about 1' in height and are being constructed as broad naturally shaped features. Wildlands has revisited and minimized the natural levy designs and in some cases graded them out entirely. The natural floodplain levies will help maintain geometric and slope continuity in the remaining segments which are typically abutting upstream and downstream transition areas where restoration and enhancement bank grading is being tied to enhancement work without grading. Their purpose is to promote sediment transport continuity and capacity that has been lost in these limited segments of the valley where prior manipulation is more than channel grading alone can counteract.

- ***Section 3.5 Site Constraints to Functional Uplift & Project Plan Set:*** *Please also discuss the cultural resource areas located within and adjacent to the project site. Please provide specific details noting how these important cultural resource areas will be protected during project construction. At a minimum, these sites should be discussed at all pre-construction meetings with applicable contractors and should be clearly marked in the field to avoid any missteps or impacts. Please update the project plan set with any appliable details and/or safety fencing locations proposed to protect all of the cultural resource areas identified in the archeological survey provided in Appendix 5.*

Response: The Section 3.5 text has been updated to include discussion of cultural resource areas. Sheet 0.3 of the plans has been updated to prescribe required cultural resource review at pre-construction meetings and to specify that areas noted on the plans be marked prior to commencing

construction activities. Cultural resource areas and Cherokee Nation requests are discussed in subsequent comments, and relevant notes pertaining to these have also been addressed on this sheet.

- ***Section 4.1 Biological and Cultural Resources:*** *Please briefly discuss the updated botanical survey information provided to USFWS on 7/5/2022 and included in Appendix 6 – IRT Communications.*

Response: Discussion of the recently provided botanical survey information has been added to the writeup.

- ***Section 4.1 Biological and Cultural Resources & Project Plan Set: "****Two archeological sites were identified for protection, and the Eastern Band of Cherokee Indians has requested that these areas be maintained free of disturbance from planting." The Cherokee Nation's letter (not the EBCI) notes; "The Nation concurs with the provided report that Sites 31MA873 and 31MA877 should be avoided throughout the course of this project, including direct and indirect activities, such as borrow pits and equipment staging. This Office respectfully requests additional consultation if these aforementioned sites cannot be avoided." Based on a review of the draft mitigation plan submitted, site 31MA877 is outside of the proposed conservation easement area and can be completely avoided as part of project implementation. In the FHWA Categorical Exclusion, Wildlands committed to not planting the small area (~0.008 Ac) of site 31MA873 located within the proposed conservation easement area. This no planting zone is shown in the Project Plan Set; however, the call out on sheet 4.5 indicates that bare root planting will be conducted in this area. Please review and update the Section 4.1 report text and project Plan Set accordingly. In addition, all cultural resource areas noted in the Archaeological Survey documentation provided to NC SHPO should be show on the Project Plan Set as necessary so areas can be located, avoided, and protected as necessary during project construction and implementation revised document should be clear as the cultural resource component of this project will be critical during IRT review and project permitting.*

Response: The text in Section 4.1 has been corrected to clarify that the request was made by the Cherokee Nation. The call out on sheet 4.5 was in error and has been updated. The Archeological Survey indicates that only two of the sites identified should be avoided and follow-up correspondence indicated that other unstudied areas would be proposed for bare root planting only. All of these areas have been identified on the plans. Disturbance to other low density artifact areas that were not deemed eligible for Section 106 designation will be kept to the minimum necessary to complete the project but no special avoidance or other requirements have been identified or required through study and review of the proposed resources and project activities. As such, these ineligible areas are not being shown on the plans. Cultural resource notes have been added to Sheet 0.3 to guide construction phase activities with respect to cultural resources.

- ***Section 6.1 Stream Design Approach Overview:*** *The overall description of the approach includes the statement "Establishing partial confinement of high flows along Jones Creek has been identified as an important aspect of sediment transport continuity" is unclear. Given WLE is planning to restore 'stable' channel geometries, why is there a concern about bedload transport of large material. If deposition of coarse sediment from upstream is burying the substrate (as mentioned in the reach description), why would the approach be to transport this sediment by*

confinement rather than constructing the upstream reach to stabilize /balance transport? This statement also applies to the sediment transport section and the proposed levy construction. Page 42 references 'sediment transport continuity' as part of trespass. Are the landowner needs the primary reason/justification for the levy? If so, please state. Please revise for clarity and to justify the intent throughout the document.

Response: This statement has been revised in Section 6.1 for clarity:
"To address aggradation in Reaches 2 and 4/5 of Jones Creek, channel sinuosity will be reduced and aggraded sediment will be removed to steepen the profile, and the restored channel dimension has been sized to transport coarse sediment being delivered by the watershed."

To answer the follow-up questions: (1) The larger section selected for design is consistent with stable reaches within and upstream of the project. Incoming sediment loading cannot be manipulated and the loss of competence is due to low banks where flow escapes the channel at a frequency significantly lower than bankfull. (2) The proposed design includes a natural levy feature in limited areas to transition from existing stable sections into the restoration reach and back to existing sections. The feature is a broad rise and only present on one side of the river where the bank is excessively low and no alternative is available. Landowner needs are not a primary consideration for this design approach. The primary consideration is to develop a geomorphic design approach that adequately addresses the existing conditions that are causing erosion as well as avulsion risk.

While we understand the concern that this is an atypical approach, design refinement has worked to further blend and naturalize this approach to the landscape. Furthermore, no other reasonable approach to this issue exists and the approach is anticipated to be effective in addressing aggradation.

- ***Section 6.0 Design Approach and Mitigation Work Plan:*** *Reaches UT3R2, Jones Creek Reach 5, UT2R2, and UT3R4 all have the construction of bankfull benches indicated in the text describing the proposed design intervention. This Priority II approach should only be used in transition zones to meet elevations not subject to project design. Please verify this is the case for these reaches or revise as necessary.*

Response: UT3R2 and UT3R4 are enhancement reaches. These two reaches and UT2R2 are considered step-pool (B or B/Cb hybrid) designs based on valley slope. These tributaries transition from narrower headwater valleys onto the larger floodplain of Jones Creek and the original shape of their valleys in this transition zone has been influenced by ditching and smoothing of fields for agriculture. The design approach is to reshape valleys consistent with step-pool and hybrid design targets for entrenchment ratio and reestablish the concave surface that is judged to have existed prior to modification for agriculture.

Jones Creek Reach 5 is being constructed to match the slope and dimension of stable reaches within the project area and upstream of the project. We do not consider this a Priority 2 design approach.

- ***Table 28: Stream Stressors and Mitigation Approach:*** *The footnote indicates; "Where only supplemental planting is proposed, this is noted." Is this applicable to any of the project reaches proposed? If not, please remove or revise as necessary.*

Response: The table has been updated to designate reaches where supplemental planting is proposed in either the entire reach or a substantial portion of the reach.

- ***Table 31 and all following: Summary of Design Morphologic Parameters for Jones Creek:*** *Please remove the word 'design' from the discharge width, depth, area, and velocity parameters. This table was updated in the 2020 mitigation plan guidance. Please utilize the October 2020 table templates in the revised report and digital support documents. The templates are available on the DMS website here: https://deq.nc.gov/about/divisions/mitigation-services/dms-vendors/templates-guidelines-tools- projects*

Response: Wildlands has set up this report based on the applicable format when the RFP was issued. In discussion of this comment, Wildlands has agreed to update the crediting table to reflect the template but indicated that other table formats would reflect the applicable format when the RFP was issued.

- ***Section 6.6 Stream Design Implementation:*** *"Livestock will be excluded from the entire conservation easement as part of the project, and the landowner will install livestock watering systems post-construction as part of the project implementation.". As discussed with the IRT on a previous Wildlands project (Wyant Lands), all project fencing and livestock watering systems should be installed during project construction to avoid landowner issues and potential livestock watering within project crossings.*

Response: Wildlands recognizes the issue being highlighted and intends to have the landowner complete all fencing and watering prior to or during construction.

- ***Section 6.5 Sediment Transport Analysis:*** *The statement "…. critical in reaches 2 and 5 of Jones Creek where continuity is disrupted by inadequate floodplain bench confinement" is not clear; please clarify. The use of berms on Reach 5 to serve as channel confinement is not clear. The approach applied to address entrenchment is typically to adjust channel dimension; not through the use of berms to affect valley dimension. Please review and update as necessary.*

Response: This statement has been rewritten as:
"Reaches 2 and 5 of Jones Creek are aggrading due to loss of slope and appropriate cross-sectional area."

The cross section of Reach 5 has been designed to target stable channel dimensions and slopes observed in stable onsite and upstream reaches. In order to achieve these targets, the profile of Reach 4 has been steepened to address prior aggradation and increase channel depth coming into the beginning of Reach 5 where the issue of aggradation is present. In addition, the transition areas of Reach 5 (at the top and the bottom) have a subtle natural levy designed into the cross section to tie-out to adjacent field grades on the right floodplain where there is an area that is lower than the prevailing floodplain. Using this approach, channel dimension was addressed to the maximum extent possible prior to adding this subtle grading addition to the design.

- ***Section 6.5 Sediment Transport Analysis & Section 6.6.4_Jones Creek Reach 4:*** *The design of Jones Creek includes the construction of 2-foot-tall levy features to help target semi- confinement*

of bankfull flows and flows less than the 5 to 10-year event. Will these proposed constructed levys be designed to allow floodplain flow and significant storm flow (greater than 10-year) access back into Jones Creek? Please explain and add detail to the revised mitigation plan as necessary.

Response: During final 60% design efforts leading up to the submittal, Wildlands was able to reduce the designed natural levy to one foot or less and has further refined these tie-outs as part of this revised submittal to make the transitions as smooth as possible through Reaches 4 & 5.

Proposed natural levies are not continuous features but only exist where the river channel abuts areas that are lower than the prevailing floodplain. Water cresting these rises in Reach 4 or 5 will flow down-valley and reenter Jones Creek. The proposed natural floodplain levies will not result in ponding water on the floodplain or a lack of an outlet for receding floodwater.

The last paragraph of 6.6.4 has been revised accordingly to explain.

- ***Section 6.6.1 Jones Creek Reach 1a and 1b:*** *Table 28 indicates left bank grading will occur on Reach 1b. Recommend quantifying the length of bank grading in this section and any other potential work that will occur to justify the EII 2.5:1 mitigation ratio.*

Response: The primary work on Reach 1a and 1b is revegetation of the buffer which is largely in pasture, and fencing of livestock. These activities are indicated in footnote 1 of Table 28. As indicated in Table 28, bank grading is in the transition areas between Reach 2 → Reach 1b only, for about 70 feet. The credit ratio is proposed based on the large stream size and significant uplift from revegetation and removal of livestock from the buffer.

- ***Section 6.6.2 Jones Creek Reach:*** *Please clarify how the establishment of vegetation along the lower slope stream banks will impact bank toe erosion and how deposition along the banks will be induced based on riffle bottom widths.*

Response: The intent of this discussion of stream bank slope is to indicate that a lower bank angle should promote a lower-risk recovery trajectory where banks are more likely to deposit with material and successfully revegetate with herbaceous cover to provide short-term resistance to erosion while woody vegetation is establishing.

The text suggests that deposition will be induced based on the gentle bank slopes but does not suggest that bank deposition is related to riffle bottom width.

The narrative has been revised in an attempt to more succinctly make this point.

- ***Section 6.6.6 UT1:*** *The plan states existing pipe will be removed from within the conservation easement to the extent practicable and a headwall or similar outlet will be constructed. Infrastructure should be outside of the conservation easement in order to provide maintenance opportunities should they arise during long term stewardship.*

Response: Some of the flow in UT1 enters the site in a small diameter pipe. This pipe will be removed as close to the property line as possible without impacting the existing hedge row that is a

visual buffer for the adjacent landowner. This exception will be noted on the plat and in the conservation easement deed and has been reviewed with DMS and SPO for concurrence.

- ***Section 6.7 Wetland Design:*** *In this section, please discuss and explain how the areas of wetland rehabilitation, wetland enhancement, and wetland re-establishment differ in approach. Wetland rehabilitation typically involves an increase in wetland hydrology while wetland enhancement focuses more on a planting and cattle exclusion approach. Wetland enhancement is typically proposed at a 2:1 mitigation ratio. As noted in the comment above, removal of 12" of soil from re-establishment areas is typically considered wetland creation at a 3:1 mitigation ratio. Please respond and update the mitigation plan accordingly.*

Response: Section 6.7 has been revisited and paragraph 2 of this section now clarifies the proposed types of credited wetland work on the site and specific applications and activities along each stream corridor.

- ***Section 6.7 Wetland Design:*** *Please ensure that overburden to be removed is clearly anthropogenically sourced and can be attributed to discreet manipulation event/s.*

Response: The only areas proposed for reestablishment with grading of greater than 12" are highly obvious cases of ditch and side cast berm construction and these areas are small percentages of the adjacent likewise credited areas.

Where overburden cannot be attributed to specific activities along UT1, the proposed crediting has been adjusted accordingly.

- ***Section 6.7.1 Hydric Soils Investigation:*** *This section notes that total of 52 hand augured soil borings were performed as part of the hydric soil investigations (Appendix 4). The detailed soils borings were not included in Appendix 4 of the draft report received. Please provide all available soil borings and the associated soils report, boring log information and associated maps in the revised report appendices. Please confirm that the hydric soils investigation was completed by a Licensed Soil Scientist (LSS).*

Response: The soil borings were performed by Wildlands and not by an LSS. The map provided in Appendix 4 includes the soils borings depth to hydric indicator and locations. No report was developed as the analysis of data was integrated into Civil 3D drawing files and used to guide design. Wetlands were added to the contract after the post-contract IRT Site Visit.

- ***Section 6.8 Stormwater BMPs:*** *Does WEI have prior experience and success using straw wattles for BMPs? Are the wattles a short-term solution to promote deposition while vegetation becomes established in the area? Recommend providing maintenance as necessary early in the project to ensure the BMP functions as designed. Please provide more information regarding the stormwater BMP. If maintenance is not an issue, it may be more appropriate to call this feature an agricultural BMP.*

Response: We have used straw wattles to disperse concentrated flow but not in this exact configuration, and not always in conjunction with proposed BMPs. As the second question suggests, the straw wattle is not the primary BMP, but a short-term approach to promoting vegetation

reestablishment. We agree to provide maintenance as necessary during the 7-year monitoring period and anticipate that this period will suffice to reestablish vegetation and roughness in the area and that the BMP will be self-sustaining once these two target conditions are met. We are OK with calling this an agricultural BMP and have adjusted the Section heading to refer to it as such.

- ***Section 6.9 Vegetation, Planting Plan and Land Management:*** *Other than the ecological community assessment of the site, did WEI consider any reference sites when determining the species list?*

Response: The ecological communities present onsite were intact enough to assign natural community classifications. Additionally, our Falcon mitigation site located just downstream was used as a reference site, as the plant communities there, along some reaches, are in moderate-good condition and used to confirm and fill out natural community species composition. Observations of the natural communities identified on these two sites helped guide planting plan development.

- ***Section 6.9 Vegetation, Planting Plan and Land Management:*** *Does WEI intend to treat fescue grass within the conservation easement prior to or during construction? Please discuss in the revised mitigation plan.*

Response: Fescue will be treated before planting activities begin in all non-graded areas within the conservation easement. Language has been added to the revised mitigation plan to address this.

- ***6.10 Project Risk and Uncertainties:*** *This system naturally has 'high stream power'. DMS expects high stream power to be included in modeling and design rather than listed as a risk/ uncertainty.*

Response: The design approaches applied are intended to mitigate these risks. Wildlands has removed reference to risks that have been addressed by discussion in other design sections.

- ***Section 6.10 Project Risk and Uncertainties*** *– This section notes; "Wildlands' design balances landowner needs with potential ecological uplift at the Site by managing the depth of proposed stream profiles and floodplain grading and allowing for existing ditches to remained tied directly to Site streams." What measures will or can be taken to exclude livestock from existing ditches located outside of the conservation easement so animal waste does not discharge directly into the project streams?*

Response: It has been clarified in Section 6.10 that the existing ditches are vegetated. Where sufficient gradient exists, ditches have been graded out once they enter the easement in order to spread flow across the buffer. Examples of this exist on the left bank of UT2 and the right bank of UT3. The addition of wetland crediting to the project allowed for several ditches to be removed completely by allowing for the purchase of additional buffer that could become wetter without adversely affecting agricultural operations (as an example, along the right floodplain of UT1 above UT1A).

Where ditches extend beyond the conservation easement into adjacent fields and do not have sufficient gradient to be graded out within the easement, no viable solution was identified to remove ditches without excessively wetting fields. Ditch management is rare and ditches are allowed to remain vegetated and act as wet vegetated swales in providing some filtration and

treatment of field runoff.

- *Existing ditches are shown on Figure 2 and Wildlands acknowledges allowing existing ditches to remain and tie directly to site streams in Section 6.10. Recommend showing the locations of these ditches on the grading plans and Figure 9. Please include detail or discussion regarding how these ditches will be tied into streams and the conservation easement boundary.*

Response: Wildlands has updated Figure 9 to show ditches to remain and ditches to be removed. Additionally, this layer has been added to the Figure 8, the Concept Design Map. Of the ditches to remain, two approaches for stream tie-ins are described in Section 6.10.

- ***Section 7.0 Performance Standards:*** *Please utilize the most recent 10/1/2020 Monitoring Report and Monitoring Report Table templates for the project monitoring efforts on the site and update the mitigation plan accordingly.*

Response: The tables that were applicable at the RFP issuance have been used in the report. At DMS' request, the crediting table, Table 43, has been updated to the 2020 format. During monitoring, Wildlands will prepare tables in the 2020 format.

- ***Section 7.0 Performance Standards Wetland Specific Performance Standards:*** *Please clarify how bud burst and soil temperature will be used if the growing season has been established based on the Soil Survey to be 192 days. Please note that the IRT has indicated that if mitigation providers intend to utilize bud burst and soil temperature data to extend the start of the growing season then they must also utilize this data to amend the end date of the growing season. In all cases, the start of the growing season should not be before March 1. The IRT has also indicated that they do not want growing seasons to vary in each monitoring year. Please review and update the performance standards accordingly.*

Response: Wildlands clarified the language in section 6.7.1 regarding wetland performance criteria. The growing season will be set during the first monitoring year using soil temperature probes and bud burst observations. The growing season will remain the same throughout all 7 years of monitoring once established.

- ***Section 7.0 Performance Standards Vegetation Performance Standards:*** *The performance standards reference success criteria for a riparian planting zone and a wetland planting zone and reference Figure 10. Figure 10 references an open planting zone; shaded planting zone; and wetland planting zone. Are the success criteria proposed for the riparian zones applicable to both the open planting zone and shaded planting zone? Additionally, footnote 4 for Table 40 does not correspond with the planting zones shown in Figure 10. Please review and update as necessary so the performance criteria, figures and plan set are consistent.*

Response: No. Wildlands will monitor vegetation within vegetation plots in the Open Planting Zone and Wetland Planting Zone only. The Shaded Planting Zone will only receive visual monitoring because mature forest canopy cover already exists. Text has been added to the Mitigation Plan in Section 6.9 to improve consistency and clarity for planting zone names referred to on figures and as shown on the plans. The footnotes for Table 40 and 41 have been updated with more consistent language to clarify that the Shaded Planting Zone will receive visual monitoring only.

- ***Section 7.0 Performance Standards Photo Documentation:*** *Per recent IRT comments and requests, photo points should be included at the upstream and downstream location of all project crossings. Table 40 indicates that internal crossing photos will be provided. Please confirm and update the text to note that upstream and downstream photos will be taken at all project crossings to demonstrate crossing stability and organism passage.*

Response: This update has been added to Table 40, and photo points on Figure 9 have been either added or modified accordingly.

- ***Table 40_ Summary of Performance Standards:*** *The footnote statement "The tributaries are designed to incise as they approach the main streams, so this would not be considered a trend towards instability. Riffles may fine over the course of monitoring due to the stabilization of contributing watershed sediment sources". Discussion of sediment sources notes fine sediment is primarily introduced through bank erosion, so why is this a risk after construction and during the entire monitoring period? Does this refer to the design as proposed or is this in reference to anticipated further incision through time. Please explain and update as necessary.*

Response: The footnote statement regarding tributary confluences has been revised to more accurately reflect the intent: "The tributaries are designed to gradually drop to the base level of the main streams at their confluence, so bankfull dimensions exceeding targets would not be considered a trend towards instability in this landscape position where it can be demonstrated that the streambed profile is steeper than the bankfull or prevailing floodplain grade of the main stream."

The riffle-fining note has been removed.

- ***Section 8.0 Monitoring Plan:*** *Recommend adding a permanent vegetation plot in the wetland area on UT1.*

Response: A vegetation plot has been added.

- ***Section 8.0 Monitoring Plan:*** *Additional groundwater gauges may be necessary to monitor wetland areas that are non-represented by proposed gauge locations. Please review and update the plan accordingly.*

Response: Wildlands has reviewed the proposed gauge locations and added a proposed wetland gauge to the re-establishment wetland area on UT2 Reach 2.

- ***Section 8.0 Monitoring Plan_****Wetland Hydrology Monitoring: Per recent IRT discussions, DMS recommends including soil profiles annually (or at a minimum of monitoring years 4 and 7) at the groundwater gauge locations.*

Response: Wildlands suggests that this be conducted only as a remedial measure if wetland hydrology is not being met after year 3 or 4 and further assessment of hydrology and hydric soil development is warranted. Wildlands collects soil profiles during as-built instrumentation and can provide at that time.

- ***Section 8.0 Monitoring Plan:*** *Table 41 does not include the required annual project boundary inspection. Please update accordingly.*

Response: A "Y" has been added to the gray box as was done for visual assessments.

- ***Section 11.0 Determination of Credits & Section 6.7 Wetland Design:*** *Wetland Enhancement is typically credited at a 2:1 mitigation ratio. Please explain why a 2.5:1 ratio was chosen.*

Response: The wetland enhancement area in question has canopy but it was proposed for understory planting.

- ***Table 43: Project Asset Table:*** *Please review and revise the asset table to ensure correct lengths are listed for all reaches and measurements end at the top of bank of the receiving stream. For example: Reach UT2A is shown as 421.404 on the table; however, this includes the section that is not for credit and is measured to the center of Jones Creek. Please update the plan as necessary.*

Response: All the credited asset lengths have been rechecked and are now accurate. All asset linework is measured from beginning of reach to top of bank of the confluence. Lengths at confluences shown on figures that measure from the top of bank to center of the receiving channel are not included in credited length of the reach. UT2A was updated with a revised length (and credit value) of 346.353'.

- ***Table 43: Project Asset Table:*** *Please utilize the October 2020 Project Mitigation Quantities and Credits DMS table template in the revised draft report. This table was approved by DMS and the IRT and must be used as designed.*

Response: The referenced table template has been used to update Table 43.

- ***Figure 9 Monitoring Components Map & Project Plan Set:*** *Please confirm that the wetland rehabilitation and wetland enhancement mitigation credit areas proposed correspond with the USACE approved PJD and associated PJD maps.*

Response: The wetland credit areas have been checked against the PJD maps for consistency and found to be in agreement with all existing jurisdictional features.

- ***Appendix 1 – Historic Aerial Photos:*** *Please show the project boundary/ conservation easement outline on the historic aerial photos.*

Response: Wildlands believes that georeferencing, or 'rubber-sheeting', historical aerial images to enable the overlay of the proposed conservation easement boundary would be too time consuming and provide little benefit. The majority of these aerial images are low resolution and not orthorectified which compromises accuracy when georeferencing to features tied to a local survey grid such as the easement boundary.

- ***Appendix 6 - NCIRT Communications:*** *DMS recommends including the follow up email correspondence from the IRT regarding the Post Contract IRT Site Visit meeting minutes in the Appendix. The agency follow-up emails are attached for inclusion.*

Response: The follow up emails have been added to the Appendix.

- ***General/ Appendix 8 – Site Protection Instrument:*** *Please review and update the mitigation plan, figures and plan set to include changes and comments from the DMS, SPO, and DEQ Stewardship Task II review of the property plat and conservation easements.*

Response: The submittal has been reviewed and the following updates have been made:
- The planset and figures now include a fencing plan sheet
- The plans indicate reference to the plat which is being updated to allow for a small segment of the pipe at the top of UT1 to remain within the easement
- The plat denotes that all other structures and fence will be removed from the conservation easement.

- ***Appendix 11_Preliminary Plan Set_ Sheet 3.2:*** *Wetland grading cross section 1 and 2 appear to have areas of cut much greater than 12". Can WEI quantity the among of area with wetland grading that exceeds 12"? These areas may be considered Wetland Creation and receive a reduced mitigation credit ratio of 3:1 as a result.*

Response: With the exception of spoil pile berms, the average grading through Wetland A is 15" to accommodate stream and valley grading. Based on this comment, Wildlands has made changes including minor adjustments to reduce grading and also adjustments to crediting. All crediting along UT1 is proposed as creation or enhancement.

- ***Appendix 12 - Credit Release Schedule and Supporting Information:*** *Please provide both the stream and wetland credit release schedules for DMS projects as specified in the North Carolina Interagency Review Team – October 24, 2016 Stream and Wetland Compensatory Mitigation Update. Please update the appendix and appendix text accordingly.*

Response: The stream and wetland credit release schedules have been added to Appendix 12.

Digital Deliverable Submittal Comments:

- ***Tables:*** *Please use the October 2020 Project Mitigation Plan Template Tables for Project Assets; Project Attribute Table; Morphological Table Essential Parameter; etc. These tables should also be used in the revised report as necessary. DMS is developing an application to enable automated data visualization which will require strict adherence to the templates in the near future.*

Response: The digital submittal is based on the formatting of tables required at the time of issuance of the RFP. Wildlands has updated Table 43 at the request of DMS.

- ***Figures:*** *Please add the grey lines on all maps to the map legend. These appear to be property boundaries.*

Response: The grey lines are represented in the legend as 'Project Location' and are the project parcels/boundaries.

- ***Spatial Data:*** *The jurisdictional wetlands layer is missing from the data submission. Please*

update and include this layer in the revised submittal.

Response: This layer has been included in the revised submittal.

MEETING MINUTES

MEETING:	Post Contract IRT Site Visit **CORNBREAD VALLEY Mitigation Site** Little Tennessee River Basin 06010202: Macon County, NC DMS# 100175 NCDEQ Contract No. 0304-01 Wildlands Project No. 005-02191
DATE:	*On-site Meeting:* Tuesday, January 26, 2021, 2:30 pm *Meeting Notes Distributed:* Tuesday, February 2, 2021
LOCATION:	124 Byrd Farm Rd Franklin, NC 28734 Lat: 35.105460 Long: -83.453633

Attendees

Todd Tugwell, US Army Corps of Engineers (ACE)
Erin Davis, NC Division of Water Resources (NCDWR)
David Brown, US Army Corps of Engineers (ACE)
Andrea Leslie, NC Wildlife Resources Commission (WRC)
Paul Wiesner, NC Division of Mitigation Services (DMS) Project Manager
Shawn Wilkerson, Wildlands Engineering, Principal
Jake McLean, Wildlands Engineering, Project Manager

Materials

- Wildlands Engineering Technical Proposal dated March 26, 2020 in response to NCDMS RFP #16-20190304
- Wildlands Engineering Figure 6a Concept Map – Revised Option 1 (revised project approach map)

Meeting Notes

1. Wildlands gave a brief site overview before the walk which discussed the streams that are being addressed within the project and the site/farm conditions:
    - The site streams have cattle access throughout, mature vegetation is absent in many of the buffer areas, most streams are small (20-50 acres), some smaller, mainstem 4.5-5 square miles.
    - Wildlands has worked hard to minimize crossings by proposing powerline relocation and by working with owners to reduce the number needed for rotational grazing.
    - Wildlands discussed minor modifications based on visits and observations subsequent to the original proposal time period. In general, these modifications lump reaches rather than splitting them. Enhancement 1 (E1) has been eliminated and E1 reaches were changed to either Restoration or E2. Wildlands responded to a question from NCDWR

about associate modification to proposed activities – Wildlands confirmed that no modification in approach was associated with E1 streams being modified to E2 for crediting purposes (the same activities are proposed per reach as defined in the proposal).

- For UT3C, the proposed restoration approach will take the stream offline whereas before it was proposed to be in-channel E2. UT3 Reach 2 below the confluence with UT3A has been affected by recent storms and is thought to be more suitable as a restoration candidate than an E1 candidate as originally proposed.
- DMS/Wildlands noted that crediting is Restoration (1:1), E2 (2.5:1) for all streams and that along with this some E2 streams have less work in one area and more work in another. NCDWR noted that the mitigation plan will be used to determine credit and that in concept that don't take issue with 2.5:1 being proposed for a mix of lower and higher level work, but that the presentation of supporting data is key to acceptance of the final ratios proposed.
- Wildlands pointed out that the uppermost portion of UT3A is an area that has been typically wet during several visits and which may be a candidate for intermittent stream restoration. Wildlands solicited input from the IRT (discussed below).

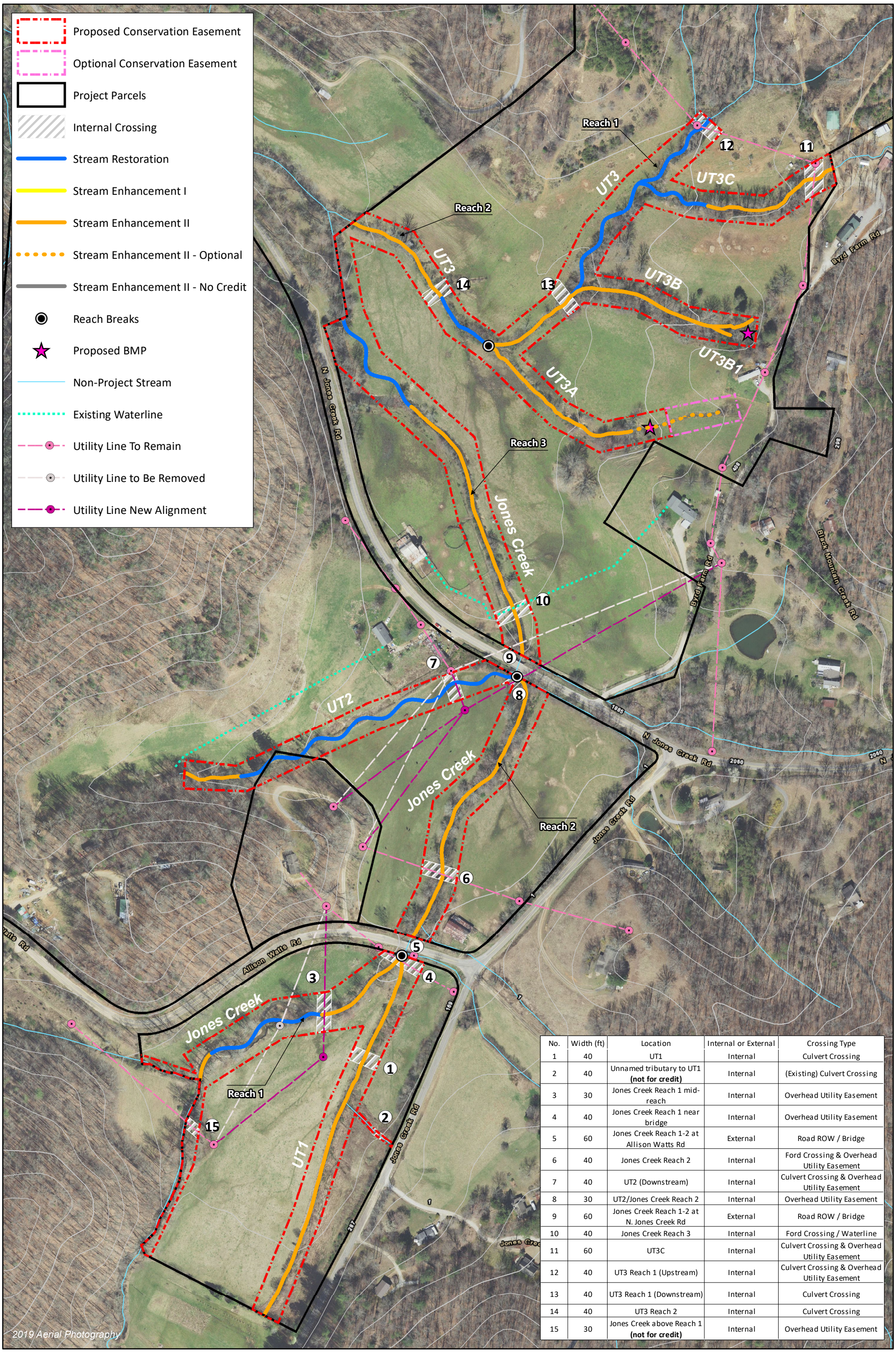
2. The walk began at the upstream extent of UT3A (optional portion). The IRT thought the reach could be credited as an intermittent restoration reach if it scored out using forms. Corps requested that some biological monitoring be considered. At meeting wrap-up, Corps indicated that this may entail monitoring for macroinvertebrates with no specific standards or thresholds being required except to report findings to document if the restored stream was supporting macroinvertebrates. It was clarified that livestock would be allowed above UT3A to access adjacent pastures. The restoration approach anticipated would be to create a single thread channel that would be maintained through establishment of canopy and to ensure that the channel stays stable long-term. A head cut was noted as was the steep drop down to the perennial stream start point.
3. UT3A was walked to the confluence of UT3. NCDWR noted that they don't want to miss opportunities for habitat uplift potential and Wildlands indicated that apart from bank grading in the upper area that has erosion, that spot treatment in overly-wide areas would establish a more competent baseflow channel and periodically install structure to help narrow the channel and induce pool formation. However, Wildlands noted that canopy establishment is the primary methods being proposed to increase bedform (by eliminating excessive herbaceous growth).
4. UT3 was walked upstream to UT3B. Wildlands indicated that minimal work would occur in the lower half of the reach and in the upper half bank grading and benching, where appropriate, would be implemented, working with the existing bedform with the possibility of a structure or two to help narrow overly-wide channel areas.
5. UT3B was walked up to its origin. The lower part of UT3B will receive some bank treatment or minor relocation off the valley wall. The upper part will receive minimal treatment except invasives treatment, removal of the existing spring box, and efforts to create a buffer from the cattle trail at the top of the slope above the origin points of UT3B and UT3B1.
6. UT3C was walked from upstream to downstream. Jake told Erin that UT3C would be credited above the crossing and that this would entail stabilizing an existing knick point to protect the upstream (offsite) crossing. Erin asked if the upstream crossing was undersized and Jake responded that it probably is but is off the project site/parcel. At the bottom of UT3C Wildlands

indicated that it would be taken offline onto the right pasture since it is against the steep left valley wall.

7. The group crossed the existing culvert across UT3 and observed the start of the project on UT3. Wildlands indicated that fencing would be brought from an existing fence on the right side of the UT3 tributary to tie into the right side of the UT3 easement. Wildlands indicated that upstream areas are relatively stable, wooded, and continue for a long ways and that the owner was not amenable to including areas in the project, nor was the project need sufficient to facilitate an easement of this size.
8. UT3 Reach 1 was walked going downstream with Wildlands noting the stream would be relocated off the left hillside to the fall line of the valley.
9. UT3 Reach 2 was walked going downstream from UT3A.
10. Jones Creek was walked going upstream from the lower project limits. NCWRC noted the trout moratorium would likely need to be observed in full as Jones Creek supports both brown and rainbow trout. The exact start point of restoration was discussed as being closer to where it is shown on the map than to the first left meander below the straight-away. NCWRC asked about the concentrated animal area. At the close of the meeting it was agreed that Wildlands would seek ways to treat runoff from the area if possible, but noted the options may be limited to treating what can be captured via existing drainage patterns in the lower portion of the field. Swales or berms were brought up as things to be explored if they made sense.
11. The IRT asked about the location of the crossing and Wildlands indicated the owner was not amenable to adjusting the location closer to the NCDOT ROW along Jones Creek Road. Wildlands pointed out the proposed powerline relocation to eliminate the powerline easement currently in place.
12. The group crossed into the middle field and walked up UT2 above the failing dam outlet to the S-curve in the driveway. Wildlands indicated that UT2 would be restored. Jake indicated that water feeds residence and spring box must remain (noted that it is currently outside of easement).
13. Jones Creek was walked in the middle field from Allison Watts Rd downstream about halfway to discuss the type of work to be performed. Wildlands indicated that spot bank treatment would be pursued in some areas with obvious impending failures. Wildlands noted that there is a large drop in the middle of the reach and a few bank erosion areas that will be proposed for treatment, supported with a couple of in-stream structures. NCWRC noted that undercut bank habitat that is stable is something they would like to see retained and Wildlands agreed.
14. Jones Creek was walked upstream from Allison Watts Road to the top of the restoration reach.
15. UT1 was walked from upstream to downstream. The IRT noted the lack of bedform and incision. Wildlands indicated that in alder thickets the bedform is more pronounced. Wildlands indicated that restoration was considered but that Wildlands didn't want to have the approach appear overly aggressive since the stream is fairly stable and the areas with alders have existing habitat value. The IRT indicated that they would support restoration on this reach and that it would be consistent with how they've viewed other sites. DMS said they will revisit with Wildlands in the near future. It was left off that Wildlands may pursue either approach but that there is a desire to ensure that as a more mature canopy establishes that the creek remains stable, and that maximum uplift potential is pursued where possible.
16. Visit takeaway notes from the group were discussed as follows:
    - Todd (USACE): UT3A upper portion may require flow monitoring, other UT's no concern. Noted that Wildlands has done a lot of lumping/mashing over splitting and is OK with it provided there is follow-through on areas with higher level of activities within reaches –

he suggested a site design graphic to show bank treatment areas, structures, etc. (or plans may suffice). Specified that biological monitoring on upper UT3A may entail macro sweeps with no required standard – mainly just to evaluate whether it can support macros and understand what the biological benefits are of restoring this type of system.

- Erin (NCDWR): Noted that typically stable wooded areas with minimal activities may not qualify for 2.5:1 ratio, but that paired with other activities in the same reach that the approach proposed is reasonable - subject to minor adjustment to ratio based on final proposed activities and documentation of uplift. Liked the uncredited areas we included to protect stream values.
- Shawn indicated Wildlands would take IRT concern about # of crossings to landowner and see if any crossings could be eliminated. Crossing 13 was noted by IRT as seemingly redundant. *(As a follow-up to meeting minutes: subsequent to the meeting, Wildlands has brought this concern to landowners and they are considering letting Wildlands do away with crossings 13 or 14 but want some time before fully committing).*
- Andrea (NCWRC): Preserve habitat in E2 reaches of Jones Creek. Noted the IRT's increasing focus on vegetation and importance of reference sites for vegetation (valley different from headwaters). Noted her concern about the concentrated livestock use at the barn on left floodplain of Jones Creek Reach 3 (see earlier notes about discussion of this). She commented that the project can have a great impact based on its landscape position, and it contributing to improvements in Cartoogechaye Creek downstream. Noted to Jake that yellow buckeye, ironwood, spicebush all good candidate species. Sycamore fine but not so heavy on it. Red maple a volunteer only.
- All agencies recognized and supportive of the wetland potential of the site and that these would be a nice compliment and provide further water quality benefits by increasing the buffer. DMS said they would revisit potential to amend the contract for wetland and stream credit in the near future.



No.	Width (ft)	Location	Internal or External	Crossing Type
1	40	UT1	Internal	Culvert Crossing
2	40	Unnamed tributary to UT1 **(not for credit)**	Internal	(Existing) Culvert Crossing
3	30	Jones Creek Reach 1 mid-reach	Internal	Overhead Utility Easement
4	40	Jones Creek Reach 1 near bridge	Internal	Overhead Utility Easement
5	60	Jones Creek Reach 1-2 at Allison Watts Rd	External	Road ROW / Bridge
6	40	Jones Creek Reach 2	Internal	Ford Crossing & Overhead Utility Easement
7	40	UT2 (Downstream)	Internal	Culvert Crossing & Overhead Utility Easement
8	30	UT2/Jones Creek Reach 2	Internal	Overhead Utility Easement
9	60	Jones Creek Reach 1-2 at N. Jones Creek Rd	External	Road ROW / Bridge
10	40	Jones Creek Reach 3	Internal	Ford Crossing / Waterline
11	60	UT3C	Internal	Culvert Crossing & Overhead Utility Easement
12	40	UT3 Reach 1 (Upstream)	Internal	Culvert Crossing & Overhead Utility Easement
13	40	UT3 Reach 1 (Downstream)	Internal	Culvert Crossing
14	40	UT3 Reach 2	Internal	Culvert Crossing
15	30	Jones Creek above Reach 1 **(not for credit)**	Internal	Overhead Utility Easement

WILDLANDS ENGINEERING

0 300 Feet

Scale Bar 1"

N

Figure 6a Concept Map - Revised Option 1
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202

Macon County, NC

Revised: January 26, 2021

From:	Davis, Erin B
To:	Wiesner, Paul
Subject:	RE: Cornbread Valley - DMS#100175_IRT Post Contract Site Visit Meeting Minutes_Little Tennessee 06010202 - Site Visit Date: Tuesday 1/26/2021
Date:	Thursday, February 4, 2021 8:21:36 AM

Thanks Paul. No additional comments.

Erin B. Davis, PWS
Stream & Wetland Mitigation Coordinator
401 & Buffer Permitting Branch
Division of Water Resources
Department of Environmental Quality
919-817-0360 cell
erin.davis@ncdenr.gov

From: Wiesner, Paul
Sent: Tuesday, February 2, 2021 4:51 PM
To: Davis, Erin B <erin.davis@ncdenr.gov>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Leslie, Andrea J <andrea.leslie@ncwildlife.org>
Cc: Shawn Wilkerson <swilkerson@wildlandseng.com>; Jake McLean <jmclean@wildlandseng.com>; Brown, David W CIV USARMY CESAW (US) <David.W.Brown@usace.army.mil>; Haywood, Casey M CIV (USA) <Casey.M.Haywood@usace.army.mil>; Kim Browning <Kimberly.D.Browning@usace.army.mil>
Subject: Cornbread Valley - DMS#100175_IRT Post Contract Site Visit Meeting Minutes_Little Tennessee 06010202 - Site Visit Date: Tuesday 1/26/2021

All;

The meeting minutes and map from Tuesday's (1-26-2021) site visit at Cornbread Valley are attached for your review.

Please let us know if you have any comments, questions or concerns.

Thanks

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801



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From:	Tugwell, Todd J CIV USARMY CESAW (USA)
To:	Wiesner, Paul; Davis, Erin B; Leslie, Andrea J
Cc:	Shawn Wilkerson; Jake McLean; Brown, David W CIV USARMY CESAW (USA); Haywood, Casey M CIV (USA); Kim Browning
Subject:	[External] RE: Cornbread Valley - DMS#100175_IRT Post Contract Site Visit Meeting Minutes_Little Tennessee 06010202 - Site Visit Date: Tuesday 1/26/2021
Date:	Wednesday, February 3, 2021 10:27:54 AM

CAUTION: External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to Report Spam.<mailto:report.spam@nc.gov>

Thanks Paul. These look good to me.

Todd

-----Original Message-----
From: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Sent: Tuesday, February 02, 2021 4:51 PM
To: Davis, Erin B <erin.davis@ncdenr.gov>; Tugwell, Todd J CIV USARMY CESAW (USA) <Todd.J.Tugwell@usace.army.mil>; Leslie, Andrea J <andrea.leslie@ncwildlife.org>
Cc: Shawn Wilkerson <swilkerson@wildlandseng.com>; Jake McLean <jmclean@wildlandseng.com>; Brown, David W CIV USARMY CESAW (USA) <David.W.Brown@usace.army.mil>; Haywood, Casey M CIV (USA) <Casey.M.Haywood@usace.army.mil>; Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Subject: [Non-DoD Source] Cornbread Valley - DMS#100175_IRT Post Contract Site Visit Meeting Minutes_Little Tennessee 06010202 - Site Visit Date: Tuesday 1/26/2021

All;

The meeting minutes and map from Tuesday's (1-26-2021) site visit at Cornbread Valley are attached for your review.

Please let us know if you have any comments, questions or concerns.

Thanks

Paul Wiesner

Western Regional Supervisor

North Carolina Department of Environmental Quality

Division of Mitigation Services

828-273-1673 Mobile

paul.wiesner@ncdenr.gov <mailto:paul.wiesner@ncdenr.gov>

Western DMS Field Office

5 Ravenscroft Drive

Suite 102

Asheville, N.C. 28801

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North Carolina Public Records Law and may be disclosed to third parties.

From:	Leslie, Andrea J
To:	Wiesner, Paul; Davis, Erin B; Tugwell, Todd J CIV USARMY CESAW (US)
Cc:	Shawn Wilkerson; Jake McLean; Brown, David W CIV USARMY CESAW (US); Haywood, Casey M CIV (USA); Kim Browning
Subject:	RE: Cornbread Valley - DMS#100175_IRT Post Contract Site Visit Meeting Minutes_Little Tennessee 06010202 - Site Visit Date: Tuesday 1/26/2021
Date:	Friday, February 5, 2021 8:42:10 AM
Attachments:	image002.png image003.png image004.png image006.png

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The notes look good to me. Thank you. Nice site – Cartoogechaye Creek is a focus for fish and mussel restoration, and I look forward to seeing this one move forward.

Andrea

Andrea Leslie
Mountain Habitat Conservation Coordinator
NC Wildlife Resources Commission
645 Fish Hatchery Rd., Building B
Marion, NC 28752
828-400-4223 (cell)
www.ncwildlife.org

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From: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Sent: Tuesday, February 2, 2021 4:51 PM
To: Davis, Erin B <erin.davis@ncdenr.gov>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Leslie, Andrea J <andrea.leslie@ncwildlife.org>
Cc: Shawn Wilkerson <swilkerson@wildlandseng.com>; Jake McLean <jmclean@wildlandseng.com>; Brown, David W CIV USARMY CESAW (US) <David.W.Brown@usace.army.mil>; Haywood, Casey M CIV (USA) <Casey.M.Haywood@usace.army.mil>; Kim Browning <Kimberly.D.Browning@usace.army.mil>
Subject: Cornbread Valley - DMS#100175_IRT Post Contract Site Visit Meeting Minutes_Little Tennessee 06010202 - Site Visit Date: Tuesday 1/26/2021

All;

The meeting minutes and map from Tuesday's (1-26-2021) site visit at Cornbread Valley are attached for your review.

Please let us know if you have any comments, questions or concerns.

Thanks

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801



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From: Youngman, Holland J
To: Kirsten Gimbert
Subject: Re: [EXTERNAL] Cornbread Valley: NLEB reinitiating consultation
Date: Tuesday, May 17, 2022 5:04:17 PM

Hi Kirsten - thank you for the letter you provided.

Given the commitments to clearing trees outside of the NLEB active season and an absence of added artificial lighting and night work, we would concur with a determination that the proposed work may affect but is not likely to adversely affect NLEB.

Please let me know if you'd prefer a more official correspondence to that same effect (i.e. via letterhead) and I'll get a letter written up. Otherwise, this email can satisfy the administrative record.

Best,

Holland Youngman
(she/her)
Wildlife Biologist
U.S. Fish and Wildlife Service
Asheville Ecological Services Field Office
160 Zillicoa Street, Asheville, North Carolina, 28801
Cell: 828-575-3920 Office: 828-258-3939 x42235

From: Kirsten Gimbert <kgimbert@wildlandseng.com>
Sent: Friday, May 13, 2022 2:25 PM
To: Youngman, Holland J <holland_youngman@fws.gov>
Subject: [EXTERNAL] Cornbread Valley: NLEB reinitiating consultation

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Hi Holland,

Attached is Wildlands letter of intent as it relates to reinitiating consultation for the NLEB reclassification purposes on Cornbread Valley. Let me know if you have any questions or need additional information included in the letter. Thanks again for your time on all this NLEB coordination!

Best,
Kirsten Gimbert | *Senior Environmental Scientist*
M: 704.941.9093

Wildlands Engineering, Inc.

1430 S. Mint St, Suite 104
Charlotte, NC 28203

WILDLANDS
ENGINEERING

May 13, 2022

Holland Youngman
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801
Submitted via email: holland_youngman@fws.gov

Subject: Cornbread Valley Mitigation Site
Macon County, North Carolina

Dear Ms. Youngman,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to the proposed reclassification of the northern long-eared bat (*Myotis septentrionalis*) (NLEB) from a threatened to an endangered status on the Cornbread Valley Mitigation Site located in Macon County, NC. A NLEB 4(d) streamlined consultation Form was submitted to the US Fish and Wildlife Service (USFWS) by the Federal Highway Administration (FHWA) on February 12, 2021. USFWS responded on March 3, 2021, concurring that any incidental take that may result from associated activities with this project is exempt under the 4(d) rule and no further consultation was required for the NLEB. In anticipation of the proposed reclassification, which if finalized, would remove the current 4(d) rule for the NLEB, Wildlands would like to re-initiate consultation for this project.

Wildlands initiated Section 7 USFWS consultation (USFWS Log#4-2-21-152) for the Indiana bat (*Myotis sodalist*) in November 2021. USFWS concurred with a "may affect, not likely to adversely affect" determination for the Indiana bat based on Wildlands commitment to the following conservation measures.

- Trees will be removed from October 15 – April 1 outside of the bat active season for tree-roosting species.
- No artificial lighting will be added to the action area.
- No night work will occur.

Suitable habitat identified for the NLEB within the project area consists of trees with a dbh greater than 3 inches, with exfoliating bark, crevices, and hollows. The project is located approximately 1.5 miles from a known NLEB 12-digit HUC and 3 miles from a known occurrence (Jones Creek) as reported in the NC Natural Heritage Program (NCNHP) data explorer. No known element occurrences exist within the proposed project area. Wildlands commitment to tree clearing moratoria outside of the Indiana bats active season is also outside of the NLEB active season and considered a conservation measure for the NLEB. The estimated amount of acres of forest conversion is approximately 5.9 acres.

We thank you in advance for your timely response and cooperation. Please feel free to contact me with any questions that you may have concerning this project.

Sincerely,

Kirsten G Gimbert

Kirsten Gimbert, *Senior Environmental Scientist*
kgimbert@wildlandseng.com
704.941.9093

Kirsten Gimbert

From: Youngman, Holland J <holland_youngman@fws.gov>
Sent: Thursday, July 7, 2022 8:55 AM
To: Kirsten Gimbert
Cc: Jake McLean; Wiesner, Paul
Subject: Re: [EXTERNAL] Cornbread Valley Mitigation Site - Botanical Survey Update

Good morning, Kirsten -

Thank you for providing the updated info on botanical surveys at the Cornbread site. I've added it to the project file. As always, your thoroughness is greatly appreciated!

Best,

Holland Youngman
(she/her)
Wildlife Biologist
U.S. Fish and Wildlife Service
Asheville Ecological Services Field Office
160 Zillicoa Street, Asheville, North Carolina, 28801
Cell: 828-575-3920 Office: 828-258-3939 x42235

From: Kirsten Gimbert <kgimbert@wildlandseng.com>
Sent: Tuesday, July 5, 2022 1:16 PM
To: Youngman, Holland J <holland_youngman@fws.gov>
Cc: Jake McLean <jmclean@wildlandseng.com>; Wiesner, Paul <paul.wiesner@ncdenr.gov>
Subject: [EXTERNAL] Cornbread Valley Mitigation Site - Botanical Survey Update

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Hi Holland,

Wildlands recently conducted a botanical pedestrian survey on the Cornbread Valley Mitigation Site (USFWS Log# 4-2-21-152) in order to maintain valid survey results through the start of construction. During the initial site assessments completed on January 26, 2021 and May 27, 2021, suitable habitat was identified for the following federally listed plant species: Small whorled pogonia (*Isotria medeoloides*), Swamp pink (*Helonias bullata*), Virginia spiraea (*Spiraea virginiana*), and the Mountain sweet pitcher-plant (*Sarracenia rubra*). No individual species were identified within the project areas for these species. With the exception of the Small whorled pogonia, these botanical results are valid through May 27, 2023. Given the shorter survey validity window for the Small whorled pogonia (1 year), an additional botanical survey was warranted with construction slated to begin early 2023. Results from the additional field survey conducted on June 28, 2022 confirmed suitable habitat is present for the Small whorled pogonia (*Isotria medeoloides*) with no individual species present within the project area.

Please let me know if you have any questions or concerns on this project update.

Thanks,

Kirsten Gimbert | *Senior Environmental Scientist*
M: 704.941.9093

Wildlands Engineering, Inc.
1430 S. Mint St, Suite 104
Charlotte, NC 28203

Cornbread Valley Mitigation Site

Discussion of Conservation Boundary Design and Internal versus External Easement Breaks

The Cornbread Valley Mitigation Site was initially proposed with internal crossings from its inception. During recent months, concerns have been expressed by the IRT about when and where internal farm and/or utility crossings should be used and where such crossings should be internal versus external. For the considerations of this project, two years of planning and landowner and utility owner negotiation have culminated in a platted conservation easement boundary this is ready for recordation and which reflects, based on our best judgment, the most appropriate approach for this site both based on our site knowledge and the process that has been followed to this point in the project.

This documentation is being provided, along with reference to Figure 8 Concept Design Map, and mitigation plan report Table 25 (copies attached for reference), to support our justification of the use of internal crossings and utility corridors internal to the conservation easement (CE) boundaries on the Cornbread Valley Mitigation Site for the purpose of farm crossings with or without utilities (internal crossings) as well for the purpose of stand-alone utility crossings where no farm crossing is proposed.

Please note that for "utility corridors", language was developed as follows for the conservation easement document which was not included in the prior draft submittal of the mitigation plan:

A. Utility Corridor Areas. Grantor reserves the right to the Utility Corridor Areas as shown on the "Conservation Easement Survey for the State of North Carolina Division of Mitigation Services, Cornbread Valley Site, SPO File No. 56-LA-77, DMS Site ID No. 100175", Property of Rita Byrd, and recorded in the Macon County, North Carolina Register of Deeds at Plat Cards _____ - _____ for the following purposes:

- Utility crossings to include overhead and buried electrical, water lines and sewer lines.

Mitigation credit has not been requested in an of the utility corridor areas.

In general, the use of internal rather than external easement breaks will put in place the legal authority necessary for NCDMS Stewardship staff to maintain the stream corridor free of livestock in perpetuity. Livestock are present in each of the fields abutting project reaches making the internalization, and subsequent protection of the stream corridor in these fields, an important consideration of long-term site integrity. Landowners are willing to abide by easement terms, however, we anticipate that a contiguous easement on the actively farmed areas of the property is the most effective way to ensure that the risk of long-term encroachment on the stream corridor outside of the platted conservation easement is minimized.

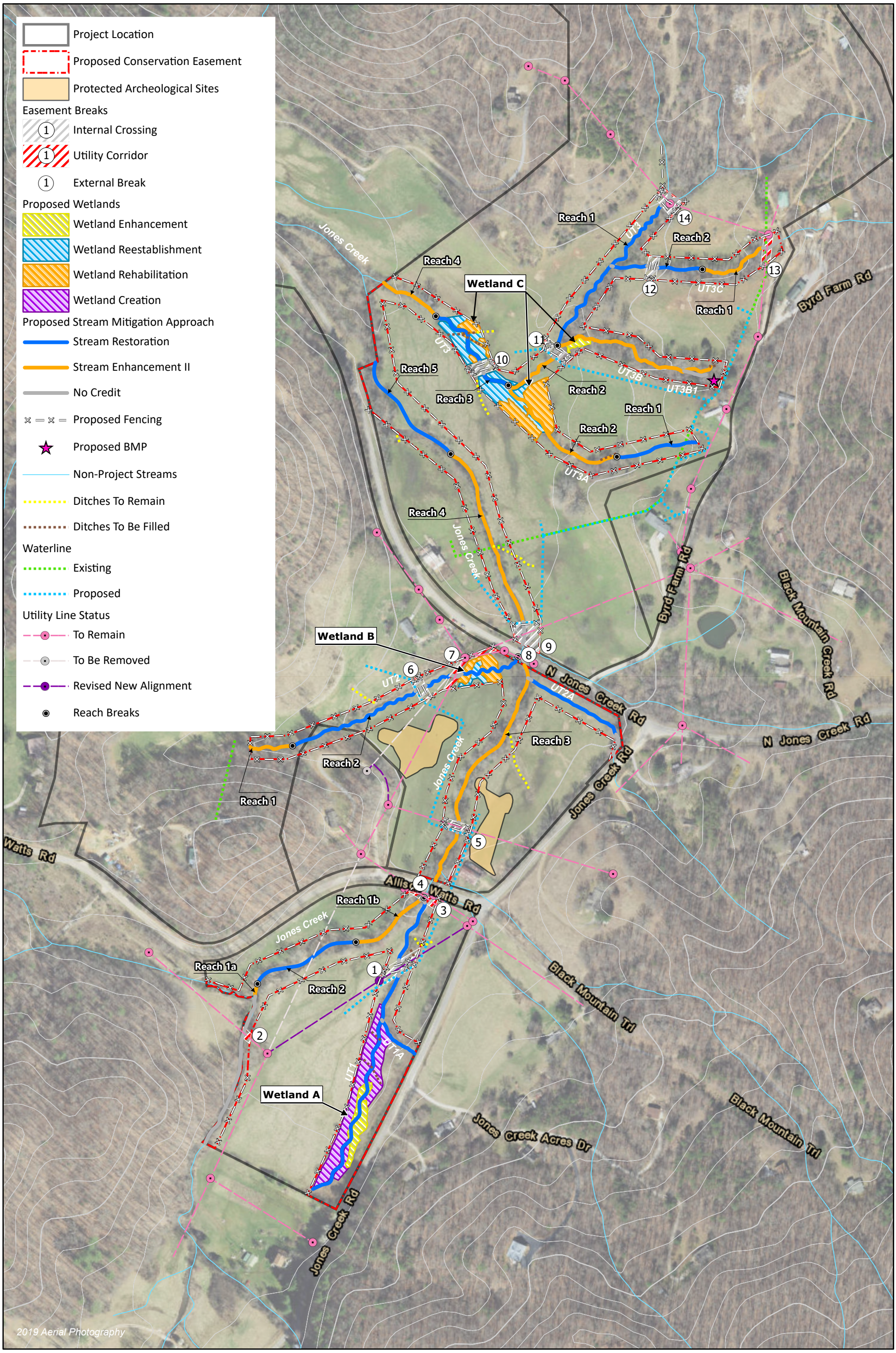
NCDOT roads abutting the project have a 60-foot right of way for 20' roadway width. These are likely to always be two-lane roads with a comparable width, given that the roads only extend 2 miles up-valley before terminating into national forest.

Fourteen (14) crossing exist at the Cornbread Valley Mitigation Site and of the 14, the breakdown is as follows:

- Two (2), No. 4 and No. 8, are external NCDOT roads. NCDOT has been contacted and has no current intent to replace these crossings in the foreseeable future.

- Four (4) are proposed utility corridor crossings (No.'s 2, 3, 7 and 13) subject to the language above:
    - No. 2, is mid-reach on an uncredited reach where one side of the bank has been purchased into easement to exclude livestock from this reach. This field is actively used for livestock grazing and omission of the powerline ROW from the CE would allow cattle to enter the stream upstream of the project. Crossing No. 2 should therefore be left as an internal easement break.
    - No. 3 abuts Jones Creek Reach 1b, and is adjacent to a grazed field above Allison Watts Rd. on the right floodplain. This area requires permanent fencing to keep livestock out of the stream and should therefore be left as an internal easement break.
    - No. 7, is mid-reach on UT2 and abuts an active livestock pasture on the right bank. Omission of the powerline ROW from the CE would allow cattle to enter the stream upstream of the project. Crossing No. 2 should therefore be left as an internal easement break.
    - No. 13, is at the upper end of UT3C with a short uncredited reach extending above the crossing to a driveway easement where the proposed tie in of fencing to existing fencing is to occur. This proposed utility crossing should remain internal as should the uncredited easement above which has been added to the project for the sole purpose of tying into the existing fence and maintaining the integrity of the stream buffer.
- Eight (8) are internal crossings for the purposes of farm crossings, including two fords and six culverted crossings. All allow for the proposed utility crossings, as shown in Figure 8, to be coincident with the internal crossings.
    - All of these crossings are likely to have livestock use. Internalizing these crossings ensures that owners must maintain cattle gates and crossings to comply with the easement terms and thereby protects the stream corridor. Without this requirement, landowners may not be compelled to resolve broken fencing or failing culverts in perpetuity and no recourse would be available to remedy this condition.

Based on the rationale presented, we propose to keep all internal crossings and utility corridors as internal to the CE.



WILDLANDS ENGINEERING

Figure 8 Concept Design Map
Cornbread Valley Mitigation Site
Little Tennessee River Basin 06010202

Macon County, NC

location to enhance the long-term stability of the crossings and minimize impacts to existing resources. All crossings have been designed to be appropriate for aquatic organism passage and sediment transport continuity. On the mainstem Jones Creek, ford crossings were selected to achieve these ends. Tributary crossings will be constructed with culverts.

Each crossing is proposed to be fenced with high tensile wire fence and gated for livestock exclusion. Crossings have been designed in coordination with the restored stream bed profile to allow for aquatic organism passage. The crossings are summarized and numbered below in Table 25 and depicted on Figure 8. More crossing and crossing fencing details are located in the planset (Appendix 11, Sheets 5.1-5.8 and Sheet 7.10).

Livestock currently have access to all streams on the project. After restoration, the landowner may remove livestock from all or a part of the property. Wildlands will provide 5-strand barbed wire fencing along the perimeter of the easement of any sections of the property where livestock will be present. The landowner will be required to install fencing if livestock are returned to the property in the future. More fencing details are located in the planset (Appendix 11, Sheets 4.2.1-4.2.4 and Sheet 7.10).

Several powerlines cross the property and creeks. Upon review with Duke Power, multiple modifications to the original powerline relocation plan were required. Wildlands worked with Duke Power and the owner to reduce Duke's easement from 50-feet to 30-feet where their utility easement crosses the proposed conservation easement. Duke crossings will be seeded with riparian or wetland seed mix and planted with a dense grid of ninebark and elderberry to provide shading of streams and to help discourage weeds. Utility corridors are maintained with helicopter trimming and therefore no ground access is anticipated to be required for utility maintenance.

Two external easement breaks are present at existing roads, and twelve internal easement breaks are proposed to maintain landowner and livestock access to pastures, as well as to accommodate utility easements.

Table 25: Summary of Site Easement Crossings and Breaks

No.	Width (ft)	Location	Internal or External	Crossing Type
1	46	UT1	Internal	Internal Crossing - Culvert
2	30	Jones Creek above Reach 1a (non-credited reach)	Internal	Utility Corridor
3	Varying Width (4' – 34')	Jones Creek Reach 1b near Allison Watts Rd	Internal	Utility Corridor
4	60	Between Jones Creek Reach 1b and Reach 3 at Allison Watts Rd	External	NCDOT Allison Watts Road ROW
5	35	Jones Creek Reach 3 near Allison Watts Rd	Internal	Internal Crossing - Ford
6	40	UT2	Internal	Internal Crossing - Culvert
7	30	UT2 near N Jones Creek Rd	Internal	Utility Corridor
8	60	Between Jones Creek Reach 3 and Reach 4 at N Jones Creek Rd	External	NCDOT North Jones Creek Road ROW
9	Varying Width (61' – 109')	Above Jones Creek Reach 4	Internal	Internal Crossing – Ford

No.	Width (ft)	Location	Internal or External	Crossing Type
10	40	UT3 Reach 3	Internal	Internal Crossing - Culvert
11	40	UT3 Reach 2	Internal	Internal Crossing - Culvert
12	36	UT3C Reach 2	Internal	Internal Crossing - Culvert
13	30	Above UT3C Reach 1	Internal	Utility Corridor
14	Varying Width (41' – 63')	Above UT3 Reach 1	Internal	Internal Crossing - Culvert

The easement boundaries around all streams proposed for mitigation credit provide the required 30-foot minimum riparian buffer for Mountain streams. The easement area will be marked per requirements outlined in RFP 16-20190304.

The entire easement area can be accessed for construction, monitoring, and long-term stewardship via North Jones Creek Road and Allison Watts Road.

4.0 Regulatory Considerations

Table 26, below, is a summary of regulatory considerations for the Site. These considerations are expanded upon in Sections 4.1-4.3.

Table 26: Regulatory Considerations Attribute Table

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	No	PCN[1]
Water of the United States - Section 401	Yes	No	PCN[1]
Endangered Species Act	Yes	Yes	Appendix 5
Historic Preservation Act	Yes	Yes	Appendix 5
Coastal Zone Management Act	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

1. PJD was approved on 8/16/21. PCN to be provided to IRT with Final Mitigation Plan.

4.1 Biological and Cultural Resources

A Categorical Exclusion for the Site was approved on November 24, 2021. This document included investigation into the presence of threatened and endangered species onsite protected under the Endangered Species Act of 1973, any historical resources protected under the National Historic Preservation Act of 1966, and places of religious importance to American Indians, Eskimos, and Native Hawaiinas protected under the American Indian Religious Freedom Act.

Per the Categorical Exclusion research and response by US Fish and Wildlife Service, the project will have no effect on the Appalachian elktoe (*Alasmidonta raveneliana*), gray bat (*Myotis grisescens*), littlewing pearlymussel (*Pegias fabula*), rock gnome lichen (*Gymnoderma lineare*), and spotfin chub (*Erimonax monachus*). The project may affect but is not likely to adversely affect the following species: Indiana bat (*Myotis sodalist*), Bog turtle (*Clemmys muhlenbergii*), mountain sweet pitcher-plant (*Sarracenia rubra*

APPENDIX 7 – Invasive Species Plan

Appendix 7 Invasive Species Plan

A goal of this project is to treat and reduce the exotic species found on site. The presence and extents of invasive species will be monitored, and treatment of invasive species will continue as necessary throughout the life of the project to ensure project stability and success of the riparian and streambank vegetation. Regular site visits will be conducted to assess the condition of the finished project. Existing populations of Japanese honeysuckle (*Lonicera japonica*) and multiflora rose (*Rosa multiflora*) occur throughout most of the existing stream buffers. Smaller populations or single individuals of Chinese privet (*Ligustrum sinense*) and Callery pear (*Pyrus calleryana*) also occur in parts of the existing buffer.

Generally, the treatment plan shall follow the below guidelines in Table 1 for invasive plant species found on the site; however, the treatment may be changed based on the professional judgement of the project engineer and biologist. The planned timeline of invasive plant control will likely involve heavier efforts during construction and in monitoring years 1-3. Additional invasive plant control will likely occur after monitoring year 3 but at a smaller scale. The planned timeline of invasive plant control on the Site may change due to unforeseen circumstances and potential new introductions. Significant invasive species control efforts will be reported in each year's monitoring report.

Table 1. Invasive Species Treatment

Invasive Species	Recommended Removal Technique
Multiflora Rose *(Rosa multiflora)*	Foliar treatment with 2-3% triclopyr solution it the preferred control method. Cut stump treatment is time consuming, though effective and can be completed with a 50% solution of triclopyr or glyphosate. Treat during active growth in the spring or during its fruiting stage in the fall. Mechanical removal is also feasible using heavy equipment.
Japanese Honeysuckle (*Lonicera japonica*)	Small infestations of *L. japonica* can be pulled by hand. Monitor to remove any re-sprouts. Care should be taken to bag and remove the plants, including mature fruits to prevent re-establishment. Large infestations of *L. japonica* will usually require a combination of cut stump and foliar herbicide treatments. Where vines have grown into the tree canopy, cut each stem as close to the ground as possible. Treat the freshly cut surface of the rooted stem with a 25-50% solution of glyphosate or triclopyr. Groundcovers of *L. japonica* can be treated with a foliar solution of 2-3% glyphosate or triclopyr plus a 0.5 percent non-ionic surfactant to thoroughly wet all the leaves. Treatment of climbing vines through foliar application is also possible in late fall/early winter and late winter/early spring when leaves are not present. Mechanical removal is also feasible using heavy equipment.
Chinese Privet (*Ligustrum sinense*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant: a glyphosate herbicide as a 2-3% solution in the late fall or early winter when safety to surrounding vegetation is desired, imazapyr as a 1% solution, or Escort XP (metsulfuron methyl) at 1 ounce per acre (0.2 dry ounces per 3-gallon mix and 10 gallons per acre) during winter for safety to dormant hardwoods. Summer applications of glyphosate may not be as effective as other times and require a higher percent solution. The best time for imazapyr and Escort XP* is summer to fall. For stems too tall for foliar sprays and when safety to surrounding vegetation is desired, apply a basal spray of Garlon 4 (or similar) as a 20% solution in a labeled basal oil product, vegetable oil or mineral oil with a penetrant, or fuel oil or diesel fuel (where permitted); or undiluted Pathfinder II. Elsewhere, apply Stalker as a 6-9% solution in a labeled basal oil product, vegetable oil or mineral oil with a penetrant, or fuel oil or diesel fuel (where permitted) to young bark as a basal spray

Invasive Species	Recommended Removal Technique
	making certain to treat all stems in a clump. Cut stump treatment is an effective treatment using a 25-50% glyphosate solution when the cut is made within 4" of the ground. Hack and squirt using a 25-50% glyphosate solution can also be an effective treatment on larger stems where cut stump and foliar application are not feasible. Also, an EZ-Ject stem injector using either glyphosate or imazapyr shells is an effective treatment method, particularly on larger stems.
Callery pear (*Pyrus calleryana*)	Treatment for Callery pear is typically decided based on the treated individual's size class. For seedlings, foliar application of a 3% triclopyr solution can be effective. Saplings and some larger stems are generally treated using the cut stump method with a 50% triclopyr solution. Larger trees will most frequently be treated using the hack and squirt method with a 50% triclopyr solution, basal bark method using a 20% triclopyr solution mixed with a penetrant such as crop oil, or an EZ-Ject stem injector using shells containing imazapyr. Fall is the most effective time for most Callery pear treatments with foliar application to seedlings also being effective during active growth in the spring.

APPENDIX 8 – Site Protection Instrument

Appendix 8 Site Protection Instrument

The land required for construction, management, and stewardship of this mitigation project includes portions of Rita Byrd and Steven Byrd parcels listed in Table 1. These properties are optioned for purchase of a conservation easement by Wildlands Engineering, Inc. (Wildlands). Wildlands will record a conservation easement on the parcels to encompass the streams and wetlands being restored and enhanced along with their corresponding buffers.

Table 1: Site Protection Instrument – *Cornbread Valley Mitigation Site*

Property Owner	Parcel ID Number	County	Under Option to Purchase by Wildlands?	Memorandum of Option/Temporary Access and Conservation Easement Deed Book (DB) and Page Number (PG)	Acreage to be Protected
Mrs. MW-Bill Byrd (Rita Byrd)	6562-71-5245	Macon	Yes	DB: U-39 PG: 1062	18.18
Steven David Byrd	6562-72-5090	Macon	Yes	DB: U-39 PG: 1064	0.19

The conservation easement template that will be used for recordation is included in this appendix. All site protection instruments require 60-day advance notification to the USACE and or DMS prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

STATE OF NORTH CAROLINA

DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

_____ COUNTY

SPO File Numbers: XX-XX
DMS Project Number: XXXXXX

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 _____ day of _____, 2020, by _____ ("**Grantor**"), whose mailing address is _____ 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 Environmental Quality (formerly 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 **Wildlands Engineering, Inc.** and the North Carolina Department of Environmental Quality, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number ____.

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 (formerly Department of Environment and Natural Resources), 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 properties situated, lying, and being in _____Township, _____ County, North Carolina (the "**Property**"), and being more particularly described as that certain parcels of land containing approximately

____ acres and being conveyed to the Grantor by deed as recorded in **Deed Book _____, Page _____** of the _____ 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 unnamed tributaries to _____.

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 and Right of Access together with an access easement to and from the Conservation Easement Area described below.

The Conservation Easement Area consists of the following:

Total conservation Easement Area containing a total of _____ acres as shown on the plats of survey entitled "Final Plat, Conservation Easement Survey for the North Carolina Division of Mitigation Services, Project Name: _____, SPO File No. _____, DMS Site ID No. _____", Property of _____, dated _____prepared by _____ PLS Number _____and recorded in the _____ County, North Carolina Register of Deeds at Plat Book _____, Page_____.

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. ACCESS EASEMENT

choose one option based on survey and deed, delete other

[SPECIFIC LOCATION OPTION] Grantor hereby grants and conveys unto Grantee, its employees, agents, successors and assigns, a perpetual, non-exclusive easement for ingress and egress over and upon the Property at all reasonable times and at the location more particularly described on Exhibit ___ ("Access Easement") attached hereto and incorporated herein by this reference, to access the Conservation Easement Area for the purposes set forth herein. This grant of easement shall not vest any rights in the public and shall not be construed as a public dedication of the Access Easement. Grantor covenants, represents and warrants that it is the sole owner of and is seized of the Property in fee simple and has the right to grant and convey this Access Easement.

[GENERAL LOCATION OPTION] Grantor hereby grants and conveys unto Grantee, its employees, agents, successors and assigns, a perpetual, non-exclusive easement for ingress and egress over and upon the Property at all reasonable times and at such location as practically necessary to access the Conservation Easement Area for the purposes set forth herein ("Access Easement"). This grant of easement shall not vest any rights in the public and shall not be construed as a public dedication of the Access Easement. Grantor covenants, represents and warrants that it is the sole owner of and is seized of the Property in fee simple and has the right to grant and convey this Access Easement.

III. 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

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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 except within a Crossing Area as shown on the recorded survey plat**.** 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.

P. Crossing Areas. "Grantor reserves the right to the Internal Crossing Areas as shown on the "Conservation Easement Survey for the North Carolina Division of Mitigation Services_____, SPO File No. _____, DMS Site ID No. _____", Property of _____, and recorded in the _____County, North Carolina Register of Deeds at Plat Book _____ Page_____for the following purposes:

- Motorized vehicle crossing;
- Utility crossings to include overhead and buried electrical, water lines and sewer lines;
- Cattle crossing so long as fencing across a culvert in the Crossing Area prevents cattle access to the stream, or a ford crossing is kept gated and cattle are only present in the stream only under supervision while rotating cattle between pastures; and/or
- Installation, maintenance, or replacement of a culvert or ford crossing.

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.

IV. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees, agents, successors and assigns, shall have a perpetual Right of Access over and upon the Conservation Easement Area to undertake or engage in any activities necessary to construct, maintain, manage, enhance, repair, restore, protect, monitor and inspect the stream, wetland and any other riparian resources in the Conservation Easement Area for the purposes set forth herein or any long-term management plan for the Conservation Easement Area developed pursuant to this Conservation Easement.

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.

V. 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.

VI. 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.

VII. 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,

DRAFT

AND Grantor covenants that Grantor is seized of the Property 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.

_____ (SEAL)

NAME

NORTH CAROLINA
COUNTY OF GASTON

I,_____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the _____day of_____, 2020.

_____
Notary Public

My commission expires:

_____

DRAFT

EXHIBIT A

Insert Legal Description

DRAFT

BK: CRP U-39
PG: 1059-1062
RECORDED:
03-16-2020
04:12:52 PM
BY: TODD RABY
REGISTER

2020001772
MACON COUNTY, NC
TODD RABY
REGISTER OF DEEDS

NC FEE $26.00

RECORDING REQUESTED BY
AND WHEN RECORDED MAIL TO:

Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203
Attention: Lee Knight Caffery

SPACE ABOVE THIS LINE FOR RECORDER'S USE

MEMORANDUM OF OPTION

This Memorandum of Option (this **"Memorandum"**) is between **Mrs. WM-Bill Byrd (Rita Byrd)** (**"Seller"**), and **Wildlands Engineering, Inc.,** a North Carolina corporation (**"Buyer"**).

This memorandum will become effective when all parties have signed it. The date of this Memorandum will be the date this Memorandum is signed by the last party to sign it.

Seller does hereby give and grant to Buyer the right and option to purchase a conservation easement on a portion of real property comprised of approximately 131.64 acres located at 1765 North Jones Creek Road in Franklin, Macon County, North Carolina, recorded in that county's Register of Deeds at Book O-10, Page 91 (the "**Property**").

This option expires on **March 26, 2023** and the closing shall occur on or before the date that is 30 days after the option expiration.

The provisions set forth in an Option Agreement between the parties with an effective date of March 13, 2020 are hereby incorporated in this memorandum.

Each party is signing this memorandum on the date stated below that party's signature.

BUYER:

WILDLANDS ENGINEERING, INC., a North Carolina corporation

By: _____
Shawn D. Wilkerson, President

Date: 3-13-20

SELLER:

MRS. WM-BILL BYRD (RITA BYRD)

By: Mrs. WM-Bill Byrd (Rita Byrd)
Mrs. WM-Bill Byrd (Rita Byrd)

Date: 3-13-2020

Mecklenburg County, North Carolina

I certify that Shawn D. Wilkerson personally appeared before me this day, acknowledging to me that he is President of Wildlands Engineering, Inc., a North Carolina corporation and that he, as President, being authorized to do so, executed the foregoing on behalf of Wildlands Engineering, Inc.

Date: 03-13-20

(Official Seal)

IAN MARTIN HAZELHOFF NOTARY PUBLIC MECKLENBURG COUNTY, NC

Official Signature of Notary

IAN MARTIN HAZELHOFF

Notary's printed or typed name

My commission expires: 03/11/2024

Macon County, North Carolina

I certify that the following person personally appeared before me this day, acknowledging to me that he or she signed the foregoing document:

Mrs. WM-Bill Byrd (Rita Byrd).
Name of principal

Date: 03-13-20

(Official Seal)

IAN MARTIN HAZELHOFF NOTARY PUBLIC MECKLENBURG COUNTY, NC

Official Signature of Notary

IAN MARTIN HAZELHOFF
Notary's printed or typed name

My commission expires: 03/11/2024

BK: CRP U-39
PG: 1063-1066
RECORDED:
03-16-2020
04:12:53 PM
BY: TODD RABY
REGISTER

2020001773
MACON COUNTY, NC
TODD RABY
REGISTER OF DEEDS

NC FEE $26.00

RECORDING REQUESTED BY
AND WHEN RECORDED MAIL TO:

Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203
Attention: Lee Knight Caffery

SPACE ABOVE THIS LINE FOR RECORDER'S USE

MEMORANDUM OF OPTION

This Memorandum of Option (this **"Memorandum"**) is between **Steven David Byrd** (**"Seller"**), and **Wildlands Engineering, Inc.,** a North Carolina corporation (**"Buyer"**).

This memorandum will become effective when all parties have signed it. The date of this Memorandum will be the date this Memorandum is signed by the last party to sign it.

Seller does hereby give and grant to Buyer the right and option to purchase a conservation easement on a portion of real property comprised of approximately 3.97 acres located at 69 Allison Watts Road in Franklin, Macon County, North Carolina, recorded in that county's Register of Deeds at Book D-26, Page 1406 (the "**Property**").

This option expires on **March 26, 2023** and the closing shall occur on or before the date that is 30 days after the option expiration.

The provisions set forth in an Option Agreement between the parties with an effective date of March 13, 2020 are hereby incorporated in this memorandum.

Each party is signing this memorandum on the date stated below that party's signature.

BUYER:

WILDLANDS ENGINEERING, INC., a North Carolina corporation

By: _____
Shawn D. Wilkerson, President

Date: 03-13-20

SELLER:

STEVEN DAVID BYRD

By: _____
Steven David Byrd

Date: 3-13-2020

Mecklenburg County, North Carolina

I certify that Shawn D. Wilkerson personally appeared before me this day, acknowledging to me that he is President of Wildlands Engineering, Inc., a North Carolina corporation and that he, as President, being authorized to do so, executed the foregoing on behalf of Wildlands Engineering, Inc.

Date: 03-13-20

(Official Seal)

IAN MARTIN HAZELHOFF NOTARY PUBLIC MECKLENBURG COUNTY, NC

Official Signature of Notary

IAN MARTIN HAZELHOFF

Notary's printed or typed name

My commission expires: 03/11/2024

Macon County, North Carolina

I certify that the following person personally appeared before me this day, acknowledging to me that he or she signed the foregoing document:

Steven David Byrd.
Name of principal

Date: 03-13-20

(Official Seal)

IAN MARTIN HAZELHOFF NOTARY PUBLIC MECKLENBURG COUNTY, NC

Official Signature of Notary

IAN MARTIN HAZELHOFF
Notary's printed or typed name

My commission expires: 03-11-2024

APPENDIX 9 – Maintenance Plan

Appendix 9 Maintenance Plan

The site shall be visited semi-annually and a physical inspection of the site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

Table 1. Maintenance Plan

Component/ Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel – these shall be conducted where success criteria are threatened or at the discretion of the Designer. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head-cutting. Beaver activity will be monitored and beaver dams on project streams will typically be removed, at the discretion of the Designer, during the monitoring period to allow for bank stabilization and stream development outside of this type of influence.
Wetlands	Routine wetland maintenance and repair activities may include supplemental installations of target vegetation within the wetland. Areas where storm water and floodplain flows intercept the wetland may also require maintenance to prevent scour that adversely and persistently threatens wetland habitat or function.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species requiring treatment per the Invasive Species Treatment Plan (Appendix 7) shall be treated in accordance with that plan and with NC Department of Agriculture (NCDA) rules and regulations.
Site boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis.
BMP	Prevent formation of preferred flow paths during preliminary establishment of vegetation. Complete vegetation maintenance as indicated above. Note: No long-term maintenance of BMP is anticipated. The BMP does not store water or sediment but is a passive upland slope enhancement practice.

APPENDIX 10 – Financial Assurance

Appendix 10 Financial Assurances

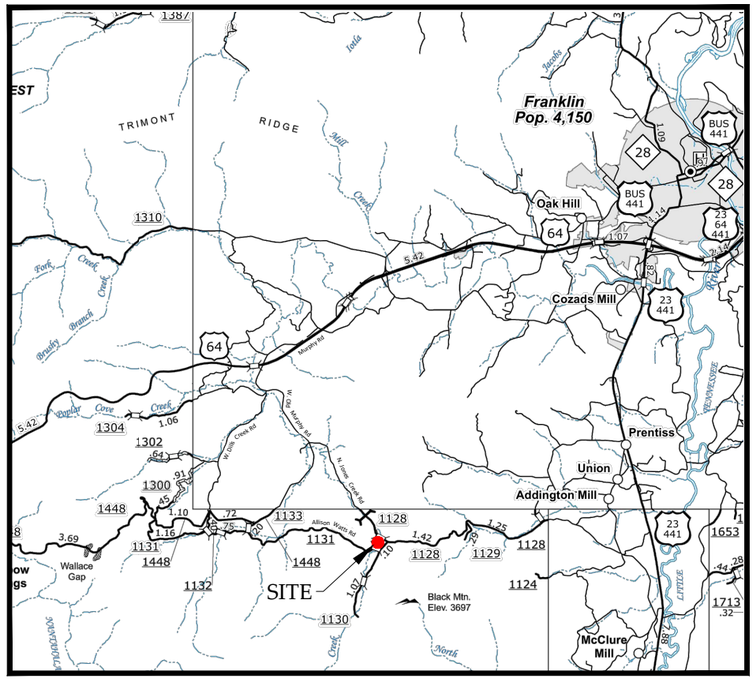
Pursuant to Section IV H and Appendix III of the Division of Mitigation Service's In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the US Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.

APPENDIX 11 – Preliminary Plans

December 22, 2023

Cornbread Valley Mitigation Site

Macon County, North Carolina
for
NCDEQ
Division of Mitigation Services



Vicinity Map
Not to Scale

BEFORE YOU DIG!
CALL 1-800-632-4949
N.C. ONE-CALL CENTER
IT'S THE LAW!

PRELIMINARY PLANS
ISSUED DECEMBER 21, 2022

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Project Directory

Engineering:
Wildlands Engineering, Inc
License No. F-0831
167-B Haywood Rd
Asheville, NC 28806
Jake Mclean, Project Engineer
828-774-5547

Surveying:
Kee Mapping and Surveying, PA
88 Central Avenue
Asheville, NC 28801
Drew V. Duinkerken, PLS
828-575-9021

Owner:
NCDEQ DMS
5 Ravenscroft Drive, Ste 102
Asheville, NC 28801
Attention: Paul Wiesner
828-273-1673

NCDEQ Contract No. 0304-01
DMS ID No. 100175
Little Tennessee River Basin
HUC 06010202
USACE Action ID No.
SAW-2020-02051
NCDWR No. 20201865

WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

DRAFT

Cornbread Valley Mitigation Site
Macon County, North Carolina

Title Sheet

Revisions:

Date: 12.21.2022
Job Number: WI02191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

0.1
Sheet

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Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Revisions:

0.2
Sheet

Cornbread Valley Mitigation Site
Macon County, North Carolina

Project Overview

DRAFT

WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

December 22, 2023

CULTURAL RESOURCE NOTES:
1. WILDLANDS SHALL HOLD A PRE-CONSTRUCTION MEETING TO REVIEW CULTURAL RESOURCE CONSIDERATIONS AND REQUIREMENTS OF THE PROJECT.
2. WILDLANDS SHALL REVIEW AREAS NOTED ON THE PLANS TO BE MARKED PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL NOTIFY WILDLANDS AND WILDLANDS SHALL FIELD-REVIEW MARKED AREAS PRIOR TO ALLOWING COMMENCEMENT OF CONSTRUCTION.
3. ENGINEER AND CONTRACTOR MUST NOT ALTER PROJECT AREA OR NATURE OF ACTIVITIES ON THE SITE WITHOUT EVALUATING THE DESIGNATED AREA OF POTENTIAL EFFECT (APE) STUDIED BY THE PROJECT. IF CHANGES IN SCOPE OR APE ARE PROPOSED, COORDINATION WITH CULTURAL RESOURCE AGENCIES MUST OCCUR TO PERMIT SUCH CHANGES. ALL CHANGES TO LOD SHALL BE REVIEWED BY THE WILDLANDS PROJECT MANAGER, JAKE MCLEAN.
4. CONTRACTOR SHALL HALT WORK IF ITEMS OF CULTURAL SIGNIFICANCE ARE DISCOVERED DURING CONSTRUCTION. THE CHEROKEE NATION AND OTHER CULTURAL RESOURCE AGENCIES SHALL BE CONSULTED PRIOR TO CONTINUANCE OF WORK IN THE AREA.

Erosion Control Features

ESC may be shown in black and white on non-ESC sheets

- LOD LOD LOD — Proposed Limits of Disturbance
- [X] [X] [X] [X] — Proposed Silt Fence
- Straw Wattles
- Proposed Staging/Stockpile Area
- Proposed Haul Road
- Proposed Construction Entrance
- Proposed Temporary Stream Crossing
- SAF SAF SAF — Proposed Temporary Safety Fence See Detail 2, Sheet 7.8

Existing Features

- Existing Property Line
- Existing Thalweg
- Existing Major Contour
- Existing Minor Contour
- TB TB — Existing Top of Bank
- x x — Existing Fence
- OU OU OU — Existing Overhead Utility
- OUE OUE OUE — Existing Overhead Utility Easement
- Existing Power Pole
- R/W — Existing Road Right of Way
- Existing Tree Line
- Existing Wetlands
- Existing Archaeologically Significant Area (No Ground Disturbance Allowed)
- Existing Road
- Existing Soil Road
- Existing Pipe
- Existing Tree

Proposed Features

- CE CE CE CE — Proposed Conservation Easement
- CE-IX CE-IX CE-IX — Proposed Internal Conservation Easement Crossing
- 10+00 — Proposed Thalweg Alignment
- Proposed Bankfull
- 100 — Proposed Major Contour
- Proposed Minor Contour
- x x — Proposed Fence
- Proposed Fence Removal
- Proposed Access Gate
- Proposed Culvert Crossing
- Proposed Tree Removal
- SAF — Proposed Tree Save
- SAF — Proposed Tree Save if Possible - Field Review with Contractor

Proposed Structures

- Proposed Constructed Riffle See Details 1-4, Sheet 7.1 and Detail 1, Sheet 7.2
- Proposed Brushtoe See Details 1-2, Sheet 7.6
- Proposed Channel Narrowing See Detail 1, Sheet 7.3
- Proposed Stream Bench Grading (refer to typicals on Sheets 1.1-1.8 for bench dimensions)
- Proposed BMP Fiber Roll See Detail 2, Sheet 7.7
- Proposed Ford Crossing
- Proposed Rock Toe Protection See Detail 3, Sheet 7.6
- Proposed Log Sill See Detail 3, Sheet 7.4
- Proposed Rock Sill See Detail 4, Sheet 7.2
- Proposed Rock Drop See Detail 3, Sheet 7.2
- Proposed Boulder Cluster See Detail 2, Sheet 7.3
- Proposed Boulder Cluster 1-sided See Detail 2, Sheet 7.3
- Proposed Angled Log Drop See Detail 4, Sheet 7.4
- Proposed Log Vane See Detail 1, Sheet 7.4
- Proposed Cover Log See Detail 2, Sheet 7.4
- Proposed Log J-hook See Detail 3, Sheet 7.5
- Proposed Brush Pack See Detail 1, Sheet 7.5

WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. P-0831

DRAFT

Cornbread Valley Mitigation Site
Macon County, North Carolina

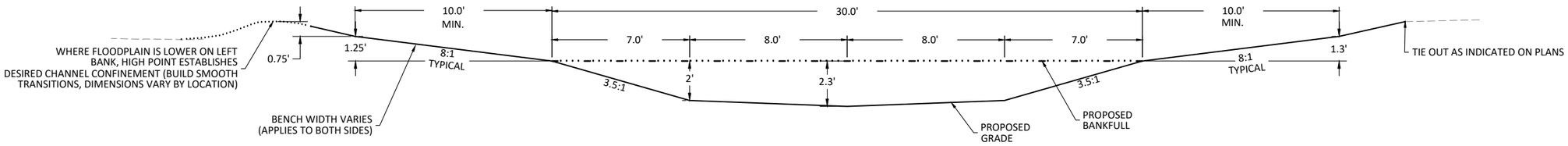
General Notes and Symbols

Revisions:

Date: 12.21.2022
Job Number: WI02191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

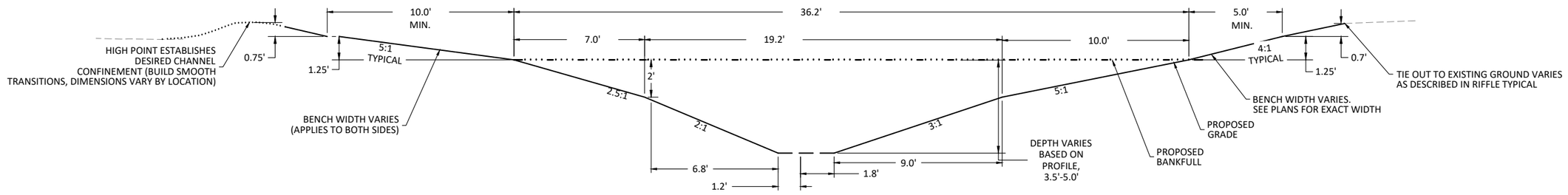
Sheet 0.3

X:\Shared\Projects\WI2191_Cornbread_Valley\Cadd\Plans\WI2191-Title and Notes.dwg



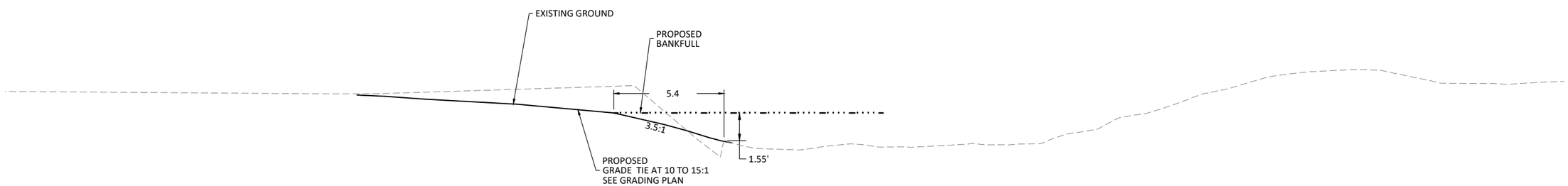
Jones Creek Reach 1A, Reach 2, Reach 3 - Riffle

STA 100+57 to 104+77
Not to Scale



Jones Creek Reach 2 - Meander Pool

STA 101+00 to 104+77
Not to Scale



Jones Creek Reach 3 - Bank Grading

STA 110+64 to 115+30
Not to Scale

WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

DRAFT

Cornbread Valley Mitigation Site
Macon County, North Carolina

Jones Creek Reach 1A, Reach 2, and Reach 3
Typical Sections

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 1.1

December 22, 2023

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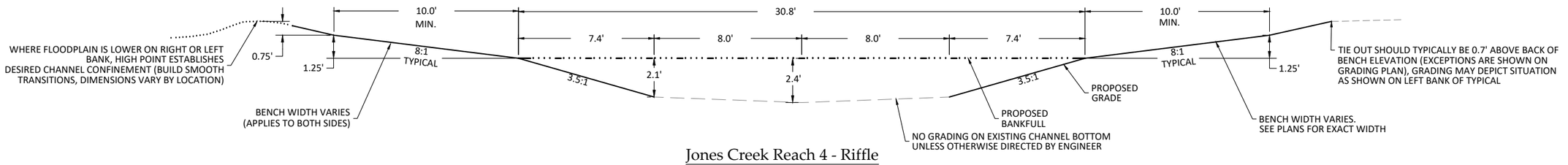
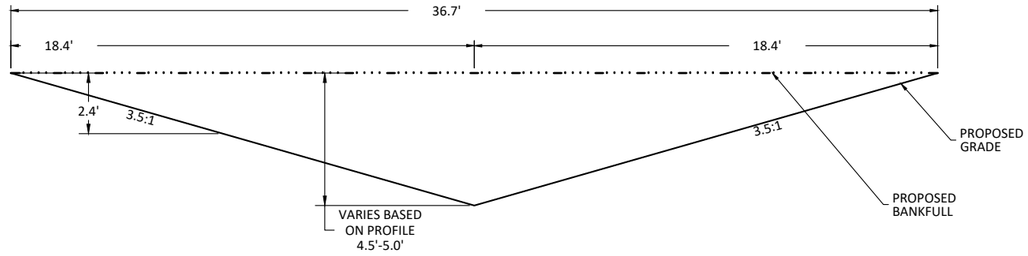
December 22, 2023



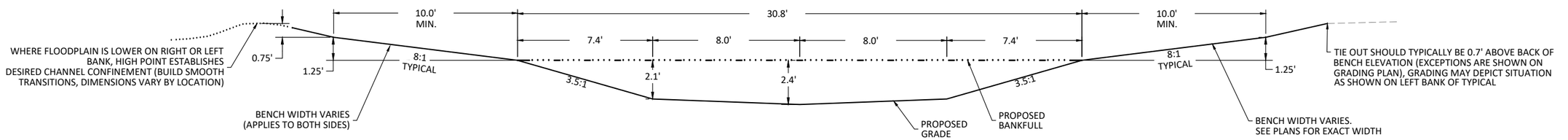
Jones Creek Reach 4 - Riffle

STA 120+86 to 124+40
Not to Scale



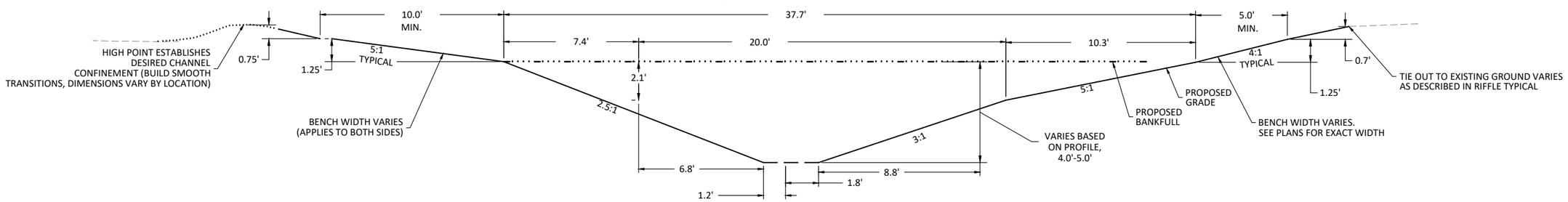
Jones Creek Reach 4 - In-line Pool

STA 120+86 to 124+51
Not to Scale



Jones Creek Reach 5 - Riffle

STA 124+40 to 128+72
Not to Scale



Jones Creek Reach 5 - Meander Pool

STA 124+51 to 128+72
Not to Scale

X:\Shared\Projects\WI2191_Cornbread_Valley\Cadd\Plans\WI2191_Typicals.dwg

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Cornbread Valley Mitigation Site
Macon County, North Carolina

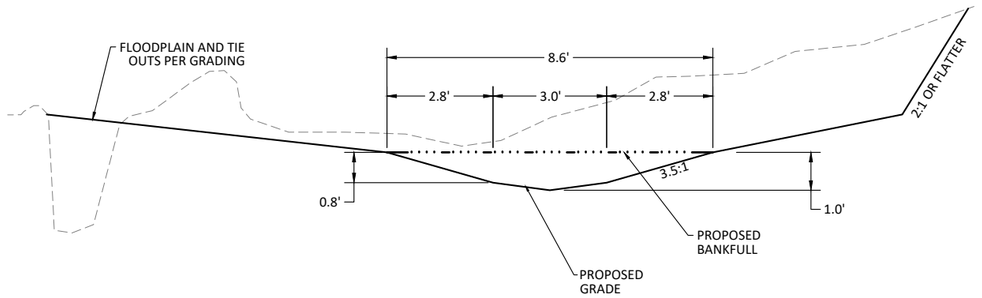
Jones Creek Reach 4 and Reach 5
Typical Sections

Revisions:

Date: 12.21.2022
Job Number: WI2191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

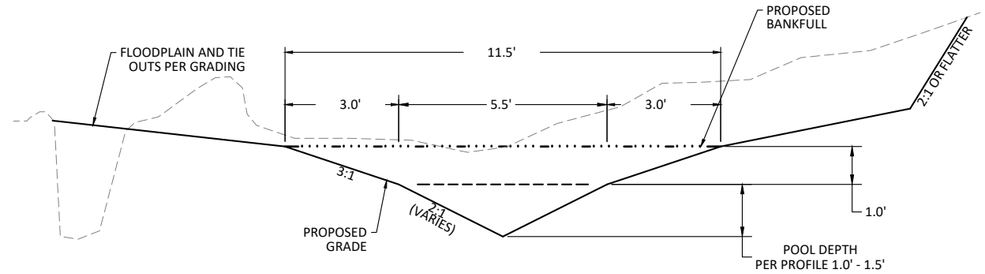
Sheet 1.2

December 22, 2023



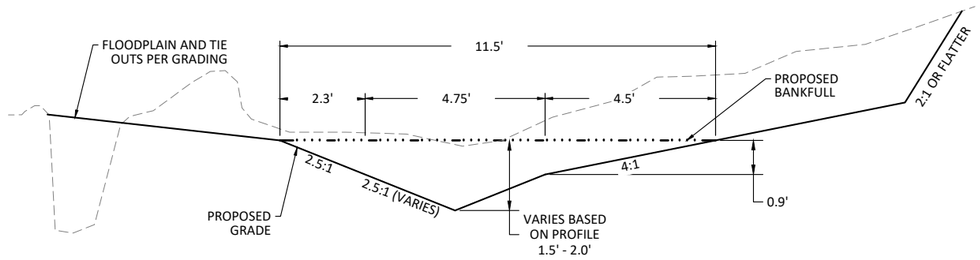
UT1 - Riffle

STA 10+00 to 21+83
Not to Scale



UT1 - Inline Pool

STA 10+00 to 21+83
Not to Scale



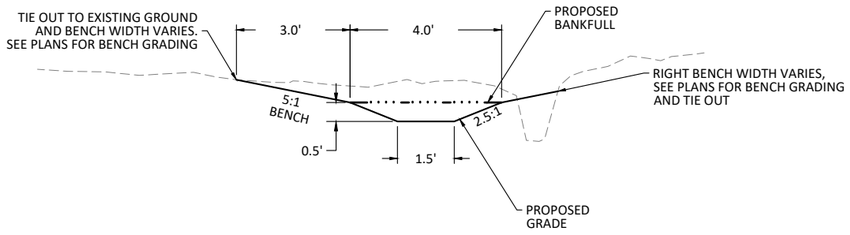
UT1 - Meander Pool

STA 10+00 to 21+83
Not to Scale

NOTES: INLINE POOL TO BE APPLIED IN STRAIGHT REACHES. IN CURVED POOLS, APPLY TYPICAL MEANDERING POOL. INTERPOLATED SECTION MAY BE PRESCRIBED BY DESIGNER IN FIELD.

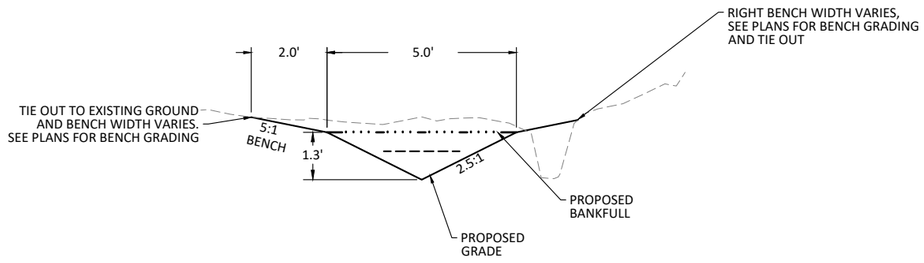
RIFFLES AND INLINE POOLS SHALL BE TYPICALLY CONSTRUCTED SYMMETRIC ABOUT THE CENTERLINE (INVERT). IMPLEMENTATION OF STRUCTURES IN POOLS MAY RESULT IN ASYMMETRY OF POOLS.

SLOPE FROM HINGE POINT TO MAX POOL VARIES BASED ON TARGET DEPTH FROM PROFILE



UT1A - Riffle

STA 20+00 to 21+66
Not to Scale



UT1A - Inline Pool

STA 20+00 to 21+66
Not to Scale

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT1 and UT1A
Typical Sections

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 1.3

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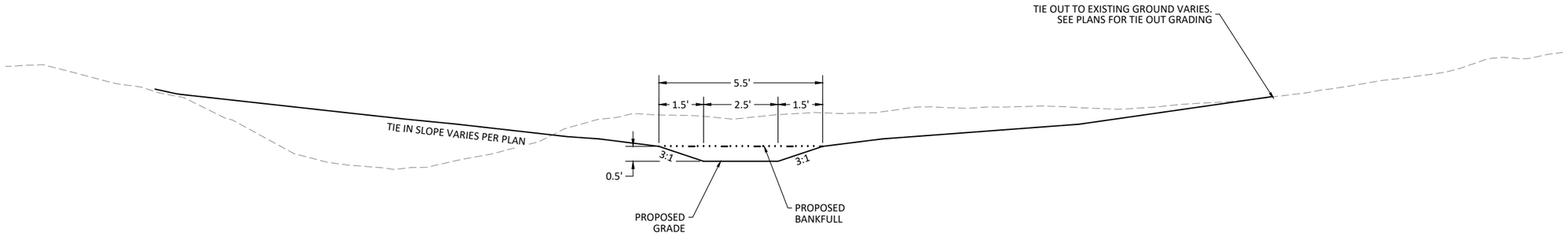
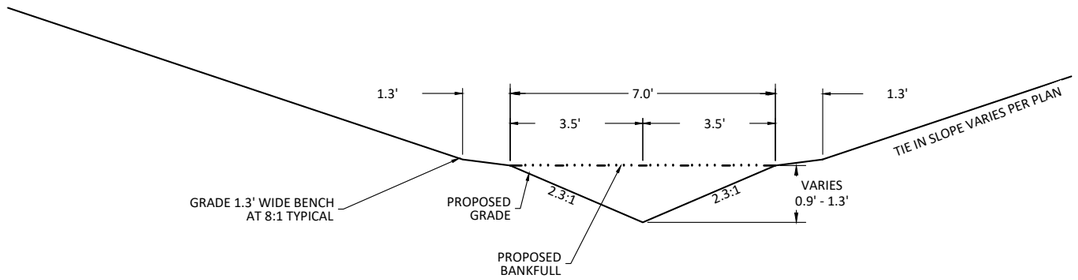


UT2 Reach 2 - Riffle

STA 201+82 to 210+61
Not to Scale



UT2 Reach 2 - Inline Pool

STA 201+82 to 210+61
Not to Scale

NOTES: INLINE POOL TO BE APPLIED IN STRAIGHT REACHES. IN CURVED POOLS, APPLY TYPICAL MEANDERING POOL. INTERPOLATED SECTION MAY BE PRESCRIBED BY DESIGNER IN FIELD.

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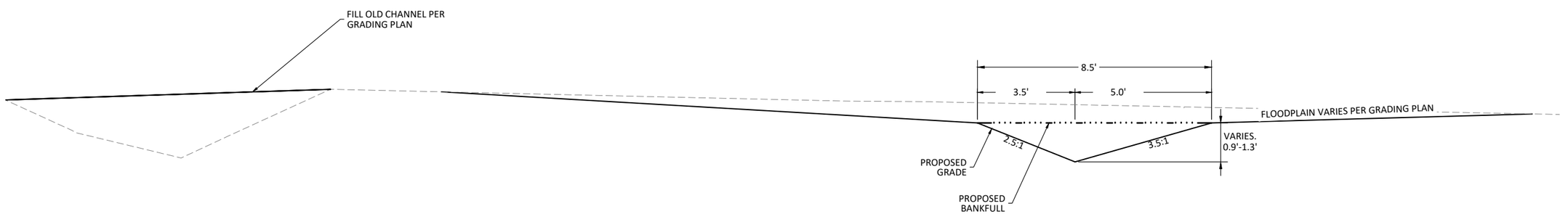

UT2 Reach 2 - Meander Pool

STA 203+45 to 210+61
Not to Scale

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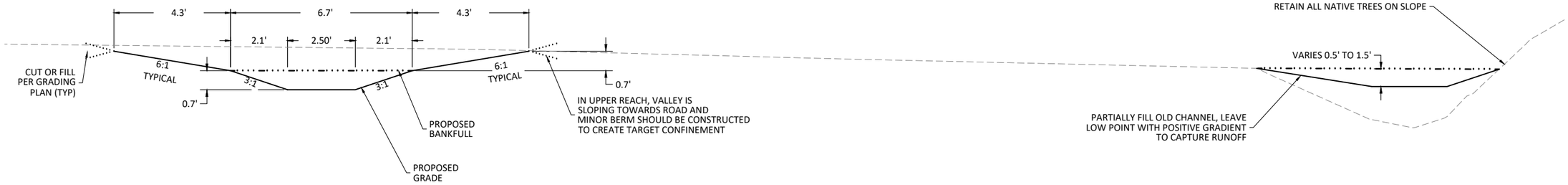
Cornbread Valley Mitigation Site
Macon County, North Carolina

UT2 and UT2A
Typical Sections

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 1.4



UT2A - Riffle

STA 220+61 to 224+96
Not to Scale

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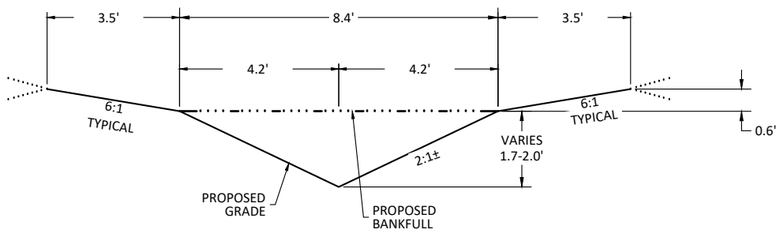

UT2A - Inline Pool

STA 220+61 to 224+96
Not to Scale

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT2A
Typical Sections

Revisions:

Date: 12.21.2022
Job Number: WI2191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

Sheet 1.5

December 22, 2023

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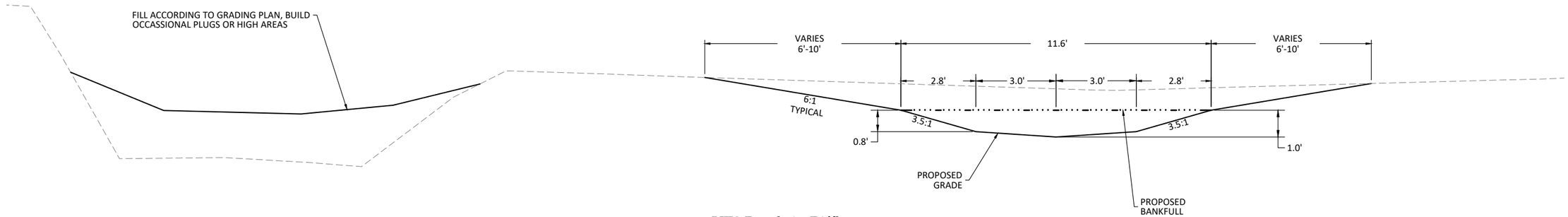
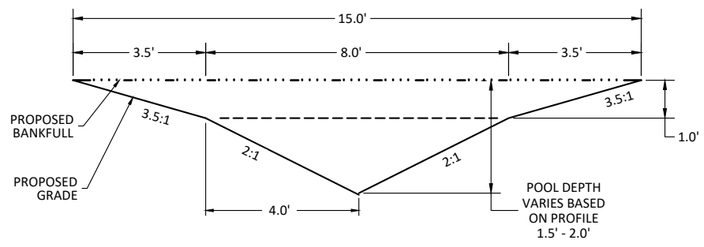


UT3 Reach 1 - Riffle

STA 1+33 to 7+72
Not to Scale



UT3 Reach 1 - In-line Pool

STA 1+33 to 7+72
Not to Scale

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SLOPE FROM HINGE POINT TO MAX POOL VARIES BASED ON TARGET DEPTH FROM PROFILE

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3 Reach 1
Typical Sections

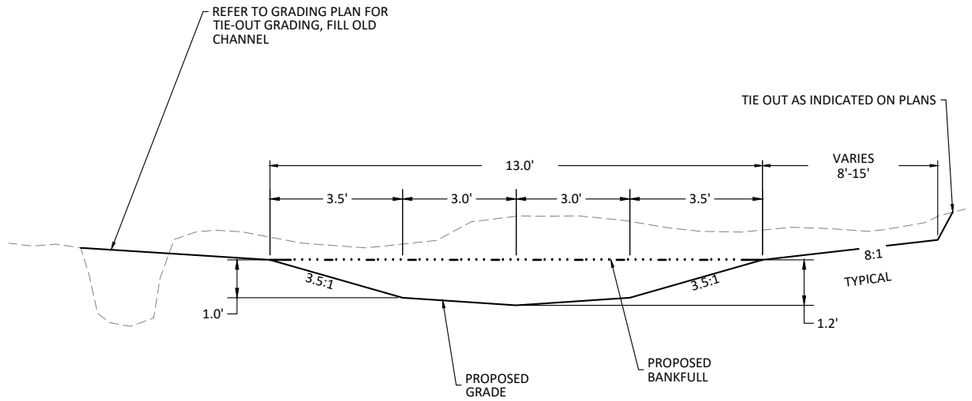
Revisions:

Date: 12.21.2022
Job Number: WI2191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

Sheet 1.6

December 22, 2023

X:\Shared\Projects\WI2191_Cornbread_Valley\Cadd\Plans\WI2191-Typicals.dwg



UT3 Reach 3 - Riffle

STA 10+13 to 13+94
Not to Scale

NOTES: INLINE POOL TO BE APPLIED IN STRAIGHT REACHES. IN CURVED POOLS, APPLY TYPICAL MEANDERING POOL. INTERPOLATED SECTION MAY BE PRESCRIBED BY DESIGNER IN FIELD.

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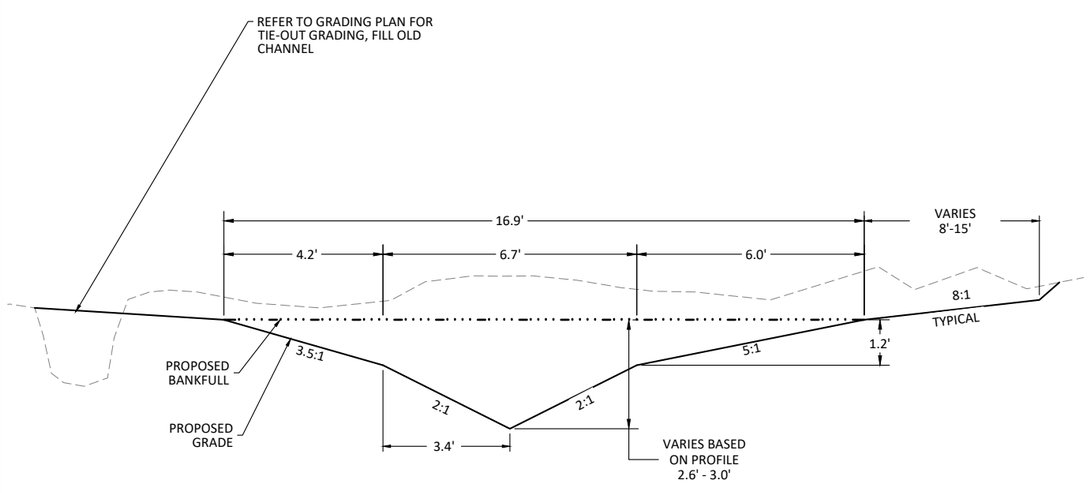
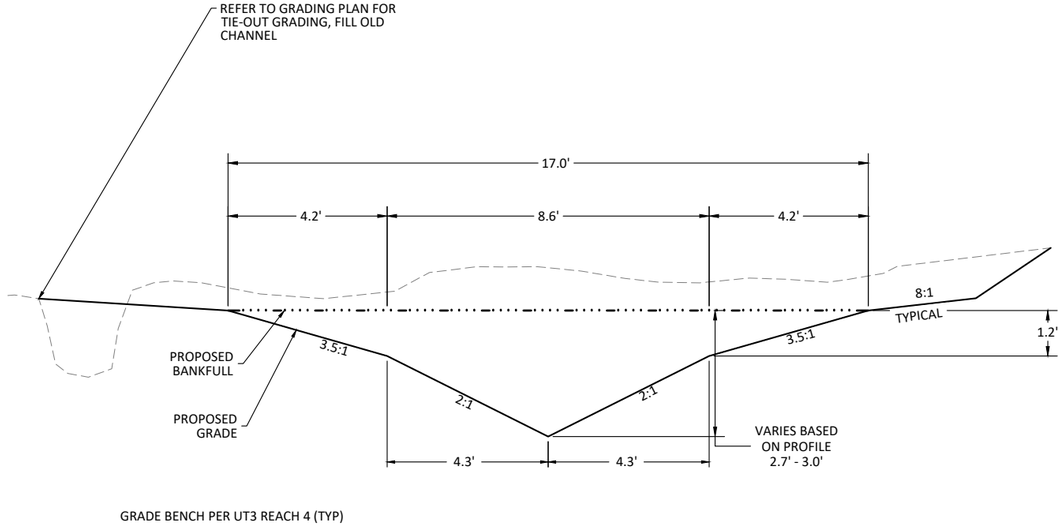
SLOPE FROM HINGE POINT TO MAX POOL VARIES BASED ON TARGET DEPTH FROM PROFILE



UT3 Reach 3 - Meander Pool

STA 10+13 to 13+94
Not to Scale



GRADE BENCH PER UT3 REACH 4 (TYP)

UT3 Reach 3 - In-line Pool

STA 10+13 to 13+94
Not to Scale

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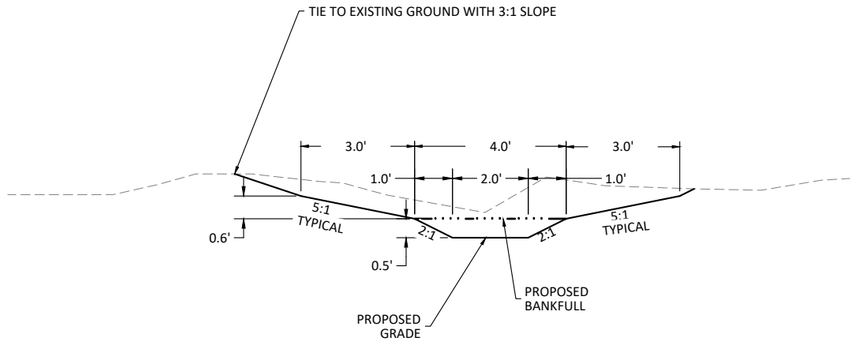
Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3 Reach 3
Typical Sections

Revisions:

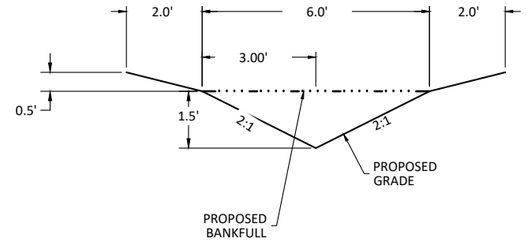
Date: 12.21.2022
Job Number: WI2191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

Sheet 1.7



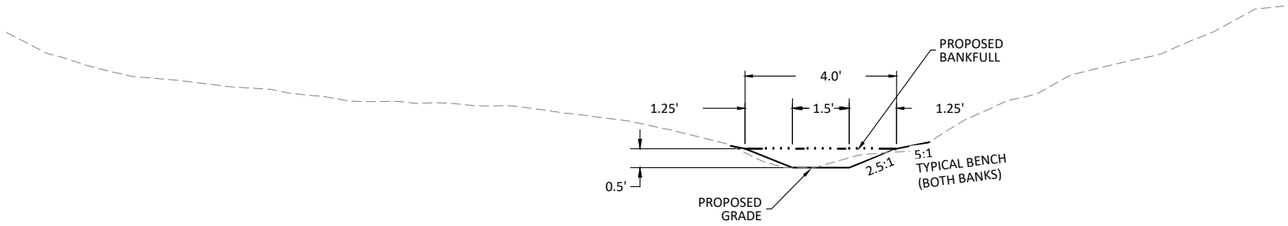
UT3A - Riffle

STA 0+00 to 7+68
Not to Scale



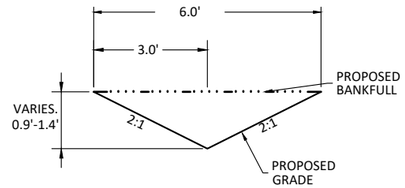
UT3a - In-Line Pool

STA 0+00 to 7+68
Not to Scale



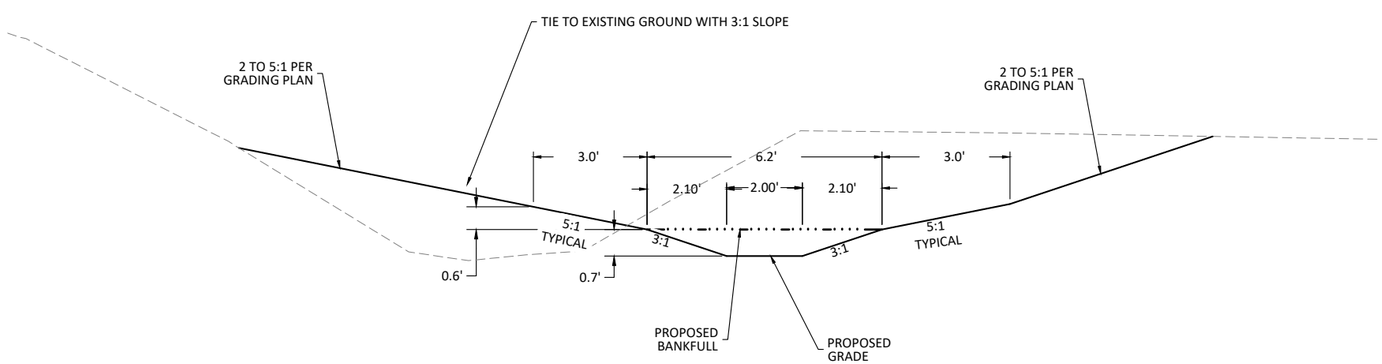
UT3B - Riffle

STA 0+00 to 5+81
Not to Scale



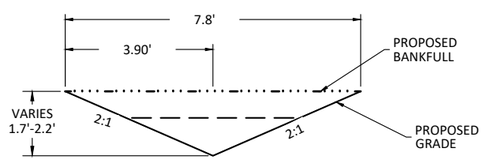
UT3B - In-Line Pool

STA 0+00 to 5+81
Not to Scale



UT3C Reach 2 - Riffle

STA 3+44 to 6+57
Not to Scale



UT3c Reach 2 - In-Line Pool

STA 3+44 to 6+57
Not to Scale

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Cornbread Valley Mitigation Site
Macon County, North Carolina

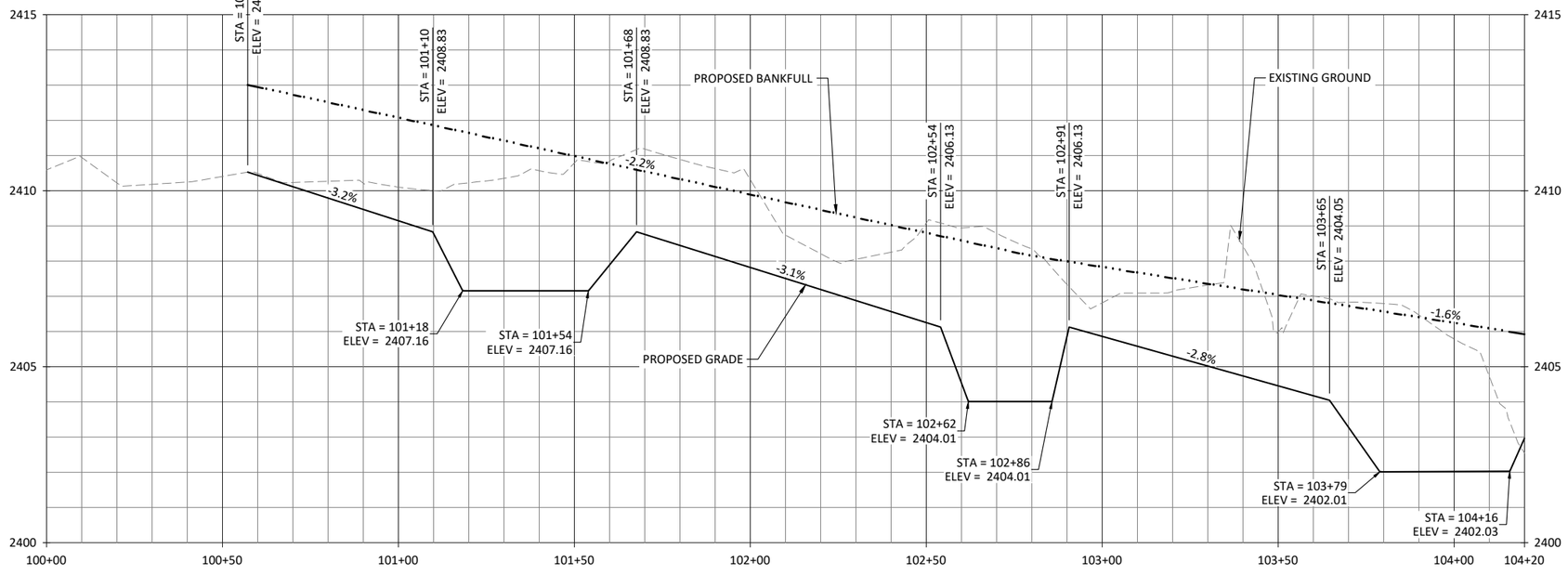
UT3 Tributaries
Typicals

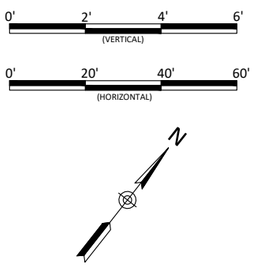
Revisions:

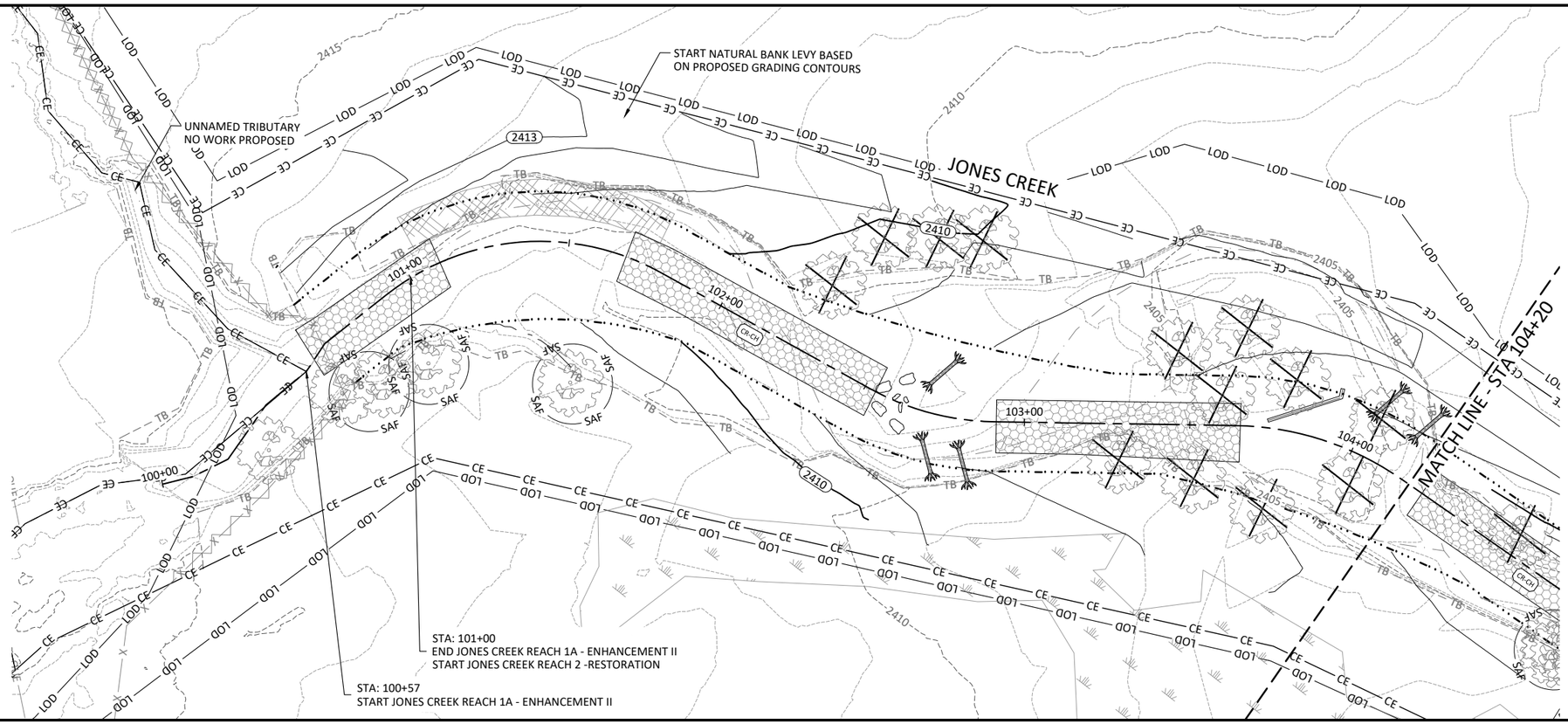
Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

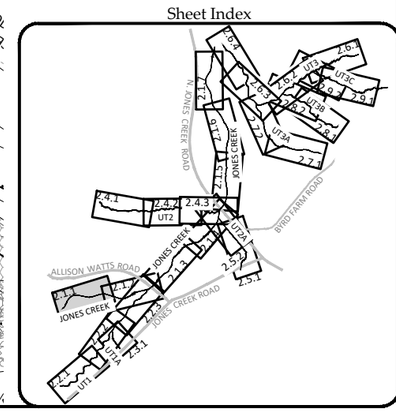
Sheet 1.8

December 22, 2023









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Cornbread Valley Mitigation Site
Macon County, North Carolina

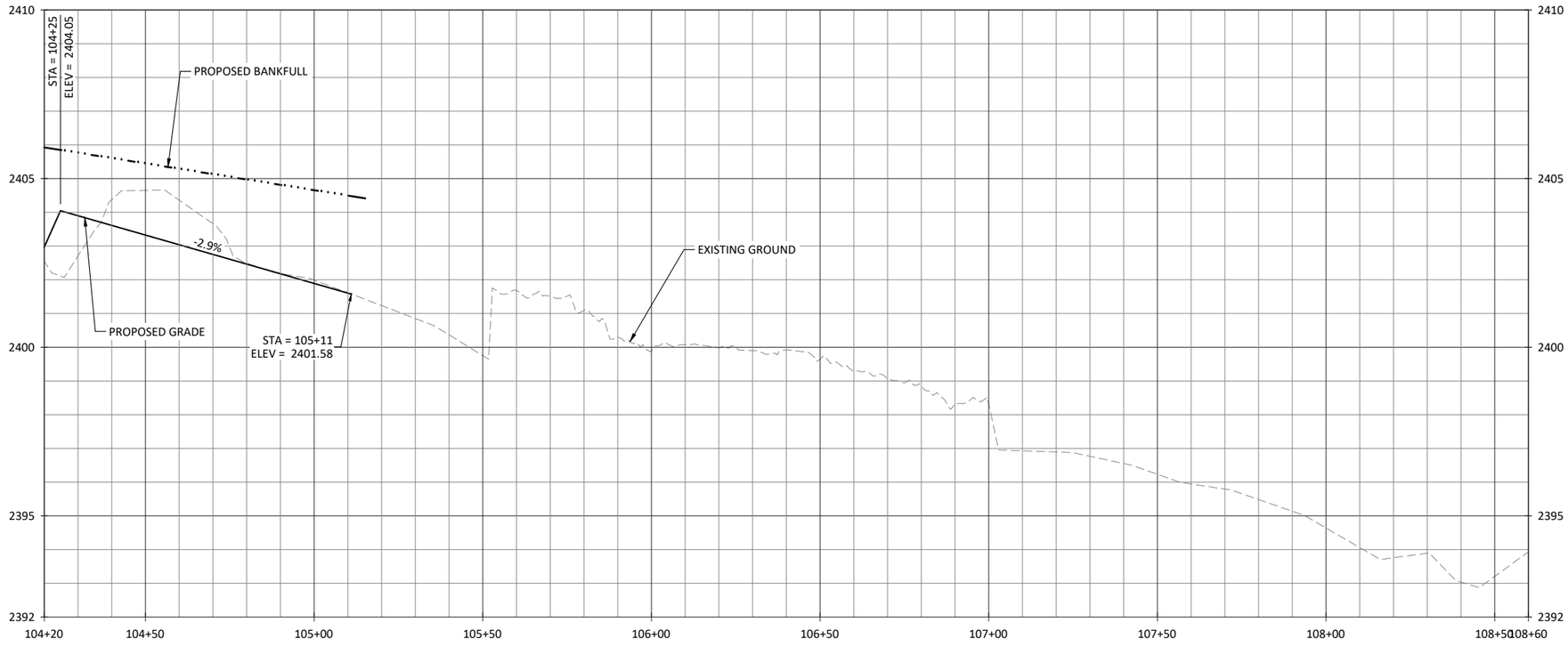
Jones Creek
Stream Plan and Profile

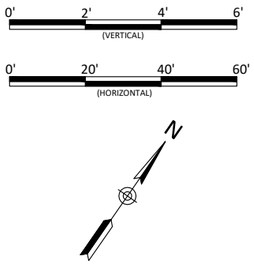
Revisions:

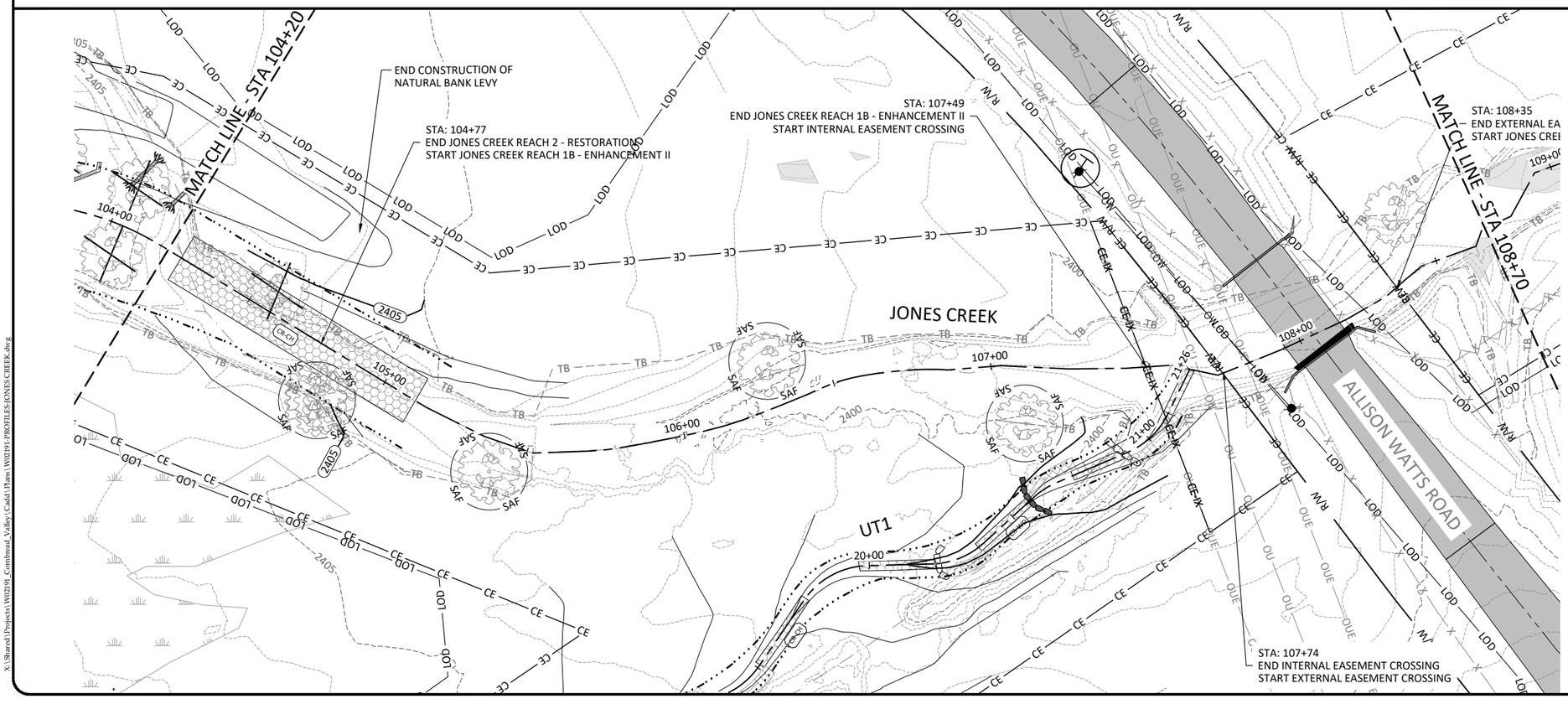
Date:	12.21.2022
Job Number:	WI2191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

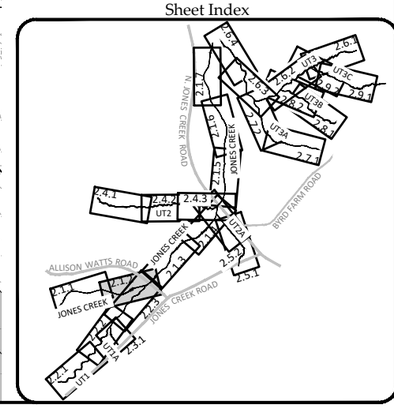
Sheet 2.1.1

December 22, 2023









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Cornbread Valley Mitigation Site
Macon County, North Carolina

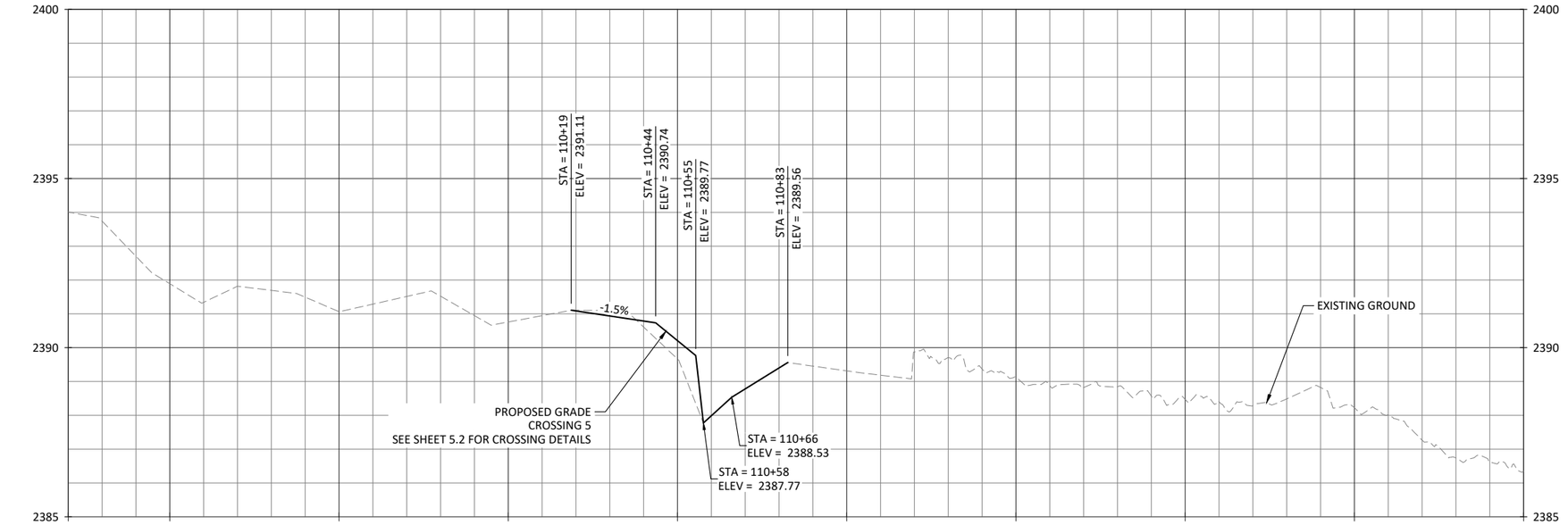
Jones Creek
Stream Plan and Profile

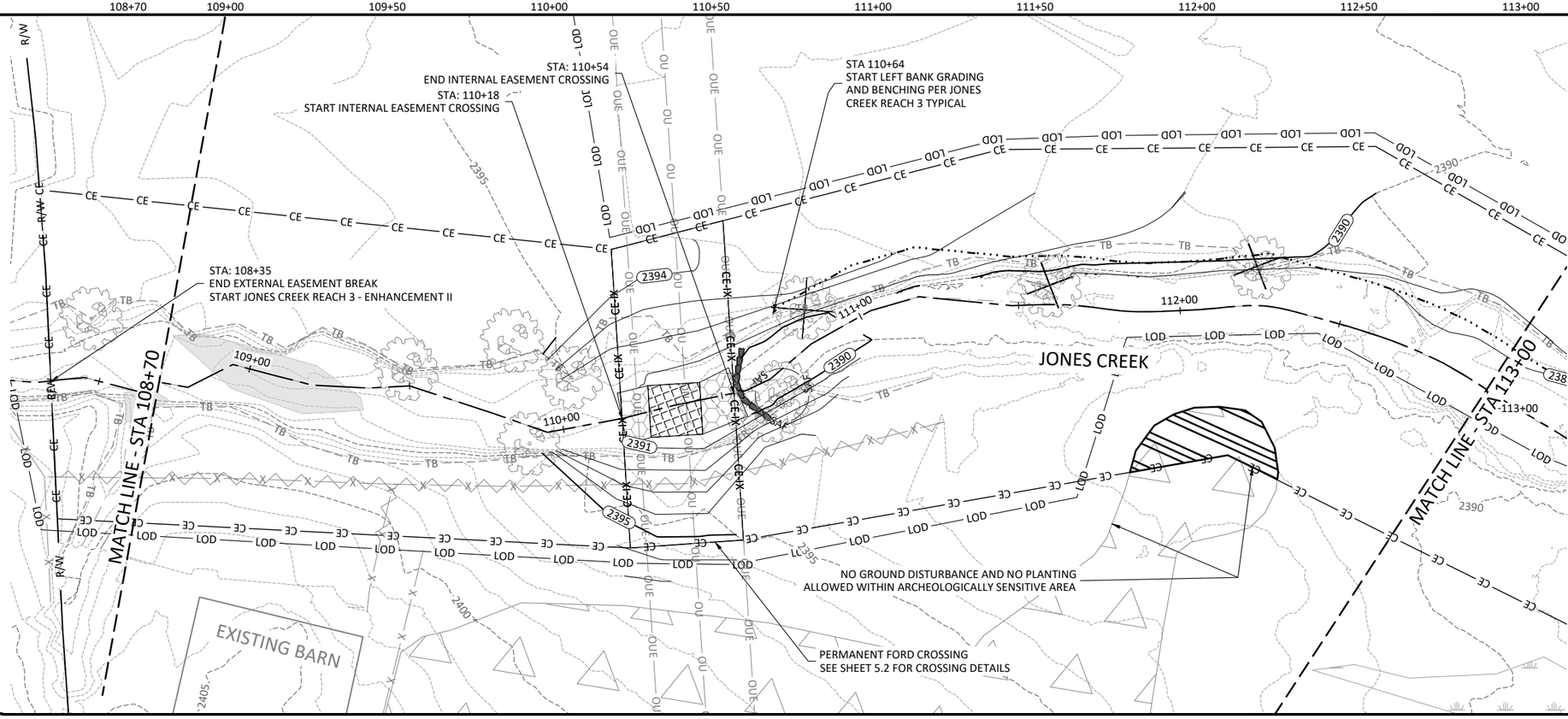
Date:	12.21.2022
Job Number:	W02191
Project Engineer:	IPM
Drawn By:	IDW
Checked By:	EPN

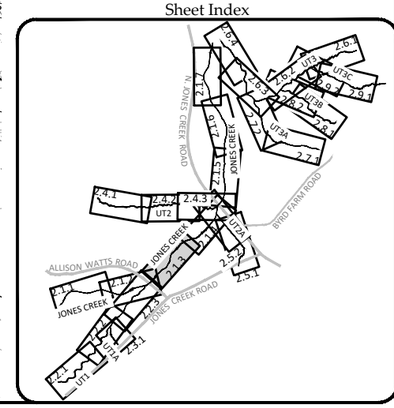
Revisions:

Sheet 2.1.2

December 22, 2023







0' 2' 4' 6' (VERTICAL)

0' 20' 40' 60' (HORIZONTAL)

N

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Cornbread Valley Mitigation Site
Macon County, North Carolina

Jones Creek
Stream Plan and Profile

Revisions:

Date:	12.21.2022
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Drawn By:	JDW
Checked By:	EPN

Sheet 2.1.3

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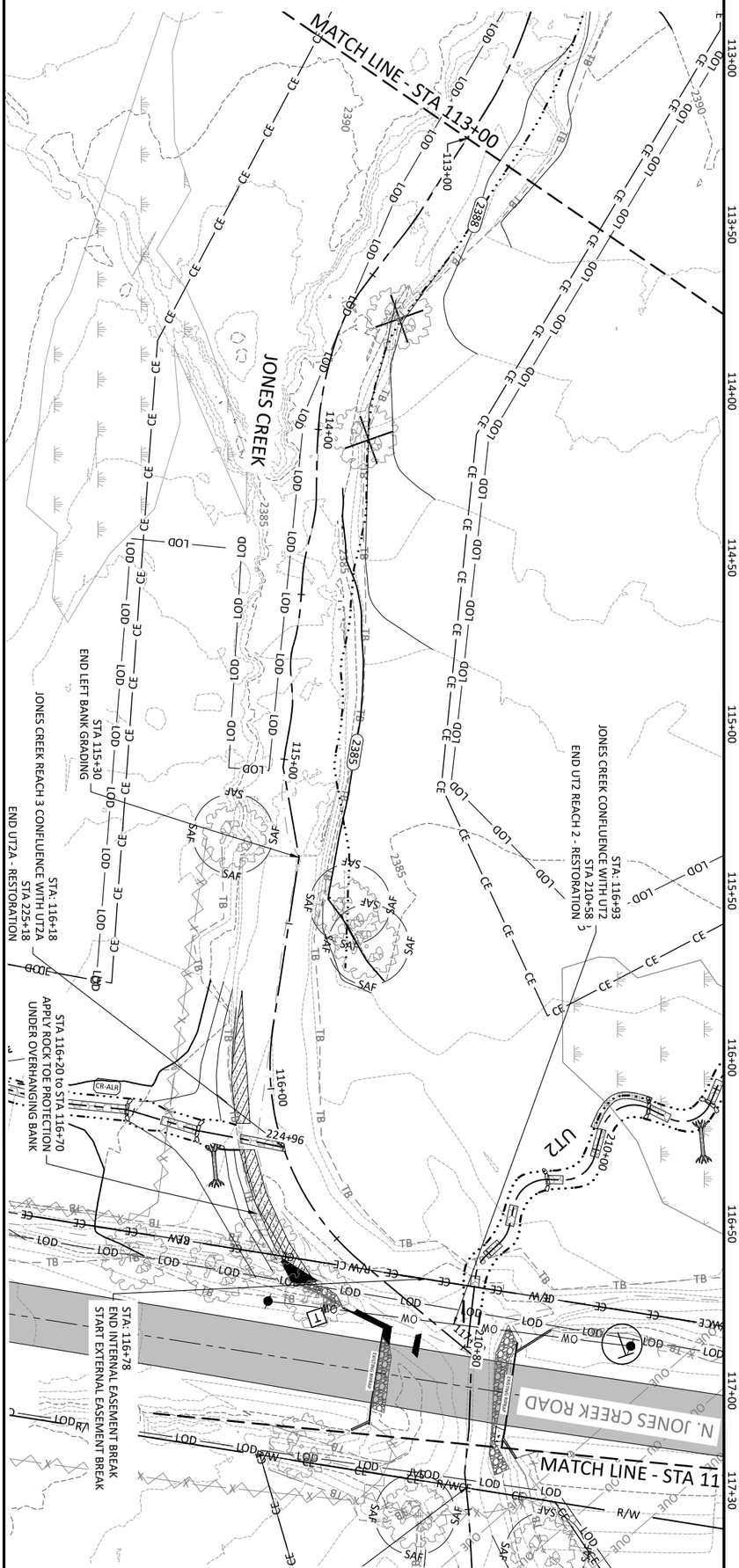

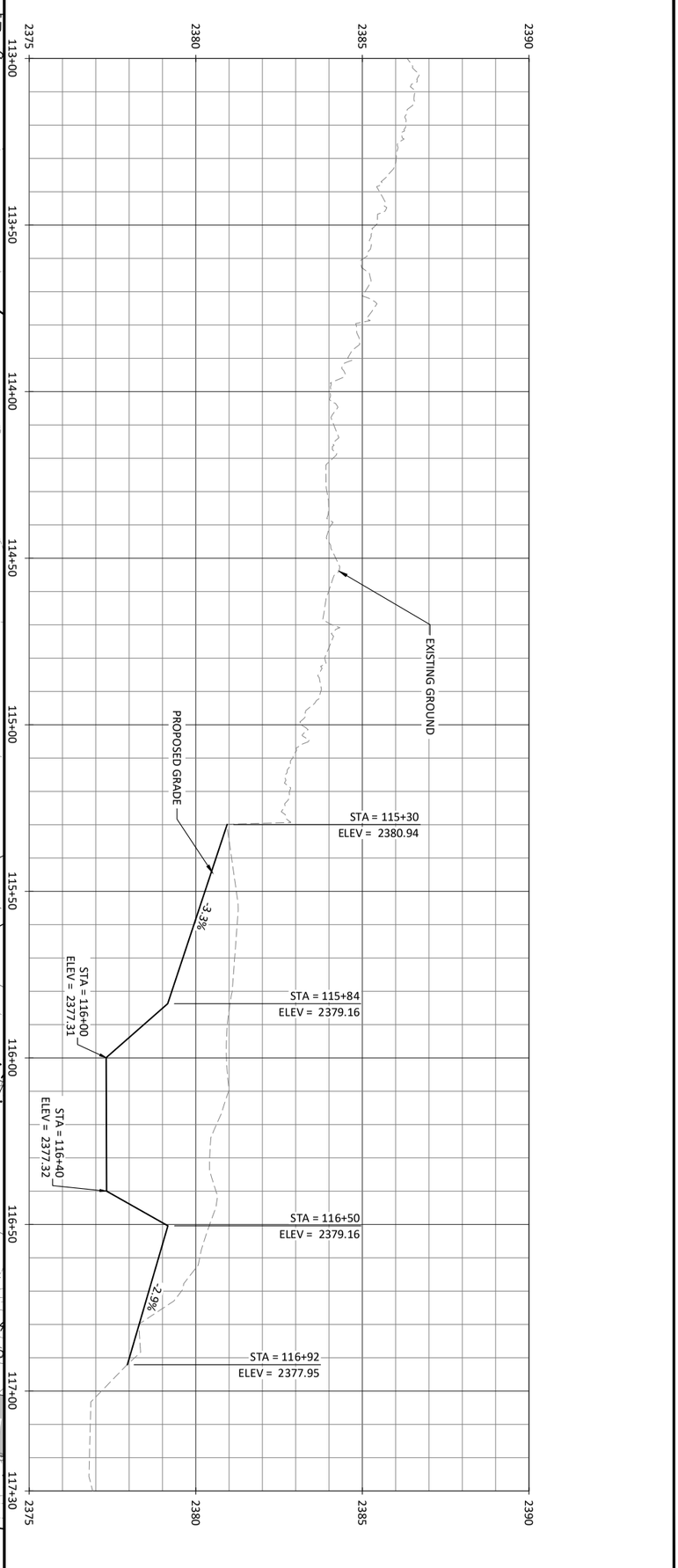

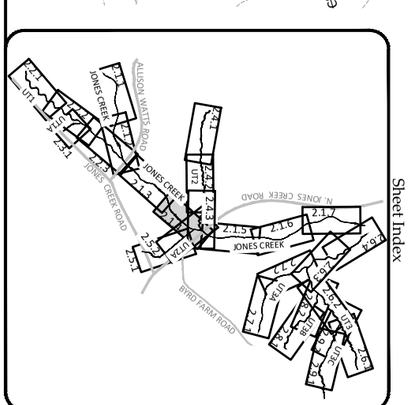

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Revisions:

2.1.4
Sheet

Cornbread Valley Mitigation Site
Macon County, North Carolina

Jones Creek
Stream Plan and Profile

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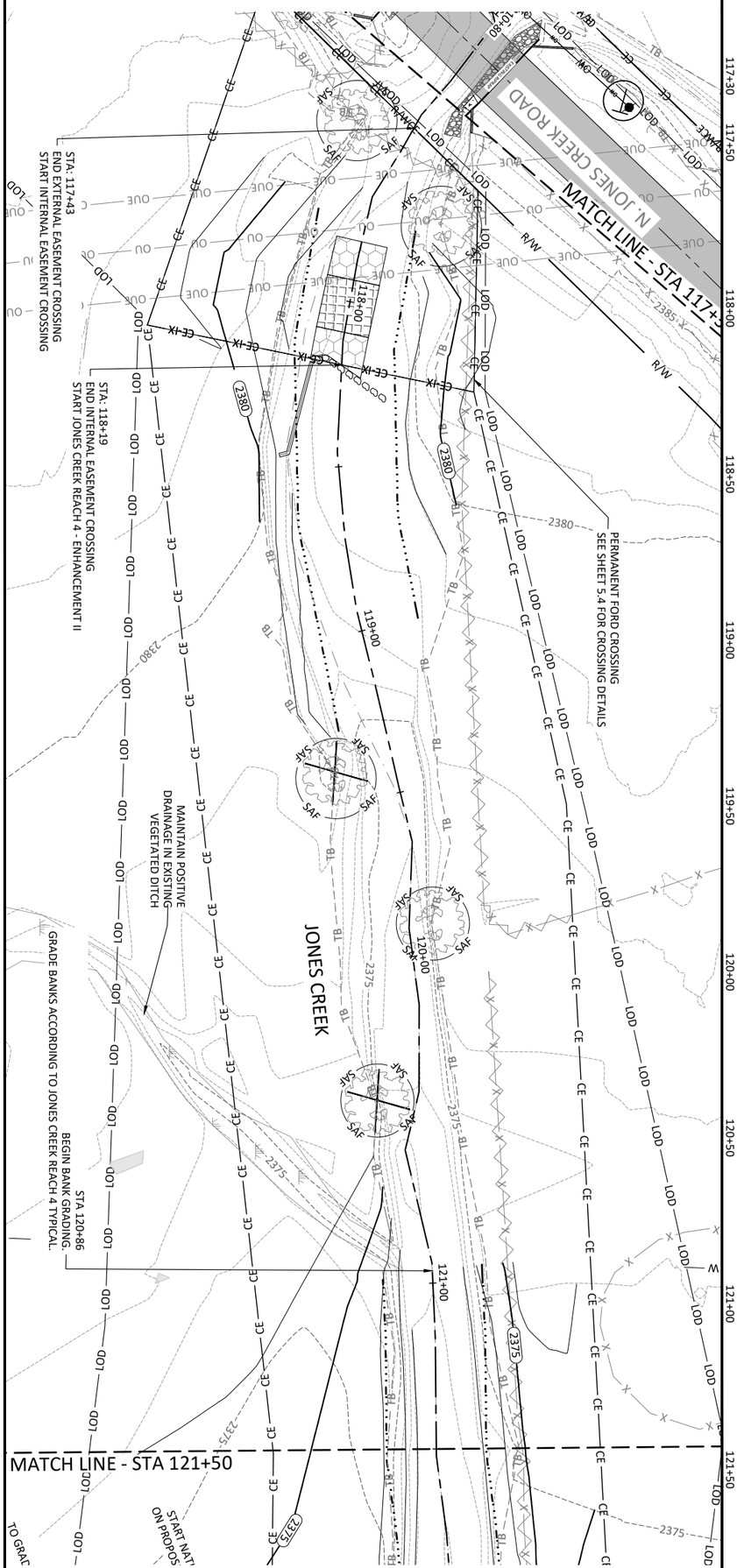

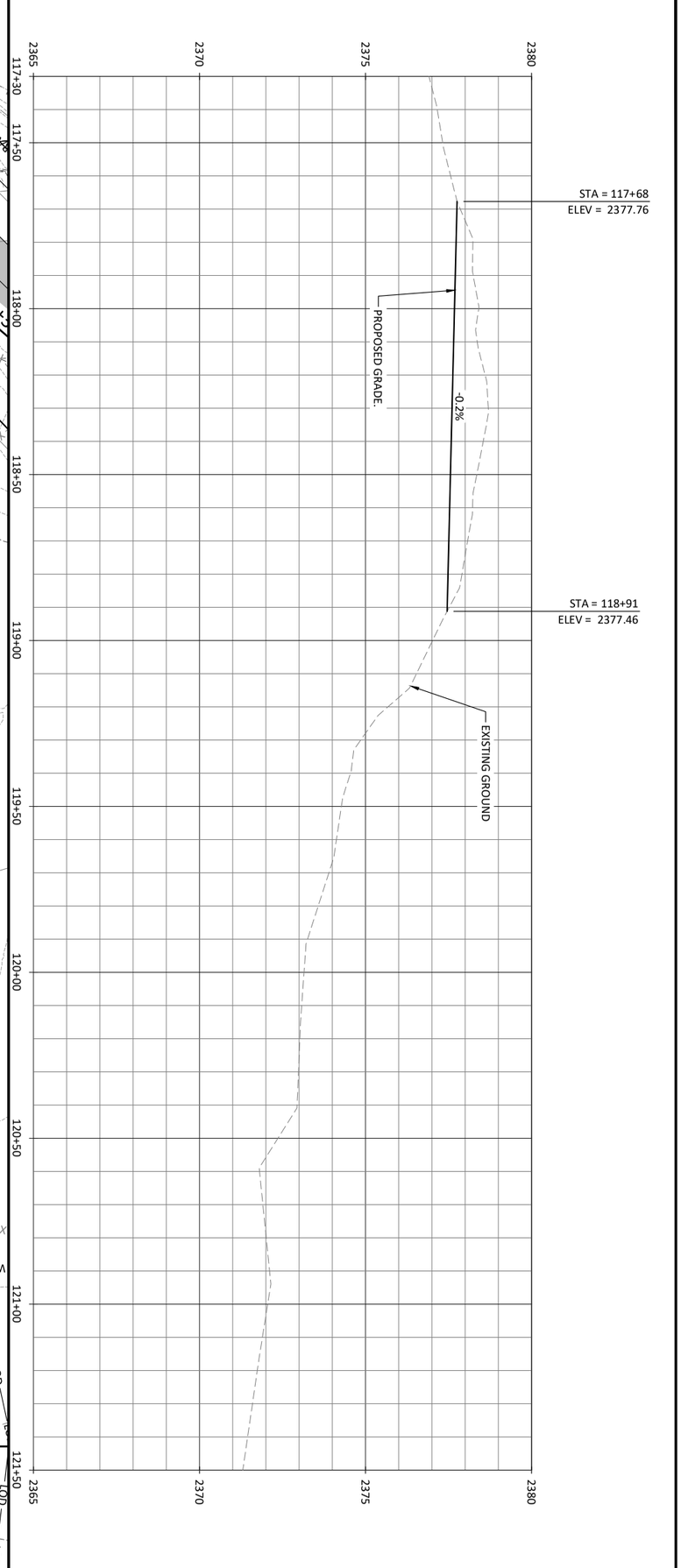

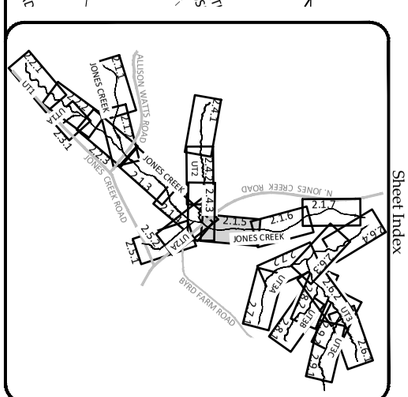

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0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Revisions:

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Cornbread Valley Mitigation Site
Macon County, North Carolina

Jones Creek
Stream Plan and Profile

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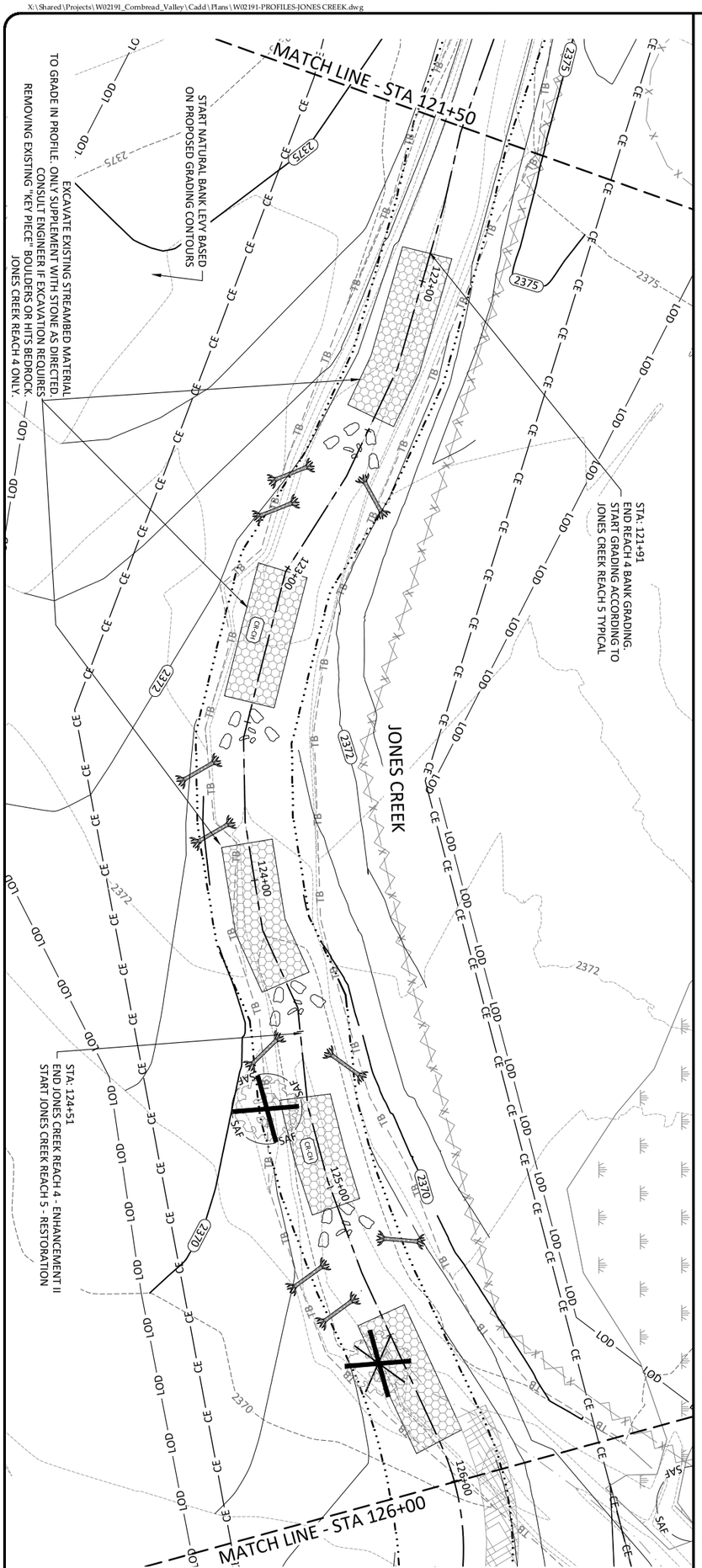

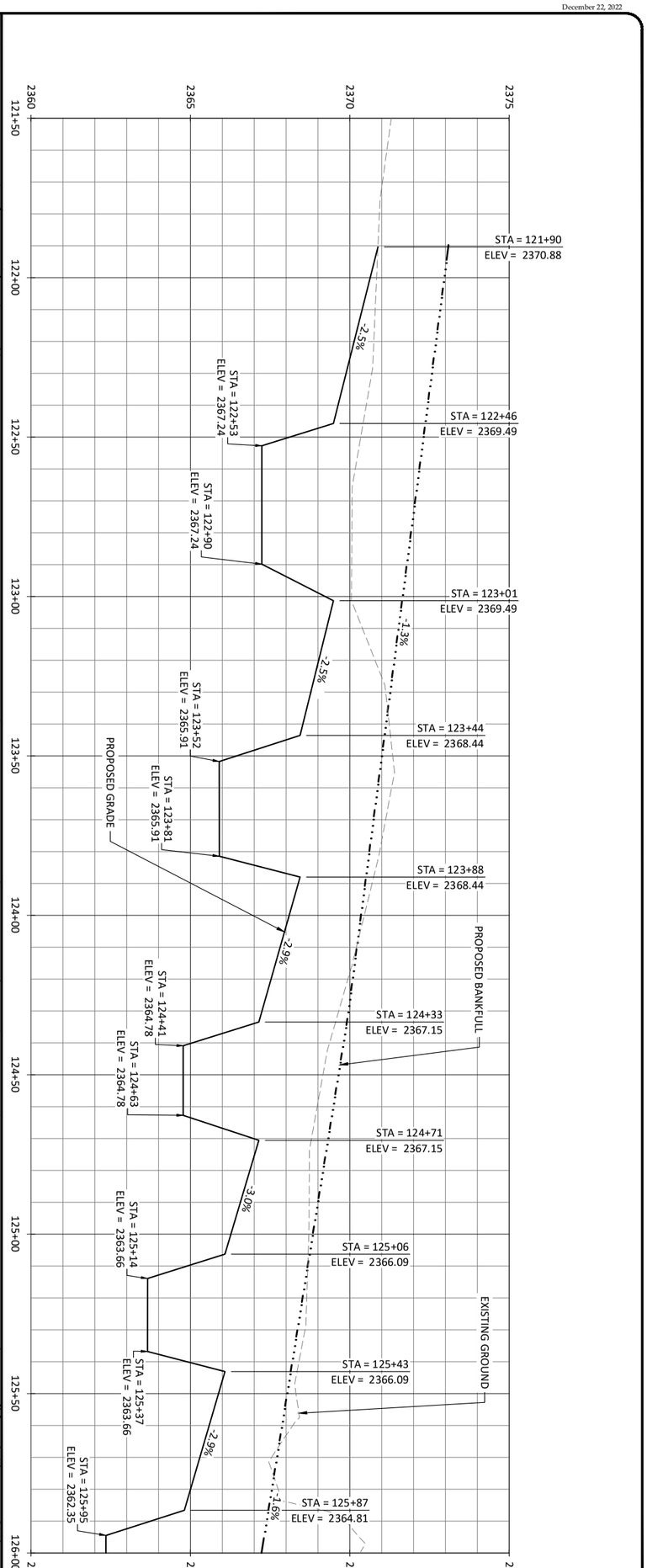

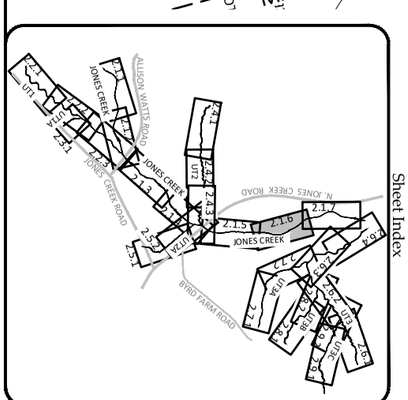

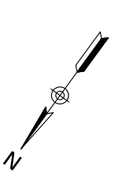

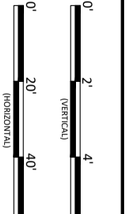

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

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Cornbread Valley Mitigation Site
Macon County, North Carolina

Jones Creek
Stream Plan and Profile

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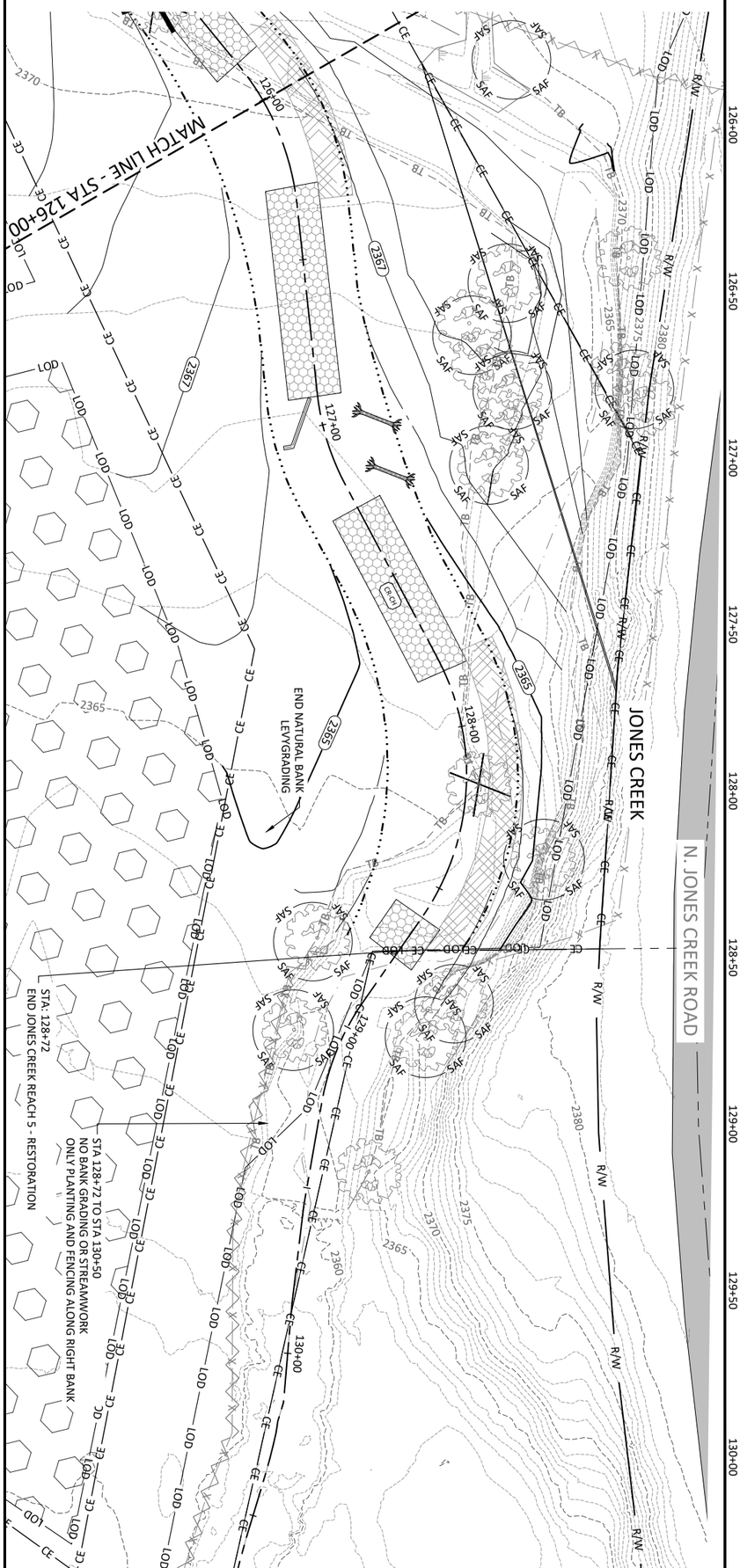

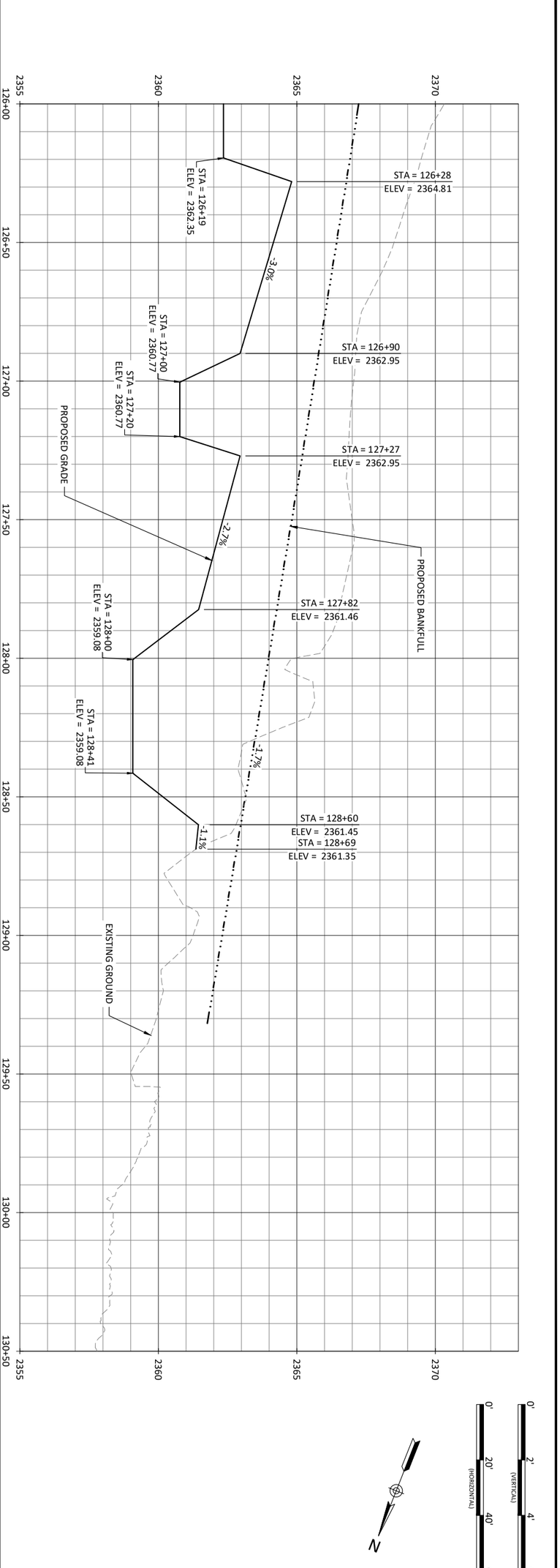

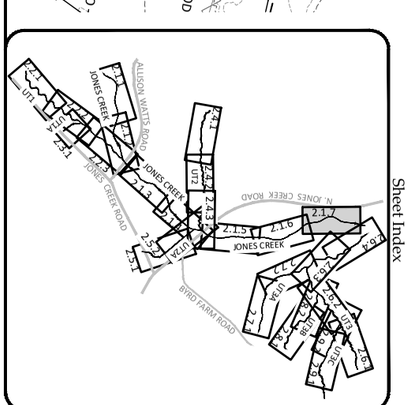

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

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Cornbread Valley Mitigation Site
Macon County, North Carolina

Jones Creek
Stream Plan and Profile

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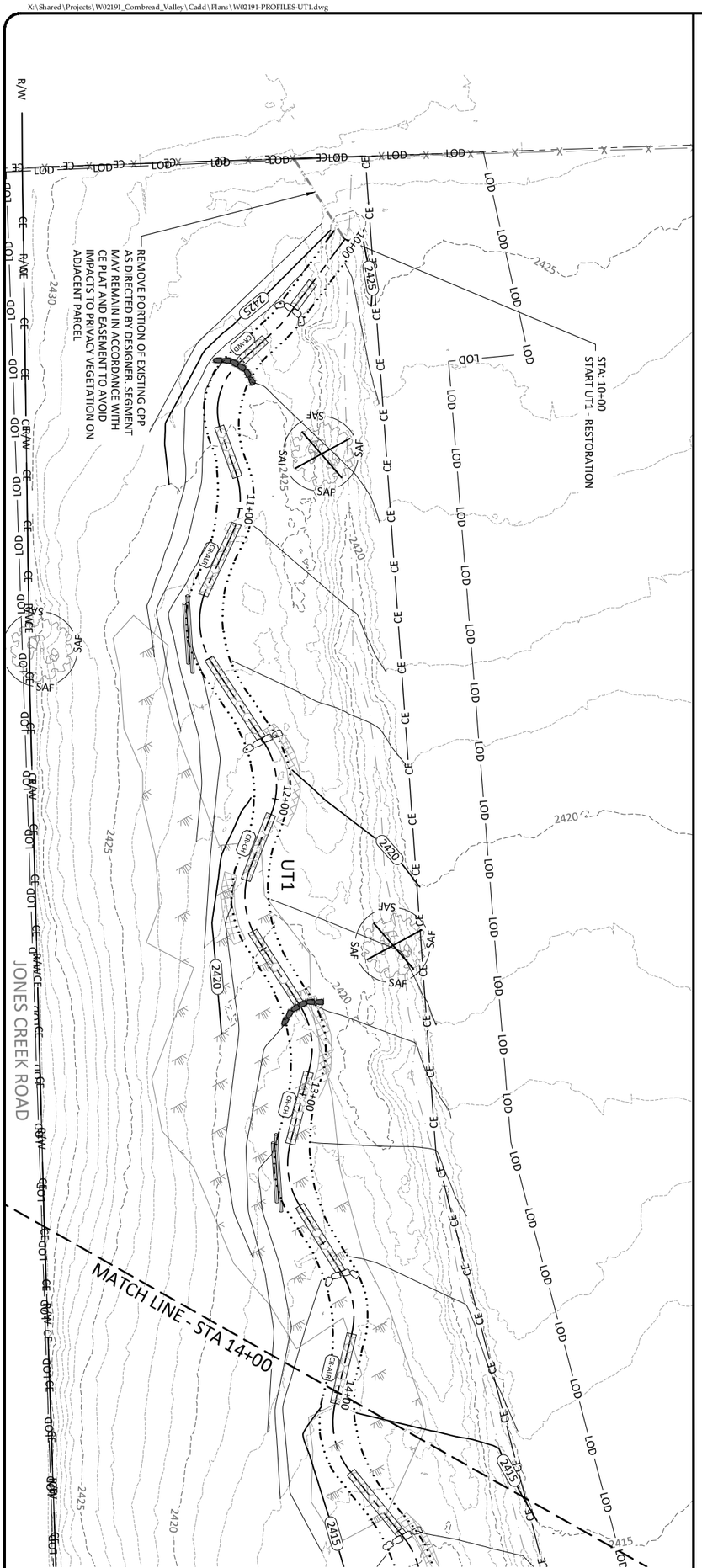

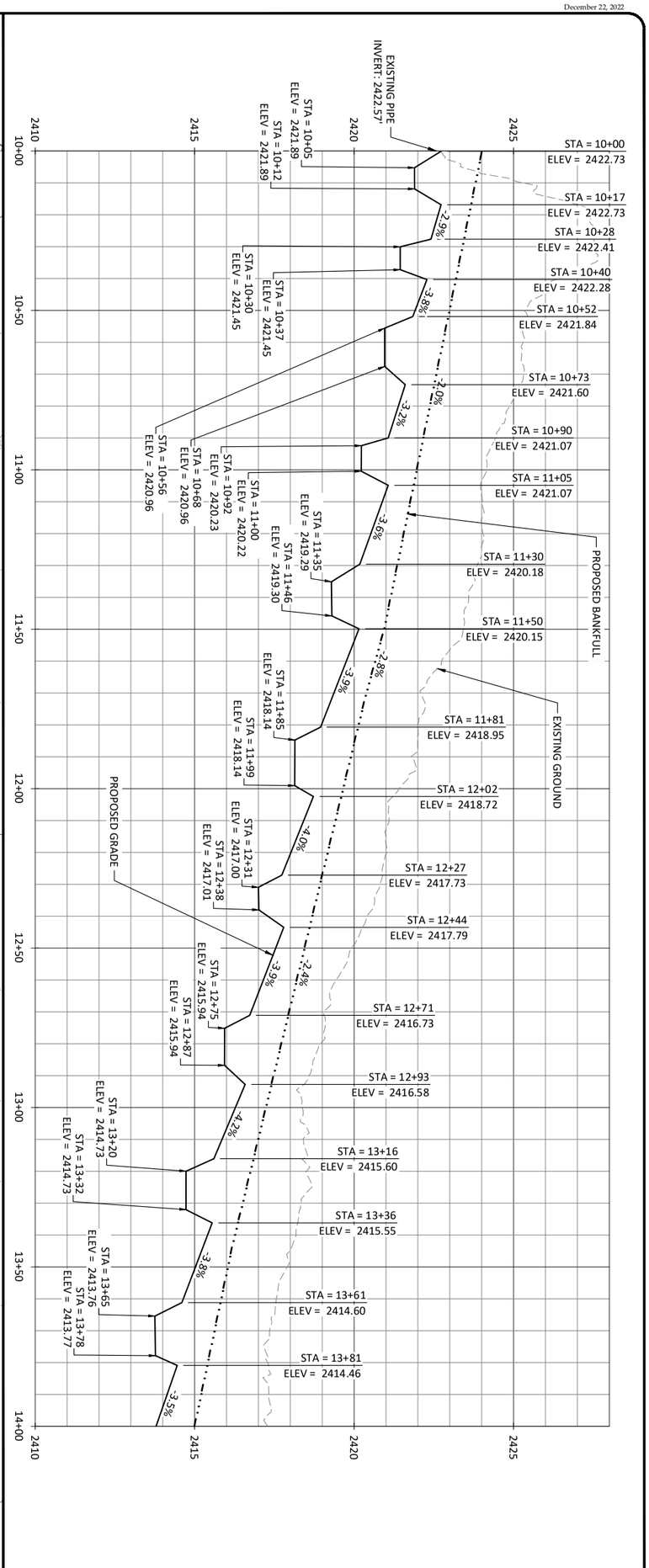

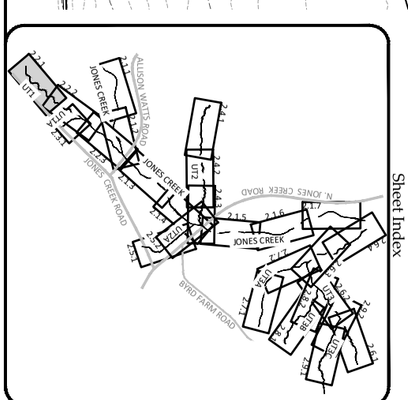

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT1
Stream Plan and Profile

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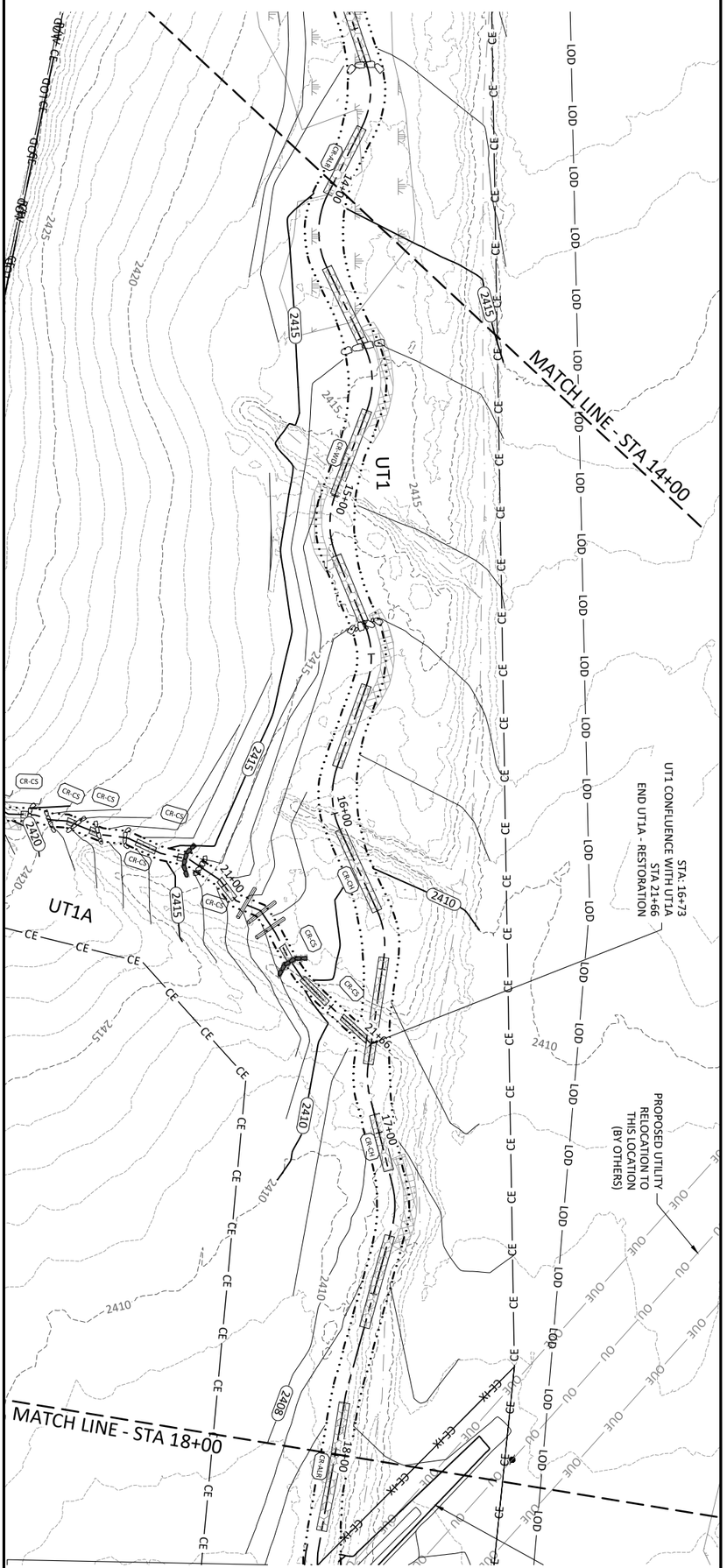

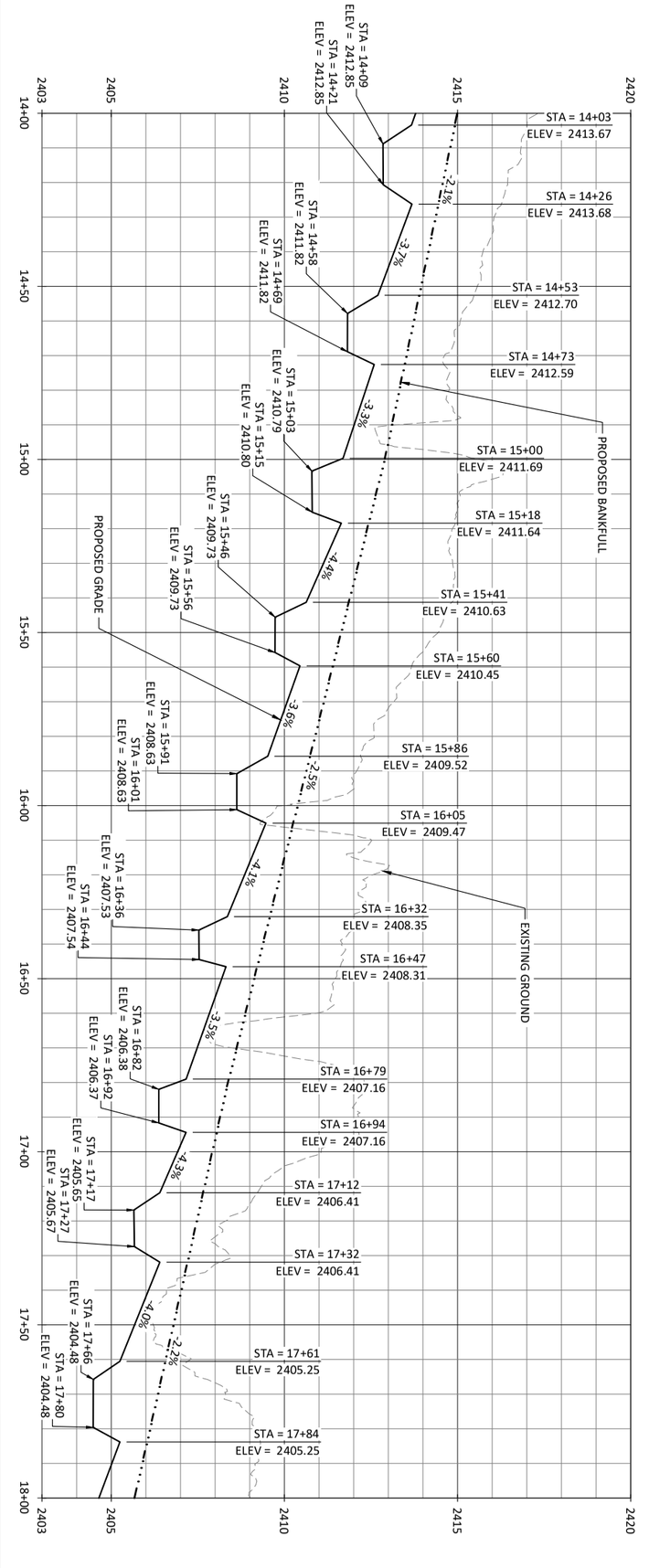

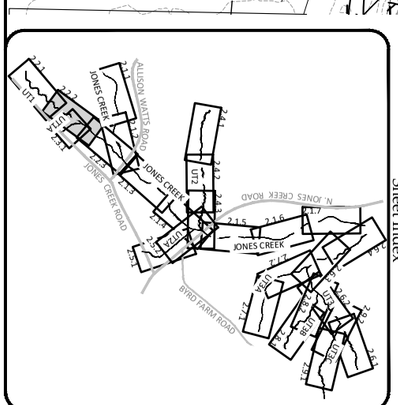

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
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2.2.2
Sheet

Cornbread Valley Mitigation Site
Macon County, North Carolina

UT1
Stream Plan and Profile

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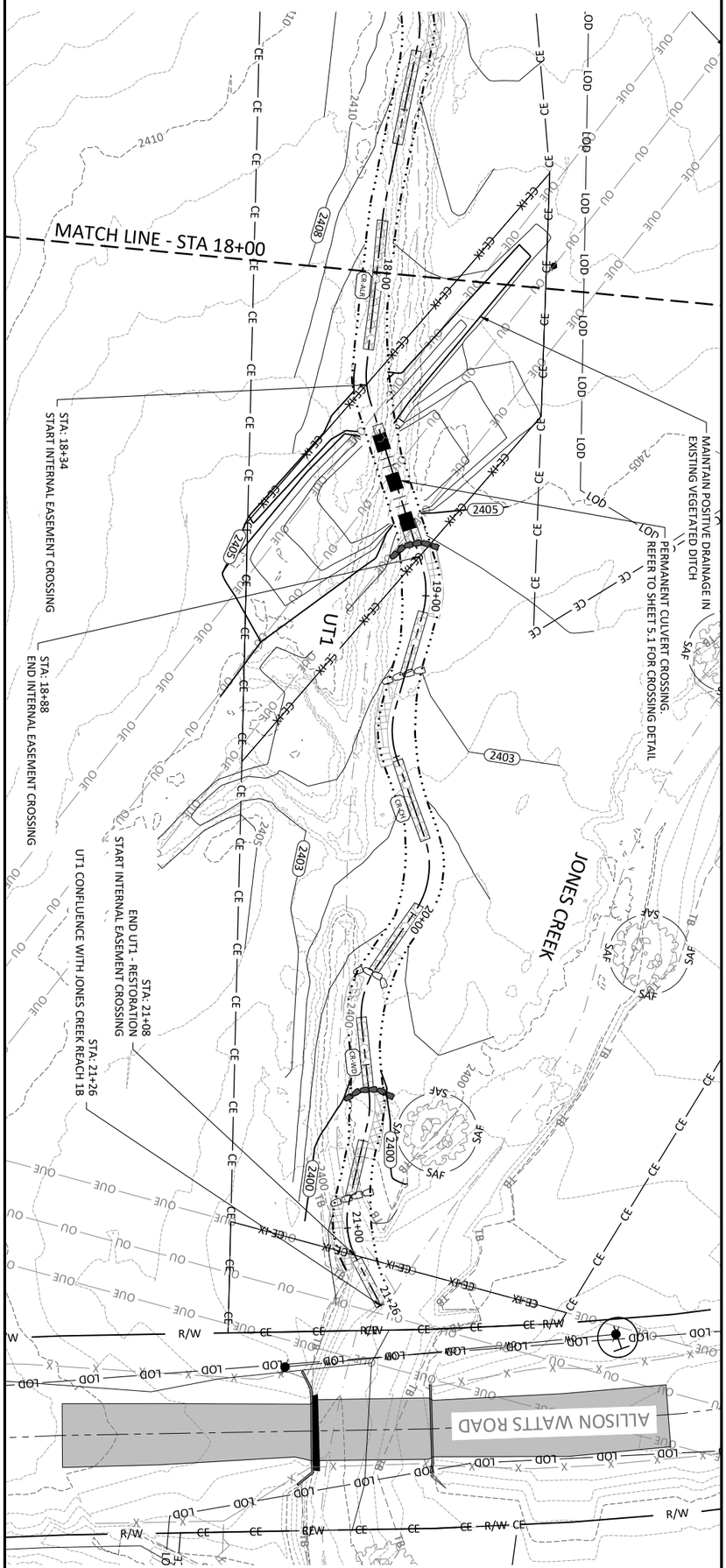

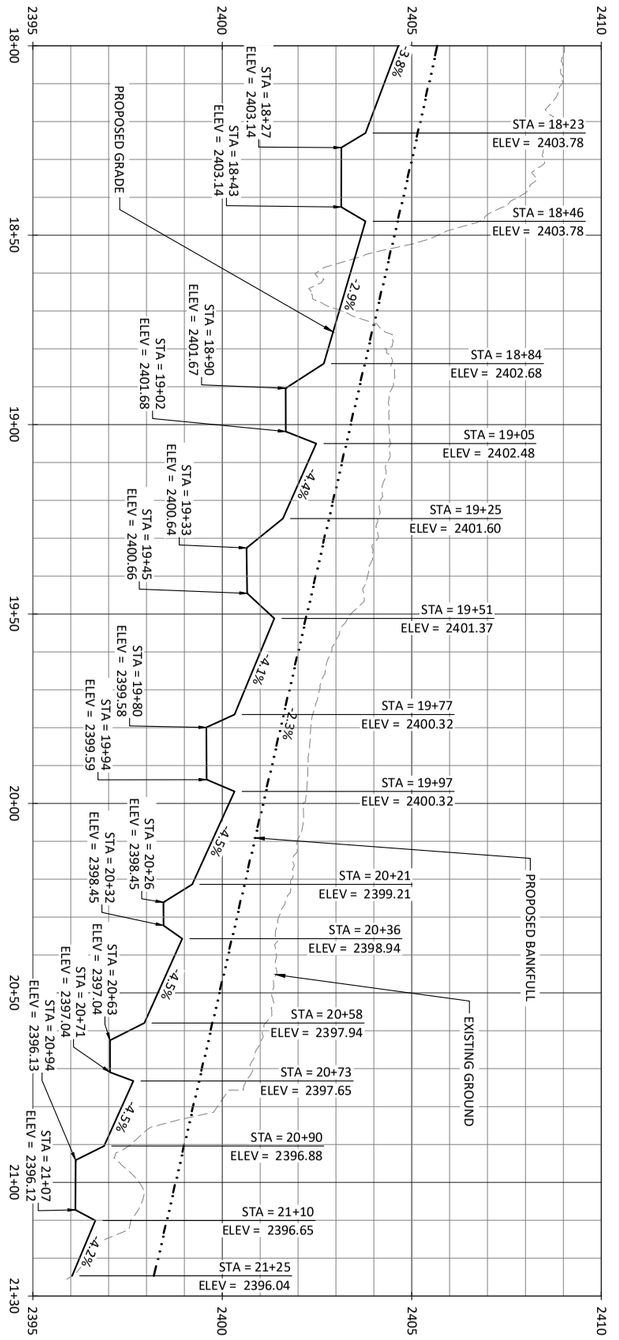

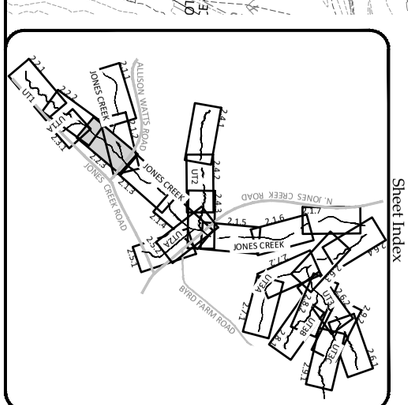

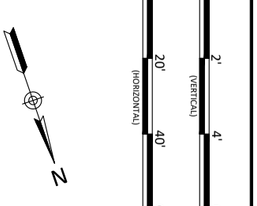

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

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Sheet

Cornbread Valley Mitigation Site
Macon County, North Carolina

UT1
Stream Plan and Profile

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December 22, 2023

0' 2' 4' 6'
(VERTICAL)

0' 20' 40' 60'
(HORIZONTAL)

N

Sheet Index

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT1A
Stream Plan and Profile

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 2.3.1

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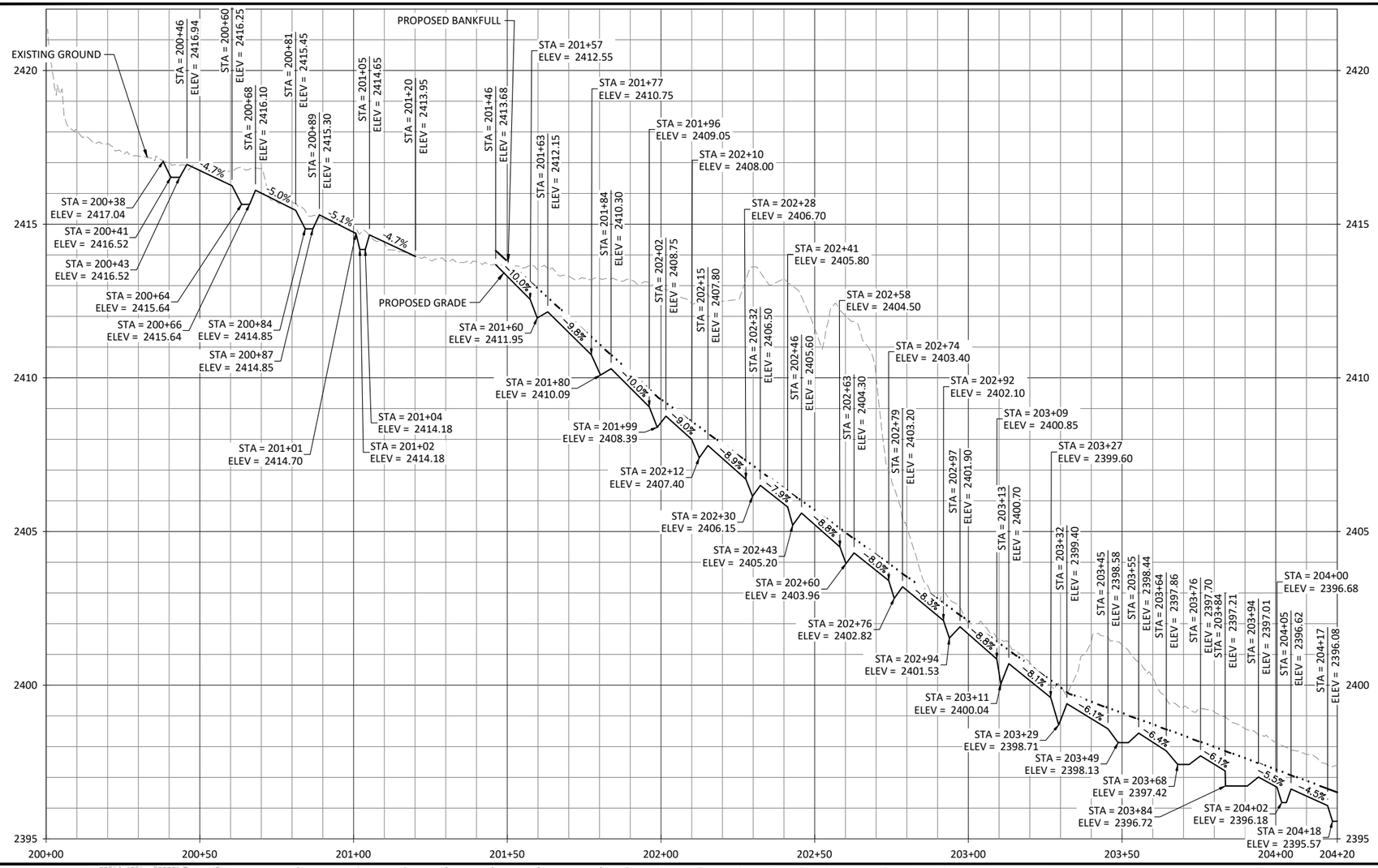
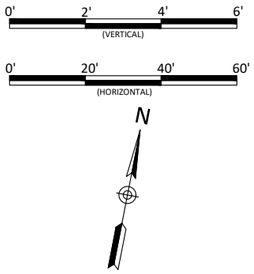
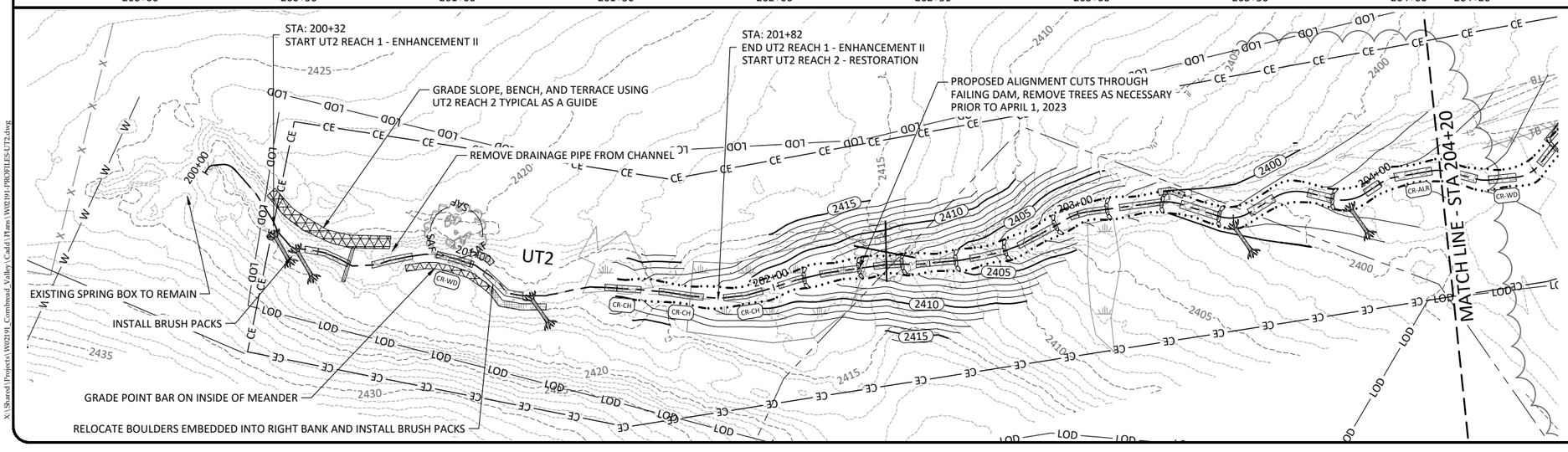
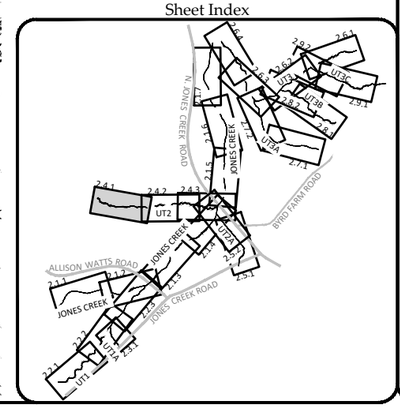
December 22, 2023









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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT2
Stream Plan and Profile

Date:	12.21.2022
Job Number:	WI2191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Revisions:

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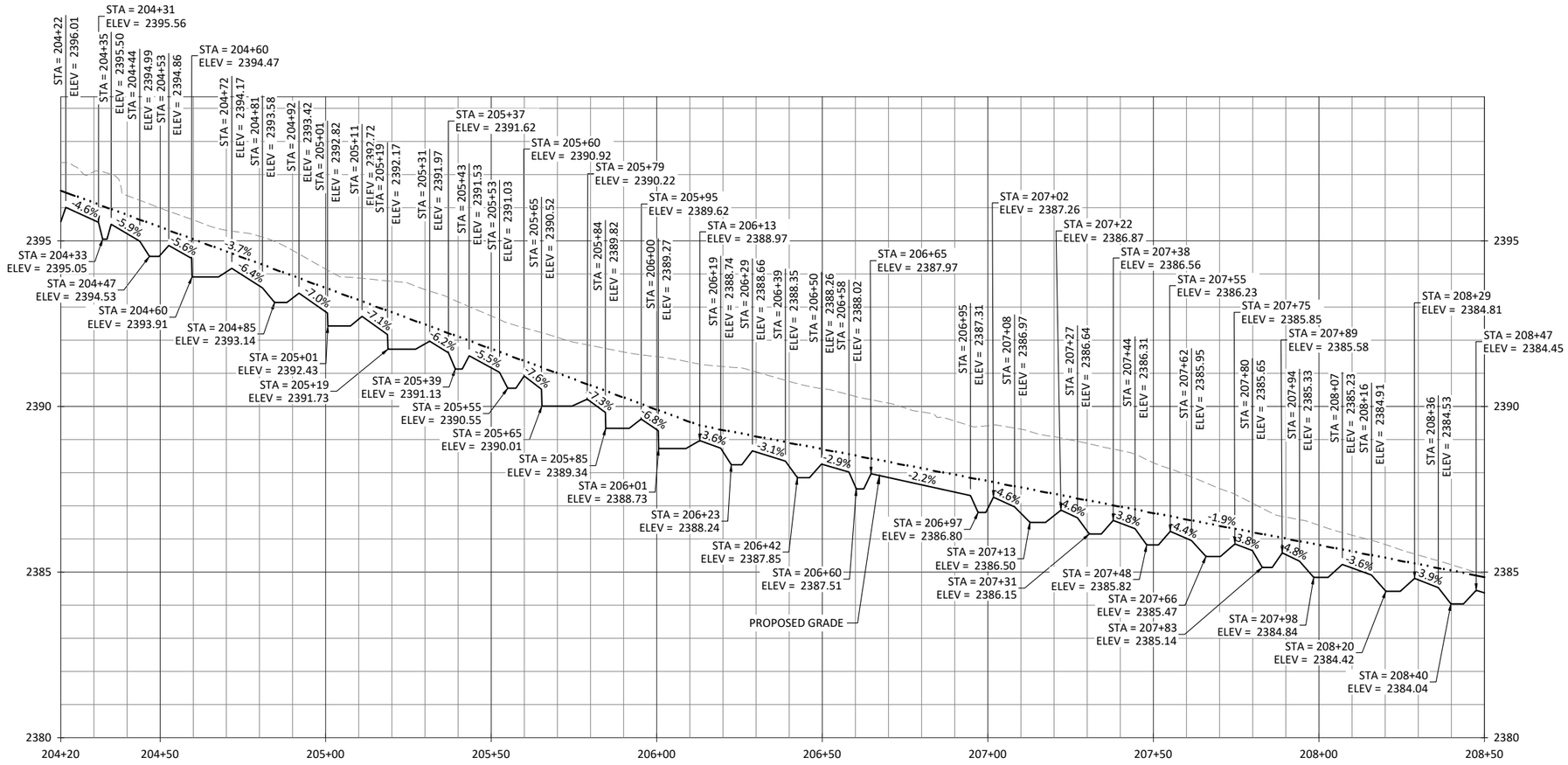
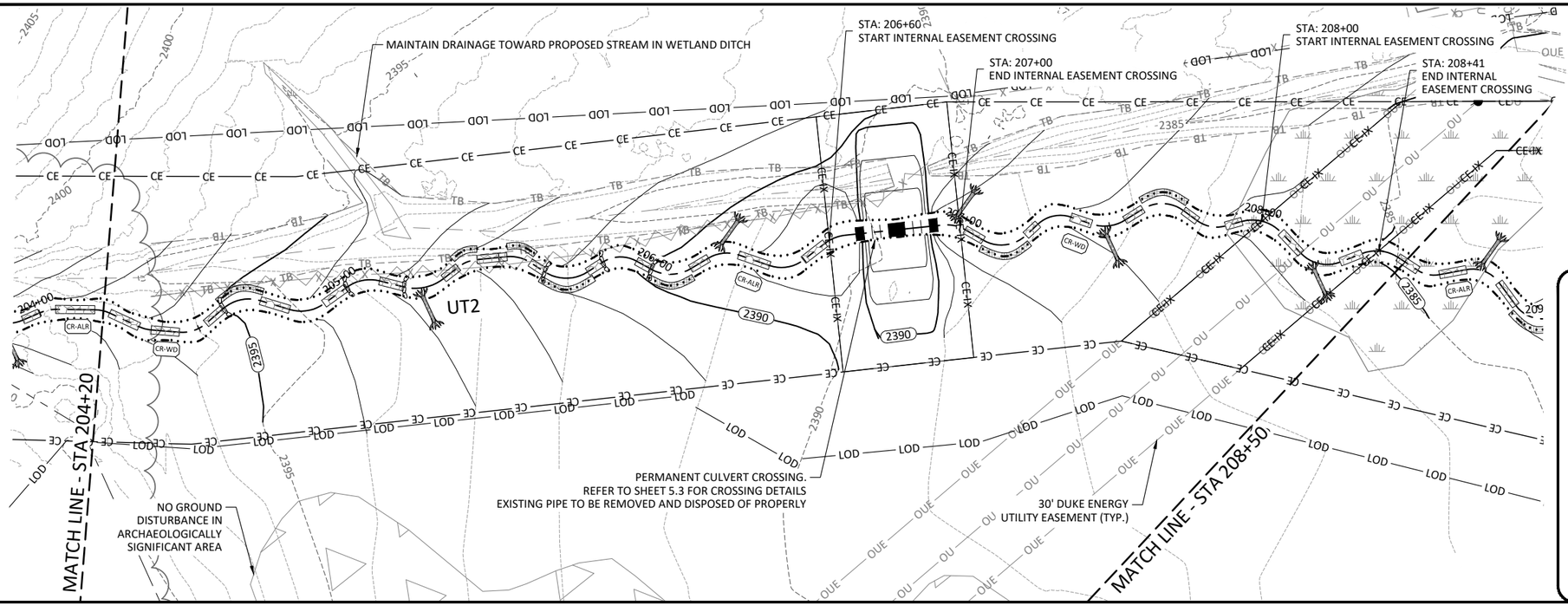
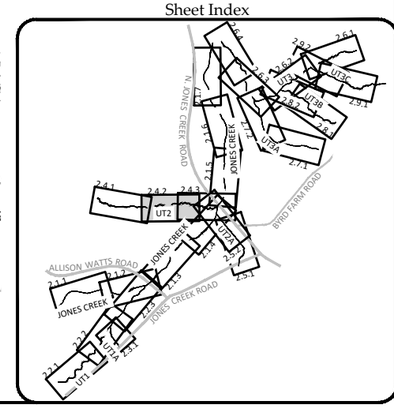
December 22, 2023







0' 2' 4' 6' (VERTICAL)

0' 20' 40' 60' (HORIZONTAL)

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT2
Stream Plan and Profile

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EFN

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Sheet 2.4.2

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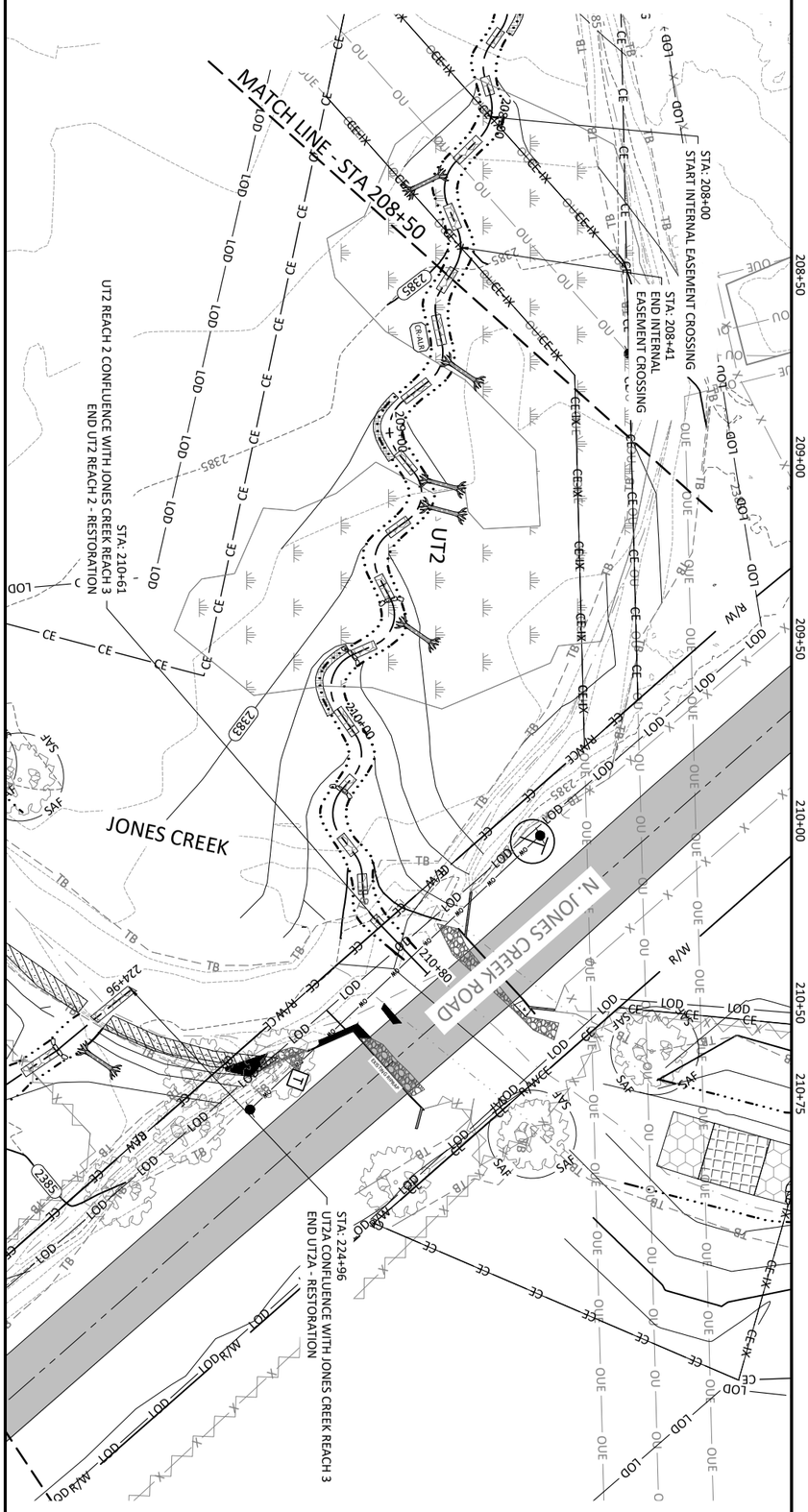

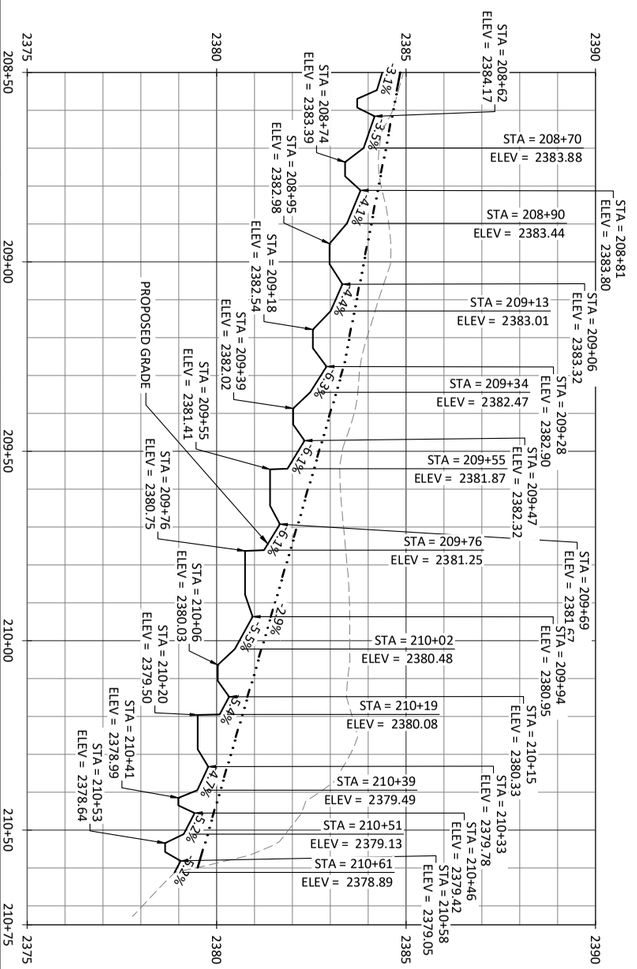

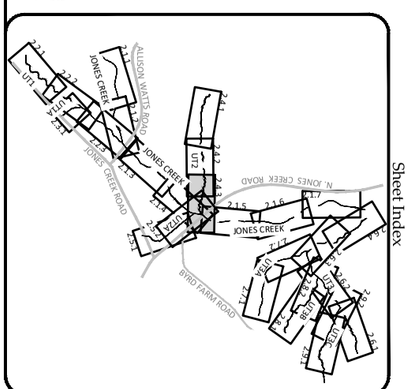

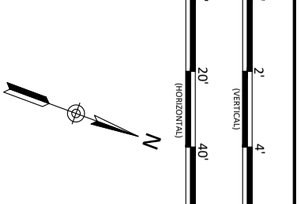

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT2
Stream Plan and Profile

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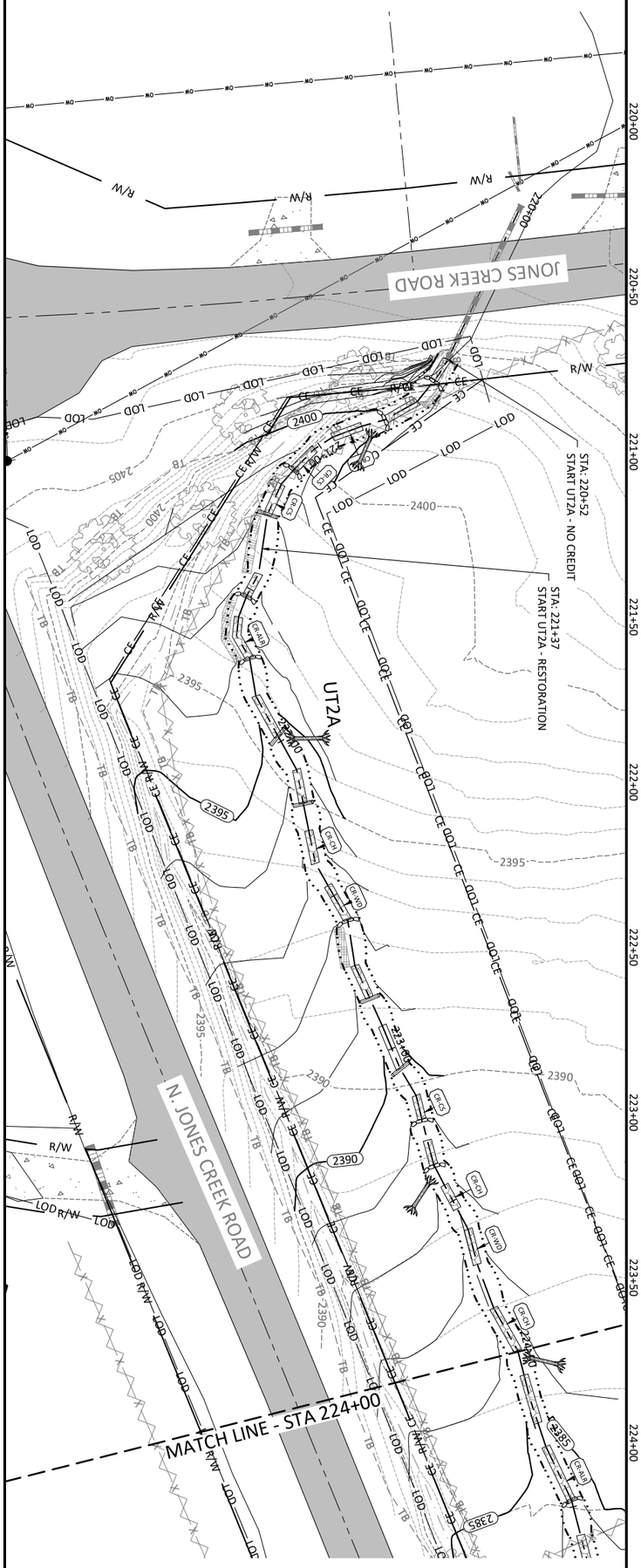

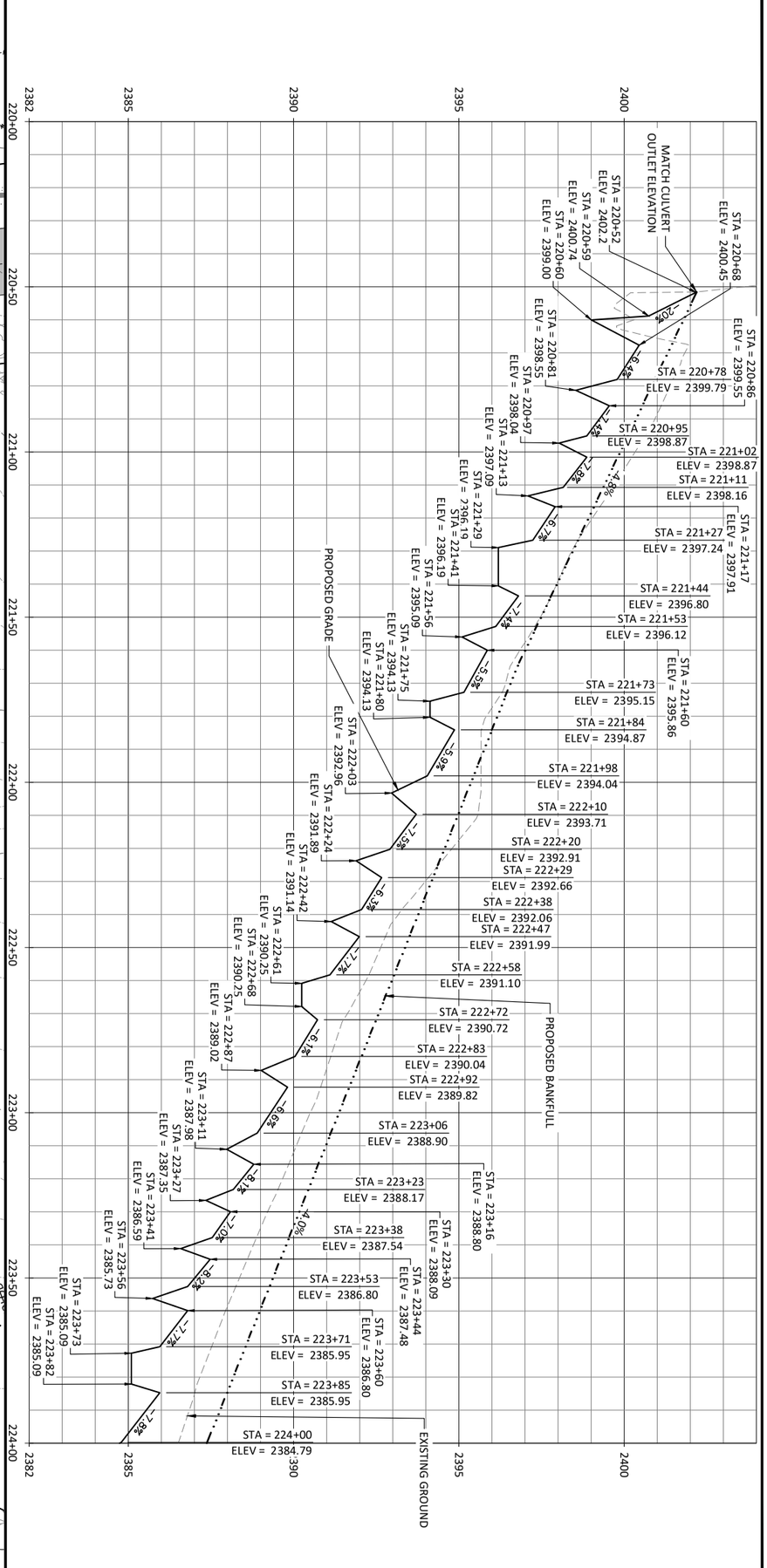

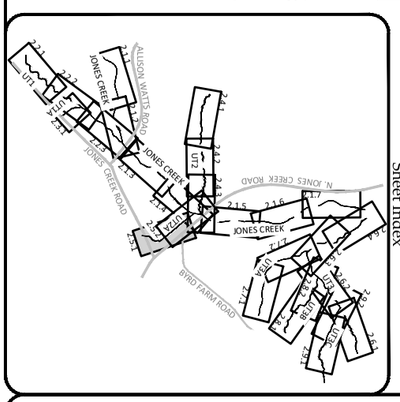

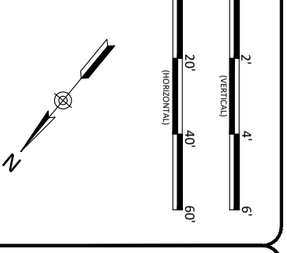

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

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Cornbread Valley Mitigation Site
Macon County, North Carolina

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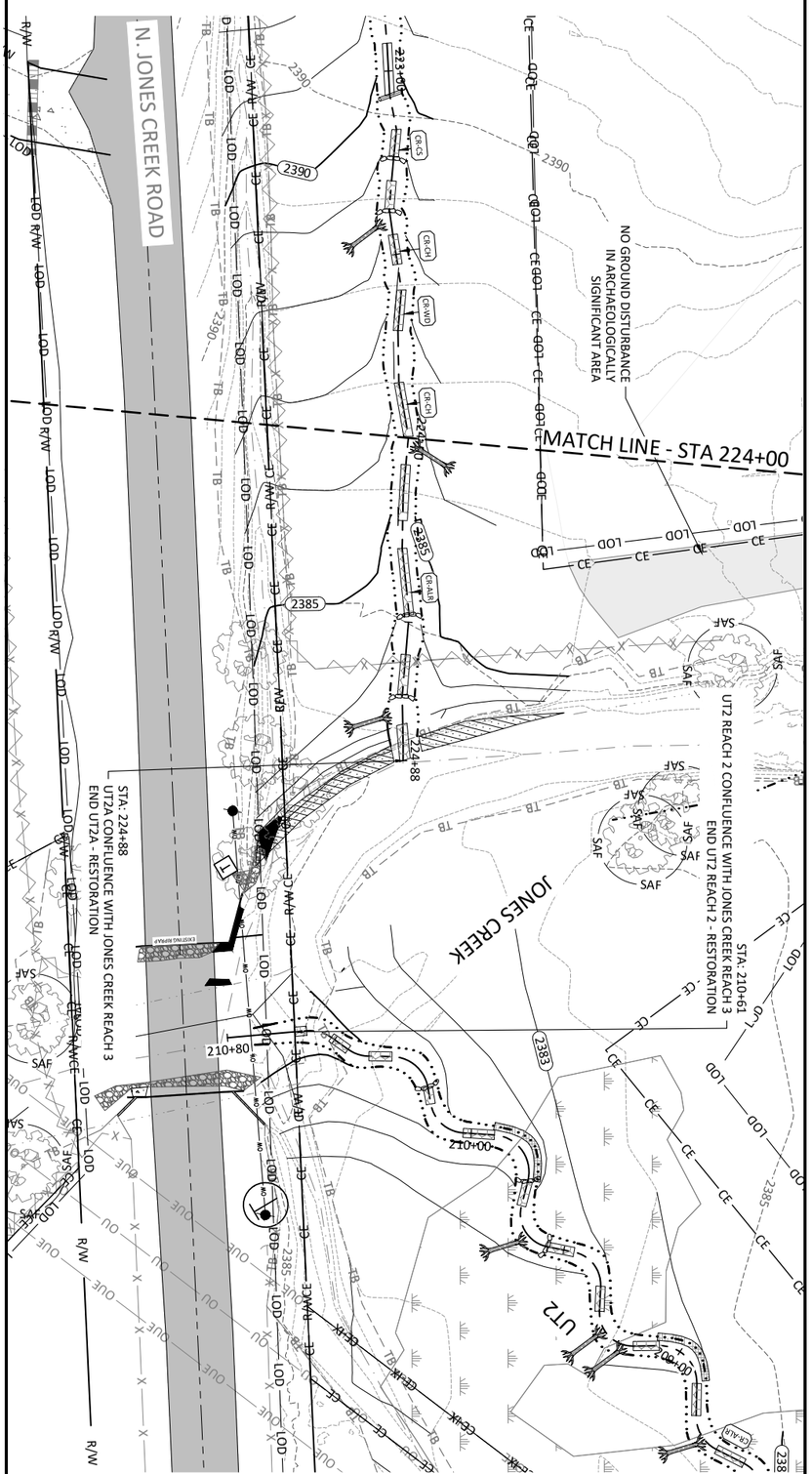

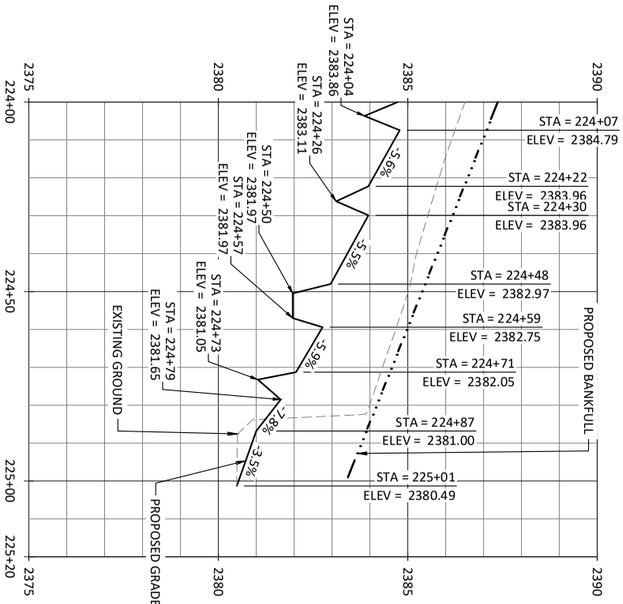

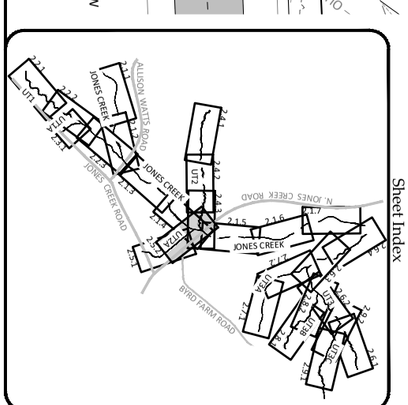

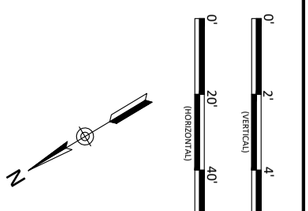

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT2A
Stream Plan and Profile

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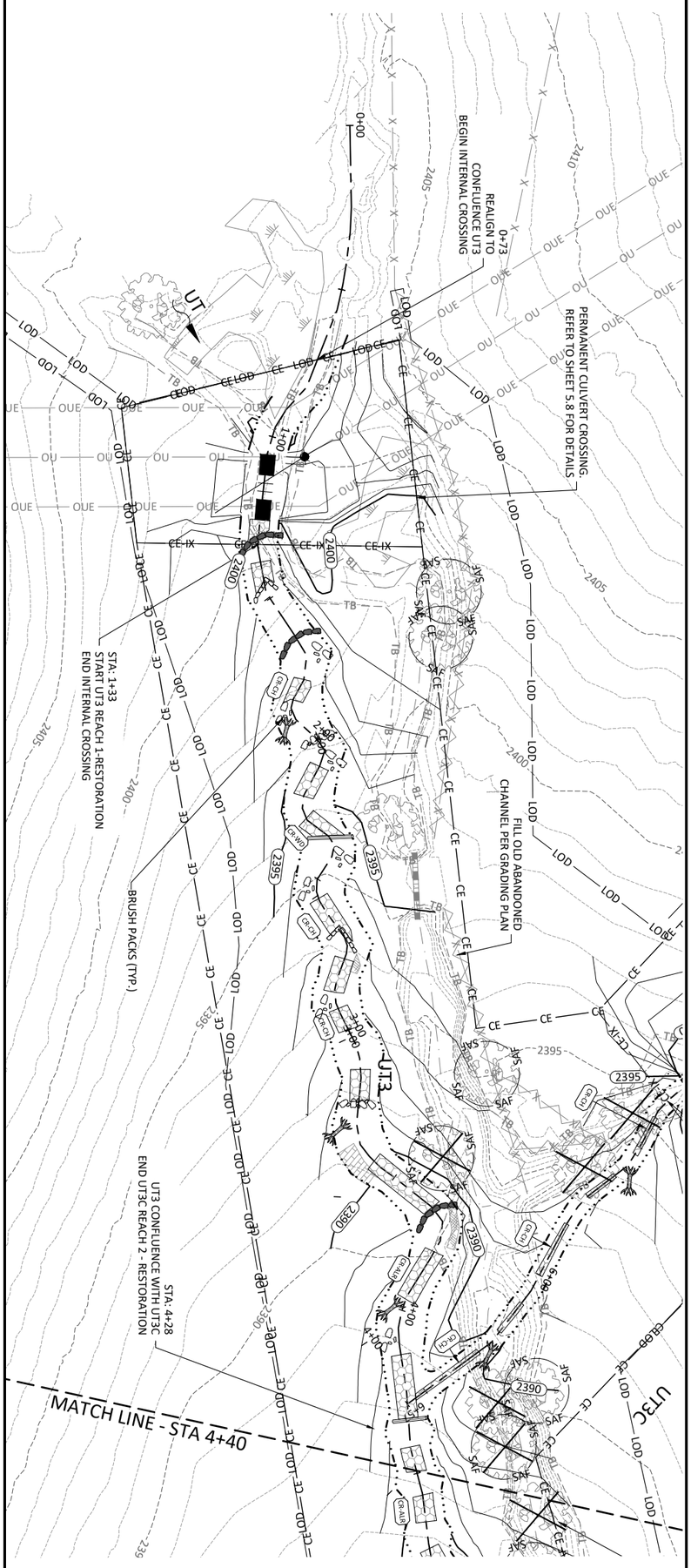

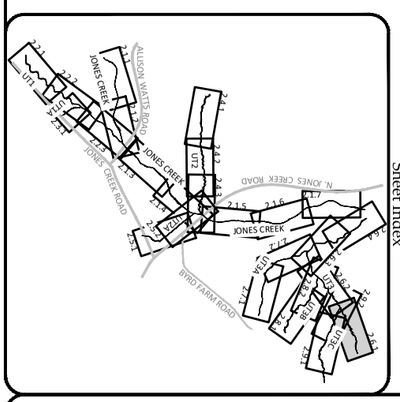

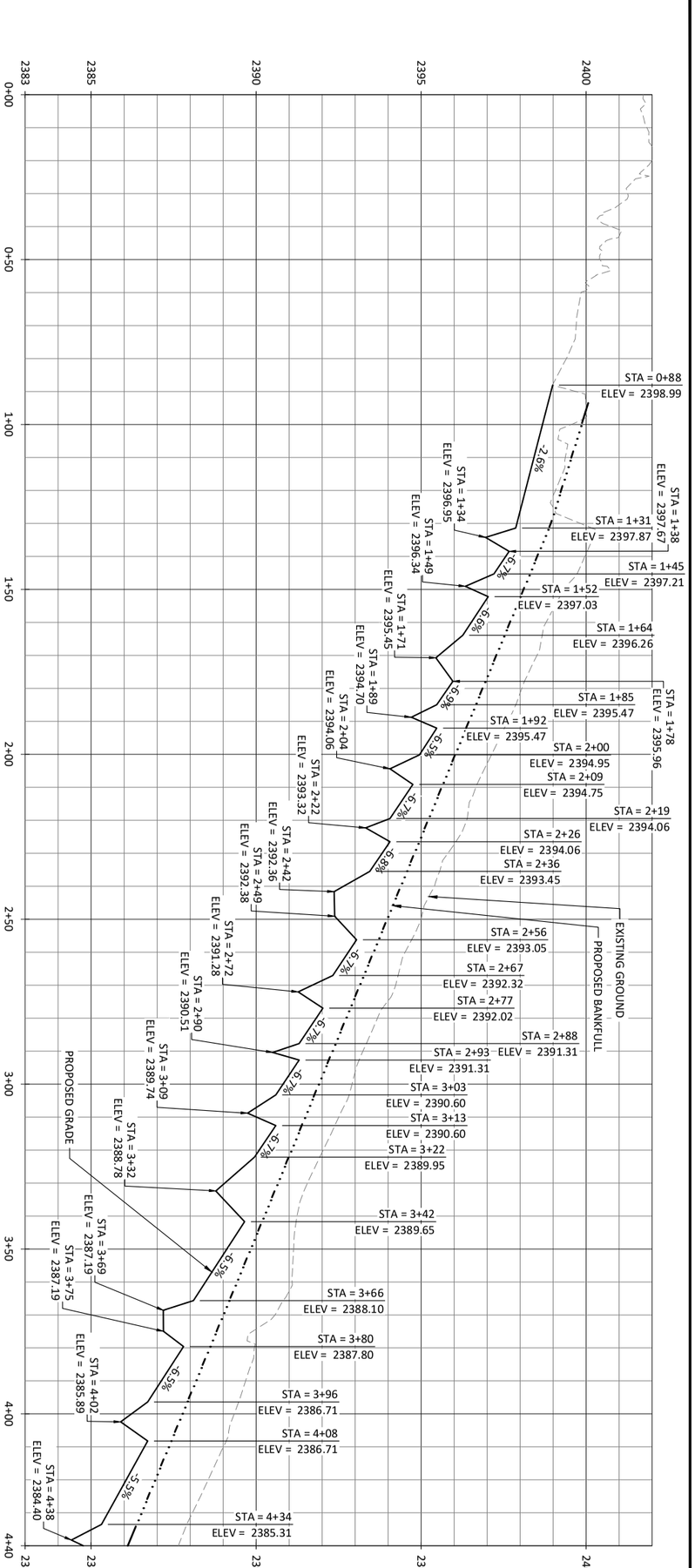

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3
Stream Plan and Profile

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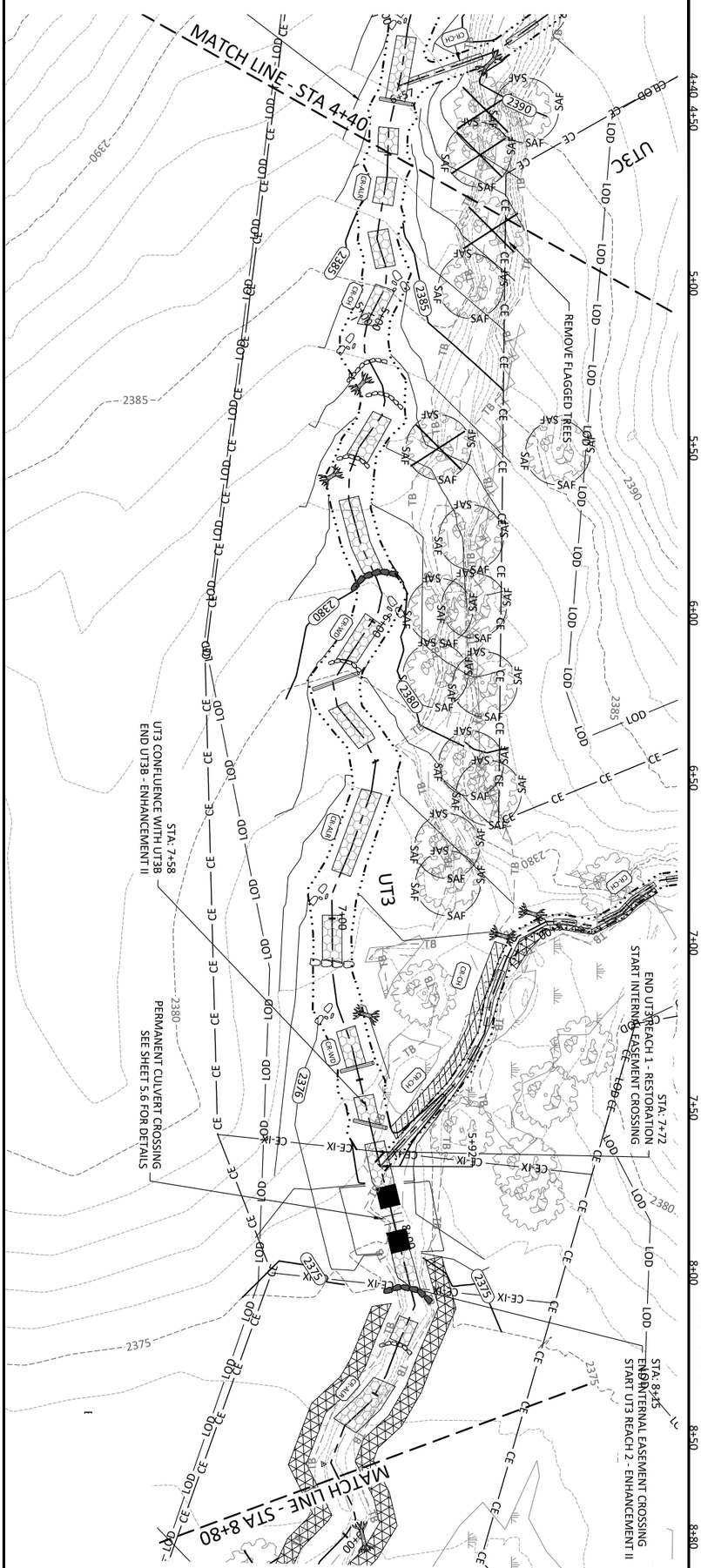

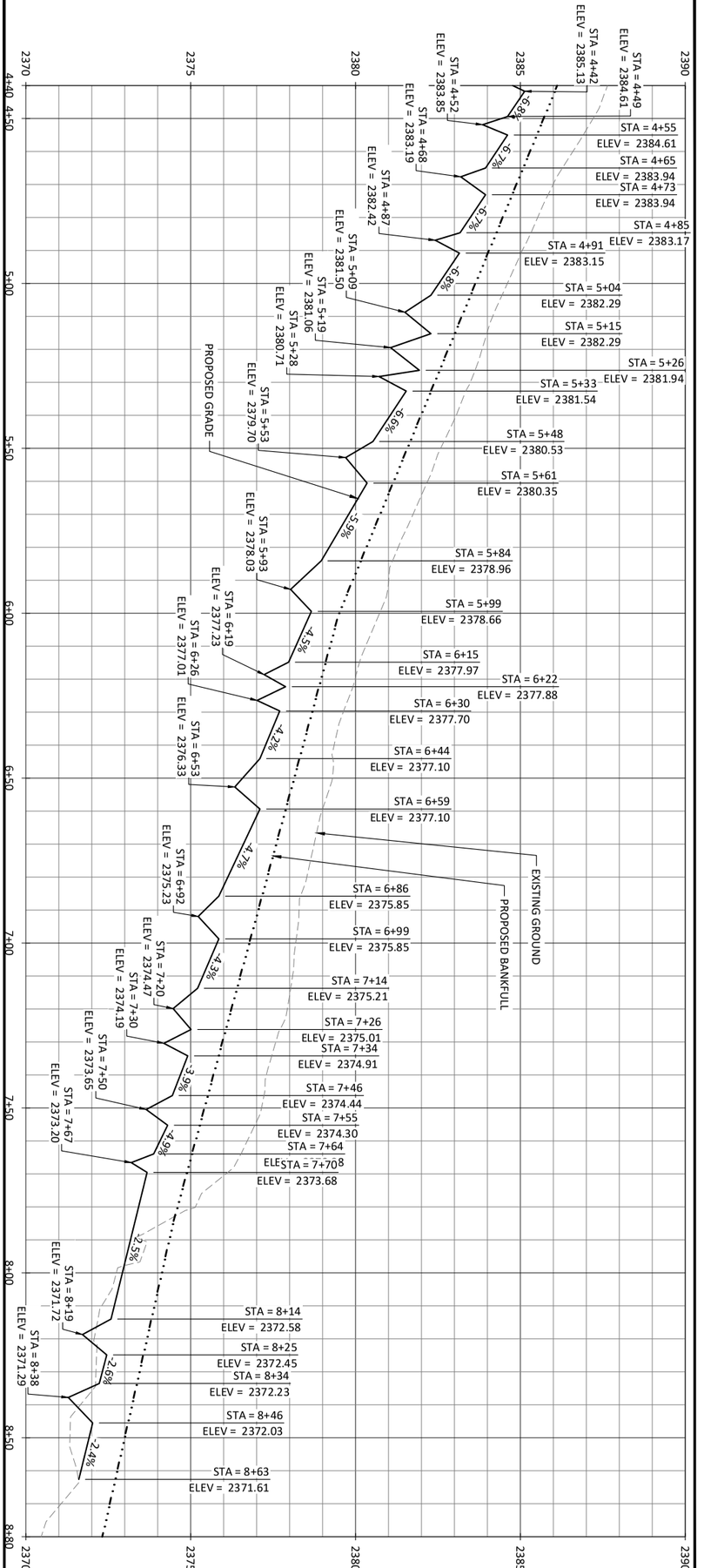

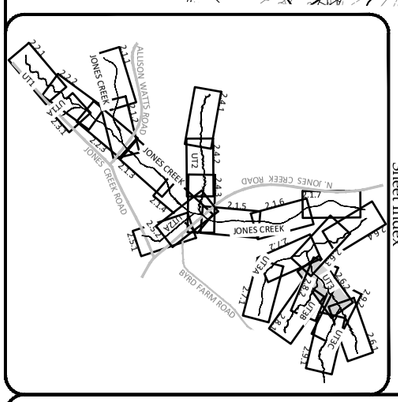

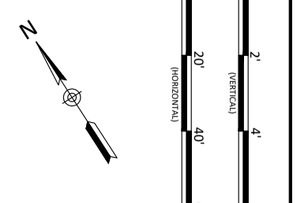

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Revisions:

2.6.2
Sheet

Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3
Stream Plan and Profile

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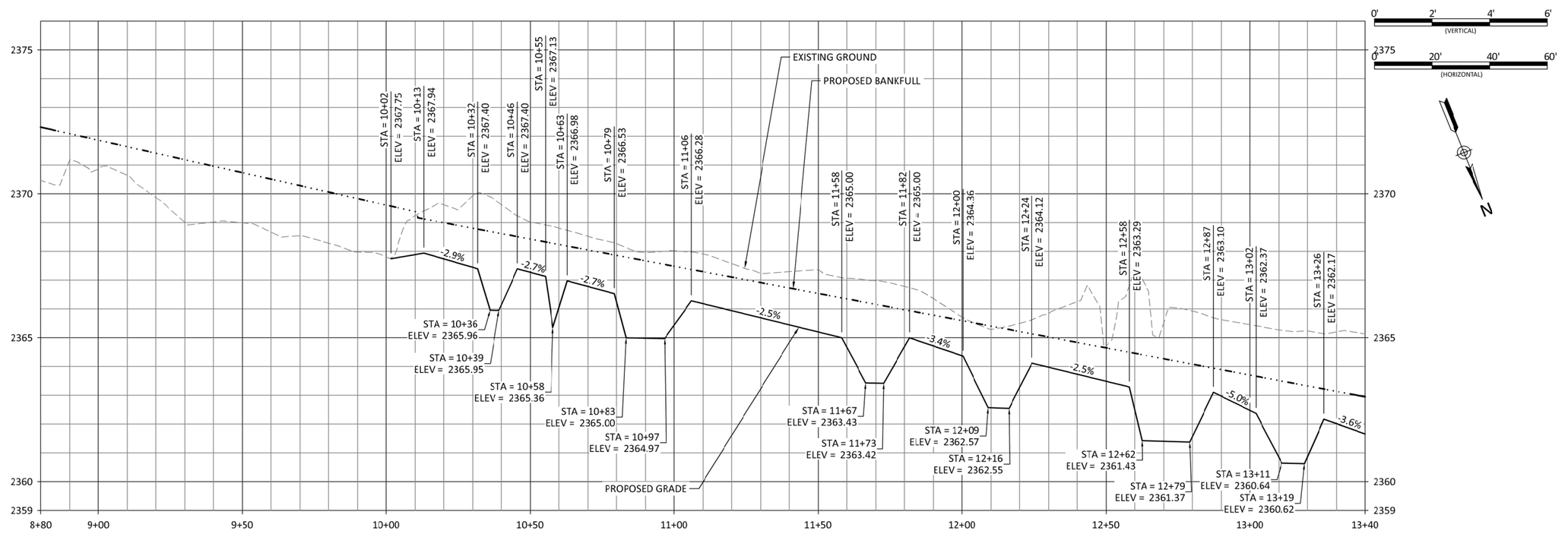

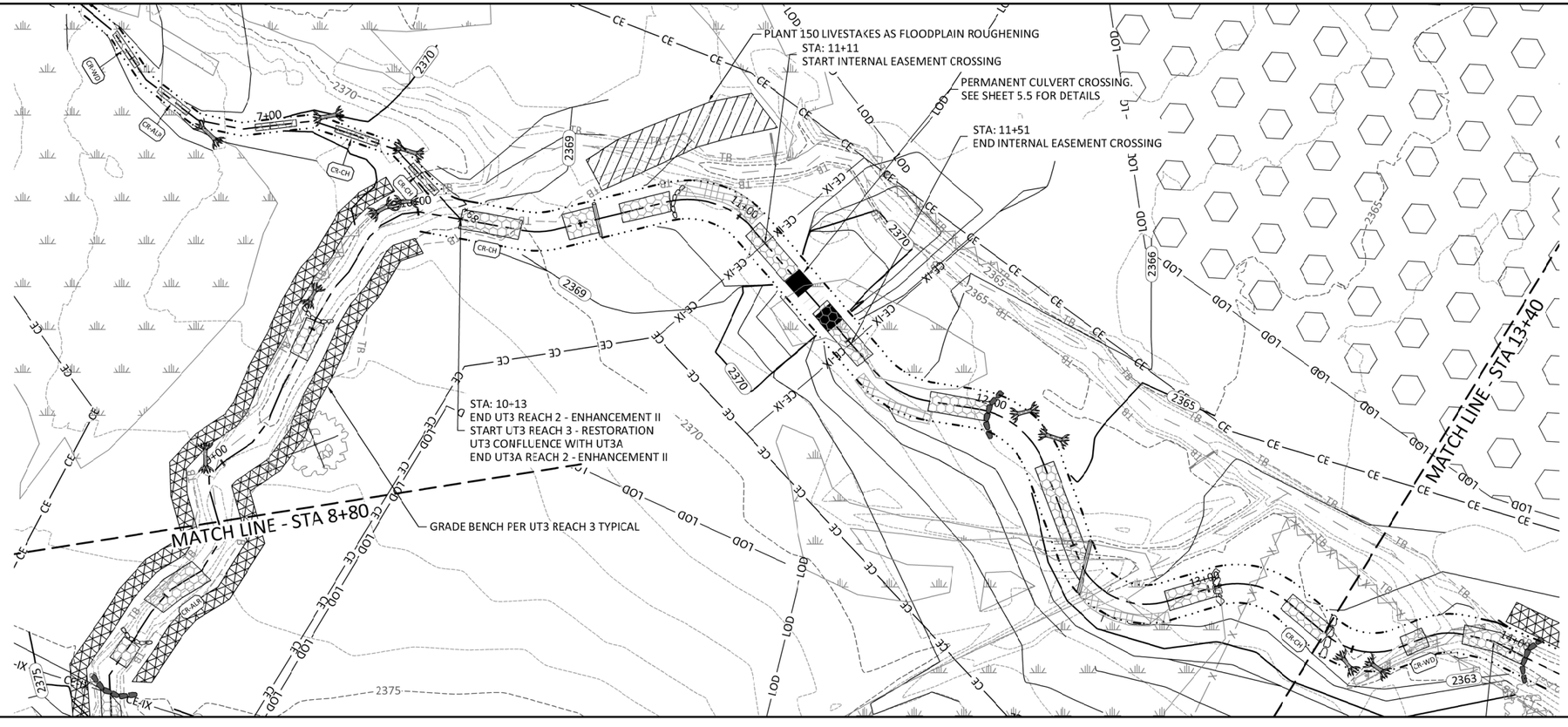



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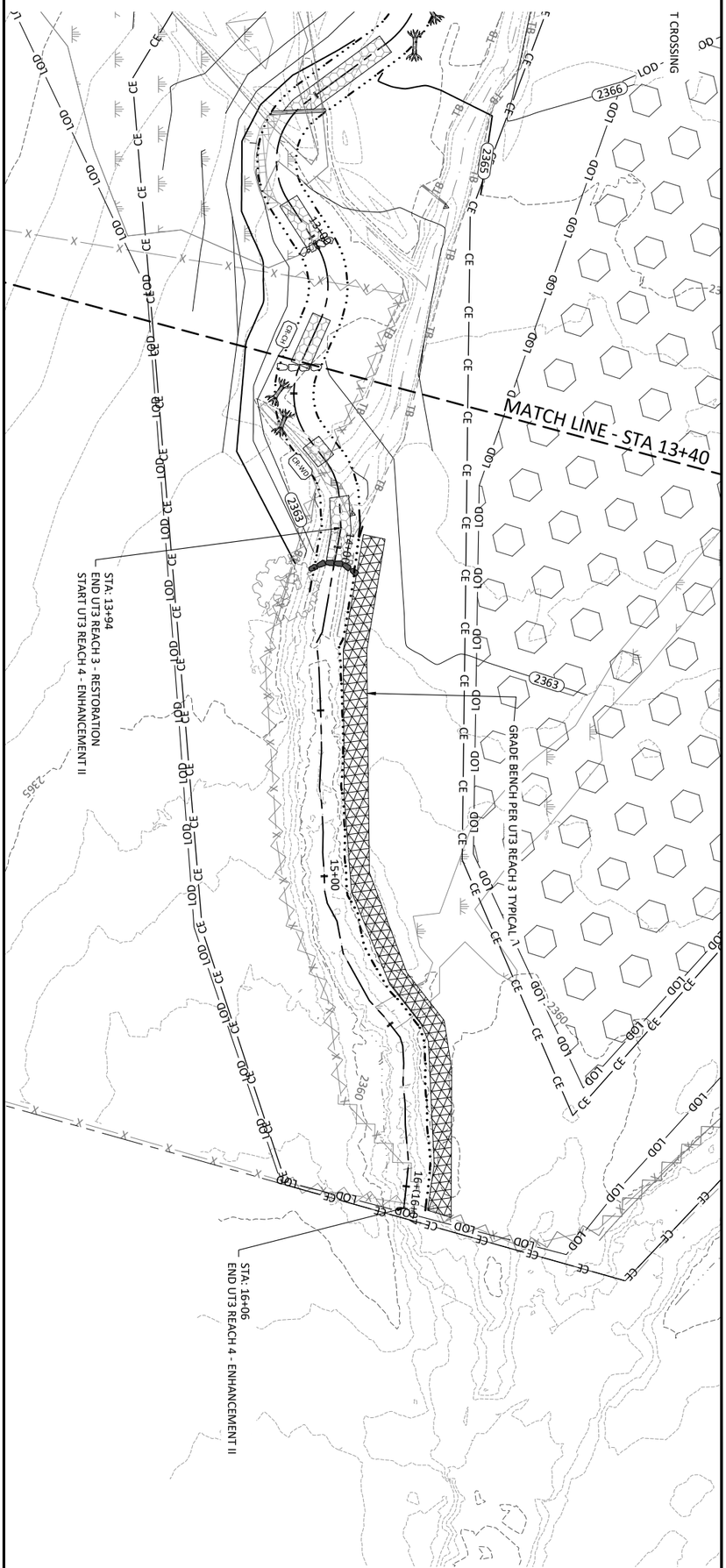
Macon County, North Carolina

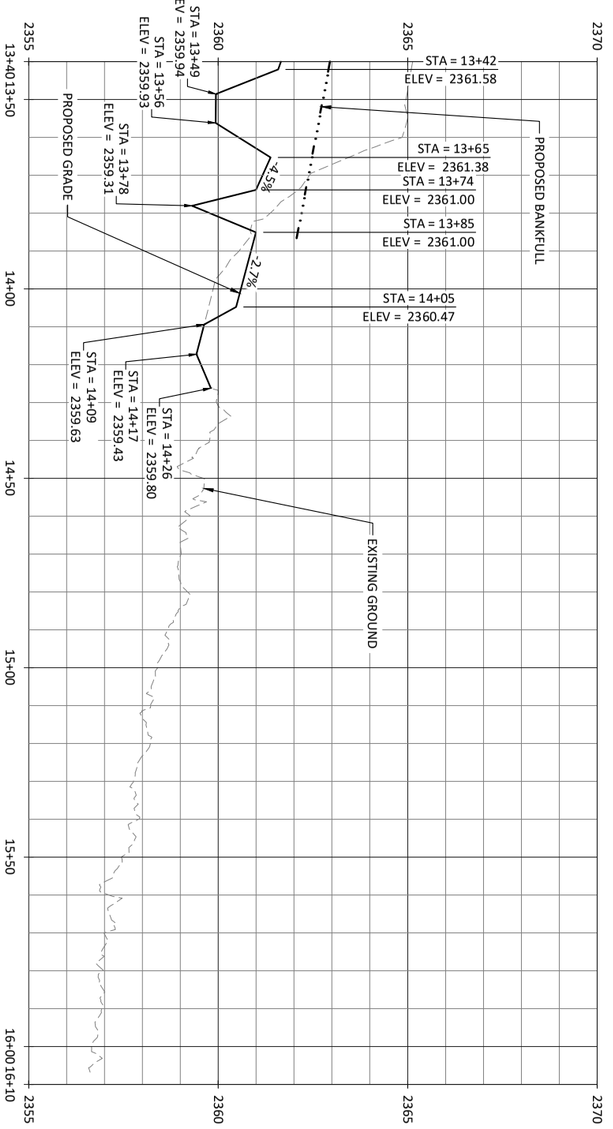
UT3
Stream Plan and Profile

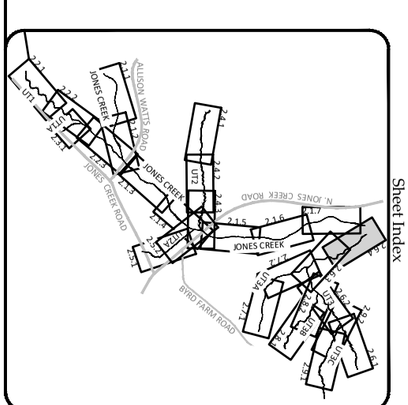
Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	IDW
Checked By:	EPN

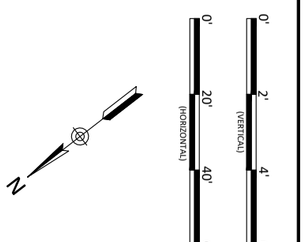
Revisions:

Sheet 2.6.3









Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3
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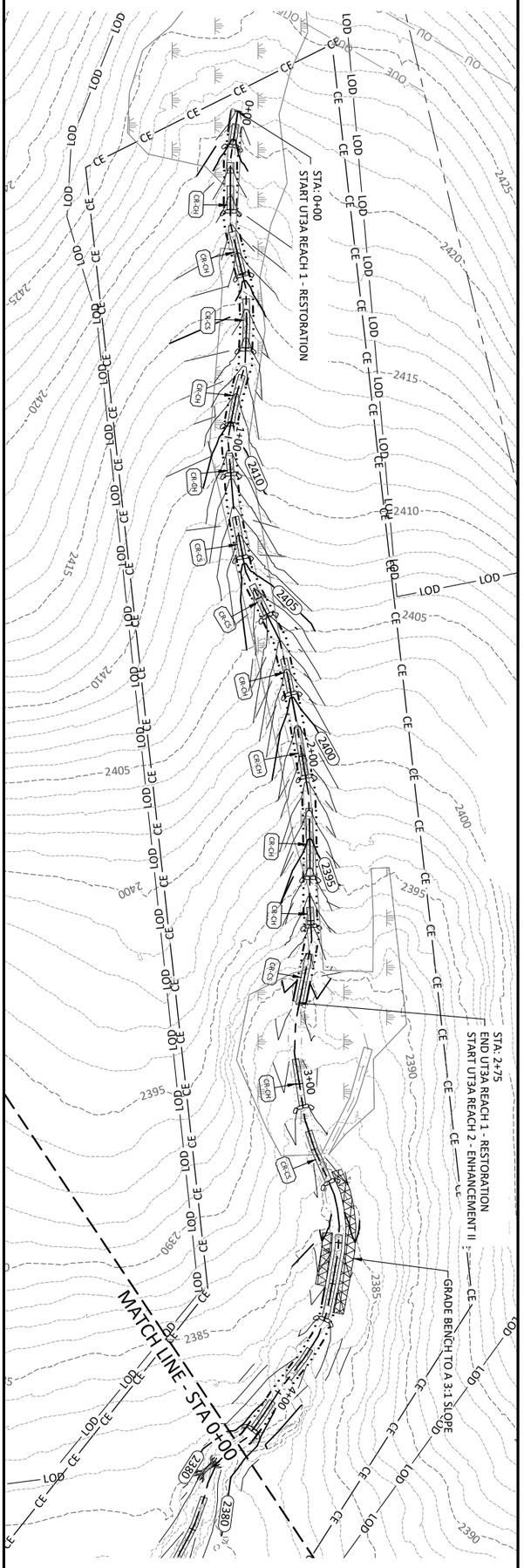

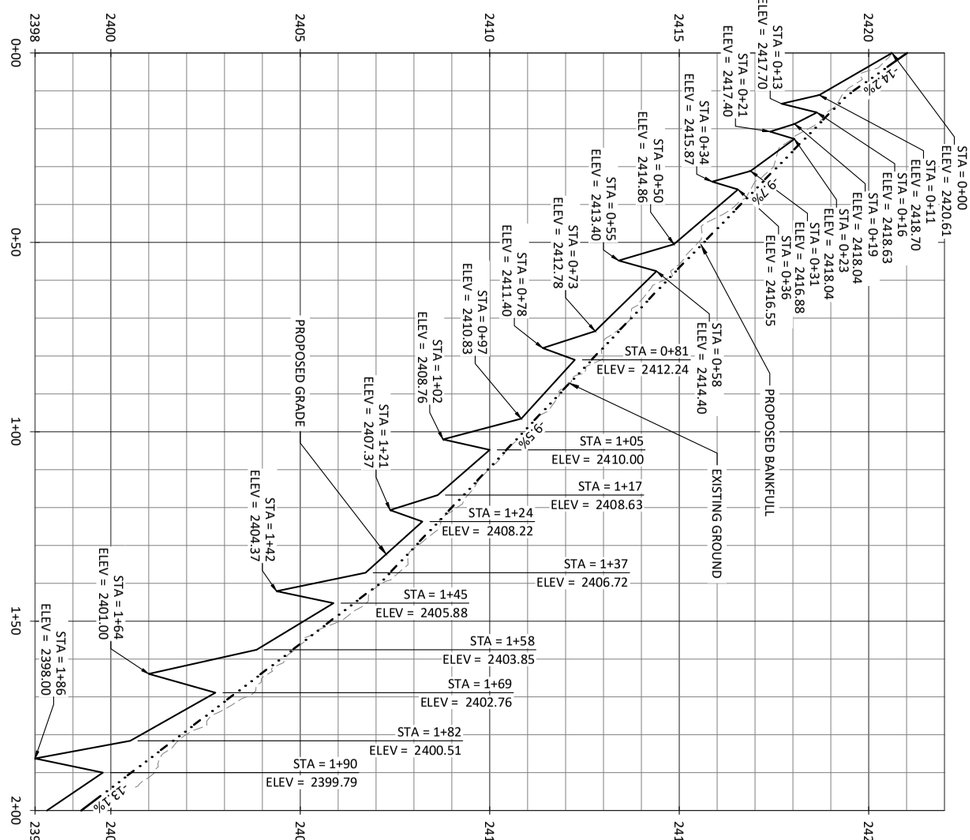

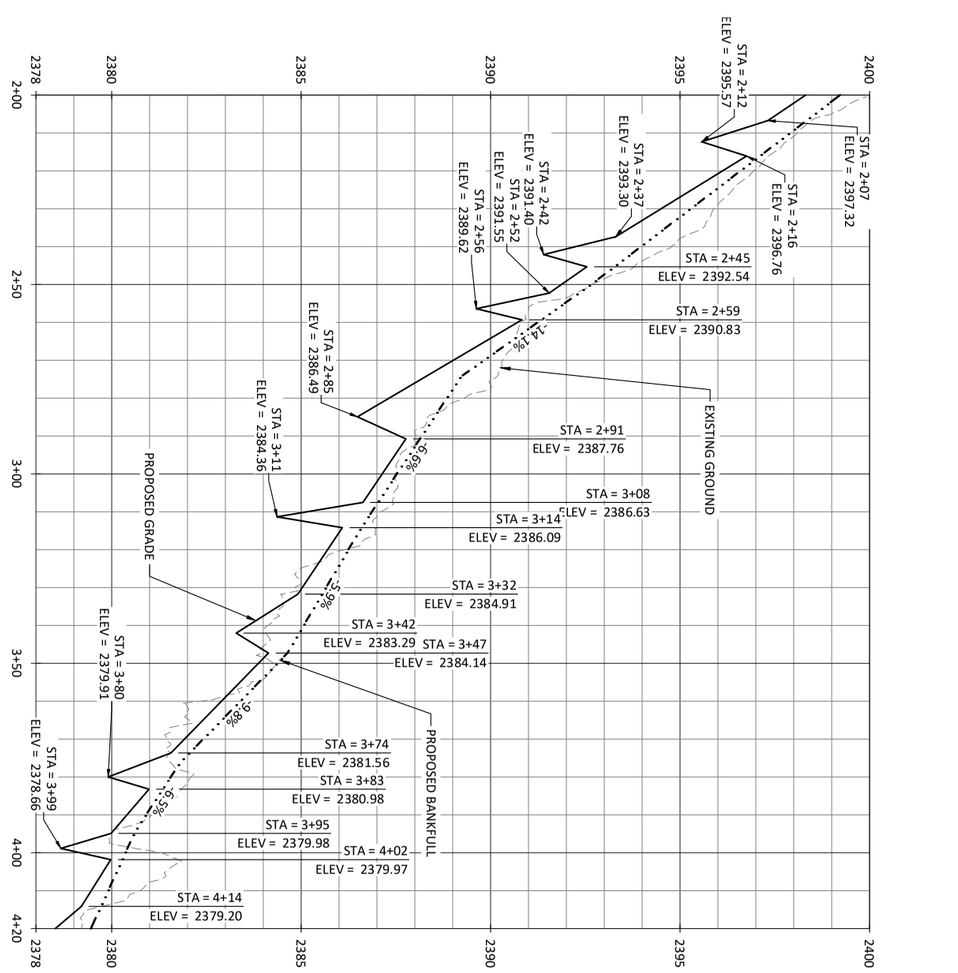

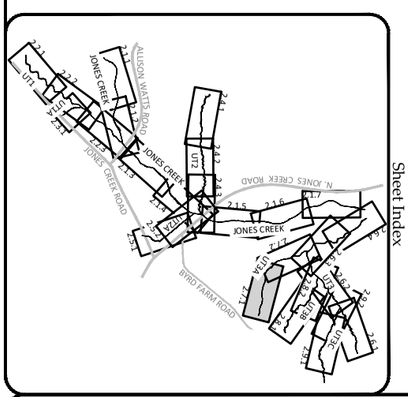

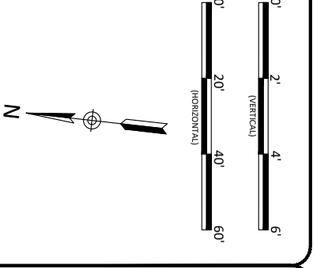

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3A
Stream Plan and Profile

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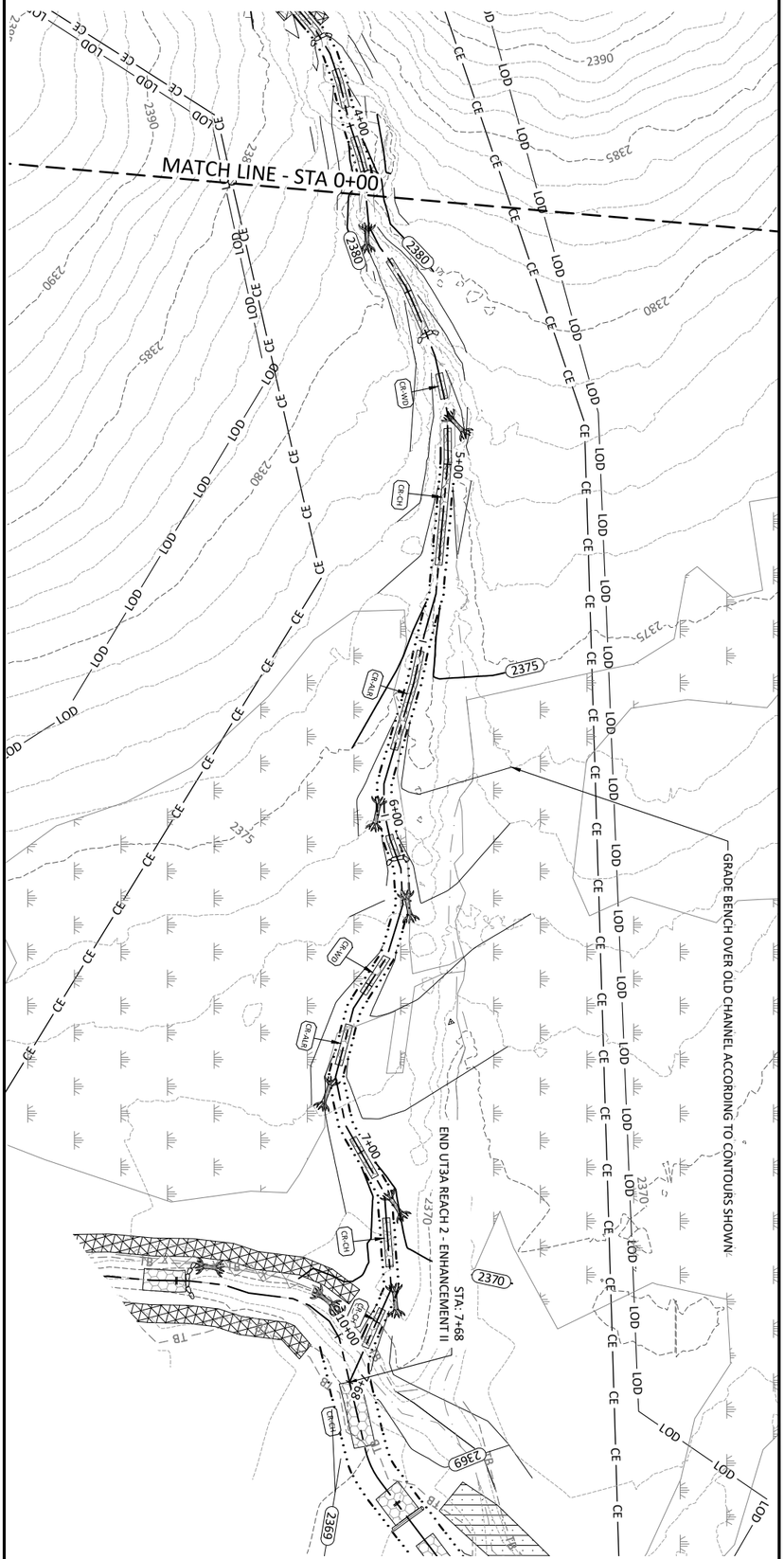

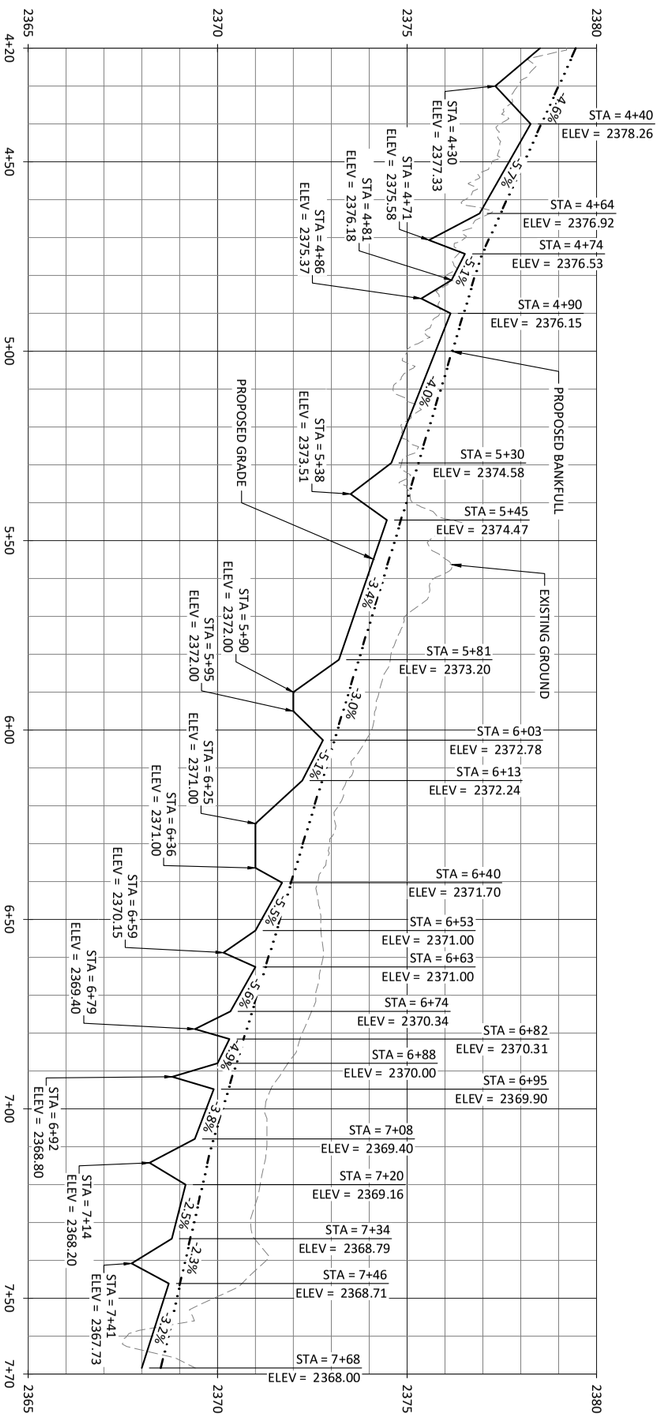

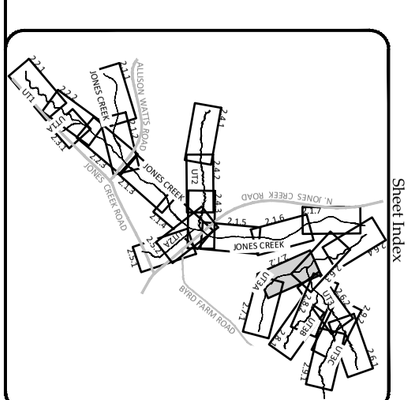

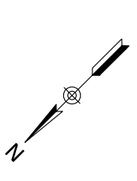

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3A
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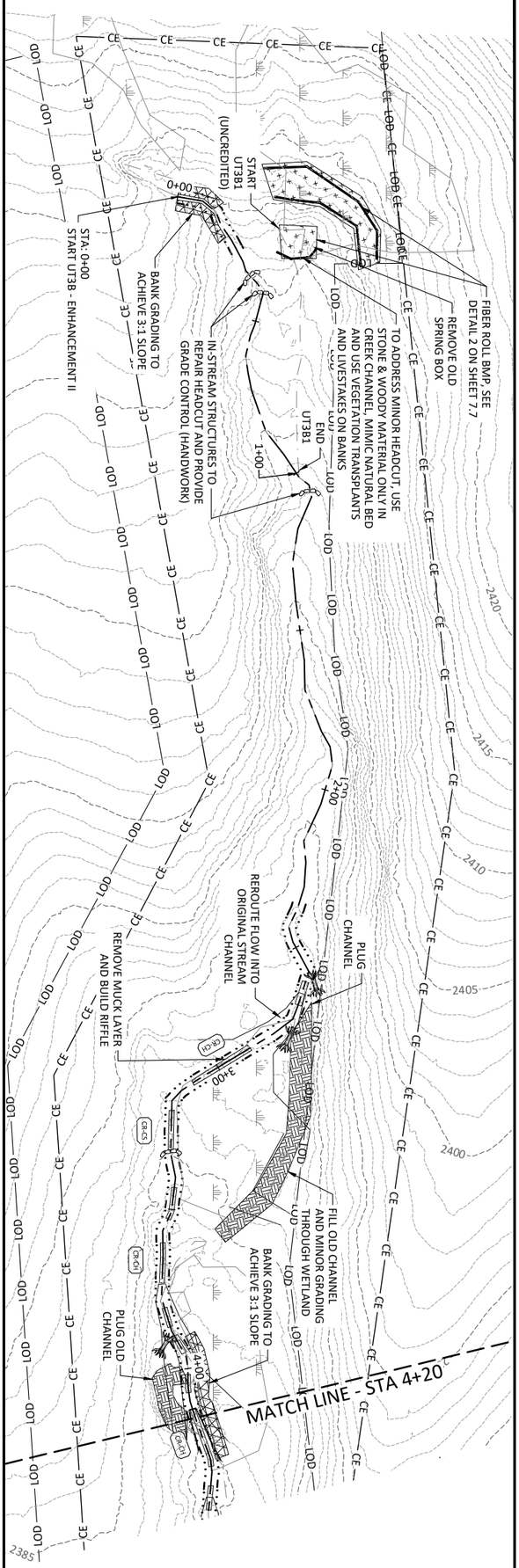

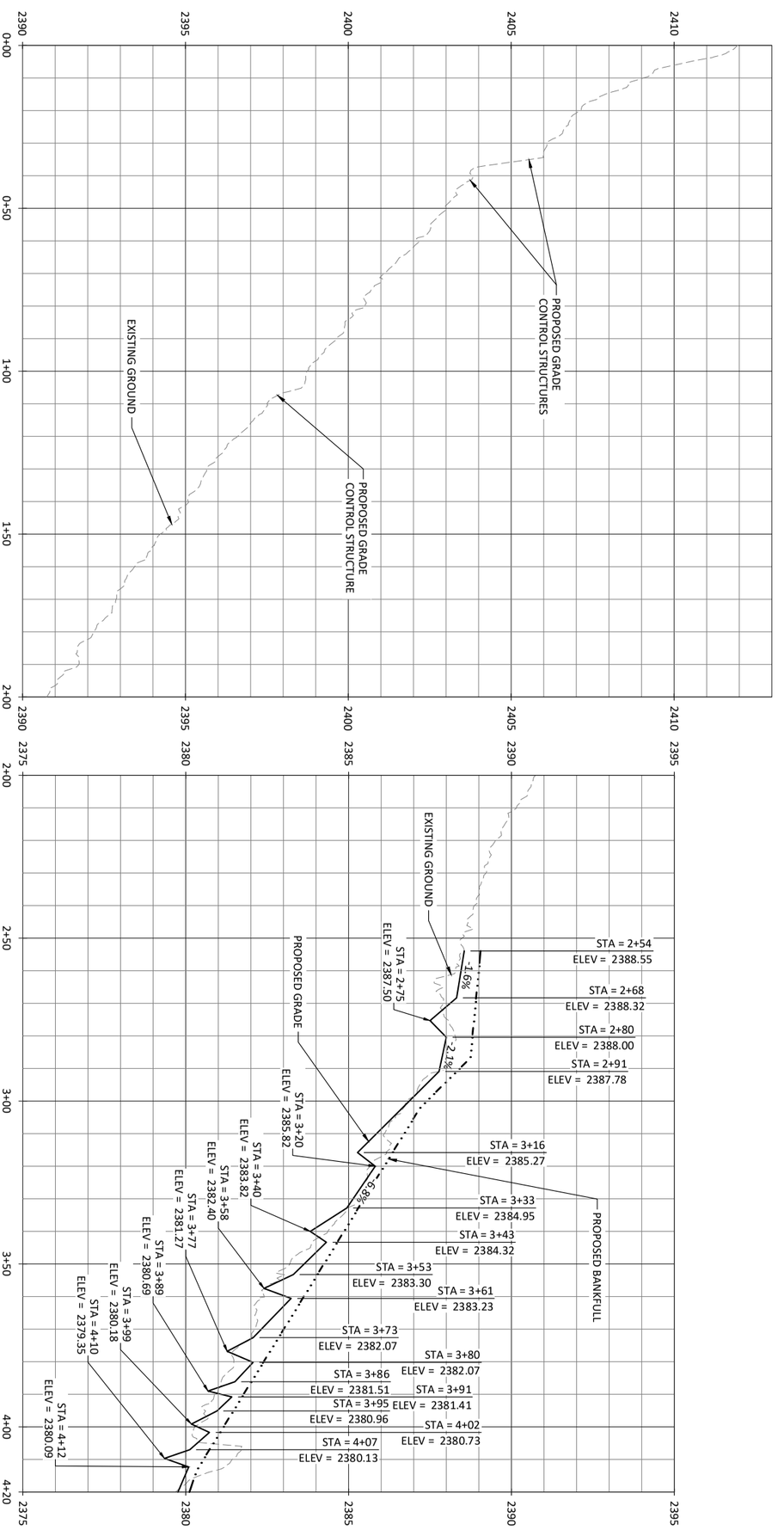

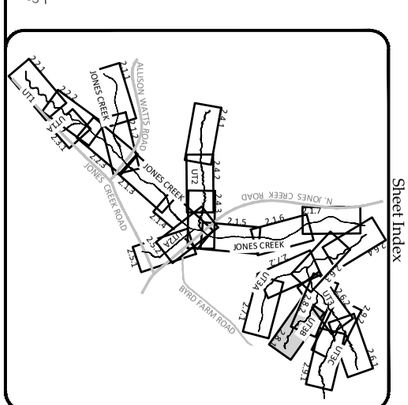

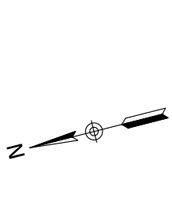

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3B
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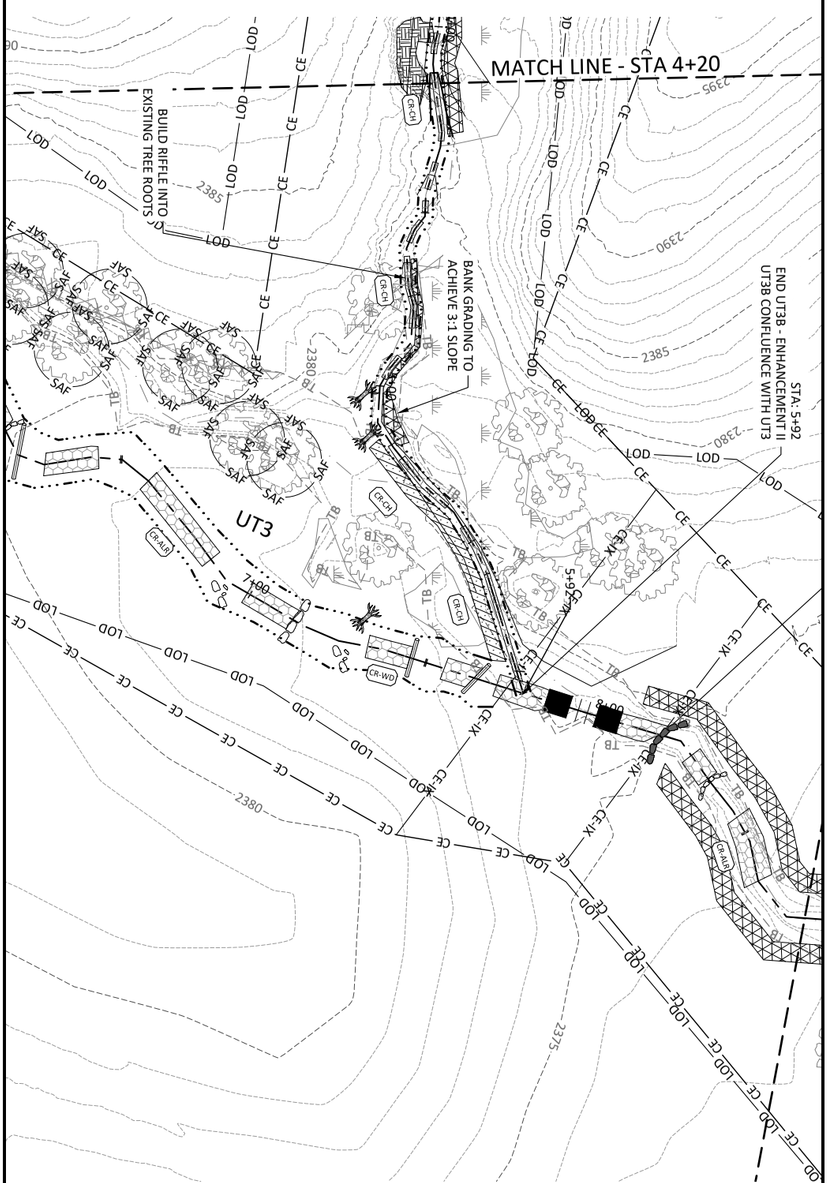

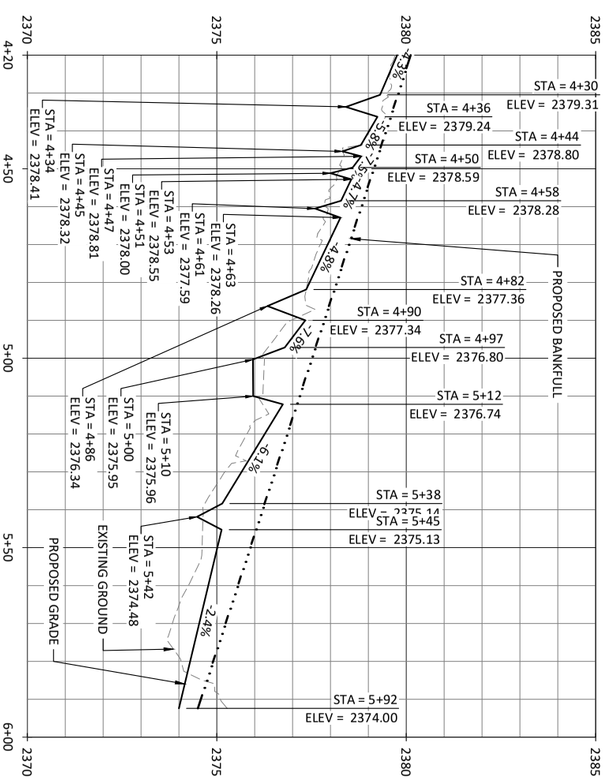

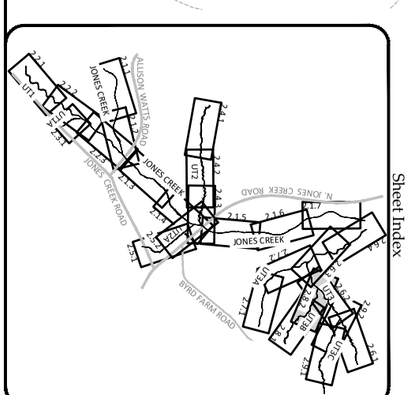

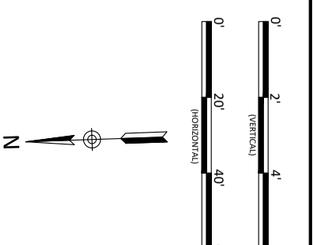

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3B
Stream Plan and Profile

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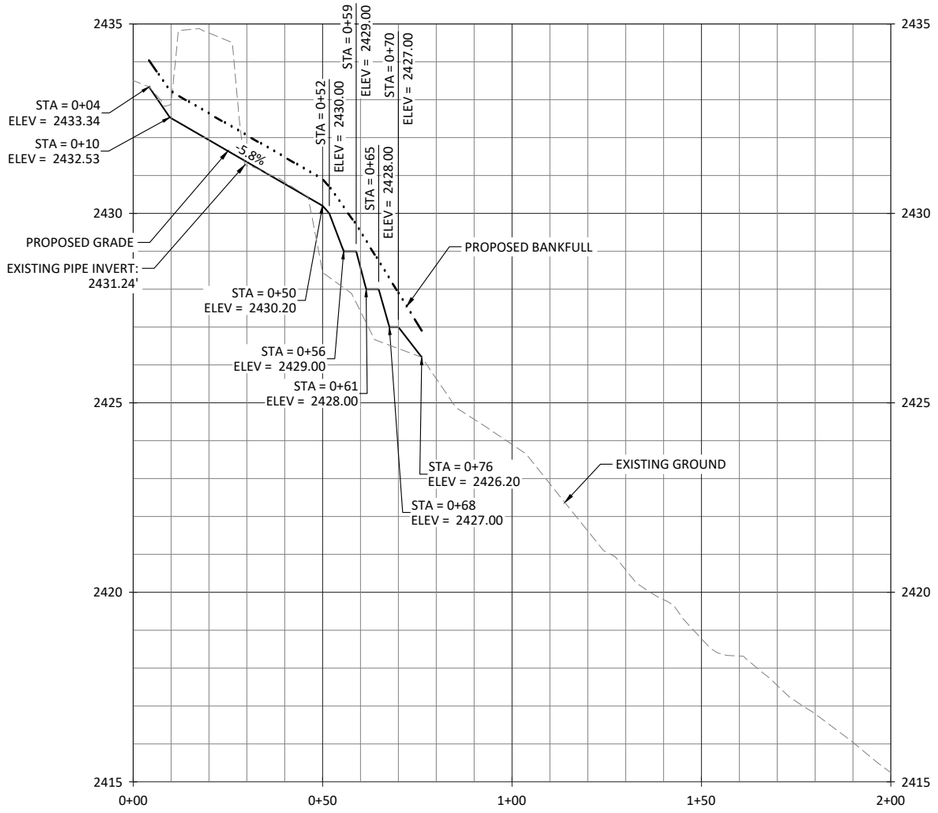

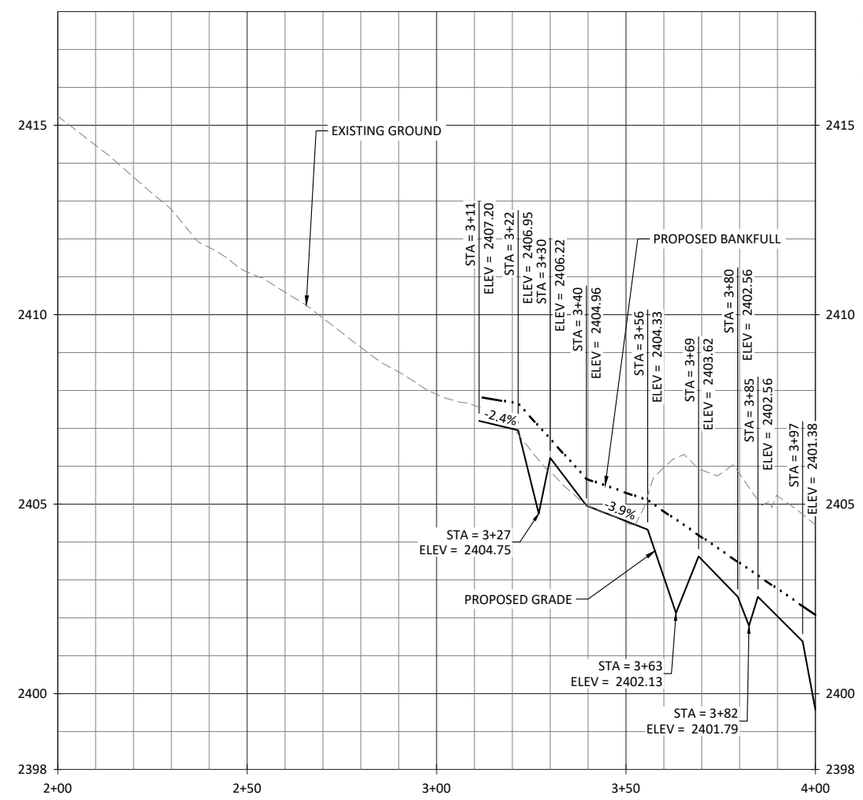

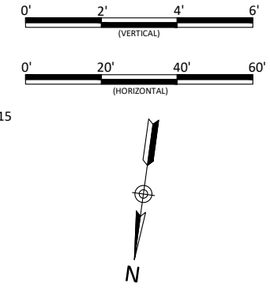

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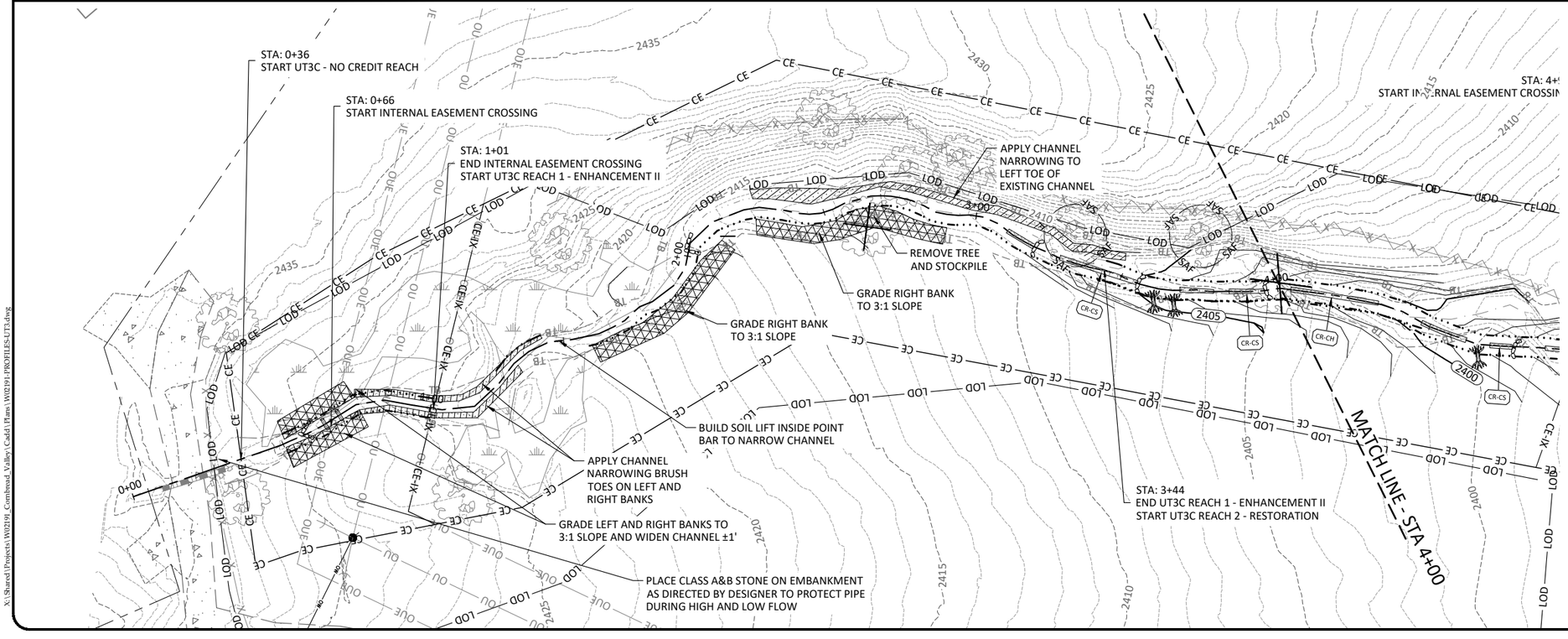
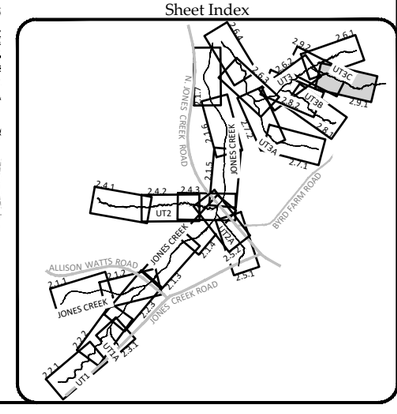
Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3C
Stream Plan and Profile





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Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	IPM
Drawn By:	IDW
Checked By:	EFN

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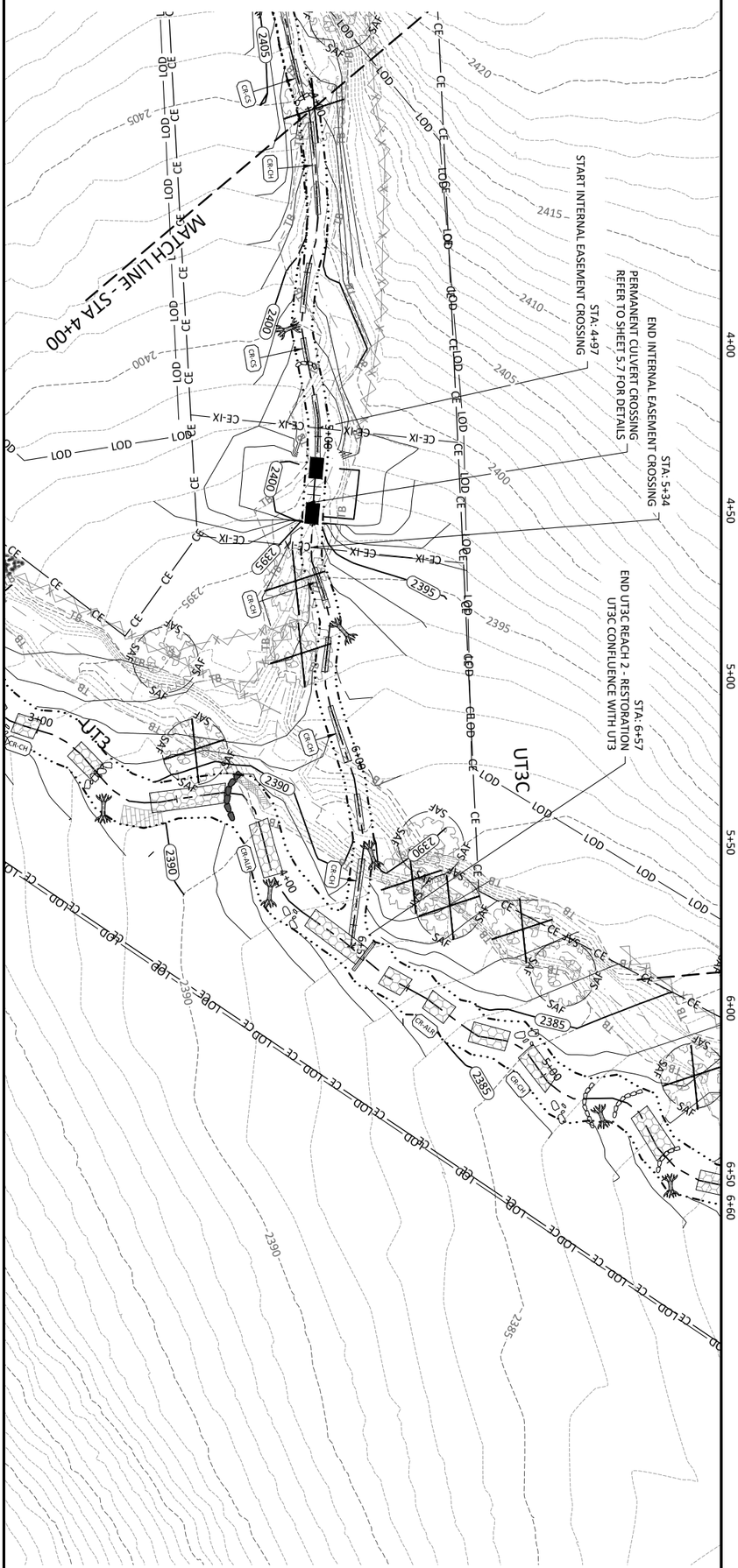

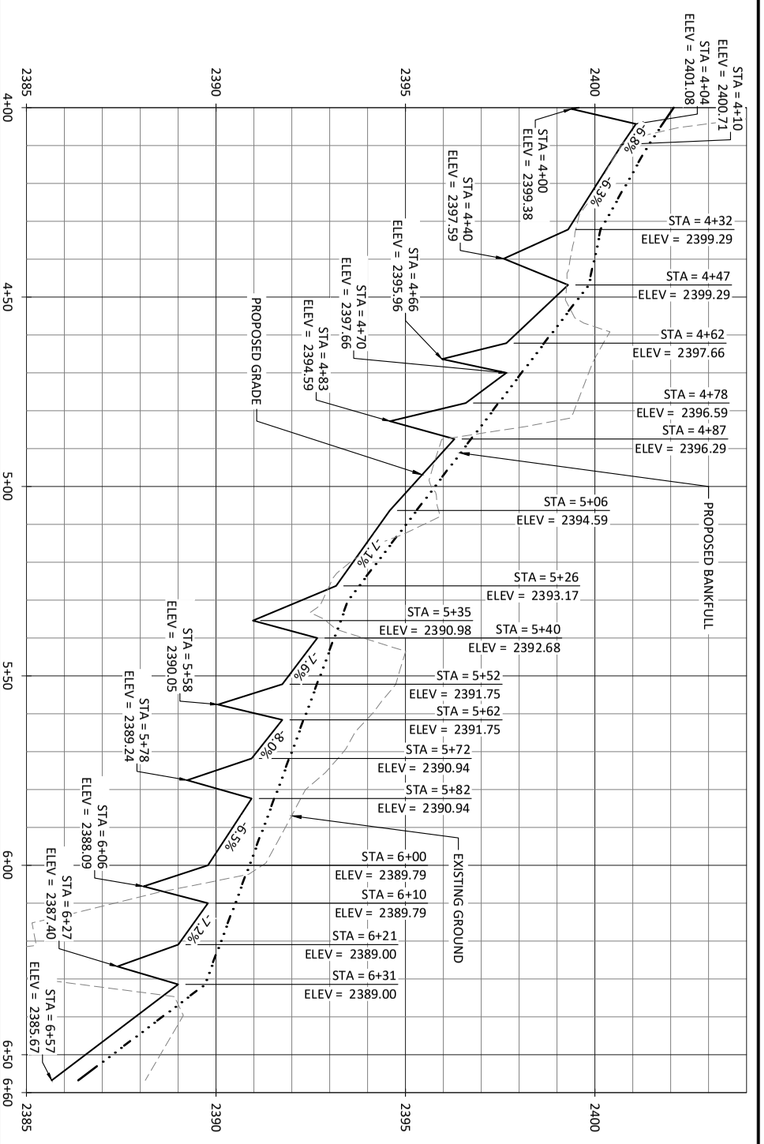

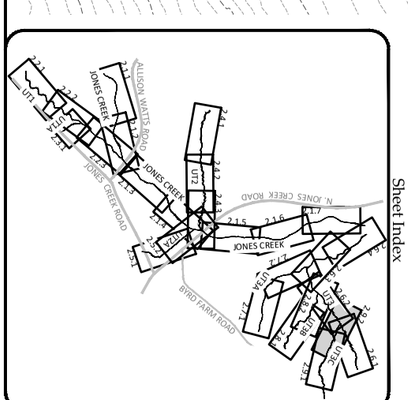

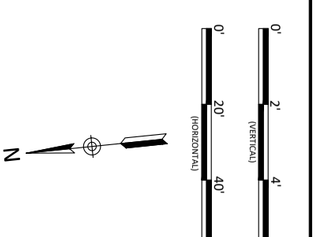

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3C
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Project Engineer:	JPM
Drawn By:	JDW
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Cornbread Valley Mitigation Site
Macon County, North Carolina

Wetland Overview

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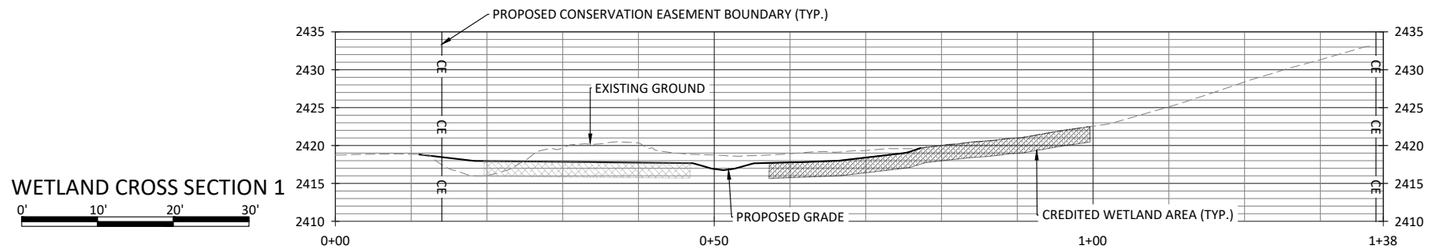

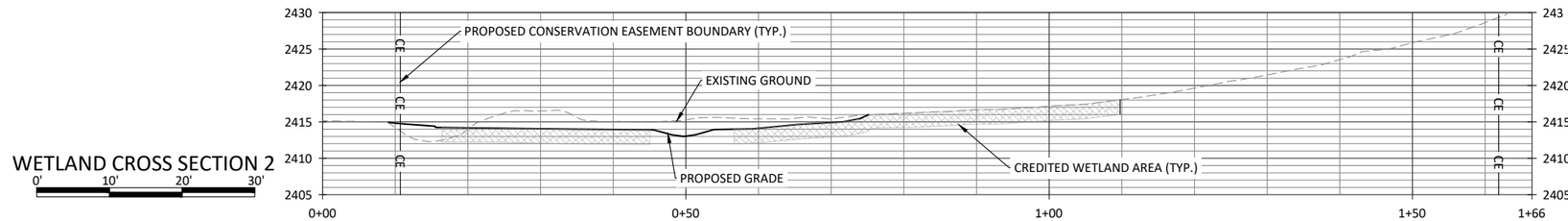

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WETLAND CREATION
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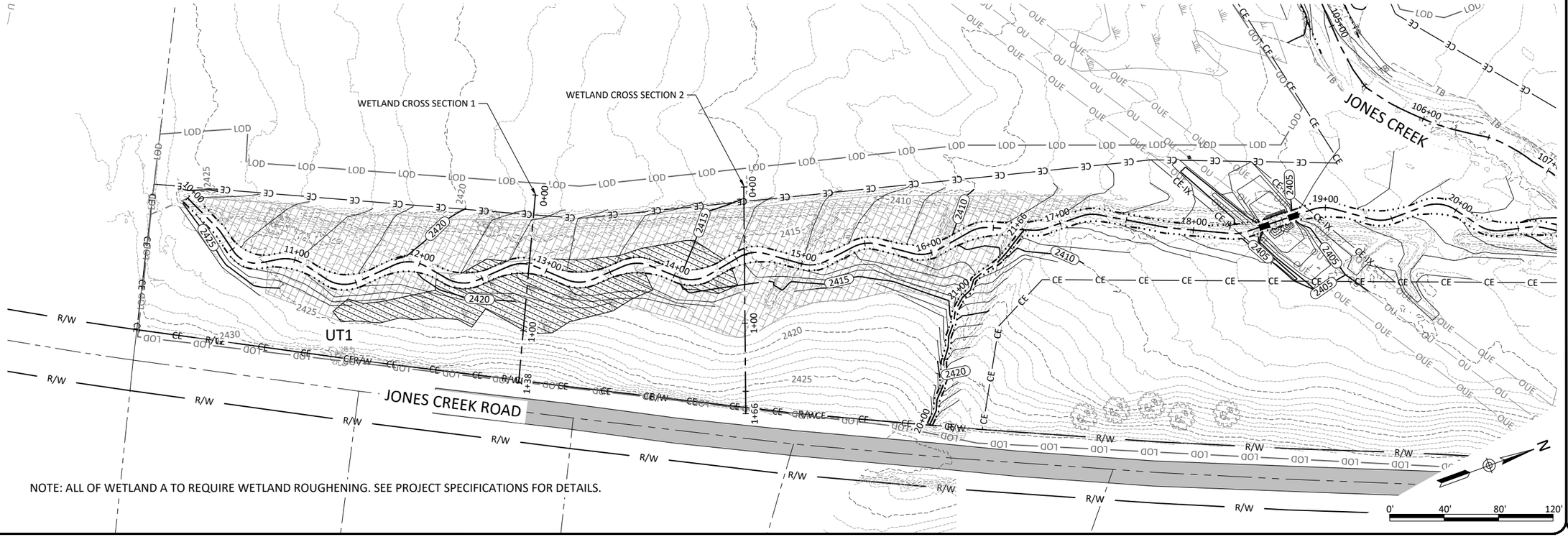

NOTE: ALL OF WETLAND A TO REQUIRE WETLAND ROUGHENING. SEE PROJECT SPECIFICATIONS FOR DETAILS.

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Cornbread Valley Mitigation Site
Macon County, North Carolina

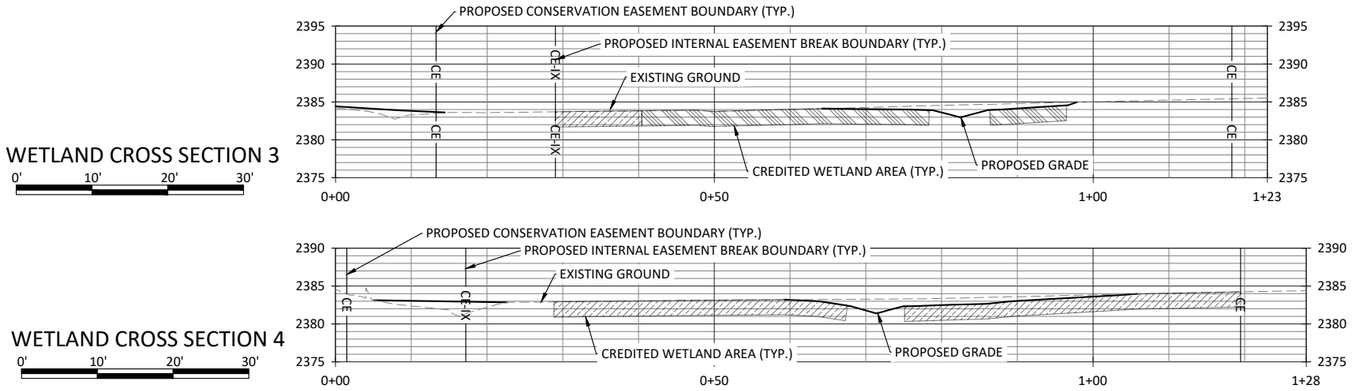
Wetland A
Wetland

Revisions:

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 3.2

December 22, 2023



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WETLAND RE-ESTABLISHMENT
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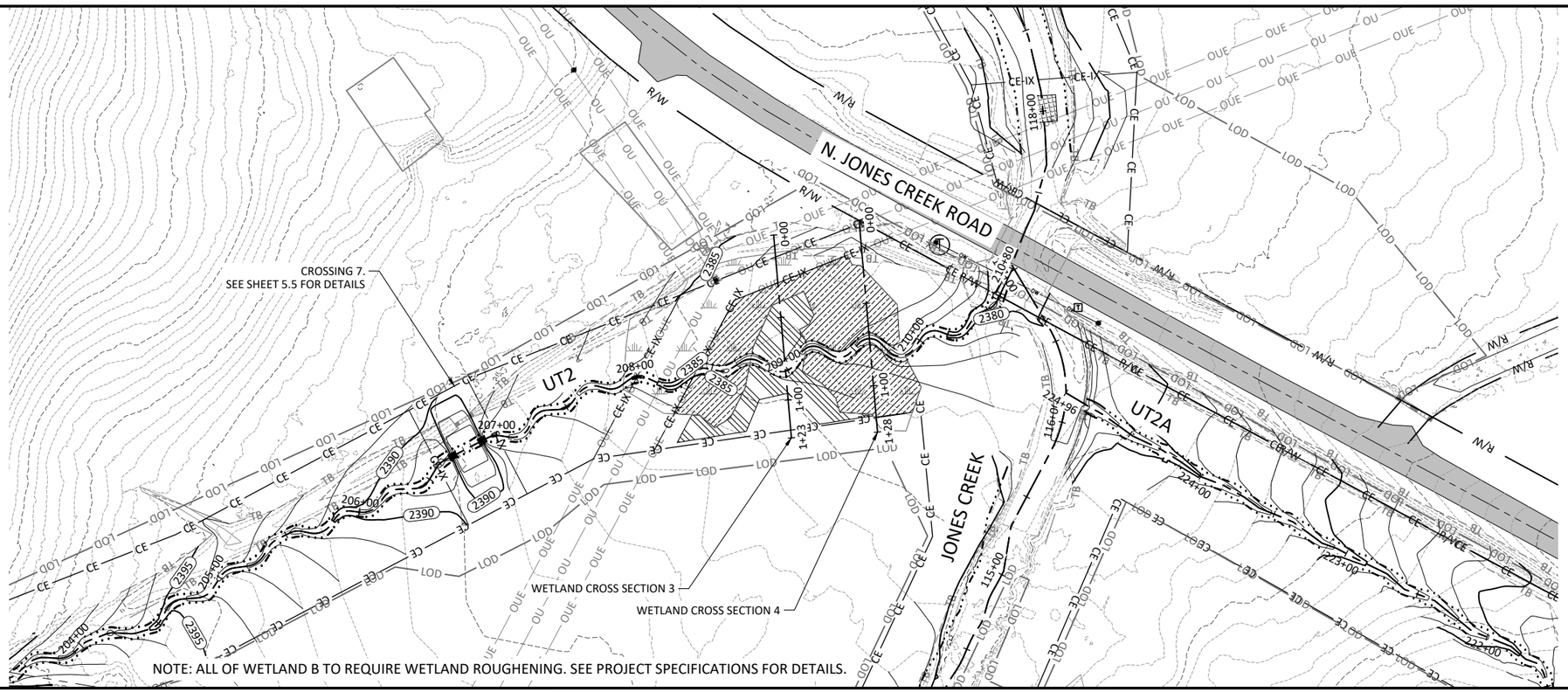

NOTE: ALL OF WETLAND B TO REQUIRE WETLAND ROUGHENING. SEE PROJECT SPECIFICATIONS FOR DETAILS.

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Cornbread Valley Mitigation Site
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Wetland B
Wetland

Revisions:

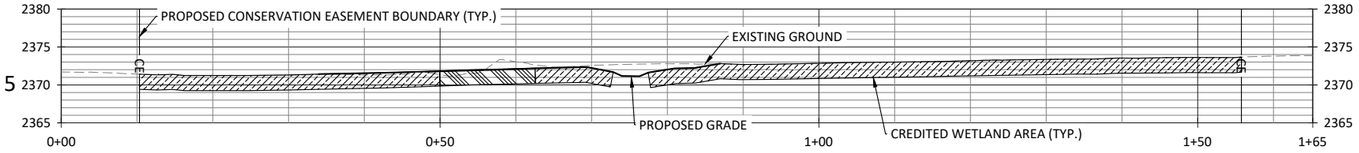
Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 3.3

December 22, 2023

WETLAND CROSS SECTION 5

0' 10' 20' 30'



WETLAND CROSS SECTION 6

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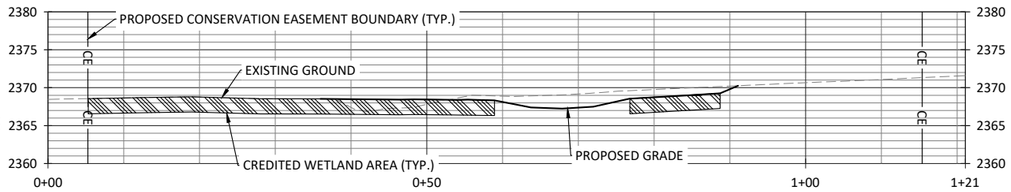
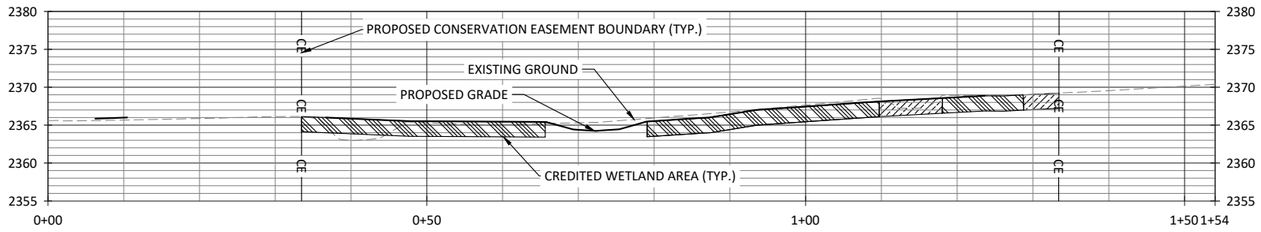


WETLAND CROSS SECTION 7

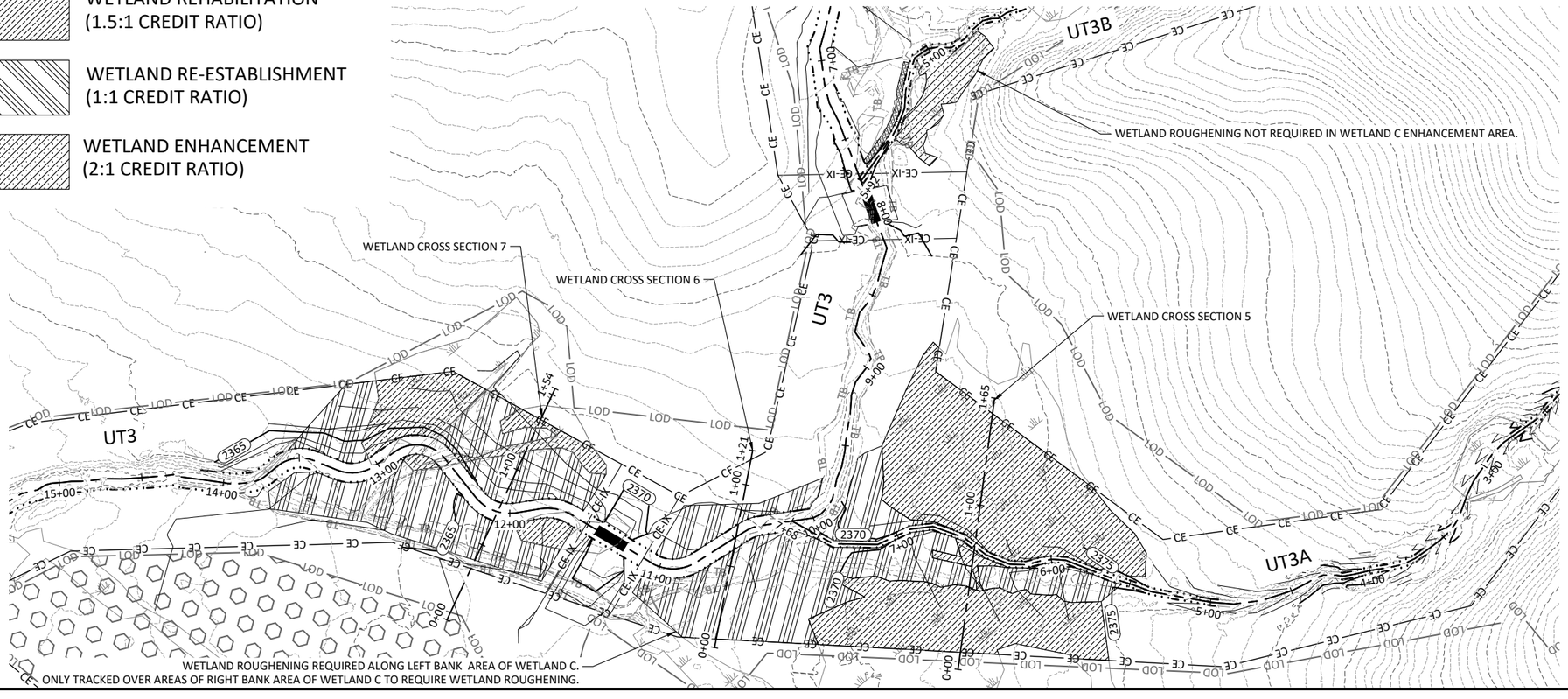
0' 10' 20' 30'



WETLAND REHABILITATION
(1.5:1 CREDIT RATIO)

WETLAND RE-ESTABLISHMENT
(1:1 CREDIT RATIO)

WETLAND ENHANCEMENT
(2:1 CREDIT RATIO)



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Cornbread Valley Mitigation Site
Macon County, North Carolina

Wetland C
Wetland

Revisions:

Date:	12.21.2022
Job Number:	WI2191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 3.4



Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
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Revisions:

4.0
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Cornbread Valley Mitigation Site
Macon County, North Carolina

Planting and Farm Plan Overview

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Asheville, NC 28806
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December 22, 2022

Streambank Planting Zone 1

Live Stakes

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Physocarpus opulifolius	Ninebark	3-6 ft.*	0.5"-1.5"	Subcanopy	FACW	10%
Sambucus canadensis	Common Elderberry	3-6 ft.*	0.5"-1.5"	Shrub	FAC	10%
Salix sericea	Silky Willow	3-6 ft.*	0.5"-1.5"	Shrub	OBL	25%
Salix nigra	Black Willow	3-6 ft.*	0.5"-1.5"	Subcanopy	OBL	40%
Cornus amomum	Silky Dogwood	3-6 ft.*	0.5"-1.5"	Shrub	FACW	15%
						100%

Woody and Herbaceous Plugs

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Xanthorhiza simplicissima	Yellowroot	6 ft.	1.0"-2.0" plug	Herb	FACW	20%
Osmunda spectabilis	Royal Fern	6 ft.	1.0"-2.0" plug	Herb	OBL	10%
Juncus effusus	Soft Rush	6 ft.	1.0"-2.0" plug	Herb	FACW	25%
Carex lurida	Lurid Sedge	6 ft.	1.0"-2.0" plug	Herb	OBL	15%
Carex vulpinoidea	Fox Sedge	6 ft.	1.0"-2.0" plug	Herb	OBL	15%
Carex stricta	Tussock Sedge	6 ft.	1.0"-2.0" plug	Herb	OBL	15%
						100%

* See Live Staking and Plugs detail

Riparian Buffer Planting Zone 2

Bare Root or Tubling

Species**	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Platanus occidentalis	Sycamore	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%
Betula lenta	Sweet Birch	6-12 ft.	0.25"-1.0"	Canopy	FACU	10%
Liriodendron tulipifera	Tulip Tree	6-12 ft.	0.25"-1.0"	Canopy	FACU	7%
Diospyros virginiana	Persimmon	6-12 ft.	0.25"-1.0"	Canopy	FACU	8%
Aesculus flava	Yellow Buckeye	6-12 ft.	0.25"-1.0"	Canopy	FACU	15%
Tilia americana	American Basswood	6-12 ft.	0.25"-1.0"	Canopy	FACU	10%
Halesia carolina	Carolina Silverbell	6-12 ft.	0.25"-1.0"	Subcanopy	FAC	5%
*Cornus florida**	Flowering Dogwood	6-12 ft.	0.25"-1.0"	Subcanopy	FACU	5%
*Lindera benzoin**	Spicebush	6-12 ft.	0.25"-1.0"	Shrub	FAC	5%
Alnus serrulata	Tag Alder	6-12 ft.	0.25"-1.0"	Subcanopy	OBL	7%
Carpinus caroliniana	Ironwood	6-12 ft.	0.25"-1.0"	Subcanopy	FAC	5%
*Ilex verticillata**	Common Winterberry	6-12 ft.	0.25"-1.0"	Shrub	FACW	5%
*Corylus americana**	American Hazelnut	6-12 ft.	0.25"-1.0"	Shrub	FACU	5%
						97%

* Species not included in average height calculation

**Preferred substitutes: Black Cherry, Silky Dogwood, American Holly, Paw Paw, Northern Red Oak

Note:
OPTIONAL: TRANSPLANTS and CONTAINERIZED PLANTS to be used at Engineer's discretion for streambank and floodplain planting.

Streambank Planting Zone 2

Live Stakes

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Physocarpus opulifolius	Ninebark	3-6 ft.*	0.5"-1.5"	Subcanopy	FACW	15%
Sambucus canadensis	Common Elderberry	3-6 ft.*	0.5"-1.5"	Shrub	FAC	15%
Salix sericea	Silky Willow	3-6 ft.*	0.5"-1.5"	Shrub	OBL	45%
Cornus amomum	Silky Dogwood	3-6 ft.*	0.5"-1.5"	Shrub	FACW	25%
						100%

Woody and Herbaceous Plugs

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Xanthorhiza simplicissima	Yellowroot	6 ft.	1.0"-2.0" plug	Herb	FACW	20%
Osmunda spectabilis	Royal Fern	6 ft.	1.0"-2.0" plug	Herb	OBL	10%
Liatris spicata	Dense Blazing Star	6 ft.	1.0"-2.0" plug	Herb	FAC	10%
Juncus effusus	Common Rush	6 ft.	1.0"-2.0" plug	Herb	FACW	25%
Carex lurida	Lurid Sedge	6 ft.	1.0"-2.0" plug	Herb	OBL	20%
Carex vulpinoidea	Fox Sedge	6 ft.	1.0"-2.0" plug	Herb	OBL	15%
						100%

* See Live Staking and Plugs detail

Wetland Planting Zone

Bare Root or Tubling

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Platanus occidentalis	Sycamore	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
*Rosa palustris**	Swamp Rose	6-12 ft.	0.25"-1.0"	Shrub	OBL	5%
Carpinus caroliniana	Ironwood	6-12 ft.	0.25"-1.0"	Subcanopy	FAC	5%
Salix nigra	Black Willow	6-12 ft.	0.25"-1.0"	Canopy	OBL	15%
Salix sericea	Silky Willow	6-12 ft.	0.25"-1.0"	Subcanopy	OBL	10%
Cornus amomum	Silky Dogwood	6-12 ft.	0.25"-1.0"	Subcanopy	FACW	5%
Amelanchier arborea	Downy Serviceberry	6-12 ft.	0.25"-1.0"	Subcanopy	FAC	5%
Alnus serrulata	Smooth Alder	6-12 ft.	0.25"-1.0"	Subcanopy	OBL	15%
Ilex verticillata	Common Winterberry	6-12 ft.	0.25"-1.0"	Shrub	FACW	5%
Sambucus canadensis	Common Elderberry	6-12 ft.	0.25"-1.0"	Subcanopy	FAC	10%
Viburnum nudum	Possumnhaw Viburnum	6-12 ft.	0.25"-1.0"	Subcanopy	OBL	5%
*Lindera benzoin**	Spicebush	6-12 ft.	0.25"-1.0"	Shrub	FAC	5%
						100%

* indicates species that will be removed from the average height calculation

Wetland Supplemental Planting Zone

Woody and Herbaceous Plugs

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Juncus effusus	Common Rush	3 ft.	1.0"-2.0" plug	Herb	FACW	10%
Xanthorhiza simplicissima	Yellowroot	3 ft.	1.0"-2.0" plug	Herb	FACW	10%
Asclepias incarnata	Swamp Milkweed	3 ft.	1.0"-2.0" plug	Herb	OBL	10%
Eupatorium fistulosum	Joe Pye Weed	3 ft.	1.0"-2.0" plug	Herb	FACW	10%
Carex vulpinoidea	Fox Sedge	3 ft.	1.0"-2.0" plug	Herb	OBL	10%
Carex lupulina	Hop Sedge	3 ft.	1.0"-2.0" plug	Herb	OBL	10%
Conoclinium coelestinum	Blue Mistflower	3 ft.	1.0"-2.0" plug	Herb	FAC	10%
Eupatorium perfoliatum	Common Boneset	3 ft.	1.0"-2.0" plug	Herb	FACW	10%
Liatris spicata	Dense Blazing Star	3 ft.	1.0"-2.0" plug	Herb	FAC	10%
Lobelia cardinalis	Cardinal Flower	3 ft.	1.0"-2.0" plug	Herb	FACW	10%
						100%

Riparian Buffer Planting Zone 1

Bare Root or Tubling

Species**	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Platanus occidentalis	Sycamore	6-12 ft.	0.25"-1.0"	Canopy	FACW	7%
Aesculus flava	Yellow Buckeye	6-12 ft.	0.25"-1.0"	Canopy	FACU	10%
Tilia americana	American Basswood	6-12 ft.	0.25"-1.0"	Canopy	FACU	10%
Diospyros virginiana	Persimmon	6-12 ft.	0.25"-1.0"	Canopy	FACU	8%
*Cornus florida**	Flowering Dogwood	6-12 ft.	0.25"-1.0"	Subcanopy	FACU	5%
*Amelanchier arborea**	Downy Serviceberry	6-12 ft.	0.25"-1.0"	Subcanopy	FAC	8%
Betula lenta	Sweet Birch	6-12 ft.	0.25"-1.0"	Canopy	FACU	8%
Fagus grandifolia	American Beech	6-12 ft.	0.25"-1.0"	Canopy	FACU	3%
Nyssa sylvatica	Black Gum	6-12 ft.	0.25"-1.0"	Canopy	FAC	5%
Liriodendron tulipifera	Tulip Tree	6-12 ft.	0.25"-1.0"	Canopy	FACU	5%
Halesia carolina	Carolina Silverbell	6-12 ft.	0.25"-1.0"	Subcanopy	FAC	3%
*Carpinus caroliniana**	Ironwood	6-12 ft.	0.25"-1.0"	Subcanopy	FAC	5%
*Lindera benzoin**	Spicebush	6-12 ft.	0.25"-1.0"	Shrub	FAC	5%
Hamamelis virginiana	Witch Hazel	6-12 ft.	0.25"-1.0"	Subcanopy	FACU	5%
Alnus serrulata	Tag Alder	6-12 ft.	0.25"-1.0"	Subcanopy	OBL	7%
*Corylus americana**	American Hazelnut	6-12 ft.	0.25"-1.0"	Shrub	FACU	3%
*Calycanthus floridus**	Sweetshrub	6-12 ft.	0.25"-1.0"	Shrub	FACU	3%
						100%

* Species not included in average height calculation

**Preferred substitutes: Black Cherry, Silky Dogwood, American Holly, Paw Paw, Northern Red Oak

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Macon County, North Carolina

Planting Tables

Revisions:

Date: 12.21.2022
Job Number: WI2191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

Sheet 4.1.1

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December 22, 2022

Utility Right-of-Way Planting Zone - Shrub and Low Growing Species

Bare Root or Tubling

Species*	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Cornus amomum	Silky Dogwood	6-12 ft.	0.25"-1.0"	Shrub	FACW	20%
Physocarpus opulifolius	Ninebark	6-12 ft.	0.25"-1.0"	Subcanopy	FACW	20%
Sambucus canadensis	Common Elderberry	6-12 ft.	0.25"-1.0"	Shrub	FAC	20%
Lindera benzoin	Spicebush	6-12 ft.	0.25"-1.0"	Shrub	FAC	15%
Calycanthus floridus	Sweetshrub	6-12 ft.	0.25"-1.0"	Shrub	FACU	10%
Corylus americana	American Hazelnut	6-12 ft.	0.25"-1.0"	Shrub	FAC	15%
						100%

Note: No planting within access ways (15-20' corridor used for vehicular maintenance access)

*Minimum of five species shall be planted in utility ROW

Supplemental Riparian Buffer Planting

Bare Root or Tubling

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Lindera benzoin	Spicebush	20 ft.	0.25"-1.0"	Shrub	FAC	15%
Hamamelis virginiana	Witch Hazel	20 ft.	0.25"-1.0"	Subcanopy	FACU	15%
Alnus serrulata	Tag Alder	20 ft.	0.25"-1.0"	Subcanopy	OBL	15%
Corylus americana	American Hazelnut	20 ft.	0.25"-1.0"	Shrub	FACU	15%
Calycanthus floridus	Sweetshrub	20 ft.	0.25"-1.0"	Shrub	FACU	10%
Carpinus caroliniana	Ironwood	20 ft.	0.25"-1.0"	Subcanopy	FAC	15%
Ilex verticillata	Common Winterberry	20 ft.	0.25"-1.0"	Shrub	FACW	15%
Sambucus canadensis	Common Elderberry	20 ft.	0.25"-1.0"	Shrub	FAC	20%
						100%

Woody and Herbaceous Plugs

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Xanthorhiza simplicissima	Yellowroot	3 ft.	1.0"-2.0" plug	Shrub	FACW	25%
Osmundastrum cinnamomeum	Cinnamon Fern	3 ft.	1.0"-2.0" plug	Herb	FACW	20%
Osmunda spectabilis	Royal Fern	3 ft.	1.0"-2.0" plug	Herb	OBL	20%
Chasmanthium latifolium	River Oats	3 ft.	1.0"-2.0" plug	Herb	FACU	20%
Symphyotrichum novae-angliae	New England Aster	3 ft.	1.0"-2.0" plug	Herb	FACW	15%
						100%

Note: Herb plugs to be planting 3 ft. on center in clusters of 4 individuals of the same species across the planting zone. Clusters will be planted 20 ft. on center.

Permanent Riparian Seeding

Pure Live Seed (20 lbs/acre)

Approved Dates	Species Name	Common Name	Stratum	Wetland Indicator Status	lbs/acre
All-Year	*Schizachyrium scoparium*	Little Bluestem	Herb	FACU	3.0
All-Year	*Elymus virginicus*	Virginia Wild Rye	Herb	FACW	4.0
All-Year	*Dichanthelium clandestinum*	Deer Tongue	Herb	FAC	4.0
All-Year	*Senna hebecarpa*	Wild Senna	Herb	FAC	1.0
All-Year	*Sorghastrum nutans*	Indiangrass	Herb	FACU	2.0
All-Year	*Elymus riparius*	Riverbank Wildrye	Herb	FACW	2.0
All-Year	*Heliopsis helianthoides*	Oxeye Sunflower	Herb	FACU	1.0
All-Year	*Rudbeckia hirta*	Blackeyed Susan	Herb	FACU	1.0
All-Year	*Coreopsis lanceolata*	Lanceleaf Coreopsis	Herb	FACU	1.0
All-Year	*Bidens aristosa*	Bearded Beggarticks	Herb	FACW	1.0
					20.0

Note: Permanent riparian seeding in all disturbed areas within Conservation Easement, Crossings, and Right-of-ways.

Permanent Wetland Seeding

Pure Live Seed (20 lbs/acre)

Approved Dates	Species Name	Common Name	Stratum	Wetland Indicator Status	Density (lbs/acre)
All-Year	*Bidens aristosa*	Bearded Beggarticks	Herb	FACW	1.0
All-Year	*Juncus effusus*	Soft Rush	Herb	FACW	1.0
All-Year	*Rudbeckia hirta*	Black Eyed Susan	Herb	FACU	1.0
All-Year	*Elymus virginicus*	Virginia Wild Rye	Herb	FACW	4.5
All-Year	*Carex vulpinoidea*	Fox Sedge	Herb	OBL	5.0
All-Year	*Panicum dichotomiflorum*	Smooth Panicgrass	Herb	FACW	2.0
All-Year	*Helianthus angustifolius*	Narrowleaf Sunflower	Herb	FACW	1.0
All-Year	*Carex lurida*	Lurid Sedge	Herb	OBL	1.0
All-Year	*Tripsacum dactyloides*	Eastern Gamagrass	Herb	FACW	1.5
All-Year	*Elymus riparius*	River Bank Wild Rye	Herb	FACW	2.0
					20.0

Permanent Seeding Outside Easement

Pure Live Seed

Approved Dates	Species Name	Common Name	Stratum	Density (lbs/acre)	Percentage
All-Year	*Festuca arundinacea*	Tall Fescue	Herb	40	44%
All-Year	*Dactylis glomerata*	Orchardgrass	Herb	40	44%
All-Year	*Trifolium pratense*	Medium Red Clover	Herb	5	6%
All-Year	*Trifolium repens*	White Ladino Clover	Herb	5	6%
					100%

Temporary Seeding

Pure Live Seed

Approved Dates	Species Name	Common Name	Stratum	Density (lbs/acre)
Aug 15 - May 1	*Avena sativa*	Winter Oats	Herb	30
Aug 15 - May 1	*Secale cereale*	Rye Grain	Herb	110
May 1 - Aug 15	*Urochloa ramosa*	Browntop Millet	Herb	50
May 1 - Aug 15	*Fagopyrum esculentum*	Buckwheat	Herb	25
All-Year	*Trifolium incarnatum*	Crimson Clover	Herb	5
All-Year	*Trifolium repens*	White Ladino Clover	Herb	3

CULTURAL RESOURCES SITE - NO PLANTING, NO GRADING, NO EQUIPMENT ACCESS

CULTURAL RESOURCES SITE - SEEDING AND BARE ROOT PLANTING ONLY; DO NOT GRADE OR MECHANICALLY PREPARE AREAS WITHIN POLYGON

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Planting Tables

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Date: 12.21.2022
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Project Engineer: JPM
Drawn By: JDW
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Sheet 4.1.2

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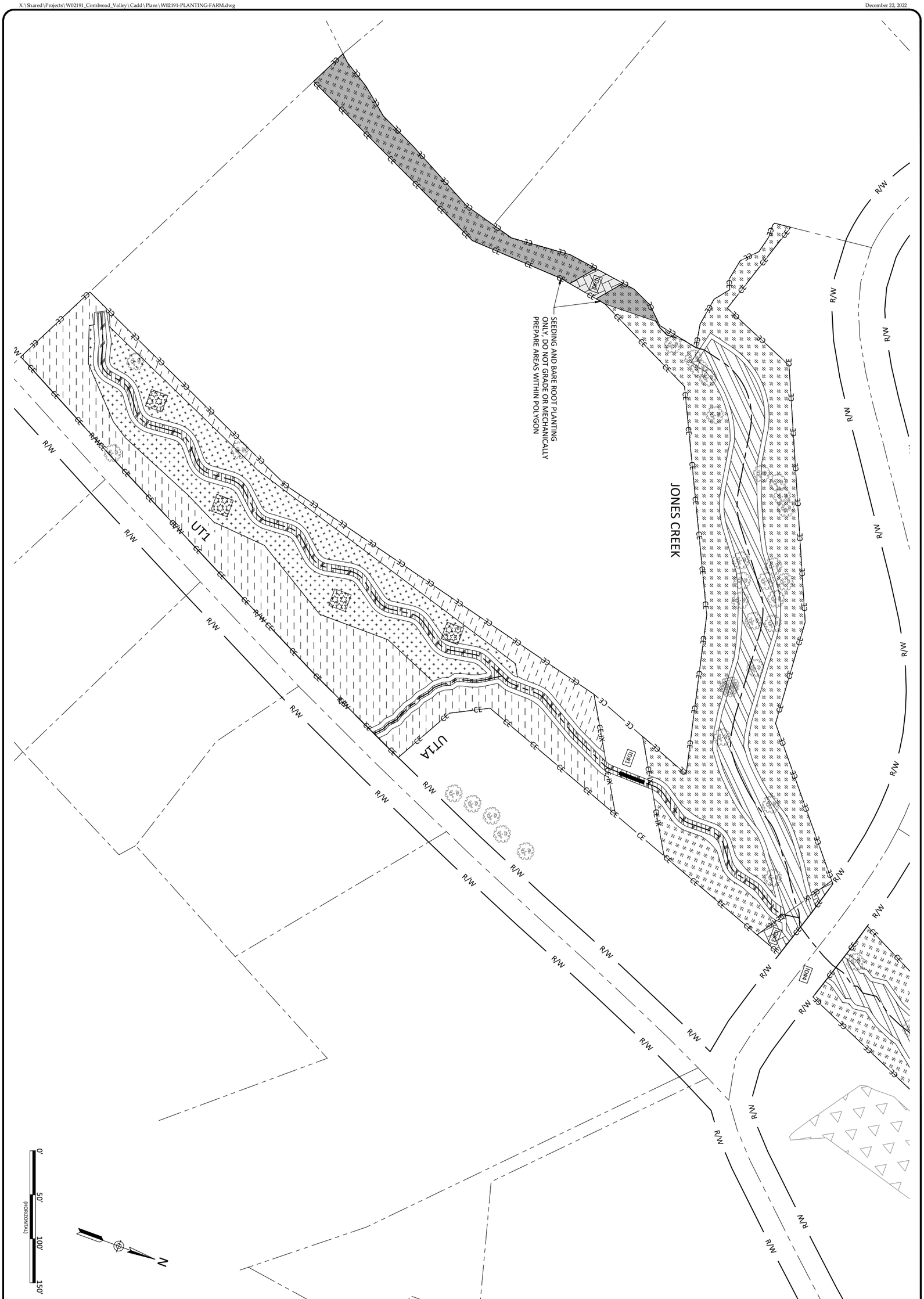

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Project Engineer:	JPM
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Mainstem Upper, UT1 & UT1A Planting

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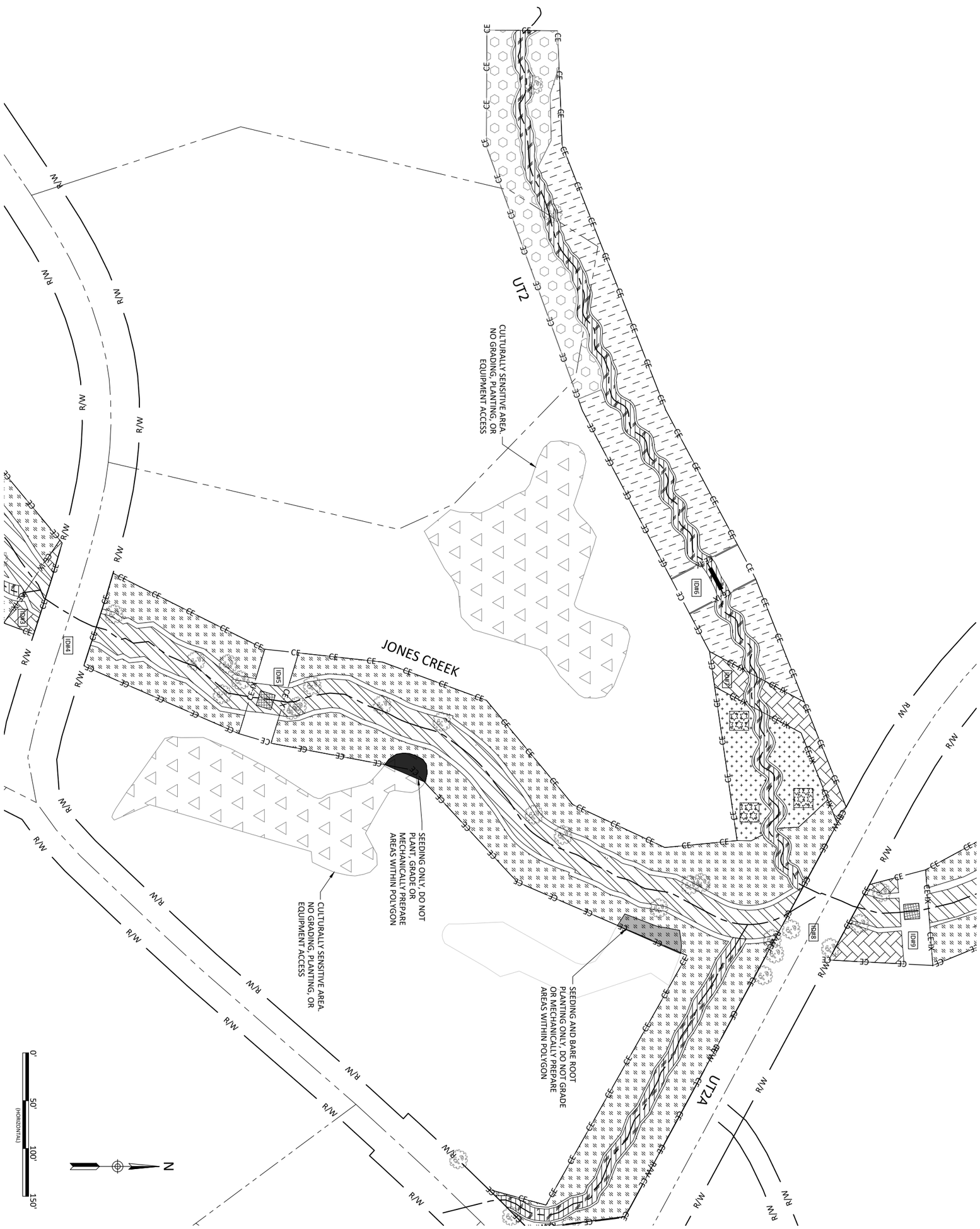

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Revisions:

Cornbread Valley Mitigation Site
Macon County, North Carolina

Mainstem Middle, UT2 & 2A Planting

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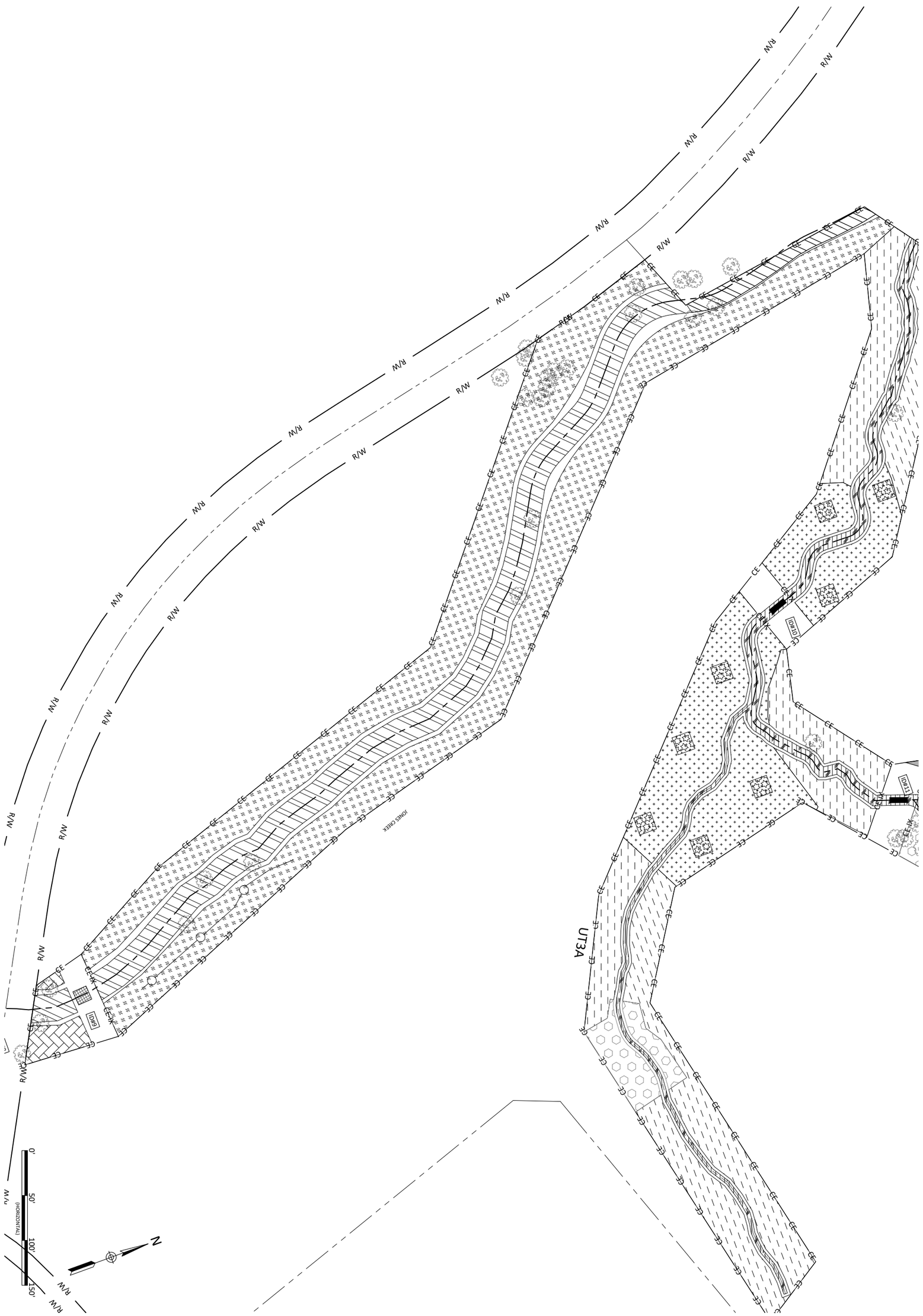

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Cornbread Valley Mitigation Site
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Mainstem Lower Planting

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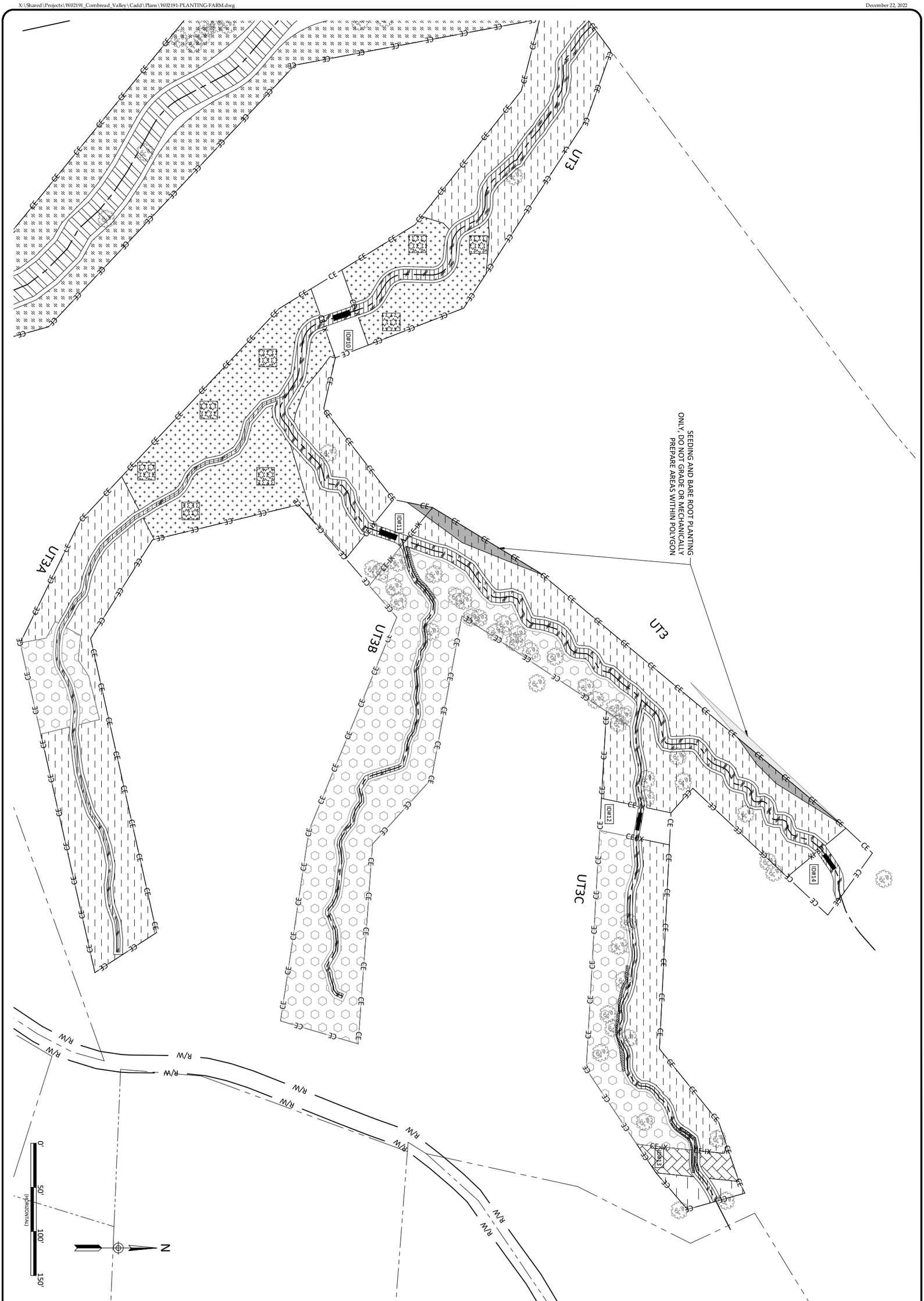

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3 and UT3 Tributaries Planting

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December 22, 2021

ALLISON WATTS ROAD

JONES CREEK

JONES CREEK ROAD

UT1

UT1A

TIE PROPOSED FENCE TO EXISTING FENCELINE

ONE (1) 8' GATE

ONE (1) 12' GATE

TWO (2) 8' GATES

TIE PROPOSED FENCE TO EXISTING FENCELINE ALONG PROPERTY LINE

CROSSING 1
SEE SHEET 5.1 FOR FENCING ORIENTATION WITHIN INTERNAL EASEMENT CROSSING

NOTE:

1. FENCING ALONG OUTER BOUNDARY OF CONSERVATION EASEMENT SHALL BE BARB WIRE FENCING. SEE SHEET 7.10, DETAIL 1
2. FENCING WITHIN INTERNAL EASEMENT CROSSING SHALL BE CROSSING FENCING. SEE SHEET 7.10, DETAIL 3

0' 50' 100' 150'
(HORIZONTAL)

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Cornbread Valley Mitigation Site
Macon County, North Carolina

Mainstem Upper, UT1, & UT1A Fencing

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Sheet 4.2.1

December 22, 2023

ONE (1) 8' GATE

TWO (2) 8' GATES

CROSSING 6
SEE SHEET 5.3 FOR FENCING ORIENTATION
WITHIN INTERNAL EASEMENT CROSSING

ONE (1) 8' GATE

ONE (1) 8' GATE

UT2

ONE (1) 12' GATE

ONE (1) 8' GATE

ONE (1) 12' GATE

ONE (1) 12' GATE

CROSSING 5
SEE SHEET 5.2 FOR FENCING ORIENTATION
WITHIN INTERNAL EASEMENT CROSSING

TWO (2) 8' GATES

ONE (1) 12' GATE

TWO (2) 8' GATES

TIE PROPOSED FENCE
TO EXISTING
FENCELINE ALONG
PROPERTY LINE

ONE (1) 12' GATE

JONES CREEK

N JONES CREEK ROAD

UT2A

ONE (1) 12' GATE

ONE (1) 8' GATE

TIE PROPOSED FENCE
TO EXISTING
FENCELINE ALONG
PROPERTY LINE

ONE (1) 12' GATE

ALLISON WATTS ROAD

JONES CREEK ROAD

TWO (2) 8' GATES

ONE (1) 8' GATES

NOTE:
1. FENCING ALONG OUTER BOUNDARY OF CONSERVATION EASEMENT SHALL BE BARB WIRE FENCING. SEE SHEET 7.10, DETAIL 1
2. FENCING WITHIN INTERNAL EASEMENT CROSSING SHALL BE CROSSING FENCING. SEE SHEET 7.10, DETAIL 3

0' 50' 100' 150'
(HORIZONTAL)

N

X:\Shared Projects\WI2191_Cornbread_Valley\Cadd\Plans\WI2191-FENCING PLAN.dwg

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DRAFT

Cornbread Valley Mitigation Site
Macon County, North Carolina

Mainstem Middle, UT2, & UT2A Fencing

Revisions:

Date:	12.21.2022
Job Number:	WI2191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 4.2.2

December 22, 2023

CROSSING 9
SEE SHEET 5.4 FOR FENCING ORIENTATION WITHIN INTERNAL EASEMENT CROSSING

TWO (2) 8' GATES

ONE (1) 8' GATE

N JONES CREEK ROAD

TIE PROPOSED FENCE TO EXISTING FENCELINE ALONG PROPERTY LINE

TIE PROPOSED FENCE TO EXISTING FENCELINE ALONG PROPERTY LINE

TIE PROPOSED FENCE TO EXISTING FENCELINE ALONG PROPERTY LINE

JONES CREEK

ONE (1) 12' GATE

TWO (2) 8' GATES

ONE (1) 12' GATE

TWO (2) 8' GATES

ONE (1) 8' GATE

UT3A

UT3

UT3

TWO (2) 8' GATES

CROSSING 10
SEE SHEET 5.5 FOR DETAILS

TWO (2) 8' GATES

TWO (2) 8' GATES

CROSSING 11
SEE SHEET 5.6 FOR DETAILS

NOTE:

1. FENCING ALONG OUTER BOUNDARY OF CONSERVATION EASEMENT SHALL BE BARB WIRE FENCING. SEE SHEET 7.10, DETAIL 1
2. FENCING WITHIN INTERNAL EASEMENT CROSSINGS SHALL BE CROSSING FENCING. SEE SHEET 7.10, DETAIL 3

0' 50' 100' 150'
(HORIZONTAL)

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Cornbread Valley Mitigation Site
Macon County, North Carolina

Mainstem Lower and UT3 Lower Fencing

Revisions:

Date:	12.21.2022
Job Number:	WI2191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 4.2.3

December 22, 2023

TWO (2) 8' GATES

TWO (2) 8' GATES

ONE (1) 8' GATE

TWO (2) 8' GATES
ONE (1) 12' GATE
TWO (2) 8' GATES

CROSSING 14
SEE SHEET 5.8 FOR FENCING ORIENTATION
WITHIN INTERNAL EASEMENT CROSSING

TWO (2) 8' GATES

ONE (1) 12' GATE

UT3C

UT3

CROSSING 12
SEE SHEET 5.7 FOR FENCING ORIENTATION WITHIN
INTERNAL EASEMENT CROSSING

TWO (2) 8' GATES

ONE (1) 12' GATE

ONE (1) 12' GATE

ONE (1) 8' GATE

ONE (1) 8' GATE

ONE (1) 12' GATE

ONE (1) 8' GATE

CROSSING 11
SEE SHEET 5.6 FOR FENCING ORIENTATION WITHIN
INTERNAL EASEMENT CROSSING

TWO (2) 8' GATES

ONE (1) 12' GATE

ONE (1) 12' GATE

TWO (2) 8' GATES

ONE (1) 12' GATE

ONE (1) 8' GATE

NOTE:

1. FENCING ALONG OUTER BOUNDARY OF CONSERVATION EASEMENT SHALL BE BARB WIRE FENCING. SEE SHEET 7.10, DETAIL 1
2. FENCING WITHIN INTERNAL EASEMENT CROSSINGS SHALL BE CROSSING FENCING. SEE SHEET 7.10, DETAIL 3

0' 150' 300' 450'
(HORIZONTAL)

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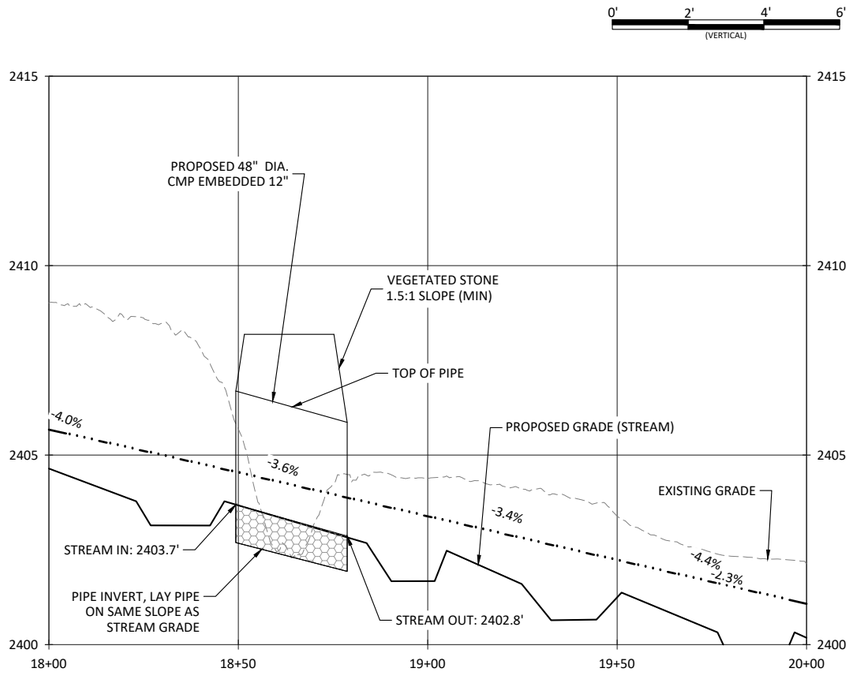
Cornbread Valley Mitigation Site
Macon County, North Carolina
UT3 & UT3 Tributaries Fencing

Revisions:

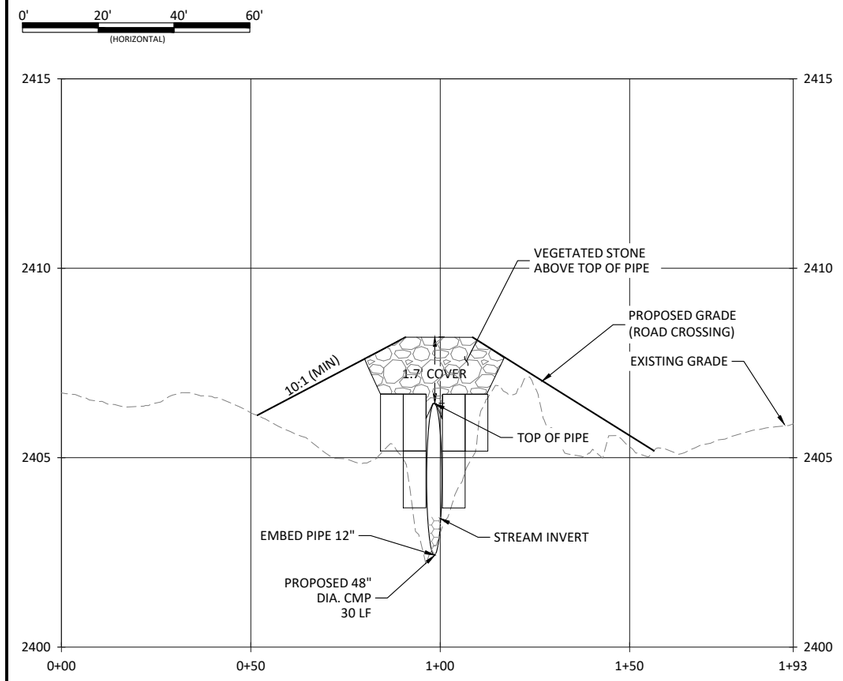
Date:	12.21.2022
Job Number:	WI2191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 4.2.4

December 22, 2023



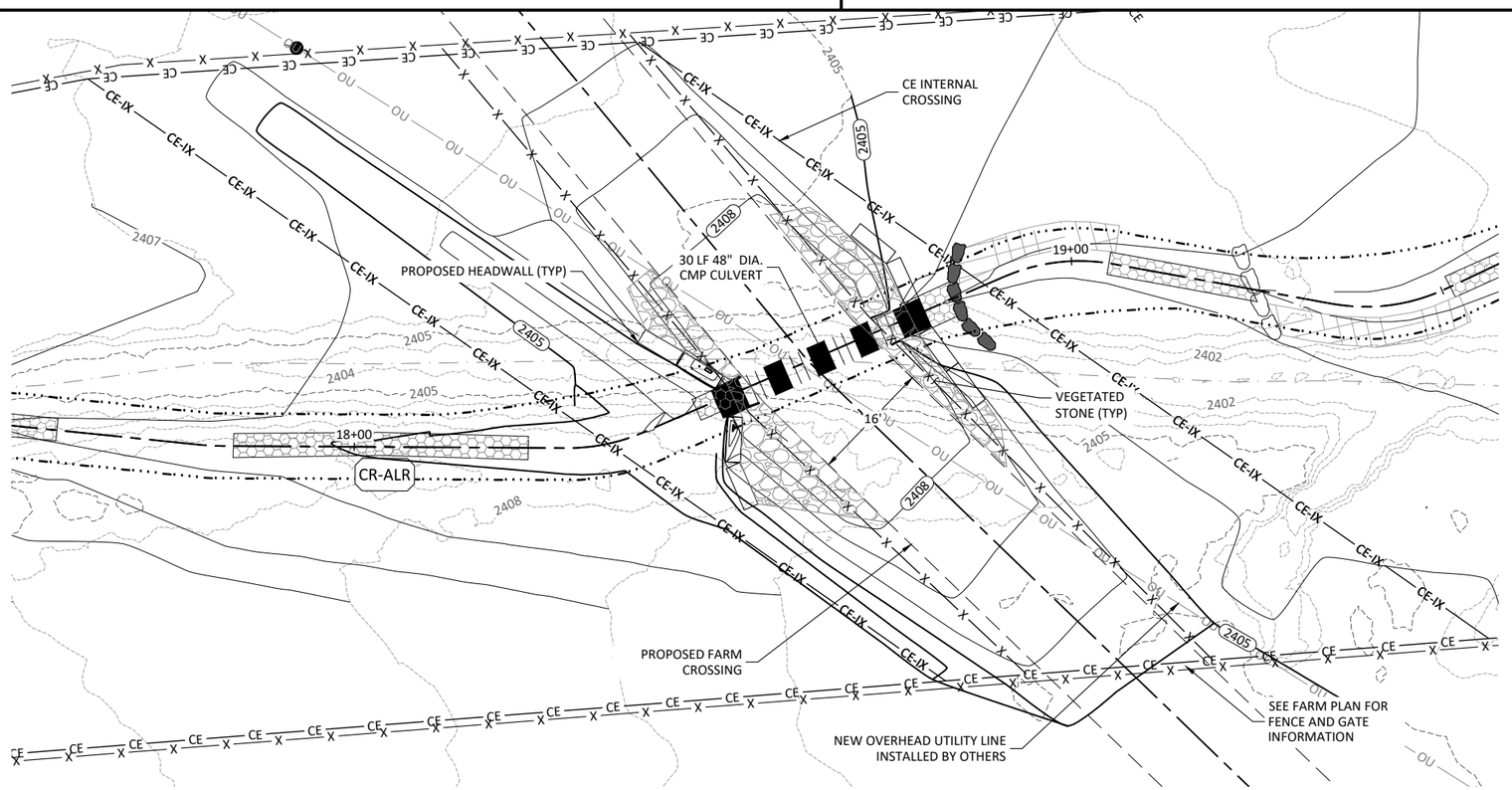
STREAM PROFILE AT CULVERT CROSSING



FARM ROAD CROSSING WITH END TREATMENT

UT1 REACH 1 - DESIGN NOTES:

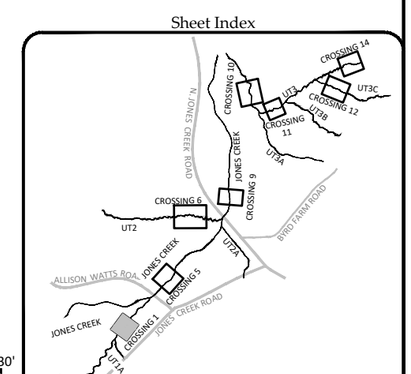
1. RIFFLE BOTTOM WIDTH - 3.0'
2. RIFFLE TOP WIDTH - 8.6'
3. BANKFULL DEPTH - 1.0'
4. BANKFULL DISCHARGE - 17 CFS
5. 10YR/25YR STORM FLOWS - 25 CFS



PLAN VIEW OF CULVERT CROSSING



Sheet Index



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Cornbread Valley Mitigation Site
Macon County, North Carolina
UT1 Reach 1 - Crossing 1 Crossings

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EFN

Sheet 5.1

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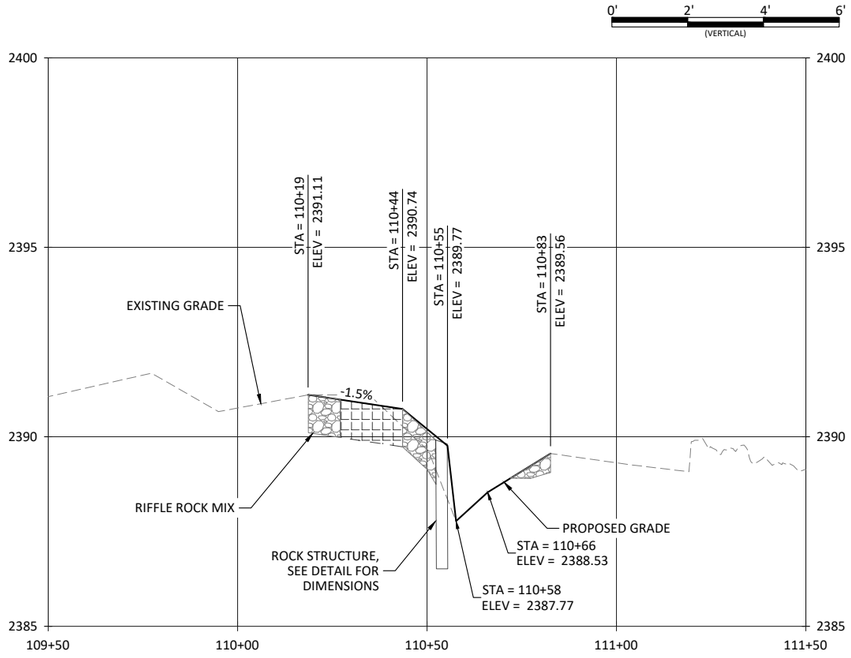
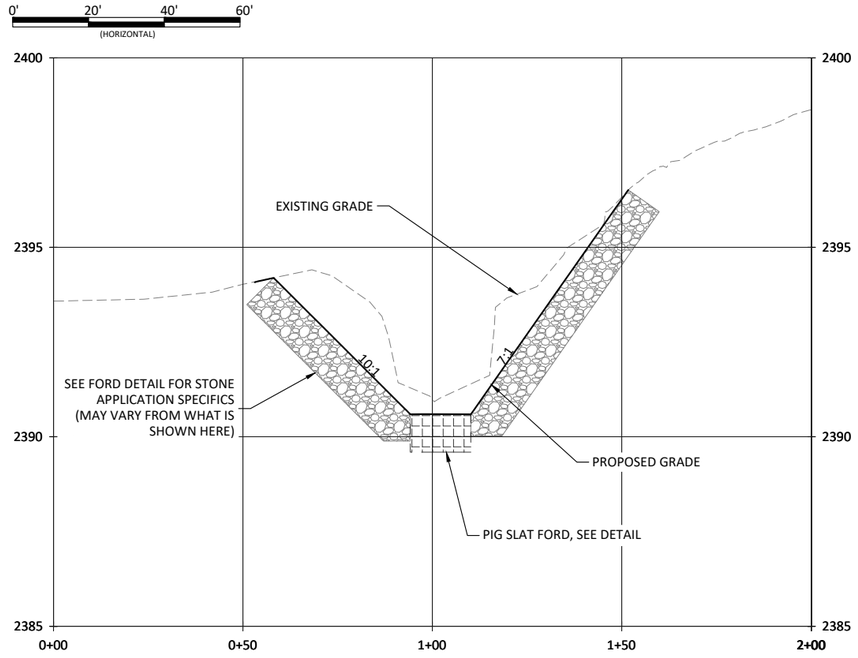
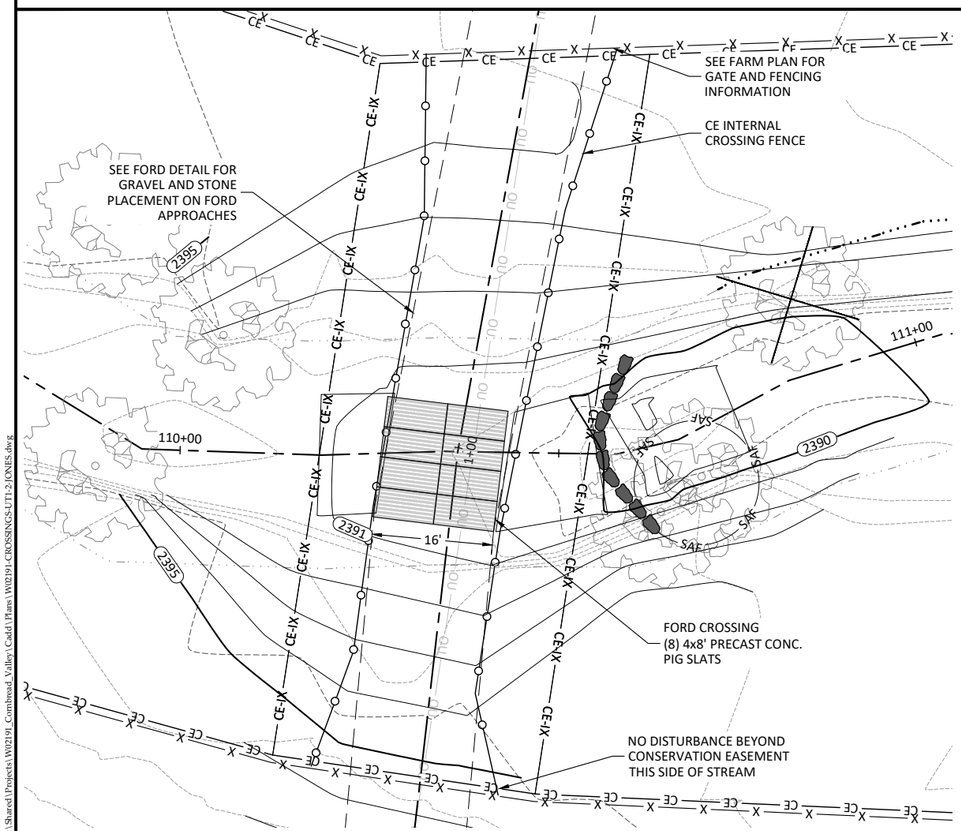
December 22, 2023



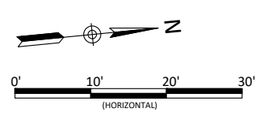
STREAM PROFILE AT FORD CROSSING



FARM ROAD CROSSING WITH END TREATMENT



PLAN VIEW OF FORD CROSSING



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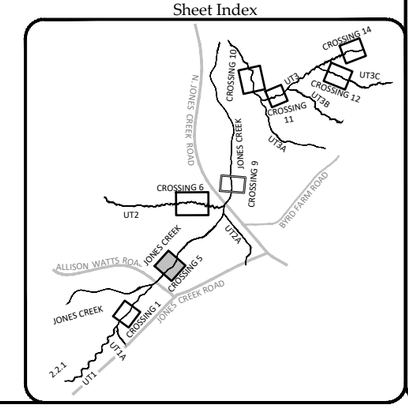

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Cornbread Valley Mitigation Site
Macon County, North Carolina

Jones Creek Reach 3 - Crossing 5
Crossings

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EFN

Sheet 5.2

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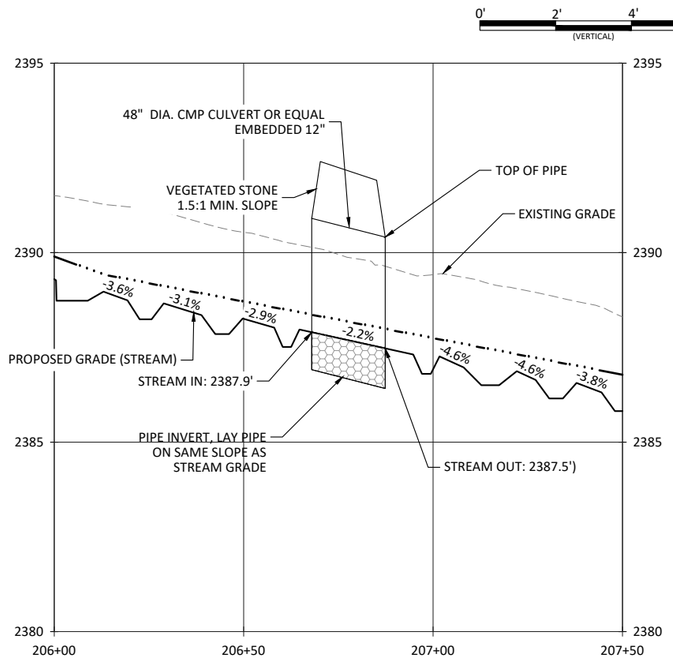
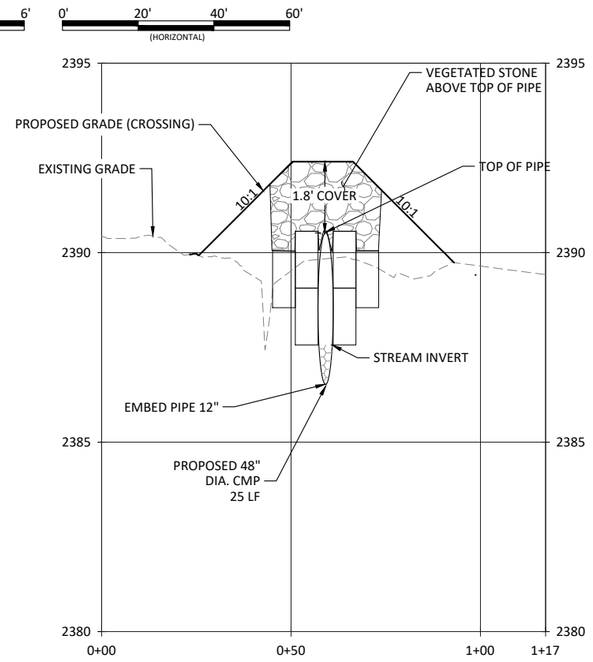
December 22, 2023



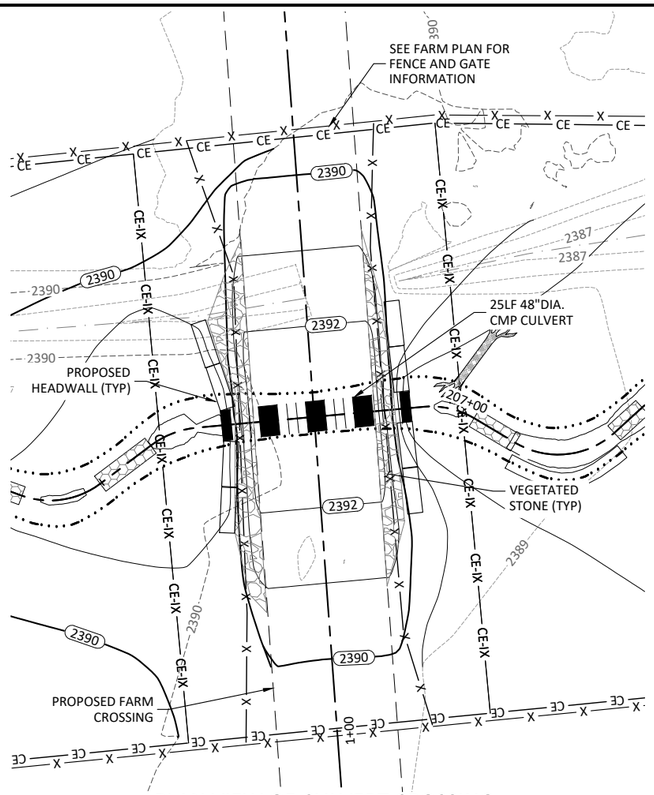
STREAM PROFILE AT CULVERT CROSSING



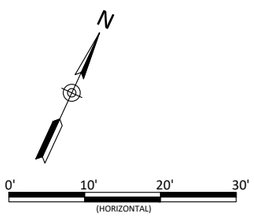
FARM ROAD CROSSING WITH END TREATMENT

UT2 REACH 2 - DESIGN NOTES:

1. RIFFLE BOTTOM WIDTH - 2.5'
2. RIFFLE TOP WIDTH - 5.5'
3. BANKFULL DEPTH - 0.5'
4. BANKFULL DISCHARGE - 5 CFS
5. 10YR STORM FLOWS - 24 CFS



PLAN VIEW OF CULVERT CROSSING



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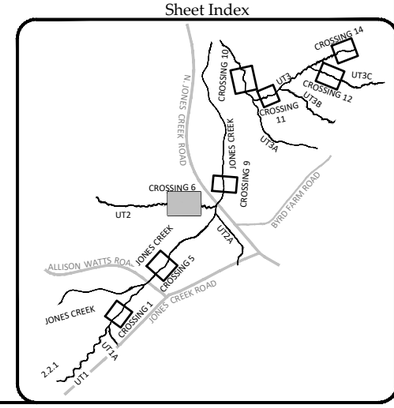

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT2 Reach 2 - Crossing 6
Crossings

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EFN

Sheet 5.3

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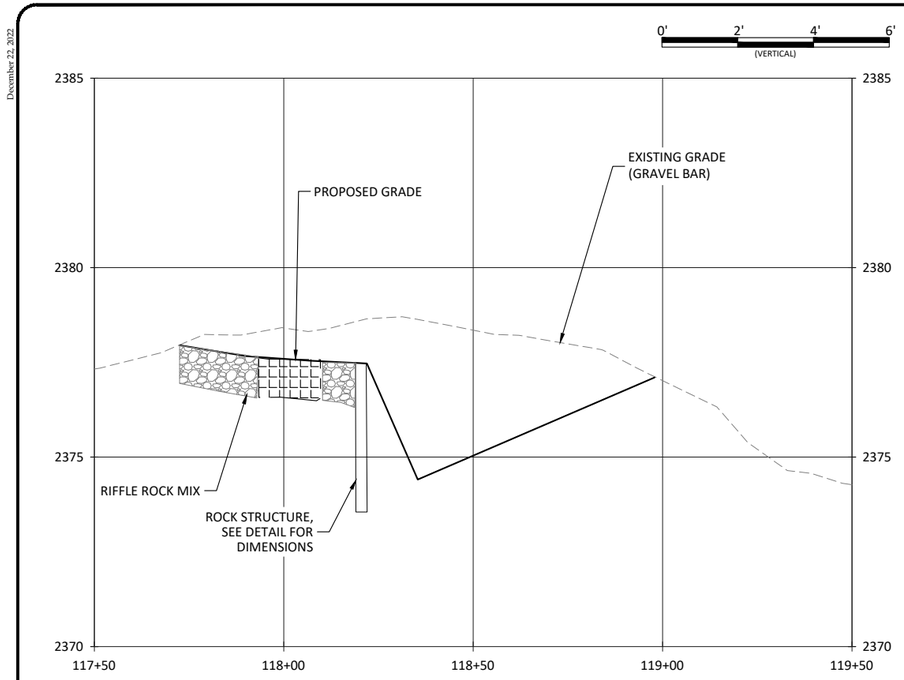
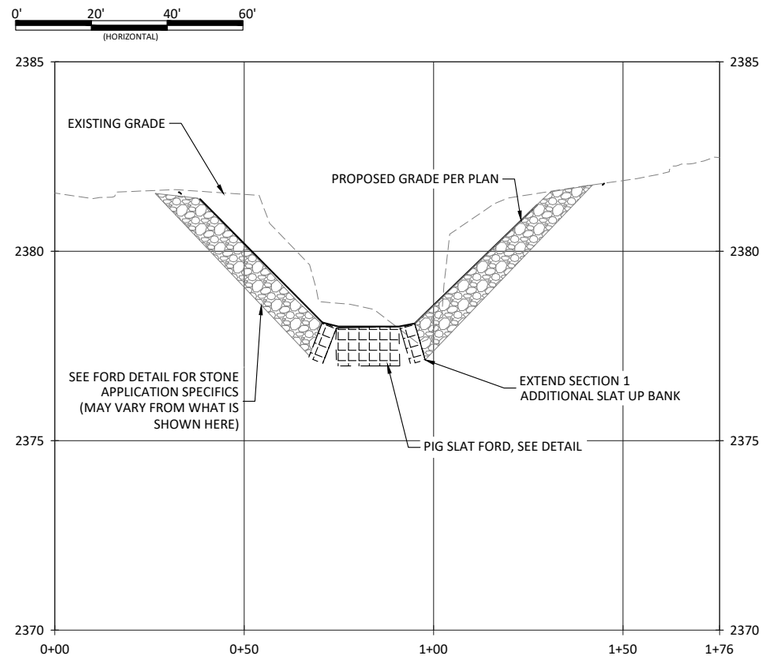
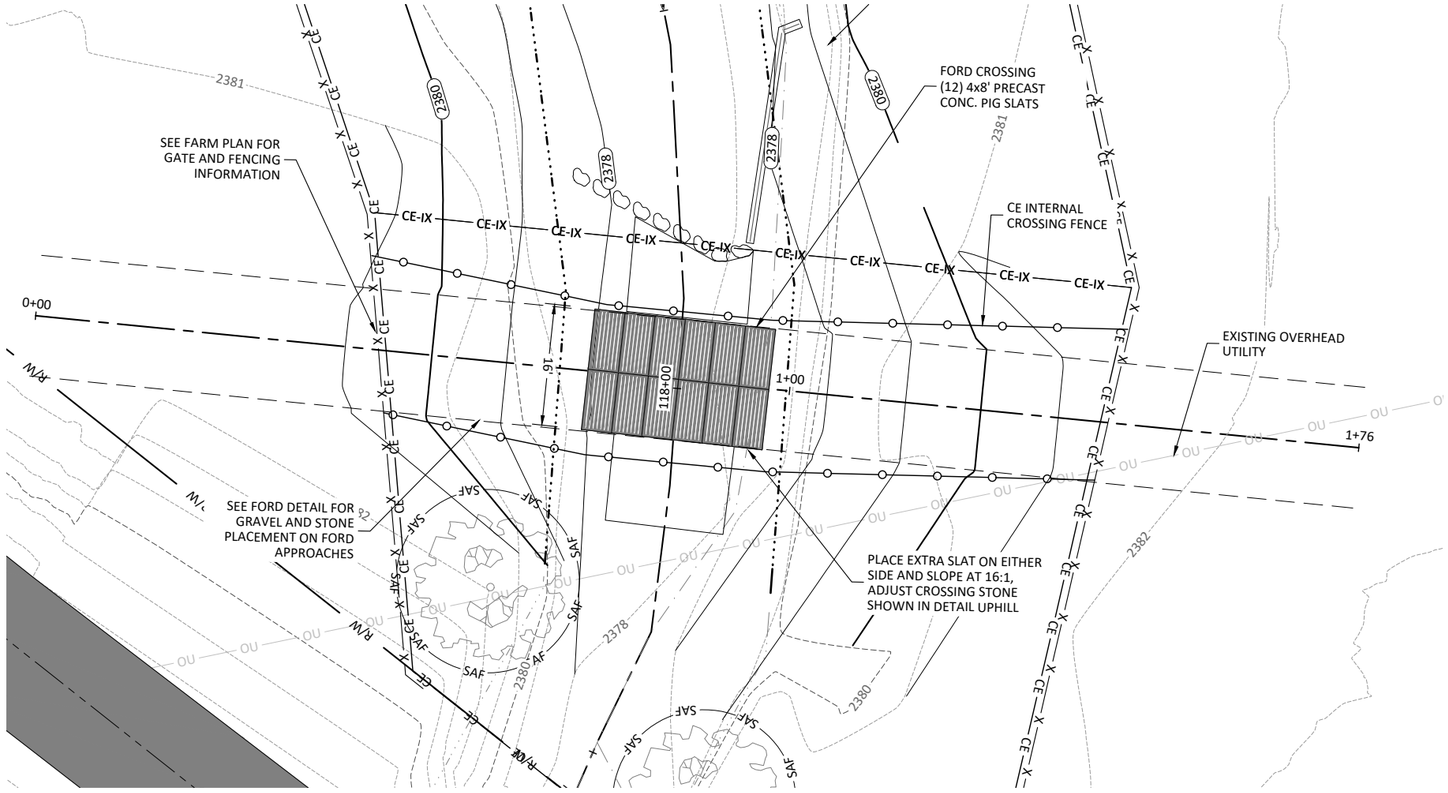
December 22, 2023



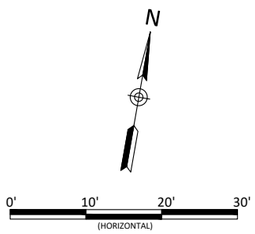
STREAM PROFILE AT FORD CROSSING



FARM ROAD CROSSING WITH END TREATMENT



PLAN VIEW OF FORD CROSSING



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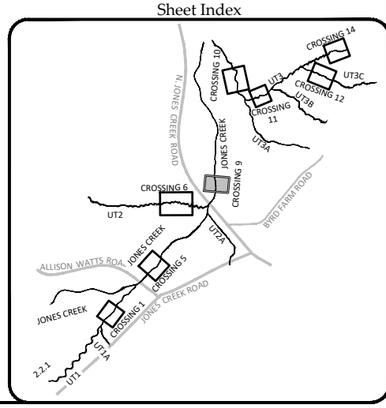

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Cornbread Valley Mitigation Site
Macon County, North Carolina

Jones Creek Reach 4 - Crossing 9 Crossings

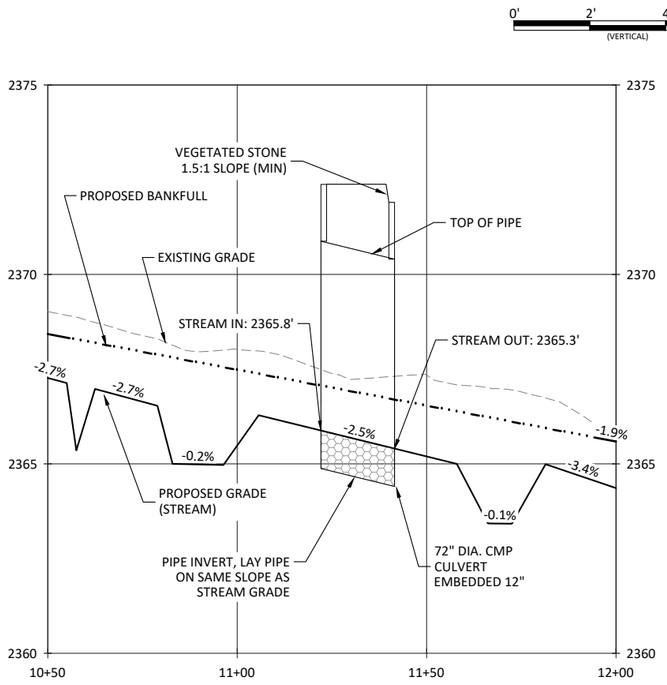
Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EFN

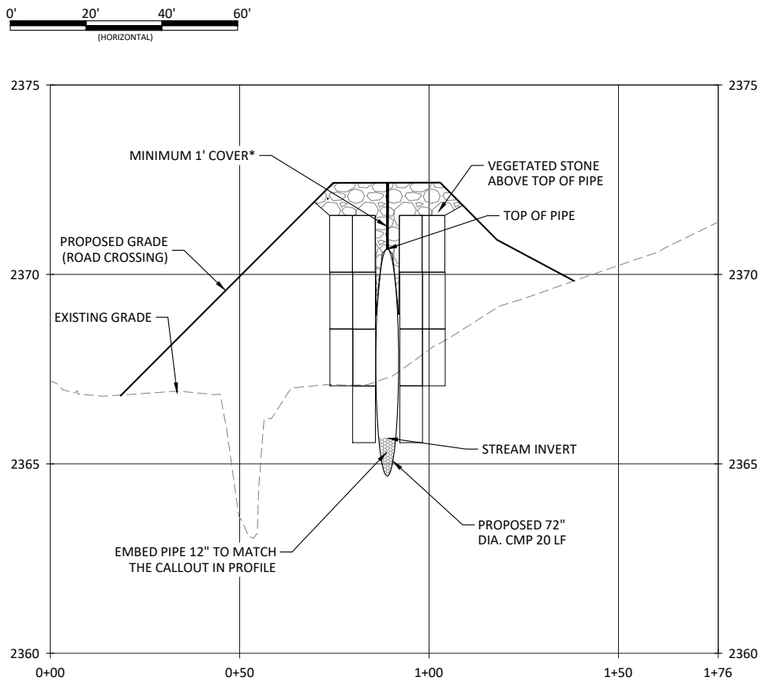
Sheet 5.4

X:\Shared\Projects\WI02191_Cornbread_Valley\Cadd\Plans\WI02191-CROSSINGS-UT1-2-JONES.dwg

December 22, 2023

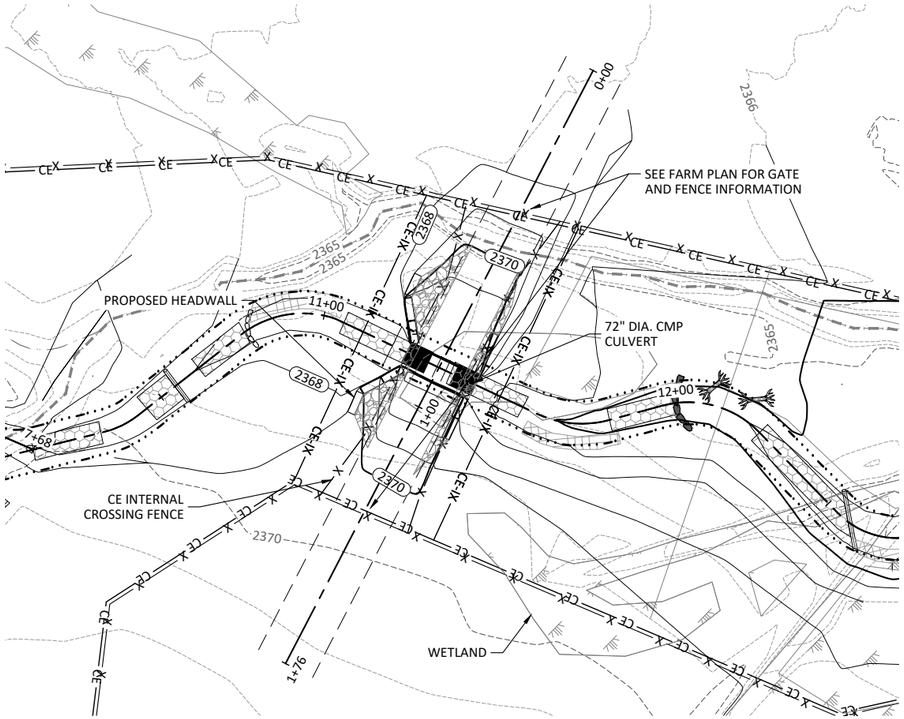


PROFILE VIEW OF CULVERT CROSSING

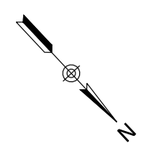


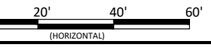
CROSS SECTION VIEW OF CULVERT CROSSING

UT3 REACH 3 - DESIGN NOTES:
1. RIFFLE BOTTOM WIDTH - 6'
2. RIFFLE TOP WIDTH - 13'
3. BANKFULL DEPTH - 1'
4. BANKFULL DISCHARGE - 38 CFS
5. 10YR STORM FLOWS - 114 CFS



PLAN VIEW OF CULVERT CROSSING





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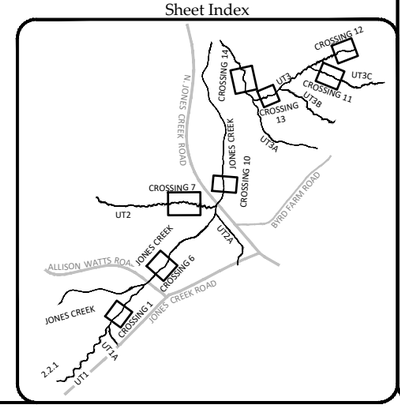

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3 Reach 3 - Crossing 10
Crossings

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 5.5

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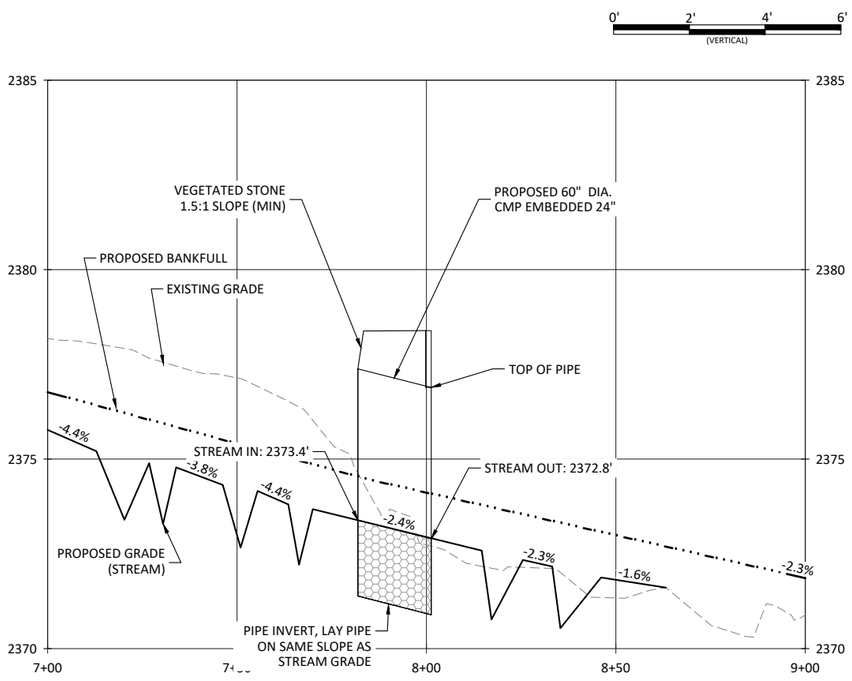
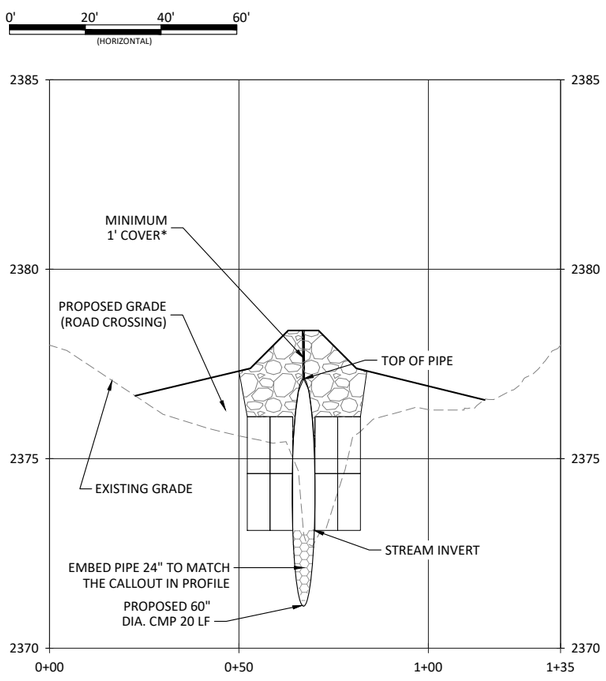
December 22, 2023



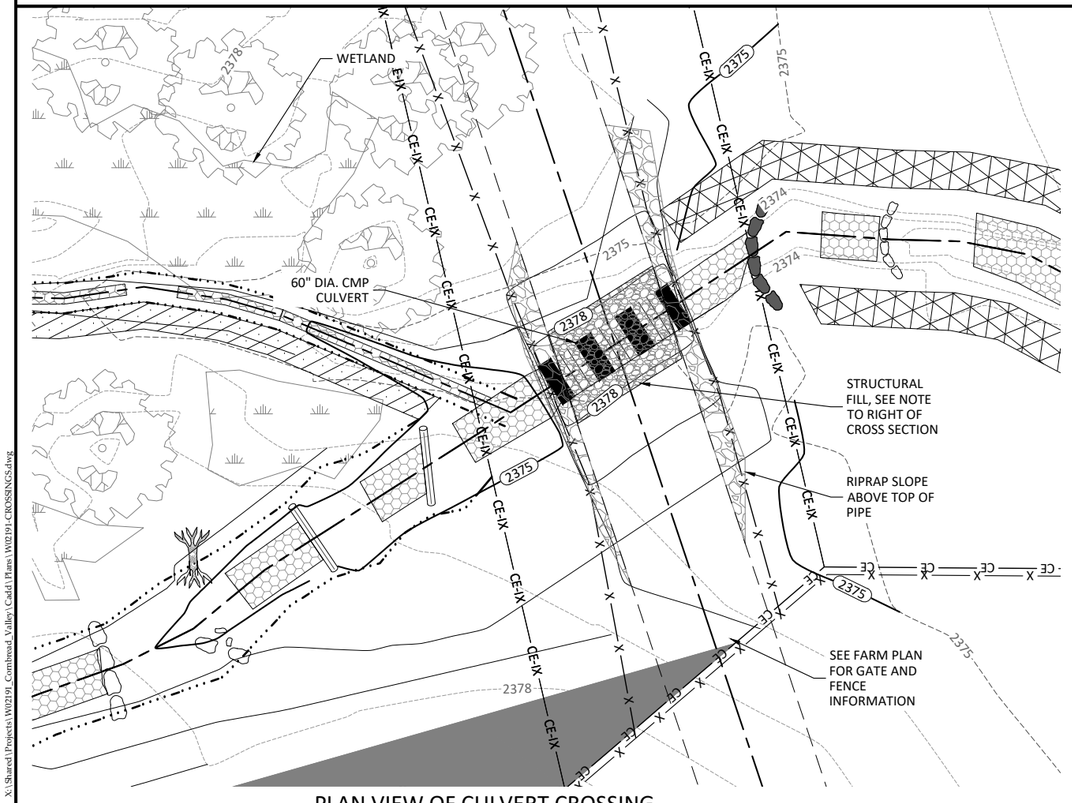
PROFILE VIEW OF CULVERT CROSSING



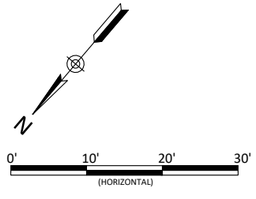
CROSS SECTION VIEW OF CULVERT CROSSING

UT3 REACH 2 - DESIGN NOTES:

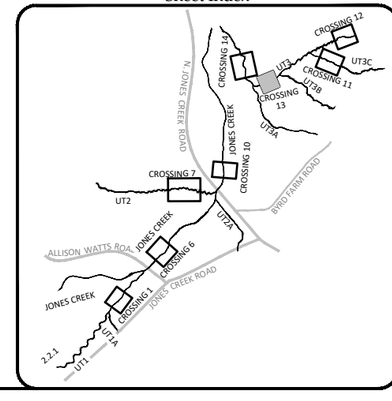
1. RIFFLE BOTTOM WIDTH - 6'
2. RIFFLE TOP WIDTH - 11.6'
3. BANKFULL DEPTH - 0.8'
4. BANKFULL DISCHARGE - 34 CFS
5. 10YR STORM FLOWS - 114 CFS



PLAN VIEW OF CULVERT CROSSING



Sheet Index



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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3 Reach 2 - Crossing 11
Crossings

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	IPM
Drawn By:	IDW
Checked By:	EJN

Sheet 5.6

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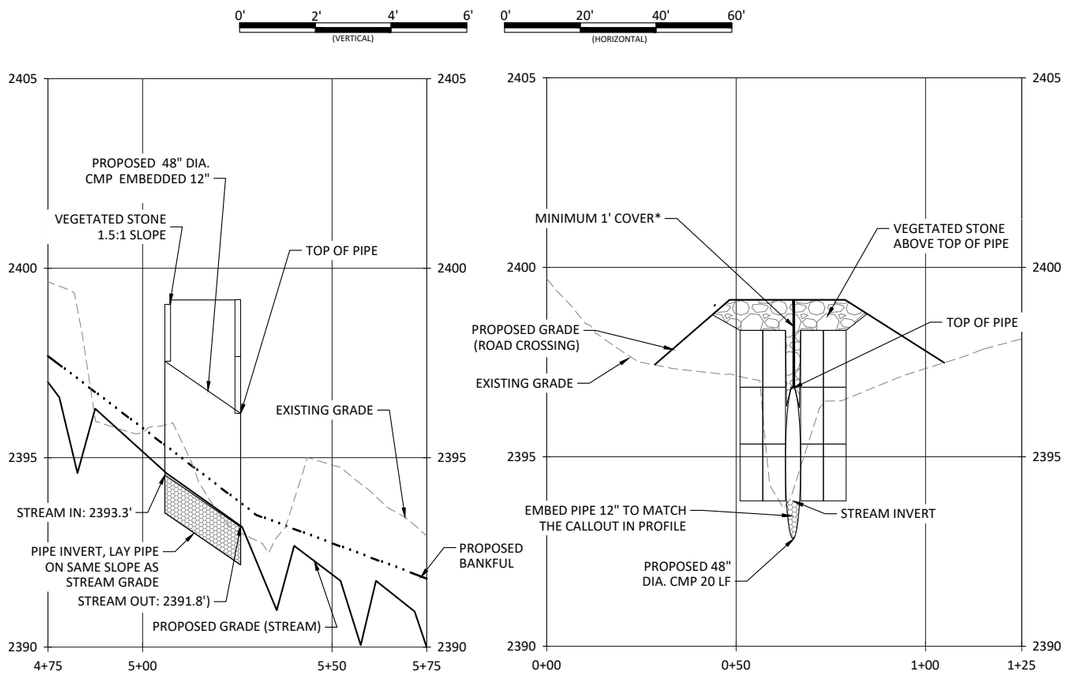
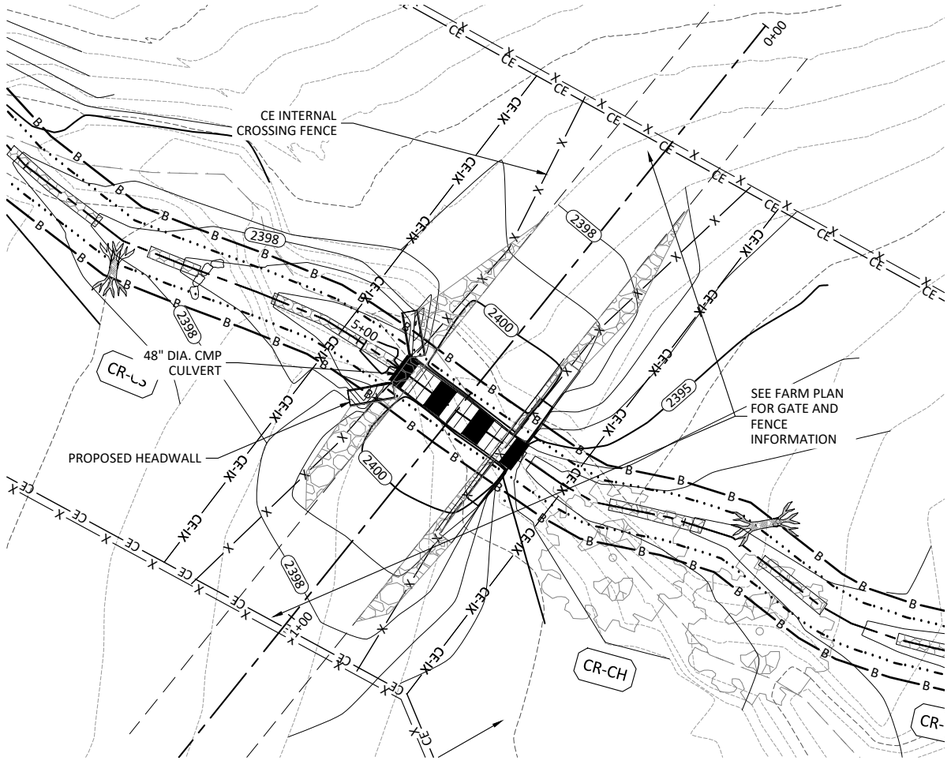
December 22, 2023



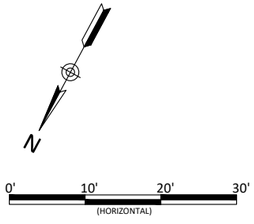
STREAM PROFILE OF CULVERT CROSSING

FARM ROAD CROSSING WITH END TREATMENT

UT3C REACH 2 - DESIGN NOTES:
1. RIFFLE BOTTOM WIDTH - 2'
2. RIFFLE TOP WIDTH - 6.2'
3. BANKFULL DEPTH - 0.7'
4. BANKFULL DISCHARGE - 13 CFS
5. 10YR STORM FLOW - 47 CFS



PLAN VIEW OF CULVERT CROSSING



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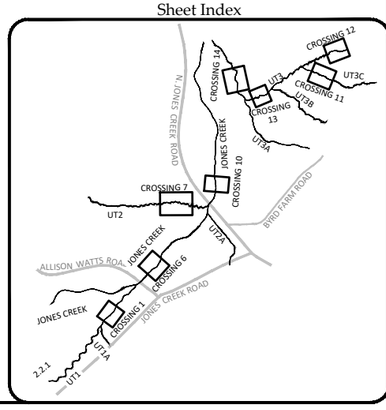

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Cornbread Valley Mitigation Site
Macon County, North Carolina

UT3C - Crossing 12
Crossings

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

5.7
Sheet

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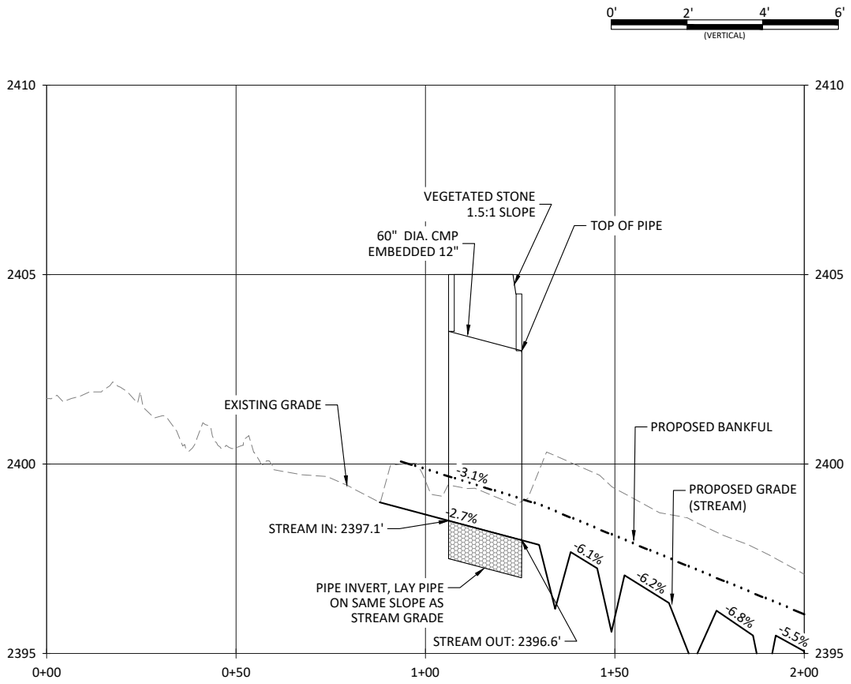
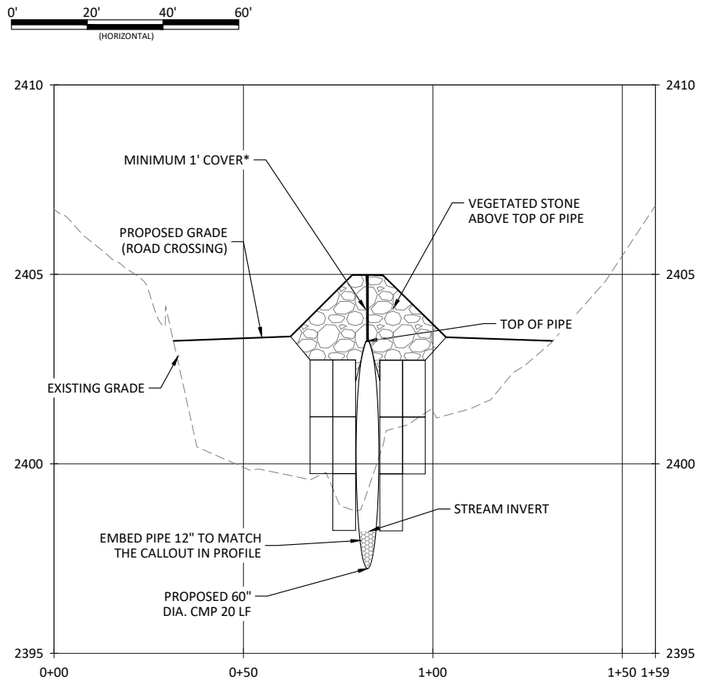
December 22, 2023

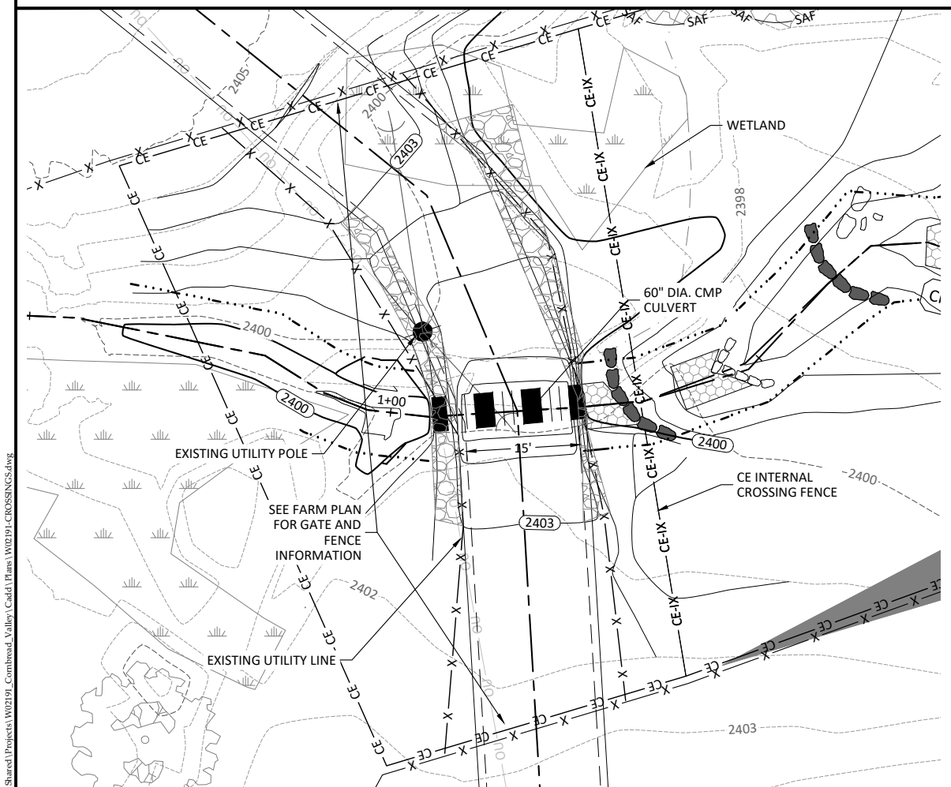


STREAM PROFILE OF CULVERT CROSSING

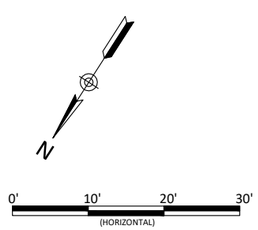


CROSS SECTION VIEW OF CULVERT CROSSING

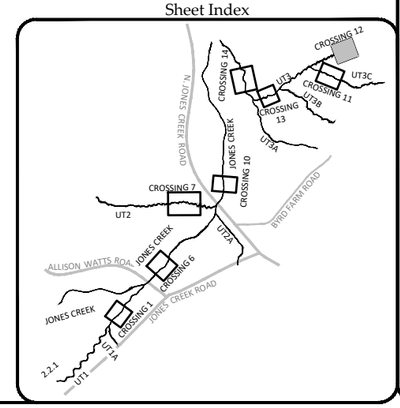
UT3 REACH 1 - DESIGN NOTES:
1. RIFFLE BOTTOM WIDTH - 6'
2. RIFFLE TOP WIDTH - 11.6'
3. BANKFULL DEPTH - 0.8'
4. BANKFULL DISCHARGE - 34 CFS
5. 10YR STORM FLOW - 114 CFS



PLAN VIEW OF CULVERT CROSSING



Sheet Index



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Macon County, North Carolina

UT3 Reach 1 - Crossing 14
Crossings

Revisions:

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EFN

Sheet 5.8

December 22, 2023

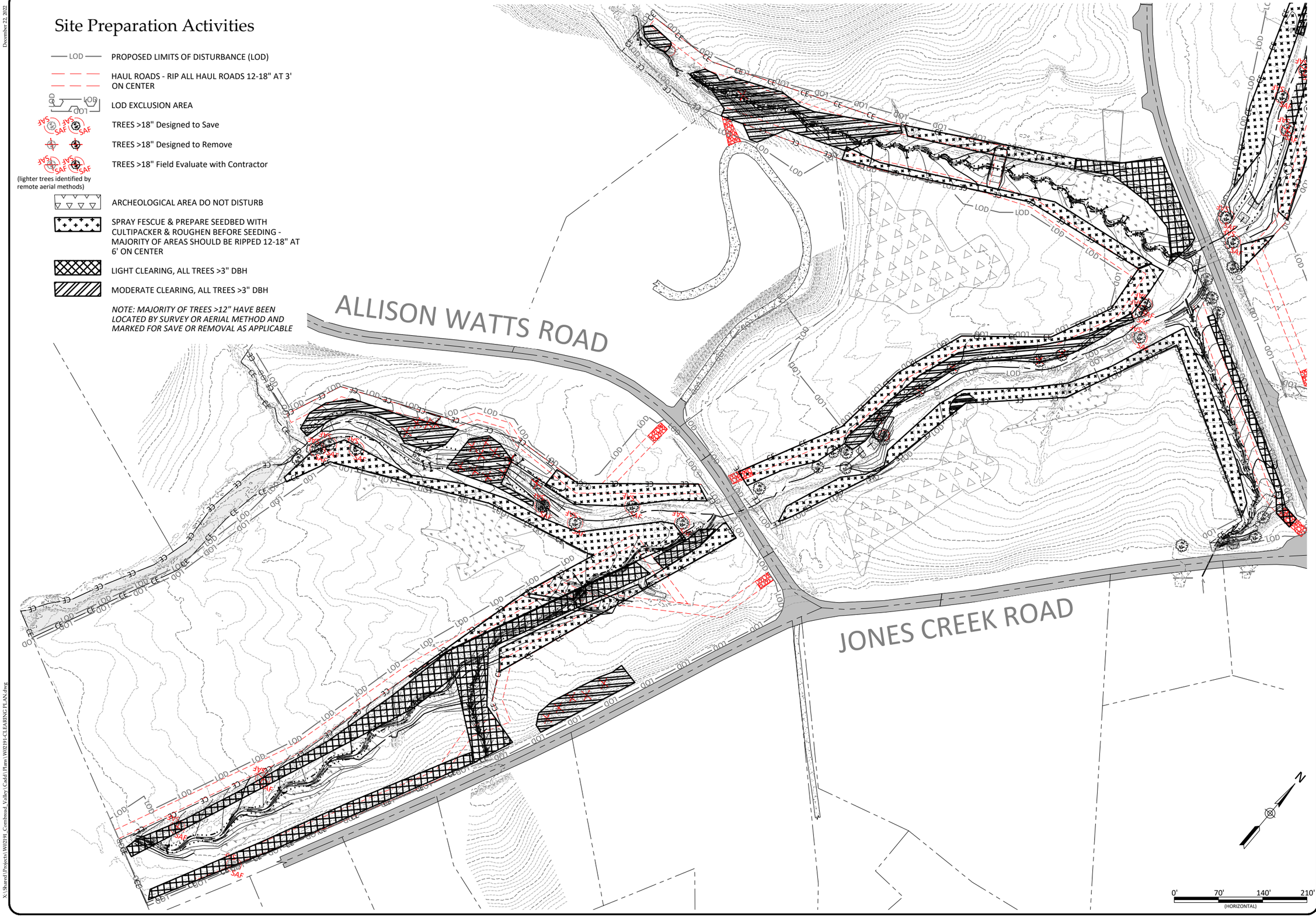
Site Preparation Activities

- PROPOSED LIMITS OF DISTURBANCE (LOD)
- HAUL ROADS - RIP ALL HAUL ROADS 12-18" AT 3' ON CENTER
- LOD EXCLUSION AREA
- TREES >18" Designed to Save
- TREES >18" Designed to Remove
- TREES >18" Field Evaluate with Contractor

(lighter trees identified by remote aerial methods)

- ARCHEOLOGICAL AREA DO NOT DISTURB
- SPRAY FESCUE & PREPARE SEEDBED WITH CULTIPACKER & ROUGHEN BEFORE SEEDING - MAJORITY OF AREAS SHOULD BE RIPPED 12-18" AT 6' ON CENTER
- LIGHT CLEARING, ALL TREES >3" DBH
- MODERATE CLEARING, ALL TREES >3" DBH

NOTE: MAJORITY OF TREES >12" HAVE BEEN LOCATED BY SURVEY OR AERIAL METHOD AND MARKED FOR SAVE OR REMOVAL AS APPLICABLE



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Cornbread Valley Mitigation Site
Macon County, North Carolina

Area 1 - Site Preparation

Date: 12.21.2022
Job Number: WI02191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

Revisions:

Sheet 6.1

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December 22, 2021

N. JONES CREEK ROAD

Site Preparation Activities

- LOD — PROPOSED LIMITS OF DISTURBANCE (LOD)
- HAUL ROADS - RIP ALL HAUL ROADS 12-18" AT 3' ON CENTER
- LOD EXCLUSION AREA
- TREES >18" Designed to Save
- TREES >18" Designed to Remove
- TREES >18" Field Evaluate with Contractor

(lighter trees identified by remote aerial methods)

- ARCHEOLOGICAL AREA DO NOT DISTURB
- SPRAY FESCUE & PREPARE SEEDBED WITH CULTIPACKER & ROUGHEN BEFORE SEEDING - MAJORITY OF AREAS SHOULD BE RIPPED 12-18" AT 6' ON CENTER
- LIGHT CLEARING, ALL TREES >3" DBH
- MODERATE CLEARING, ALL TREES >3" DBH

NOTE: MAJORITY OF TREES >12" HAVE BEEN LOCATED BY SURVEY OR AERIAL METHOD AND MARKED FOR SAVE OR REMOVAL AS APPLICABLE

N

0' 70' 140' 210'
(HORIZONTAL)

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Area 2 - Site Preparation

Revisions:

Date:	12.21.2022
Job Number:	W02191
Project Engineer:	IPM
Drawn By:	JDW
Checked By:	EPN

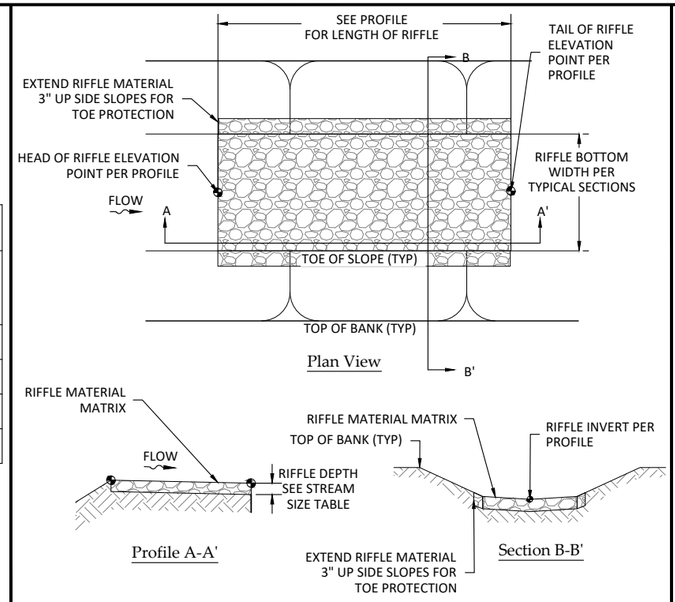
Sheet 6.2

December 22, 2021

STREAM SIZE TABLE USE FOR ALL RIFFLES & STRUCTURES	
STREAM SIZE	**STREAMS**
LARGE STREAMS	JONES CREEK, UT1, UT3
SMALL STREAMS	UT1A, UT2, UT2A, UT3A, UT3B, UT3C

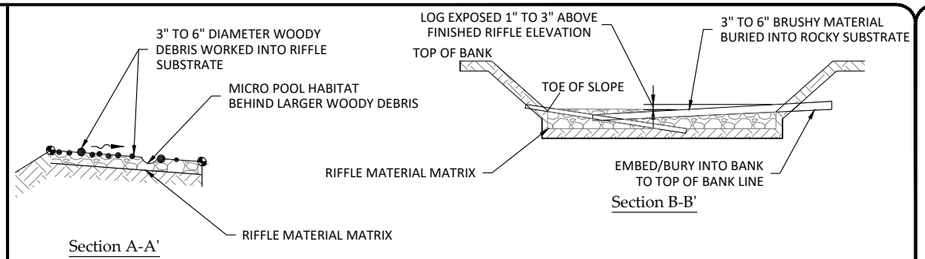
STREAM SIZE TABLE USE FOR ALL RIFFLES & STRUCTURES					
STREAM or STREAM SIZE	**RIFFLE MATRIX***	**GRADE CONTROL MATERIAL SIZE (MIN. BOULDER SIZE FOR STRUCTURES)**	**RIFFLE DEPTH**	**LOG STRUCTURE SIZE (MIN. LOG DIAMETER FOR STRUCTURES)**	**RIFFLE BOTTOM WIDTH**
JONES CREEK	50% CLASS 2 / 50% CLASS B	1.5' x 1.5' x 2'	24"	16"	16'
UT1	50% CLASS A / 50% #57	0.5' x 0.5' x 1'	8"	12"	3'
UT3	50% CLASS A / 50% CLASS B	1.0' x 1.0' x 1.5'	18"	16"	6'
SMALL STREAMS	50% CLASS A / 50% CLASS B	0.5' x 1.0' x 1.5'	12"	12"	1.5' - 2.5'

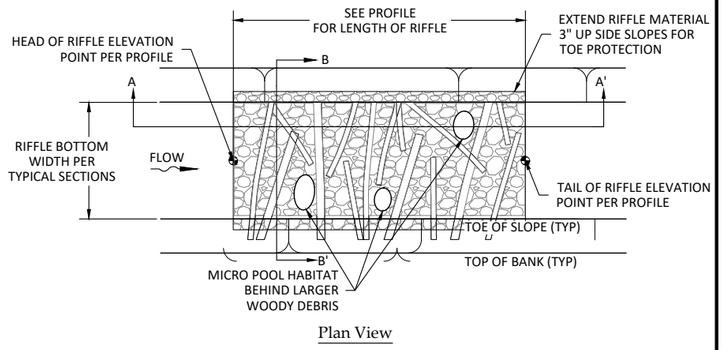
NOTE:
1. USE ONSITE MATERIAL TO MAXIMUM EXTENT POSSIBLE. SELECT ONSITE MATERIAL TO MATCH REQUIRED SIZING AND GRADATION.



1 / 7.1 Native Material Constructed Riffle
Not to Scale

NOTE:
1. IF NECESSARY, SALVAGED ONSITE ROCK MAY BE SUBSTITUTED WITH QUARRY ROCK OF SIMILAR SIZE.
2. ALL RIFFLES IN PLANS THAT ARE NOT LABELED ARE NATIVE MATERIAL CONSTRUCTED RIFFLES.





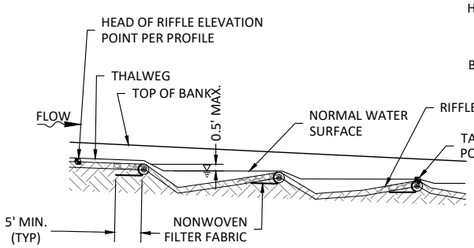
2 / 7.1 Woody Riffle
Not to Scale

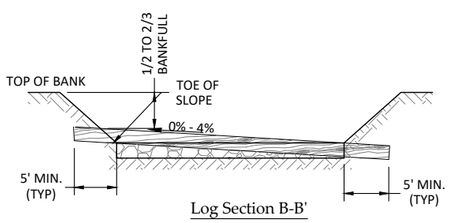
NOTES:
1. WOOD SHALL COMPRISE 20% TO 50% OF THE RIFFLE SURFACE AREA.
2. WOODY MATERIAL SHOULD NOT PROTRUDE GREAT THAN 3" ABOVE RIFFLE BED.
3. BRUSH SHOULD BE PLACED PERPENDICULAR TO CHANNEL AT UP TO A 15% ANGLE DOWNSTREAM.
4. IF NECESSARY, SALVAGED ONSITE ROCK MAY BE SUBSTITUTED WITH QUARRY ROCK OF SIMILAR SIZE.
5. BRUSH CUTTERS OR OTHER DEVICE MUST BE USED TO ENSURE PROTRUSION LIMITED TO TOLERANCE IN NOTE 2.

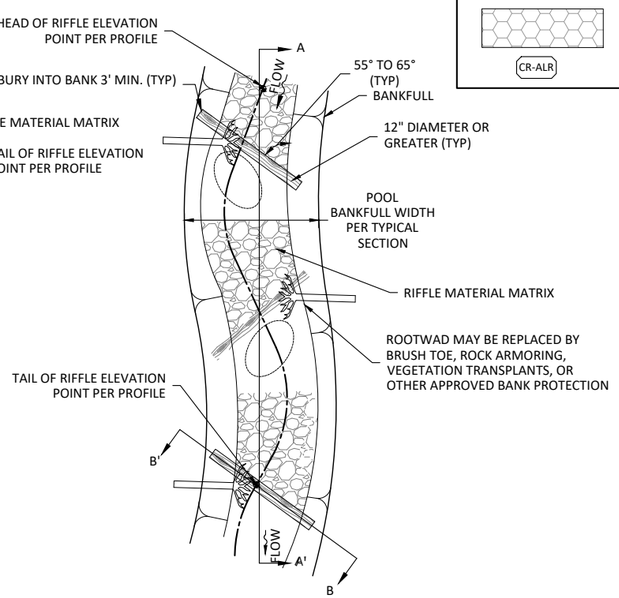
CR-WD

CR-ALR

CR-CH

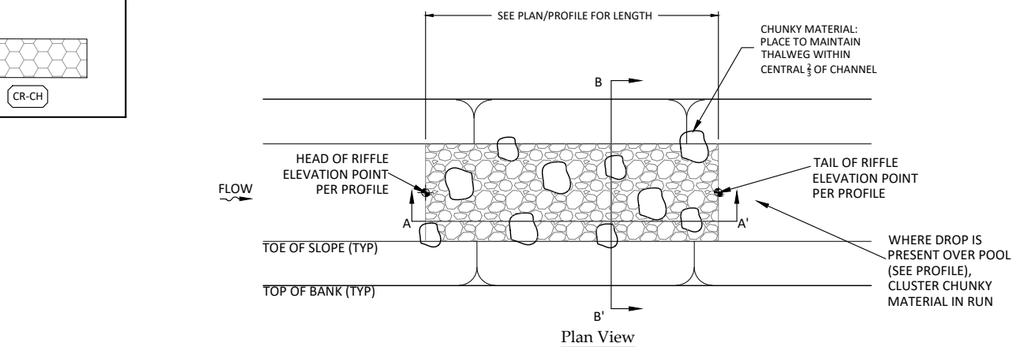


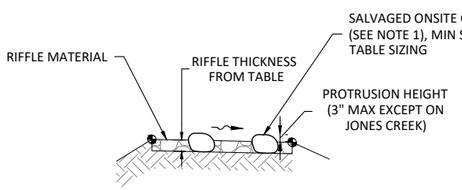


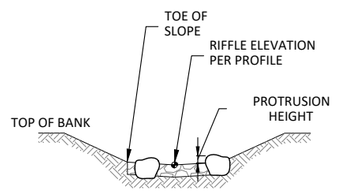


NOTE:
1. BOULDER MATERIAL CAN BE SUBSTITUTED IN PLACE OF ANGLED LOGS WITH APPROVAL OF ENGINEER.

3 / 7.1 Angled Log Riffle
Not to Scale







4 / 7.1 Chunky Riffle
Not to Scale

NOTES:
1. IF NECESSARY, SALVAGED ONSITE ROCK MAY BE SUBSTITUTED WITH QUARRY ROCK OF SIMILAR SIZE.
2. REFER TO TABLE UPPER LEFT FOR RIFFLE MATERIAL AND STRUCTURE SIZING AND RIFFLE THICKNESS.

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Details

Revisions:

Date: 12.21.2022
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Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

7.1
Sheet

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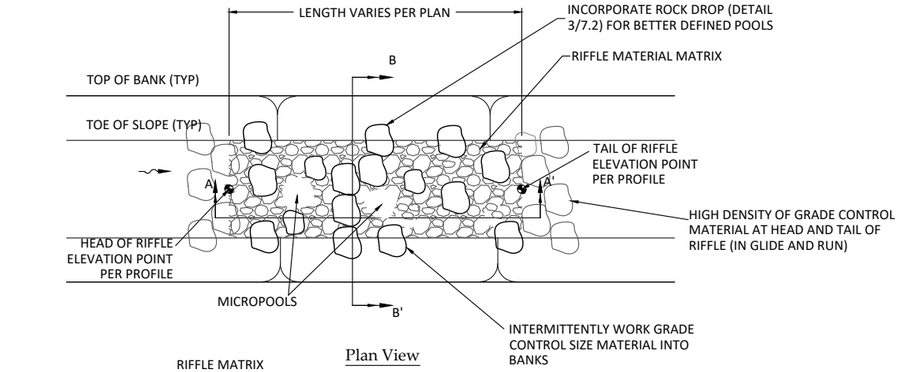
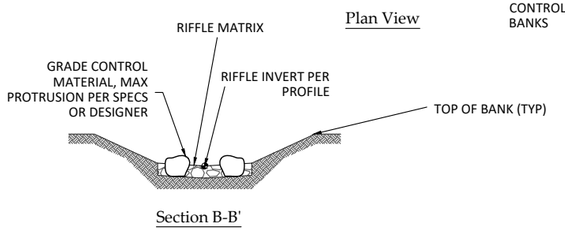
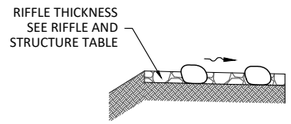


Plan View



Section B-B'

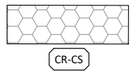


Section A-A'

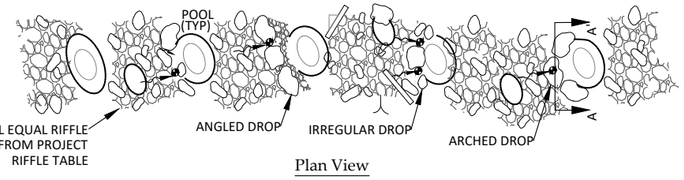
NOTES:

- INSTALL ON SMALL STREAMS ONLY
- DETAIL TO BE APPLIED IN CONJUNCTION WITH DETAIL 3/7.2 (ROCK DROP).
- FOR BOULDER AND RIFFLE MATERIAL SIZING SEE TABLE ON SHEET 7.1

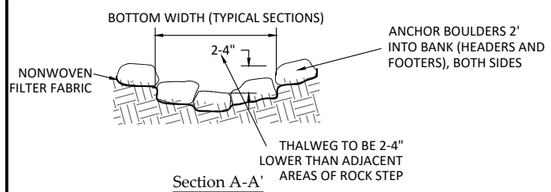
1/7.2 Cascading Riffle
Not to Scale



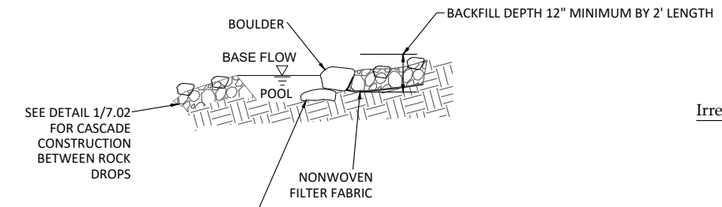
2/7.2 Not Used



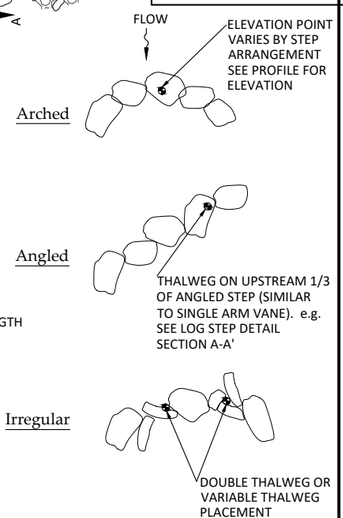
Plan View



Section A-A'



Profile View

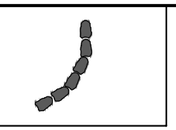


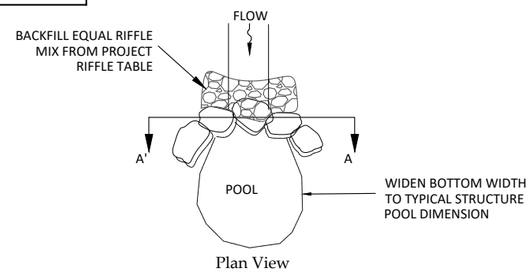
Types of Step Configurations

NOTES:

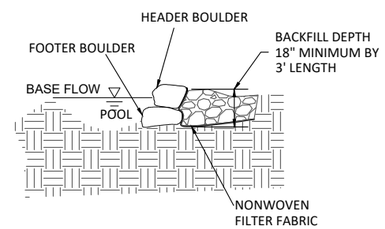
- DROP TYPE MAY BE VARIED IN THE FIELD BY DESIGNER. IN GENERAL, VARY DROP TYPE OFTEN WITH ROUGHLY EQUAL NUMBERS OF EACH DROP TYPE WITHIN A REACH.
- DETAIL TO BE APPLIED IN CONJUNCTION WITH DETAIL 1/7.2 (CASCADING RIFFLE).
- SECTION VIEWS REPRESENT ARCHED ROCK DROP VARIATION. MODIFY SECTIONS AS NEEDED TO ACCOMMODATE OTHER VARIATIONS .
- FOR BOULDER AND RIFFLE MATERIAL SIZING SEE TABLE ON SHEET 7.1

3/7.2 Rock Drop
Not to Scale

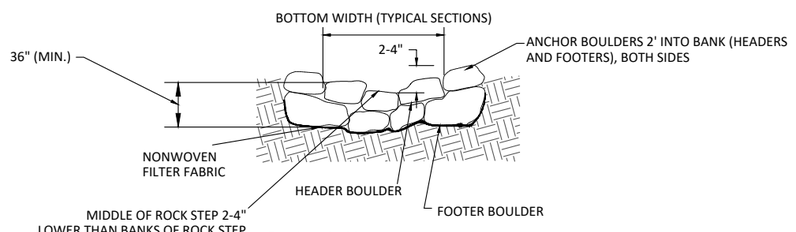




Plan View



Profile View



Section A-A'

NOTE:

- FOR BOULDER SIZING SEE TABLE ON SHEET 7.01

4/7.2 Rock Sill
Not to Scale

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Sheet 7.2

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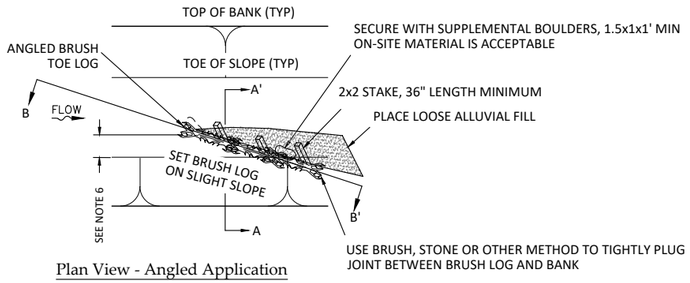
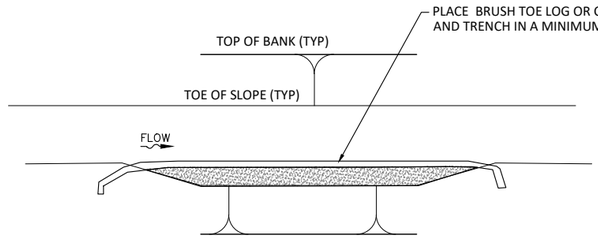
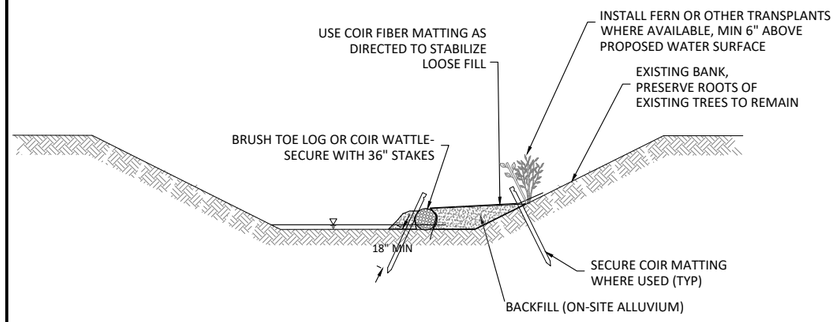


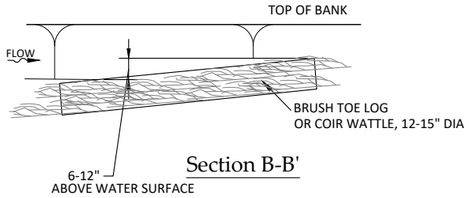
Plan View - Angled Application



Plan View - Linear Application



Section A-A'

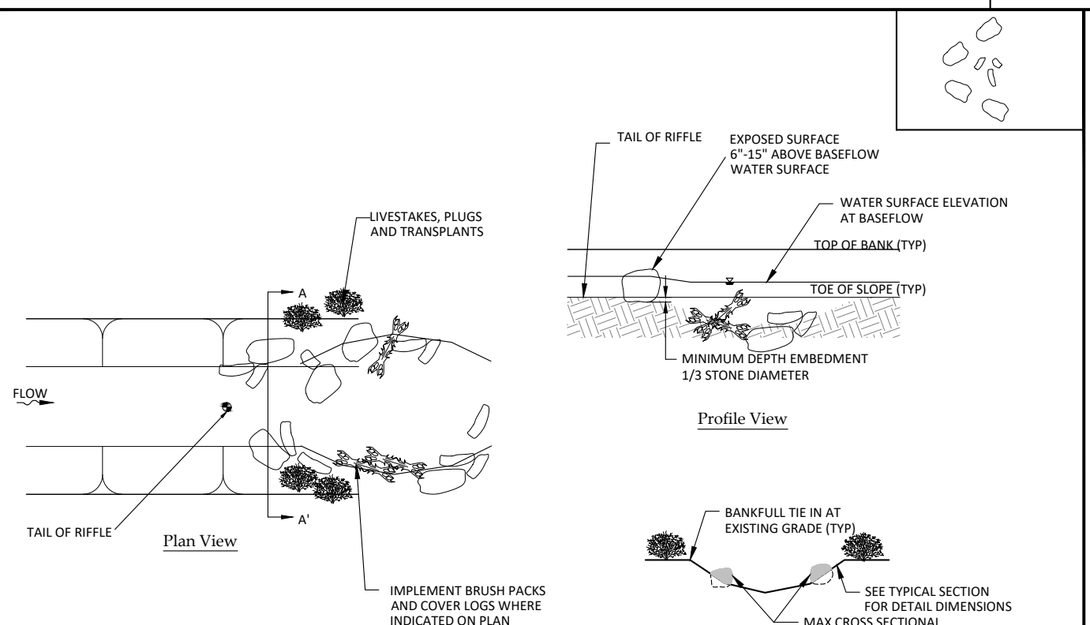


Section B-B'

NOTES:

1. PLACE 36" STAKES OR BOULDERS EVERY 3'.
2. STAKES MAY CONSIST OF COMPARABLE DIAMETER AND LENGTH.
3. CONSTRUCT BRUSH TOE LOG OF FRESH CUT BRUSH AND LIMBS ½" TO 6" DIAMETER. TIGHTLY PACK AND USE VARIOUS SIZES TO CREATE SOLID MASS.
4. PACK LEAVES WITH BRUSH WHEN AVAILABLE AND WRAP WITH JUTE.
5. SECURE BUNDLE WITH WIRE, AND JUTE WHEN LEAVES ARE USED.
6. EXTEND OUT TO CREATE BOTTOM WIDTH OF TYPICAL SECTION AT UPSTREAM EXTENT OF TOE LOG
7. ENGINEER MAY REQUIRE CONSTRUCTION OF PRACTICE BY HAND WHERE EQUIPMENT ACCESS IS LIMITED

1 / 7.3 Channel Narrowing
Not to Scale

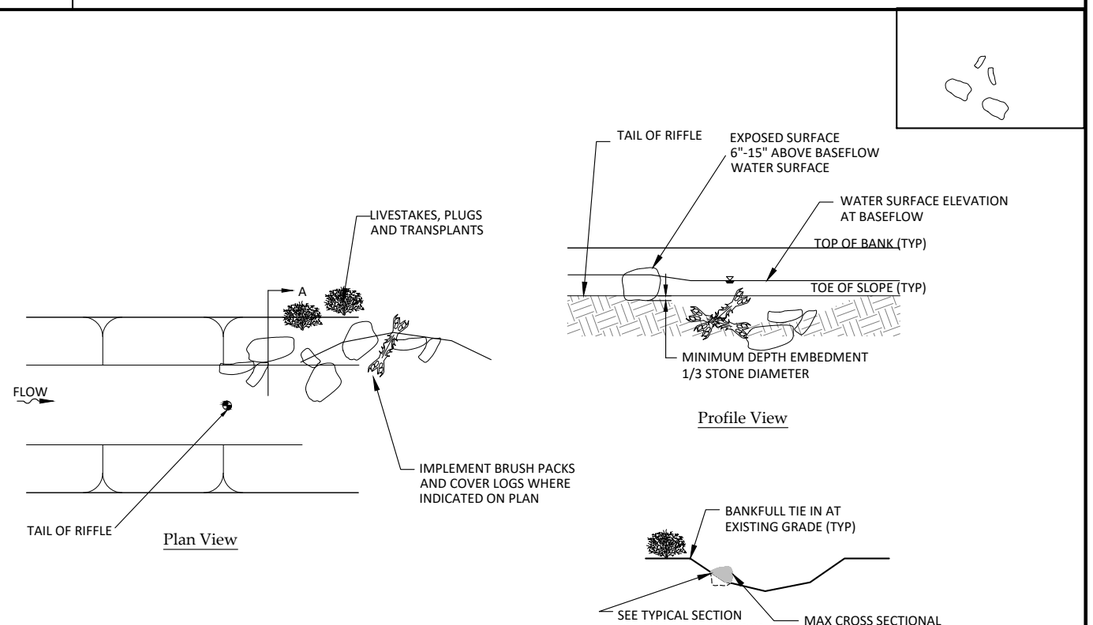


Plan View

Profile View

Section A-A'

2 / 7.3 Boulder Cluster
Not to Scale



Plan View

Profile View

Section A-A'

3 / 7.3 Boulder Cluster:1-sided

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Details

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Checked By: EPN

Sheet 7.3

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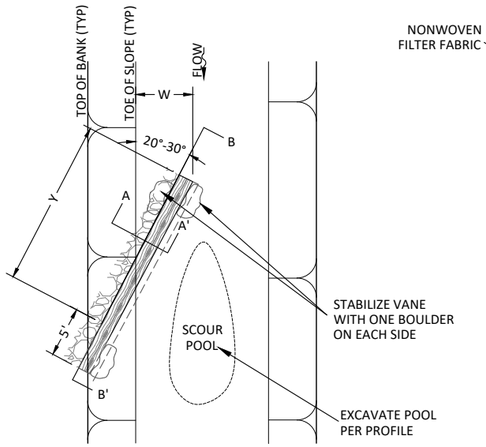
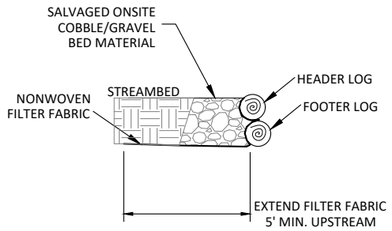
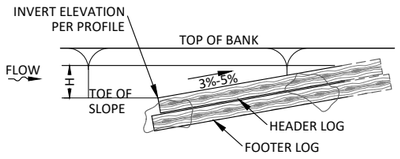
December 22, 2023



Plan View



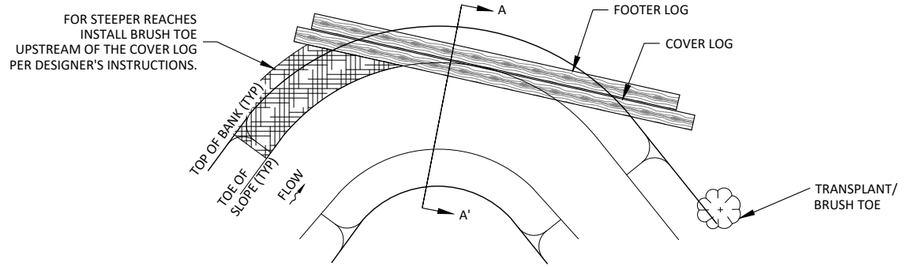
Section A-A'



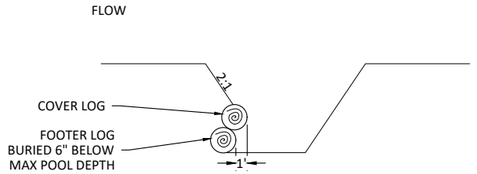
Profile B-B'

NOTE:
1. INSTALL ON LARGE STREAMS ONLY

1/7.4 Log Vane
Not to Scale

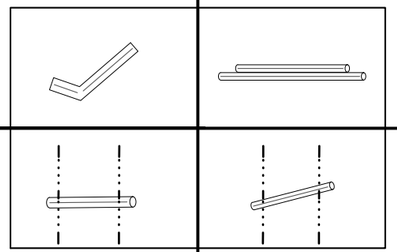


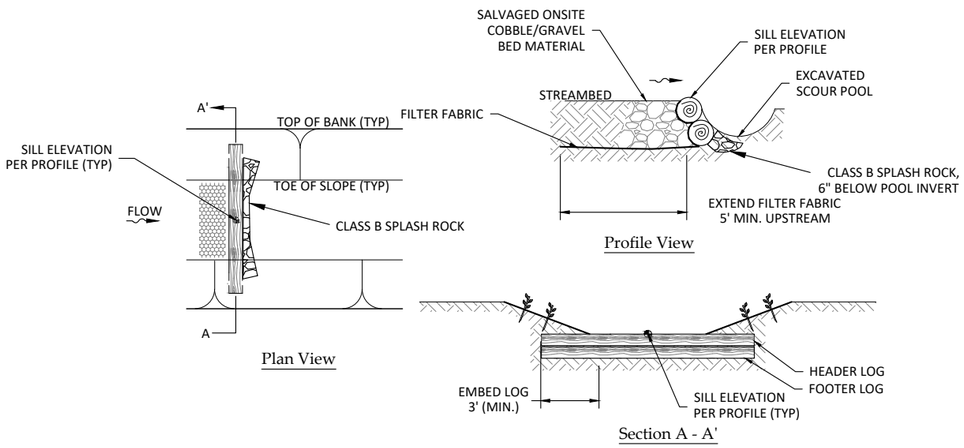
Plan View



Section A-A'

2/7.4 Cover Log
Not to Scale





Profile View

Plan View

Section A - A'

3/7.4 Log Sill
Not to Scale

NOTE:
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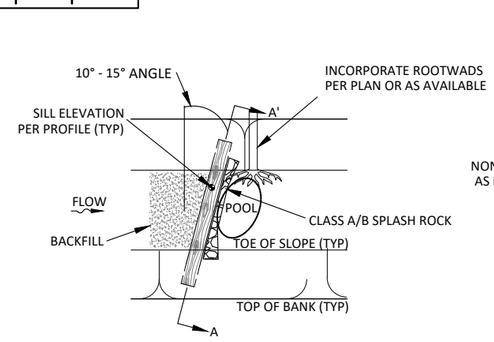
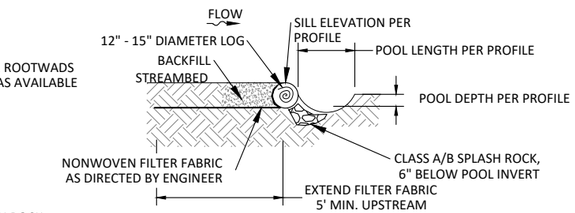
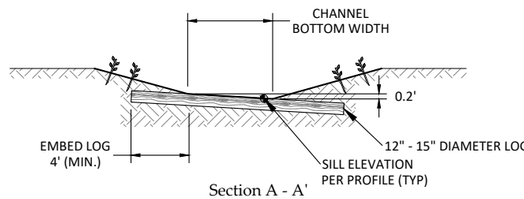


Plan View



Profile View



Section A - A'

4/7.4 Angled Log Drop
Not to Scale

NOTE:
1. INSTALL ON SMALL STREAMS ONLY

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Checked By: EFN

7.4

Sheet

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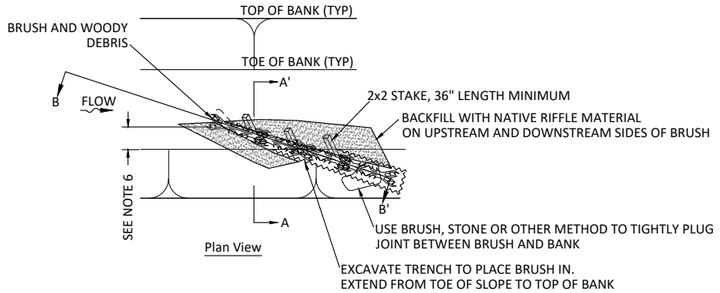

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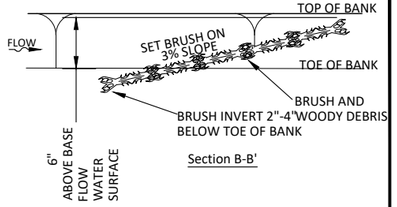
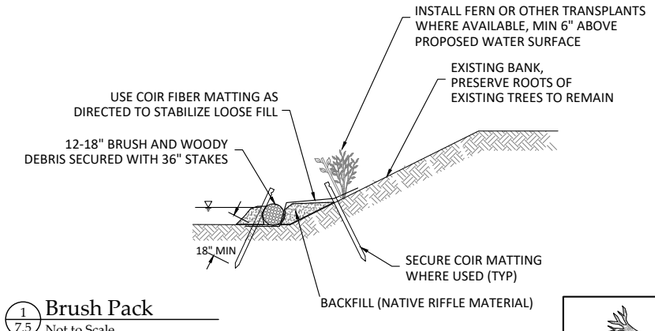


Section B-B'

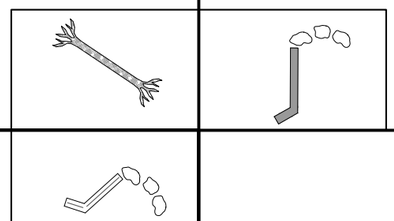
NOTE:

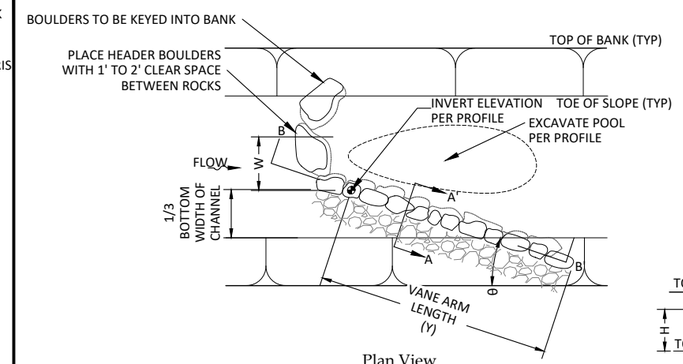
1. PLACE 36" STAKES OR BOULDERS EVERY 3'.
2. STAKES SHOULD BE OF COMPARABLE DIAMETER AND LENGTH.
3. CONSTRUCT BRUSH TOE LOG OF FRESH CUT BRUSH AND LIMBS ½" TO 6" DIAMETER. TIGHTLY PACK AND USE VARIOUS SIZES TO CREATE SOLID MASS.
4. PACK LEAVES WITH BRUSH WHEN AVAILABLE AND WRAP WITH JUTE.
5. SECURE BUNDLE WITH WIRE, AND JUTE WHEN LEAVES ARE USED.
6. EXTEND OUT TO CREATE BOTTOM WIDTH OF TYPICAL SECTION AT UPSTREAM EXTENT OF TOE LOG
7. ENGINEER MAY REQUIRE CONSTRUCTION OF PRACTICE BY HAND WHERE EQUIPMENT ACCESS IS LIMITED



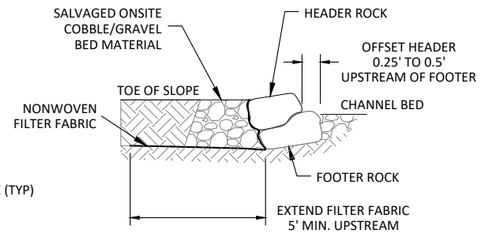
Section A-A'

1/7.5 Brush Pack
Not to Scale

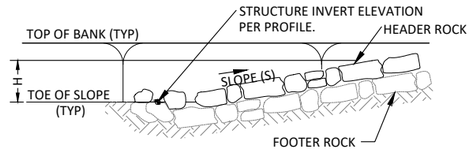




Plan View



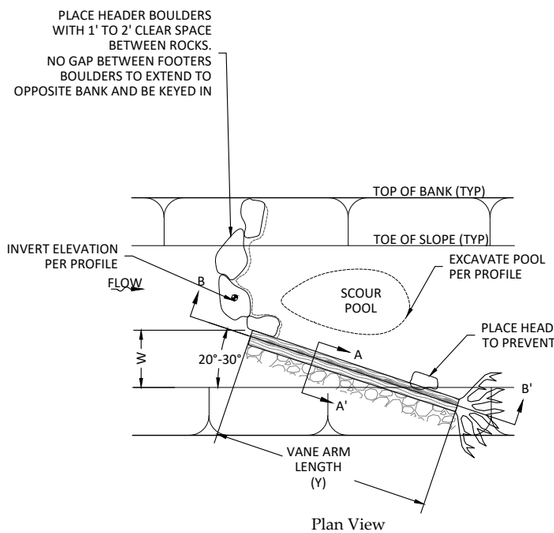
Section A-A'



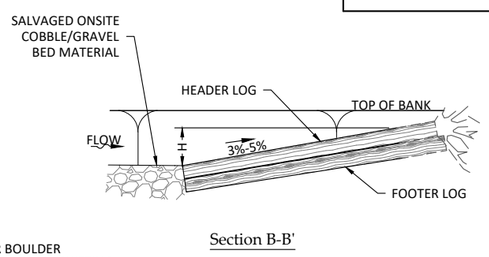
Profile View B-B'

2/7.5 Rock J-Hook
Not to Scale

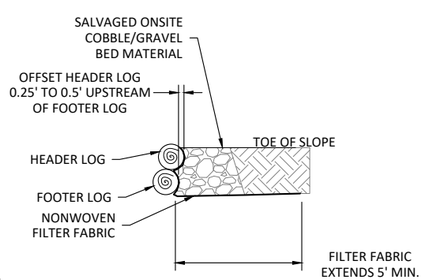
NOTES:
1. ROCK J-HOOK TO REPLACE LOG J-HOOK WHEN PROPERLY SIZED LOGS ARE NOT AVAILABLE AND WITH APPROVAL OF DESIGNER
2. SEE LOG J-HOOK DETAIL FOR J-HOOK DIMENSIONS



Plan View



Section B-B'



Section A-A'

3/7.5 Log J-Hook
Not to Scale

4/7.5 Not Used

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Drawn By: JDW
Checked By: EPN

Sheet 7.5

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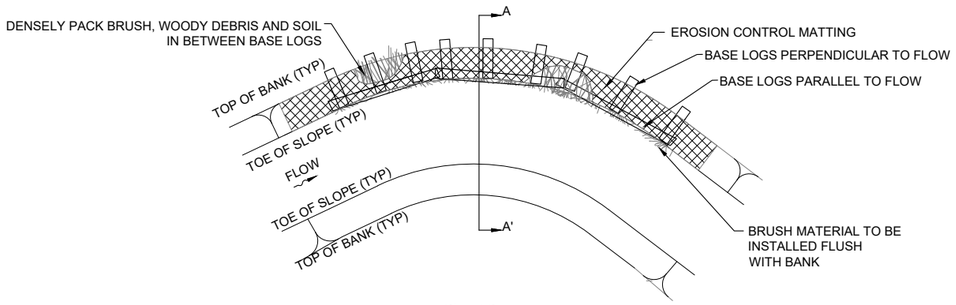
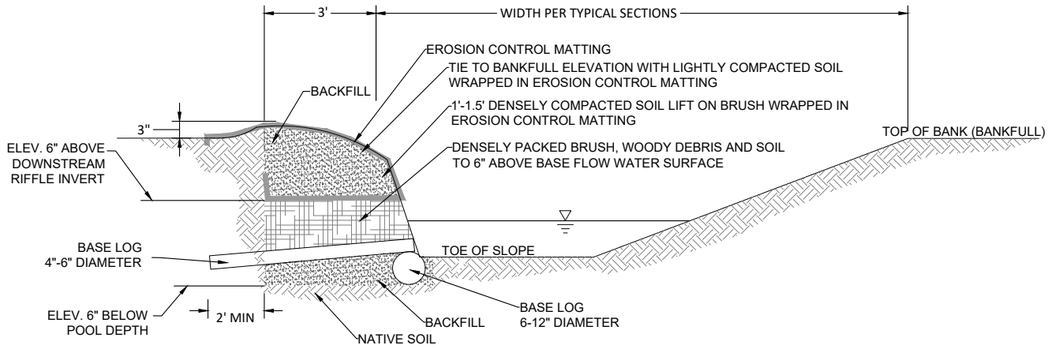


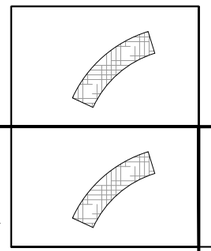
Plan View

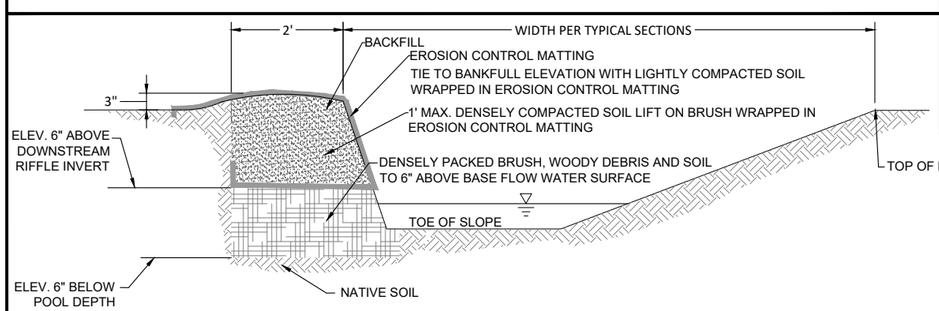


Section A-A'

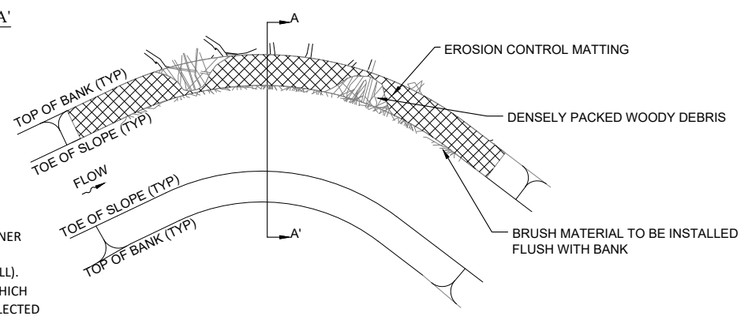
NOTES:
- OVEREXCAVATE 3' OUTSIDE OF TOP OF BANK (BANKFULL).
- INSTALL BASE LOGS PARALLEL TO FLOW AT TOE OF SLOPE. DIAMETER 6"-12".
- INSTALL BASE LOGS PERPENDICULAR TO FLOW AT INTERVALS ALONG BANK, RESTING ON TOP OF PARALLEL BASE LOGS. BASE LOGS SHALL BE 6"-12" DIAMETER.
- INSTALL A DENSE LAYER OF BRUSH/WOODY DEBRIS, WHICH SHALL CONSIST OF SMALL BRANCHES AND ROOTS COLLECTED ON-SITE AND SOIL TO FILL ANY VOID SPACE. LIGHTLY COMPACT BRUSH/WOODY DEBRIS LAYER.
- BRUSH SHOULD BE ALIGNED SO STEMS ARE ROUGHLY PARALLEL AND IS INSTALLED POINTING SLIGHTLY UPSTREAM. BRUSH LAYER SHOULD EXTEND TO 6" ABOVE THE BASEFLOW WATER SURFACE
- INSTALL EARTH BACKFILL OVER BRUSH/WOODY LAYER ACCORDING TO TYPICAL SECTION DIMENSIONS. ONLY 1 SOIL LIFT WITH A HEIGHT OF 1'-1.5' WILL BE REQUIRED.
- SEED, MULCH AND INSTALL EROSION CONTROL MATTING AND BANK STABILIZATION PER PLANS.

1 / 7.6 **Brush Toe** - Jones Creek, UT1, UT3
Not to Scale





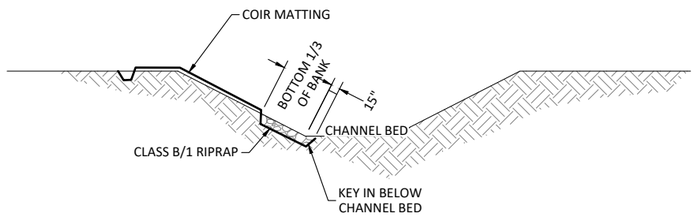
Section A-A'



Plan View

NOTES:
- GEOLIFT MAY BE REPLACED BY SOD MATS WITH DESIGNER APPROVAL ON BRUSH TOE-SMALL ONLY.
- OVEREXCAVATE 2' OUTSIDE OF TOP OF BANK (BANKFULL).
- INSTALL A DENSE LAYER OF BRUSH/WOODY DEBRIS, WHICH SHALL CONSIST OF SMALL BRANCHES AND ROOTS COLLECTED ON-SITE AND SOIL TO FILL ANY VOID SPACE. LIGHTLY COMPACT BRUSH/WOODY DEBRIS LAYER.
- BRUSH SHOULD BE ALIGNED SO STEMS ARE ROUGHLY PARALLEL AND IS INSTALLED POINTING SLIGHTLY UPSTREAM.
- INSTALL EARTH BACKFILL OVER BRUSH/WOODY LAYER ACCORDING TO TYPICAL SECTION DIMENSIONS. ONLY ONE SOIL LIFT REQUIRED. SOIL LIFT SHOULD NOT EXCEED 1' IN HEIGHT.
- SEED, MULCH AND INSTALL EROSION CONTROL MATTING AND BANK STABILIZATION PER PLANS.

2 / 7.6 **Brush Toe** - UT1A, UT2, UT2A, UT3A, UT3B, UT3C
Not to Scale



Section A-A'

3 / 7.6 **Rock Toe Protection**
Not to Scale

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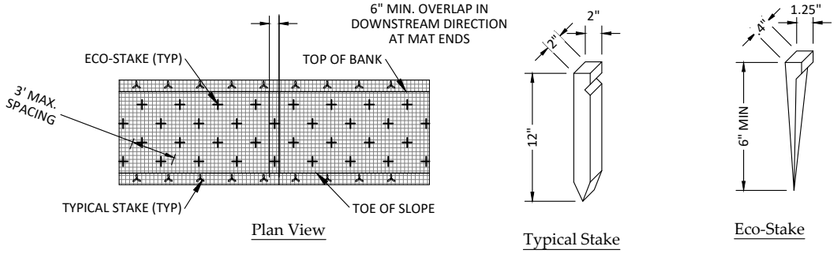
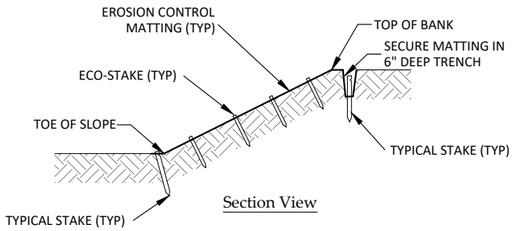
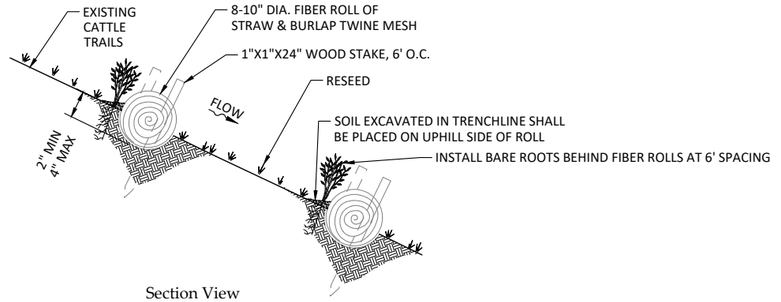


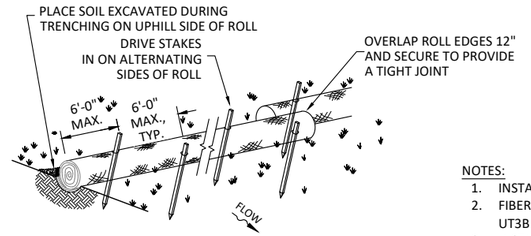


1/7.7 Erosion Control Matting
Not to Scale

ROWS OF MATTING		
	RIFFLE	POOL
JONES CREEK	1	2
ALL OTHERS	1	1

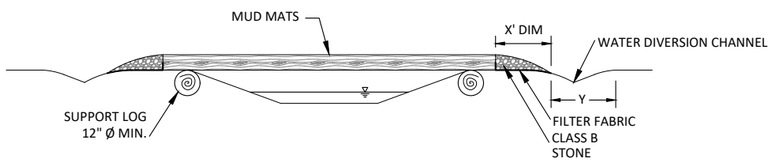
NOTE - APPLY MATTING TO INSIDE AND OUTSIDE OF BANK IN POOLS





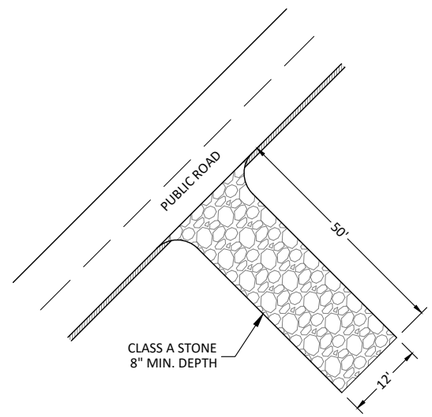
2/7.7 BMP Fiber Roll
Not to Scale

NOTES:
1. INSTALL FIBER ROLLS AS DIRECTED ON SHEET 2.8.1
2. FIBER ROLLS WILL BE PLACED IN TWO ROWS ABOVE UT3B AND BELOW EXISTING CATTLE TRAILS.
3. INSTALL FIBER ROLL ALONG CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.
4. PLANT BARE ROOT TREES BEHIND EACH ROLL AT 6' SPACING.



NOTES:
1. CONSTRUCT STREAM CROSSING WHEN FLOW IS AT NORMAL BASEFLOW.
2. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM.
3. INSTALL STREAM CROSSING PERPENDICULAR TO THE FLOW.
4. MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
5. STABILIZE AN ACCESS RAMP OF CLASS B STONE TO THE EDGE OF THE MUD MAT.
6. CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED.

3/7.7 Temporary Stream Crossing - Timber
Not to Scale



4/7.7 Construction Entrance
Not to Scale

NOTES:
1. PROVIDE TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS.
5. LOCATE CONSTRUCTION ENTRANCE AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. PROVIDE FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE.
6. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOP DRESSING WITH STONE WILL BE NECESSARY.
7. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED IMMEDIATELY.
8. USE CLASS A STONE OR OTHER COARSE AGGREGATE APPROVED BY THE ENGINEER.
9. PLACE FILTER FABRIC BENEATH STONE.

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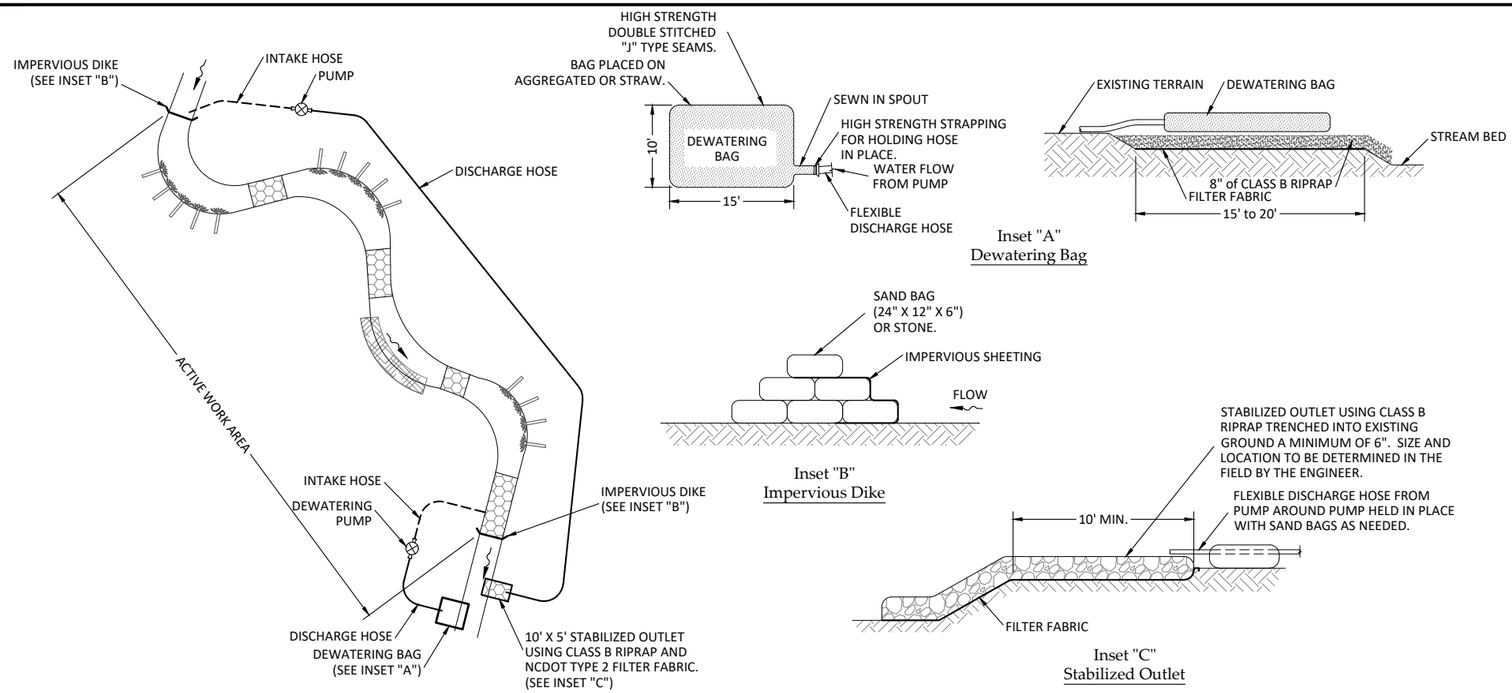
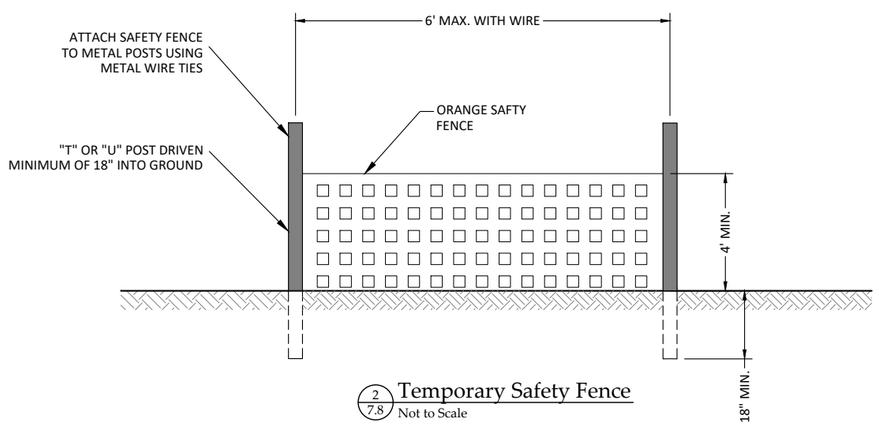


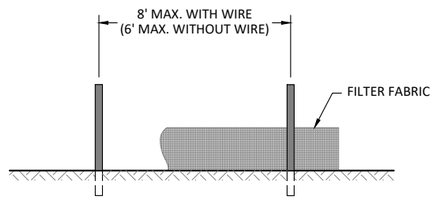
1/7.8 Pump Around System
Not to Scale

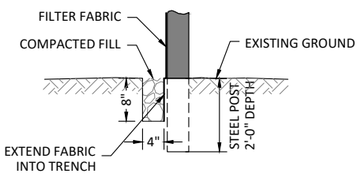
NOTES:
1. PROVIDE STABILIZED OUTLET TO STREAMBED.
2. BAG ON FLAT GROUND OR STAKE AROUND IT TO PREVENT IT ROLLING DOWNHILL.

MATERIAL SPECIFICATIONS		
PHYSICAL PROPERTY	TESTS	REQUIREMENTS
MATERIAL	N/A	POLYETHYLENE
RECOMENDED COLOR	N/A	"INTERNATIONAL ORANGE"
TENSILE YIELD	ASTM D638	AVE. 2000 LBS. PER 4' WIDE
ULTIMATE TENSILE STRENGTH	ASTM D638	AVE. 2900 LBS. PER 4' WIDE
ELONGATION AT BREAK (%)	ASTM D638	GREATER THAN 1000%
CHEMICAL RESISTANCE	N/A	INERT TO MOST CHEMICALS AND ACIDS



2/7.8 Temporary Safety Fence
Not to Scale





NOTES:
1. USE FILTER FABRIC A MINIMUM OF 36" IN WIDTH AND FASTEN ADEQUATELY TO THE POSTS AS DIRECTED BY THE ENGINEER.
2. PROVIDE 5' METAL POST OF THE SELF-FASTENER ANGLE STEEL TYPE.

3/7.8 Temporary Silt Fence
Not to Scale

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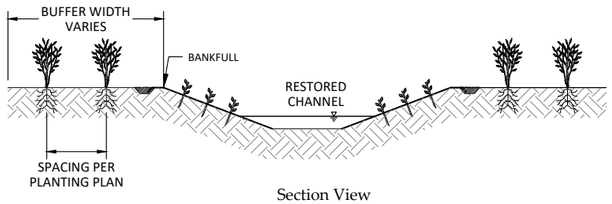
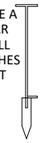
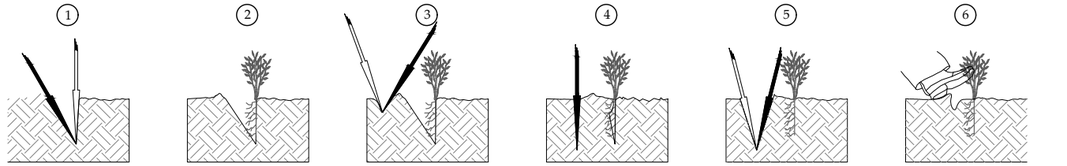


Section View

DIBBLE BAR
PLANTING BAR SHALL HAVE A BLADE WITH A TRIANGULAR CROSS-SECTION, AND SHALL BE 12 INCHES LONG, 4 INCHES WIDE AND 1 INCH THICK AT CENTER.



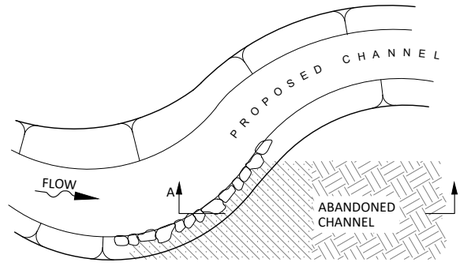
ROOTING PRUNING
ALL ROOTS SHALL BE PRUNED TO AN APPORIATE LENGTH TO PREVENT J-ROOTING.



1. INSERT THE DIBBLE, OR SHOVEL, STRAIGHT DOWN INTO THE SOIL TO THE FULL DEPTH OF THE BLADE AND PULL BACK ON THE HANDLE TO OPEN THE PLANTING HOLE. (DO NOT ROCK THE SHOVEL BACK AND FORTH AS THIS CAUSES SOIL IN THE PLANTING HOLE TO BE COMPACTED, INHIBITING ROOT GROWTH.
2. REMOVE THE DIBBLE, OR SHOVEL, AND PUSH THE SEEDLING ROOTS DEEP INTO THE PLANTING HOLE. PULL THE SEEDLING BACK UP TO THE CORRECT PLANTING DEPTH (THE ROOT COLLAR SHOULD BE 1 TO 3 INCHES BELOW THE SOIL SURFACE). GENTLY SHAKE THE SEEDLING TO ALLOW THE ROOTS TO STRAIGHTEN OUT. DO NOT TWIST OR SPIN THE SEEDLING OR LEAVE THE ROOTS J-ROOTED.
3. INSERT THE DIBBLE, OR SHOVEL, SEVERAL INCHES IN FRONT OF THE SEEDLING AND PUSH THE BLADE HALFWAY INTO THE SOIL. TWIST AND PUSH THE HANDLE FORWARD TO CLOSE THE TOP OF THE SLIT TO HOLD THE SEEDLING IN PLACE.
4. PUSH THE DIBBLE, OR SHOVEL, DOWN TO THE FULL DEPTH OF THE BLADE.
5. PULL BACK ON THE HANDLE TO CLOSE THE BOTTOM OF THE PLANTING HOLD. THEN PUSH FORWARD TO CLOSE THE TOP, ELIMINATING AIR POCKETS AROUND THE ROOT.
6. REMOVE THE DIBBLE, OR SHOVEL, AND CLOSE AND FIRM UP THE OPENING WITH YOUR HEEL. BE CAREFUL TO AVOID DAMAGING THE SEEDLING.

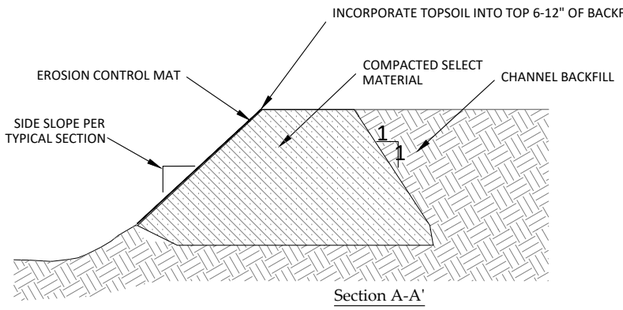
NOTES:
1. ALL SOILS WITHIN THE BUFFER PLANTING AREA SHALL BE DISKED, AS REQUIRED, PRIOR TO PLANTING.
2. ALL PLANTS SHALL BE PROPERLY HANDLED PRIOR TO INSTALLATION TO INSURE SURVIVAL.

1/7.9 Bare Root Planting
Not to Scale



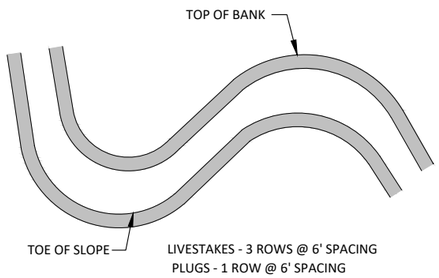
Plan View

THIS DETAIL MAINLY APPLICABLE TO JONES CREEK REACH 2. IT IS UNDESIRABLE TO USE EXCESSIVELY SANDY/GRAVELLY MATERIAL AS BACKFILL FOR THE BANKS OF THE NEWLY DEFINED CHANNEL. BANKS SHOULD UTILITIZE COMPACTED SELECT MATERIAL WHICH SHALL CONSIST OF AT LEAST SOIL CLASSIFIED AS CLAY LOAM, SANDY CLAY LOAM OR SILTY CLAY LOAM.

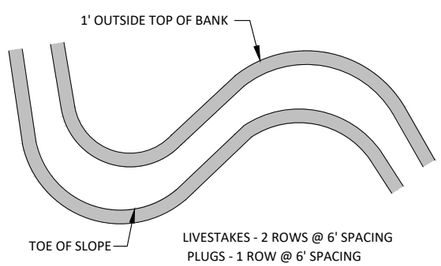


Section A-A'

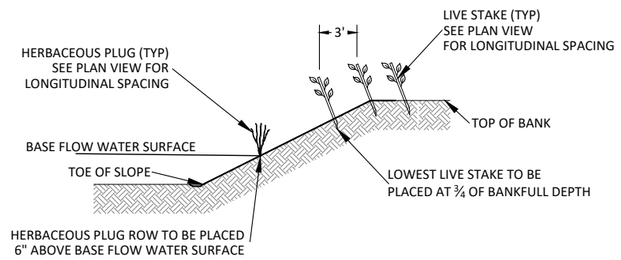
3/7.9 Channel Backfill
Not to Scale



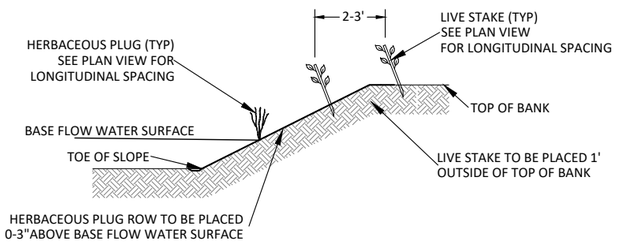
Plan View - Large Streams
(Jones Creek)



Plan View - Small Streams
(UT1, UT1A, UT2, UT2A, UT3, UT3A, UT3B, AND UT3C)

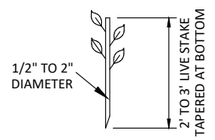


Section View - Large Streams
(Jones Creek)



Section View - Small Streams
(UT1, UT1A, UT2, UT2A, UT3, UT3A, UT3B, AND UT3C)

2/7.9 Live Staking and Plugs
Not to Scale



Live Stake Detail

NOTES:

- LIVE STAKES TO BE PLANTED IN AREAS AS SHOWN ON PLANS AND DIRECTED BY THE DESIGNER.

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167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

DRAFT

Cornbread Valley Mitigation Site
Macon County, North Carolina

Details

Revisions:

Date: 12.21.2022
Job Number: WI02191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

Sheet 7.9

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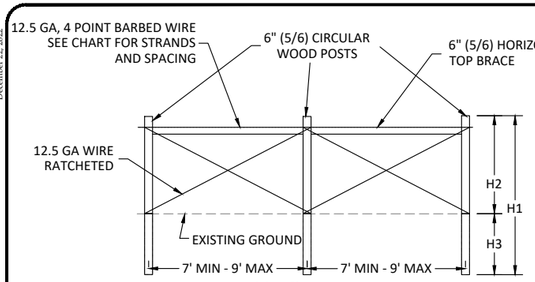
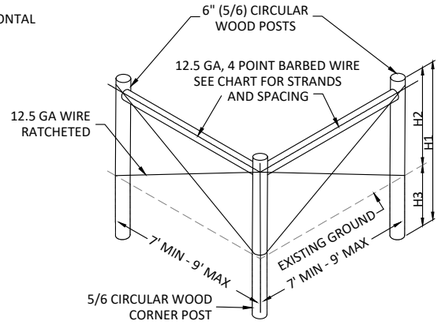
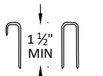
December 22, 2021



Line Braces
(MAXIMUM SPACING 330')

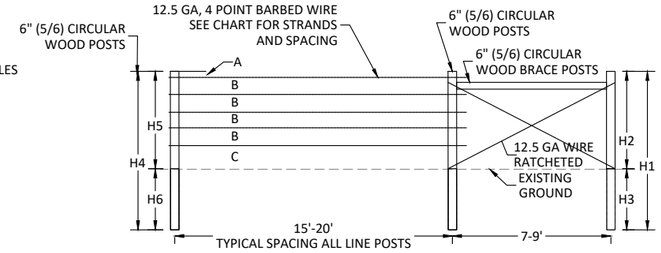


Corner Braces
USE WHEN CORNER ANGLE IS 15° OR GREATER



Alternate Types of Staples
USE ONE #9 STAPLE OR TWO #16 STAPLES
AT EACH POINT OF ATTACHMENT.

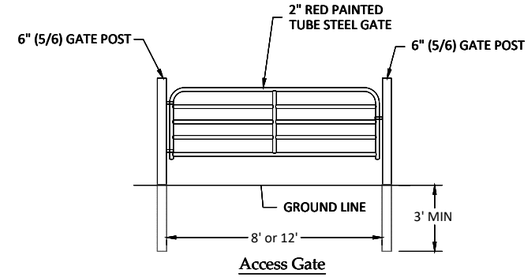
BARBED WIRE FENCE CHART		
NUMBER OF BARBED WIRE STRANDS		5
	A	2"
STRAND	B	10"
SPACING	C	12"
BRACE POSTS		
LENGTH	H1	8'
EXPOSED	H2	4'-6"
EMBEDMENT	H3	3'-6"
LINE POSTS		
LENGTH	H4	8'
EXPOSED	H5	4'-6"
EMBEDMENT	H6	3'-6"
HORIZONTAL BRAC		8'-0"



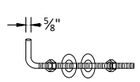
1 / 7.10 Barbed Wire Fence
Not to Scale

End or Gate Braces

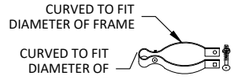
NOTES:
1. BARBWIRE FENCE TO BE INSTALLED ALONG CONSERVATION EASEMENT BOUNDARY. REFER TO FENCING PLAN FOR MORE DETAILS
2. INSTALL FENCE POSTS 1'-2' OUTSIDE OF CONSERVATION EASEMENT BOUNDARY UNLESS OTHERWISE DIRECTED



Access Gate



Bolt Hinge
(2 Required)

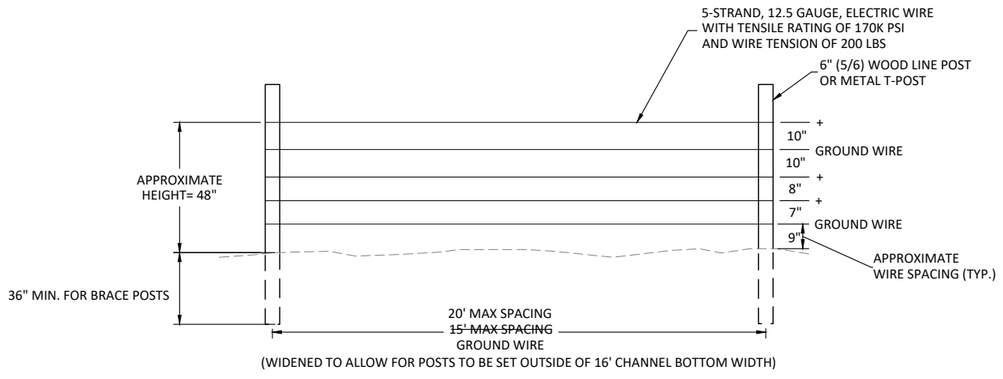


Hinge Clamp
(2 Required)

Hinge Assembly

2 / 7.10 Tubesteel Gate
Not to Scale

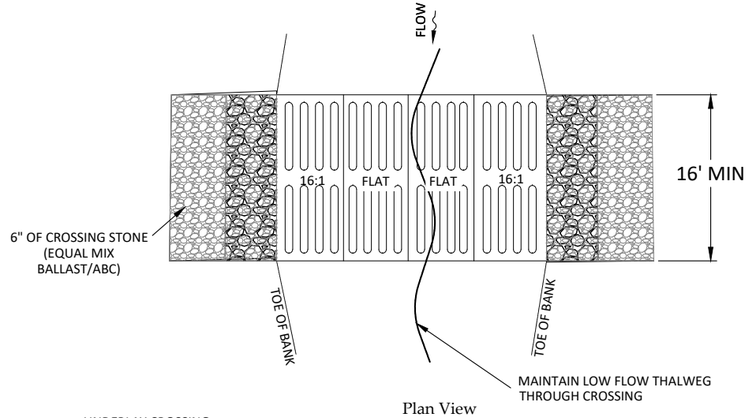
NOTES:
1. DIMENSIONS SHOWN ARE THE DIAMETER OF ROUND POSTS AND BRACES.
2. NOTCH BRACE POSTS 1" MINIMUM FOR HORIZONTAL BRACES. PLACE TWO GALVANIZED 12d OR THREE GALVANIZED 10d NAILS AT EACH END OF ALL BRACES.
3. PLACE THE BRACE WIRE AROUND THE POST. DRAW ALL BRACE WIRE TAUT BY RATCHETING BETWEEN EACH POST.
4. INSTALL THE FENCE FACING THE PROPERTY OWNER EXCEPT THAT ON HORIZONTAL CURVES GREATER THAN THREE DEGREES (3°) INSTALL THE FENCE TO PULL AGAINST ALL POSTS.
5. USE LATCH DEVICE APPROVED BY THE ENGINEER. HINGE ASSEMBLY AS SHOWN IS SUGGESTED. SUBSTITUTION MAY BE SUBJECT TO APPROVAL BY THE ENGINEER. USED 2" PAINTED STEEL PIPE FOR GATE FRAME EXCEPT AS SHOWN HERE.
6. ANY COMBINATION OF GATE AND FENCE TYPE MEETING THE APPROVAL OF THE ENGINEER IS ACCEPTABLE AND IS NOT LIMITED TO THE EXAMPLES SHOWN HEREON.



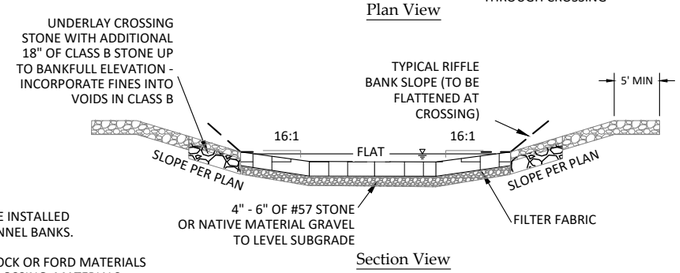
(WIDENED TO ALLOW FOR POSTS TO BE SET OUTSIDE OF 16' CHANNEL BOTTOM WIDTH)

NOTES:
1. USE HIGH TENSILE WIRE FENCING ONLY INSIDE EASEMENT BREAKS WHERE PERMANENT CULVERT OR FORD CROSSINGS ARE LOCATED.
2. 15' MAX POST SPACING MAY BE INCREASED AS NEEDED AT BOTTOM OF PERMANENT FORD CROSSINGS IN ORDER TO ACCOMMODATE BOTTOM WIDTH OF STREAM
3. WIRE SHALL BE 12.5 GAUGE, CLASS 3 GALVANIZED ZINC (ASTM-116 STANDARD) WITH 170,000 PSI TENSILE STRENGTH. WIRE SHALL BE INSTALLED ON THE LIVESTOCK SIDE OF THE FENCE.
4. LINE POSTS SHALL BE 6" (5/6) PRESSURE TREATED WOOD OR METAL T-POSTS WITH A MAXIMUM SPACING OF 15 FEET AND A MINIMUM POST HEIGHT OF 68".
5. REFER TO THE SPECIFICATIONS FOR MORE INFORMATION ON FENCING.

3 / 7.10 Permanent Crossing Wire Fence
Not to Scale



Plan View



Section View

NOTE:

FORD CROSSING SHALL BE INSTALLED PERPENDICULAR TO CHANNEL BANKS.

DO NOT INSTALL FORD ROCK OR FORD MATERIALS OUTSIDE OF INTERNAL CROSSING. MATERIALS APPLIED WITHIN CE OUTSIDE OF CROSSING WILL HAVE TO BE REMOVED BY CONTRACTOR

4 / 7.10 Permanent Concrete Ford Crossing
Not to Scale

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1430 South Mint Street, Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
License No. F-0831

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Cornbread Valley Mitigation Site
Macon County, North Carolina

Details
Details

Revisions:

Date:	12.21.2022
Job Number:	WI02191
Project Engineer:	JPM
Drawn By:	JDW
Checked By:	EPN

Sheet 7.10

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December 22, 2023

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION A: SELF-INSPECTION

Self-inspections are required during normal business hours in accordance with the table below. When adverse weather or site conditions would cause the safety of the inspection personnel to be in jeopardy, the inspection may be delayed until the next business day on which it is safe to perform the inspection. In addition, when a storm event of equal to or greater than 1.0 inch occurs outside of normal business hours, the self-inspection shall be performed upon the commencement of the next business day. Any time when inspections were delayed shall be noted in the Inspection Record.

Inspect	Frequency (during normal business hours)	Inspection records must include:
(1) Rain gauge maintained in good working order	Daily	Daily rainfall amounts. If no daily rain gauge observations are made during weekend or holiday periods, and no individual-day rainfall information is available, record the cumulative rain measurement for those un-attended days (and this will determine if a site inspection is needed). Days on which no rainfall occurred shall be recorded as "zero." The permittee may use another rain-monitoring device approved by the Division.
(2) E&SC Measures	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the measures inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Indication of whether the measures were operating properly, 5. Description of maintenance needs for the measure, 6. Description, evidence, and date of corrective actions taken.
(3) Stormwater discharge outfalls (SDOs)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the discharge outfalls inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Evidence of indicators of stormwater pollution such as oil sheen, floating or suspended solids or discoloration, 5. Indication of visible sediment leaving the site, 6. Description, evidence, and date of corrective actions taken.
(4) Perimeter of site	At least once per 7 calendar days and within 24 hours of a rain event > 1.0 inch in 24 hours	If visible sedimentation is found outside site limits, then a record of the following shall be made: 1. Actions taken to clean up or stabilize the sediment that has left the site limits, 2. Description, evidence, and date of corrective actions taken, and 3. An explanation as to the actions taken to control future releases.
(5) Streams or wetlands onsite or offsite (where accessible)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If the stream or wetland has increased visible sedimentation or a stream has visible increased turbidity from the construction activity, then a record of the following shall be made: 1. Description, evidence and date of corrective actions taken, and 2. Records of the required reports to the appropriate Division Regional Office per Part III, Section C, Item (2)(a) of this permit of this permit.
(6) Ground stabilization measures	After each phase of grading	1. The phase of grading (installation of perimeter E&SC measures, clearing and grubbing, installation of storm drainage facilities, completion of all land-disturbing activity, construction or redevelopment, permanent ground cover). 2. Documentation that the required ground stabilization measures have been provided within the required timeframe or an assurance that they will be provided as soon as possible.

NOTE: The rain inspection resets the required 7 calendar day inspection requirement.

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION B: RECORDKEEPING

1. E&SC Plan Documentation

The approved E&SC plan as well as any approved deviation shall be kept on the site. The approved E&SC plan must be kept up-to-date throughout the coverage under this permit. The following items pertaining to the E&SC plan shall be documented in the manner described:

Item to Document	Documentation Requirements
(a) Each E&SC Measure has been installed and does not significantly deviate from the locations, dimensions and relative elevations shown on the approved E&SC Plan.	Initial and date each E&SC Measure on a copy of the approved E&SC Plan or complete, date and sign an inspection report that lists each E&SC Measure shown on the approved E&SC Plan. This documentation is required upon the initial installation of the E&SC Measures or if the E&SC Measures are modified after initial installation.
(b) A phase of grading has been completed.	Initial and date a copy of the approved E&SC Plan or complete, date and sign an inspection report to indicate completion of the construction phase.
(c) Ground cover is located and installed in accordance with the approved E&SC Plan.	Initial and date a copy of the approved E&SC Plan or complete, date and sign an inspection report to indicate compliance with approved ground cover specifications.
(d) The maintenance and repair requirements for all E&SC Measures have been performed.	Complete, date and sign an inspection report.
(e) Corrective actions have been taken to E&SC Measures.	Initial and date a copy of the approved E&SC Plan or complete, date and sign an inspection report to indicate the completion of the corrective action.

2. Additional Documentation

In addition to the E&SC Plan documents above, the following items shall be kept on the site

and available for agency inspectors at all times during normal business hours, unless the Division provides a site-specific exemption based on unique site conditions that make this requirement not practical:

(a) This general permit as well as the certificate of coverage, after it is received.

(b) Records of inspections made during the previous 30 days. The permittee shall record the required observations on the Inspection Record Form provided by the Division or a similar inspection form that includes all the required elements. Use of electronically-available records in lieu of the required paper copies will be allowed if shown to provide equal access and utility as the hard-copy records.

(c) All data used to complete the Notice of Intent and older inspection records shall be maintained for a period of three years after project completion and made available upon request. [40 CFR 122.41]

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION C: REPORTING

1. Occurrences that must be reported

Permittees shall report the following occurrences:

(a) Visible sediment deposition in a stream or wetland.

(b) Oil spills if:

- They are 25 gallons or more,
- They are less than 25 gallons but cannot be cleaned up within 24 hours,
- They cause sheen on surface waters (regardless of volume), or
- They are within 100 feet of surface waters (regardless of volume).

(a) Releases of hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (Ref: 40 CFR 110.3 and 40 CFR 117.3) or Section 102 of CERCLA (Ref: 40 CFR 302.4) or G.S. 143-215.85.

(b) Anticipated bypasses and unanticipated bypasses.

(c) Noncompliance with the conditions of this permit that may endanger health or the environment.

2. Reporting Timeframes and Other Requirements

After a permittee becomes aware of an occurrence that must be reported, he shall contact the appropriate Division regional office within the timeframes and in accordance with the other requirements listed below. Occurrences outside normal business hours may also be reported to the Division's Emergency Response personnel at (800) 662-7956, (800) 858-0368 or (919) 733-3300.

Occurrence	Reporting Timeframes (After Discovery) and Other Requirements
(a) Visible sediment deposition in a stream or wetland	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days***, a report that contains a description of the sediment and actions taken to address the cause of the deposition. Division staff may waive the requirement for a written report on a case-by-case basis. • If the stream is named on the NC 303(d) list as impaired for sediment-related causes, the permittee may be required to perform additional monitoring, inspections or apply more stringent practices if staff determine that additional requirements are needed to assure compliance with the federal or state impaired-waters conditions.
(b) Oil spills and release of hazardous substances per Item 1(b)-(c) above	• ***Within 24 hours***, an oral or electronic notification. The notification shall include information about the date, time, nature, volume and location of the spill or release.
(c) Anticipated bypasses [40 CFR 122.41(m)(3)]	• ***A report at least ten days before the date of the bypass, if possible***. The report shall include an evaluation of the anticipated quality and effect of the bypass.
(d) Unanticipated bypasses [40 CFR 122.41(m)(3)]	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days,*** a report that includes an evaluation of the quality and effect of the bypass.
(e) Noncompliance with the conditions of this permit that may endanger health or the environment[40 CFR 122.41(l)(7)]	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days***, a report that contains a description of the noncompliance, and its causes; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time noncompliance is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. [40 CFR 122.41(l)(6). • Division staff may waive the requirement for a written report on a case-by-case basis.

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167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. P-0831

DRAFT

Cornbread Valley Mitigation Site
Macon County, North Carolina

NCG01 Details

Revisions:

Date: 12.21.2022
Job Number: WI2191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

Sheet 7.11

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December 22, 2023

GROUND STABILIZATION AND MATERIALS HANDLING PRACTICES FOR COMPLIANCE WITH THE NCG01 CONSTRUCTION GENERAL PERMIT

Implementing the details and specifications on this plan sheet will result in the construction activity being considered compliant with the Ground Stabilization and Materials Handling sections of the NCG01 Construction General Permit (Sections E and F, respectively). The permittee shall comply with the Erosion and Sediment Control plan approved by the delegated authority having jurisdiction. All details and specifications shown on this sheet may not apply depending on site conditions and the delegated authority having jurisdiction.

SECTION E: GROUND STABILIZATION

Required Ground Stabilization Timeframes

Site Area Description	Stabilize within this many calendar days after ceasing land disturbance	Timeframe variations
(a) Perimeter dikes, swales, ditches, and perimeter slopes	7	None
(b) High Quality Water (HQW) Zones	7	None
(c) Slopes steeper than 3:1	7	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed
(d) Slopes 3:1 to 4:1	14	-7 days for slopes greater than 50' in length and with slopes steeper than 4:1 -7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed
(e) Areas with slopes flatter than 4:1	14	-7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed unless there is zero slope

Note: After the permanent cessation of construction activities, any areas with temporary ground stabilization shall be converted to permanent ground stabilization as soon as practicable but in no case longer than 90 calendar days after the last land disturbing activity. Temporary ground stabilization shall be maintained in a manner to render the surface stable against accelerated erosion until permanent ground stabilization is achieved.

GROUND STABILIZATION SPECIFICATION

Stabilize the ground sufficiently so that rain will not dislodge the soil. Use one of the techniques in the table below:

Temporary Stabilization	Permanent Stabilization
• Temporary grass seed covered with straw or other mulches and tackifiers • Hydroseeding • Rolled erosion control products with or without temporary grass seed • Appropriately applied straw or other mulch • Plastic sheeting	• Permanent grass seed covered with straw or other mulches and tackifiers • Geotextile fabrics such as permanent soil reinforcement matting • Hydroseeding • Shrubs or other permanent plantings covered with mulch • Uniform and evenly distributed ground cover sufficient to restrain erosion • Structural methods such as concrete, asphalt or retaining walls • Rolled erosion control products with grass seed

POLYACRYLAMIDES (PAMS) AND FLOCCULANTS

1. Select flocculants that are appropriate for the soils being exposed during construction, selecting from the *NC DWR List of Approved PAMS/Flocculants*.
2. Apply flocculants at or before the inlets to Erosion and Sediment Control Measures.
3. Apply flocculants at the concentrations specified in the *NC DWR List of Approved PAMS/Flocculants* and in accordance with the manufacturer's instructions.
4. Provide ponding area for containment of treated Stormwater before discharging offsite.
5. Store flocculants in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures.

EQUIPMENT AND VEHICLE MAINTENANCE

1. Maintain vehicles and equipment to prevent discharge of fluids.
2. Provide drip pans under any stored equipment.
3. Identify leaks and repair as soon as feasible, or remove leaking equipment from the project.
4. Collect all spent fluids, store in separate containers and properly dispose as hazardous waste (recycle when possible).
5. Remove leaking vehicles and construction equipment from service until the problem has been corrected.
6. Bring used fuels, lubricants, coolants, hydraulic fluids and other petroleum products to a recycling or disposal center that handles these materials.

LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE

1. Never bury or burn waste. Place litter and debris in approved waste containers.
2. Provide a sufficient number and size of waste containers (e.g dumpster, trash receptacle) on site to contain construction and domestic wastes.
3. Locate waste containers at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
4. Locate waste containers on areas that do not receive substantial amounts of runoff from upland areas and does not drain directly to a storm drain, stream or wetland.
5. Cover waste containers at the end of each workday and before storm events or provide secondary containment. Repair or replace damaged waste containers.
6. Anchor all lightweight items in waste containers during times of high winds.
7. Empty waste containers as needed to prevent overflow. Clean up immediately if containers overflow.
8. Dispose waste off-site at an approved disposal facility.
9. On business days, clean up and dispose of waste in designated waste containers.

PAINT AND OTHER LIQUID WASTE

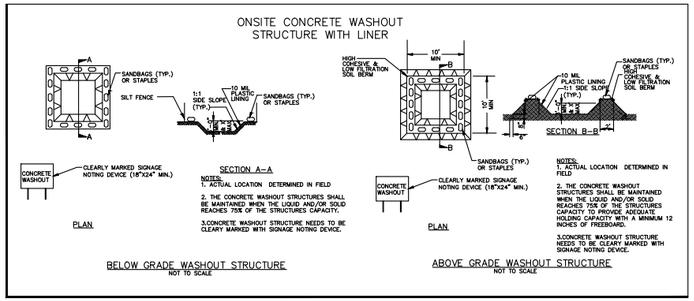
1. Do not dump paint and other liquid waste into storm drains, streams or wetlands.
2. Locate paint washouts at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
3. Contain liquid wastes in a controlled area.
4. Containment must be labeled, sized and placed appropriately for the needs of site.
5. Prevent the discharge of soaps, solvents, detergents and other liquid wastes from construction sites.

PORTABLE TOILETS

1. Install portable toilets on level ground, at least 50 feet away from storm drains, streams or wetlands unless there is no alternative reasonably available. If 50 foot offset is not attainable, provide relocation of portable toilet behind silt fence or place on a gravel pad and surround with sand bags.
2. Provide staking or anchoring of portable toilets during periods of high winds or in high foot traffic areas.
3. Monitor portable toilets for leaking and properly dispose of any leaked material. Utilize a licensed sanitary waste hauler to remove leaking portable toilets and replace with properly operating unit.

EARTHEN STOCKPILE MANAGEMENT

1. Show stockpile locations on plans. Locate earthen-material stockpile areas at least 50 feet away from storm drain inlets, sediment basins, perimeter sediment controls and surface waters unless it can be shown no other alternatives are reasonably available.
2. Protect stockpile with silt fence installed along toe of slope with a minimum offset of five feet from the toe of stockpile.
3. Provide stable stone access point when feasible.
4. Stabilize stockpile within the timeframes provided on this sheet and in accordance with the approved plan and any additional requirements. Soil stabilization is defined as vegetative, physical or chemical coverage techniques that will restrain accelerated erosion on disturbed soils for temporary or permanent control needs.



CONCRETE WASHOUTS

1. Do not discharge concrete or cement slurry from the site.
2. Dispose of, or recycle settled, hardened concrete residue in accordance with local and state solid waste regulations and at an approved facility.
3. Manage washout from mortar mixers in accordance with the above item and in addition place the mixer and associated materials on impervious barrier and within lot perimeter silt fence.
4. Install temporary concrete washouts per local requirements, where applicable. If an alternate method or product is to be used, contact your approval authority for review and approval. If local standard details are not available, use one of the two types of temporary concrete washouts provided on this detail.
5. Do not use concrete washouts for dewatering or storing defective curb or sidewalk sections. Stormwater accumulated within the washout may not be pumped into or discharged to the storm drain system or receiving surface waters. Liquid waste must be pumped out and removed from project.
6. Locate washouts at least 50 feet from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. At a minimum, install protection of storm drain inlet(s) closest to the washout which could receive spills or overflow.
7. Locate washouts in an easily accessible area, on level ground and install a stone entrance pad in front of the washout. Additional controls may be required by the approving authority.
8. Install at least one sign directing concrete trucks to the washout within the project limits. Post signage on the washout itself to identify this location.
9. Remove leavings from the washout when at approximately 75% capacity to limit overflow events. Replace the tarp, sand bags or other temporary structural components when no longer functional. When utilizing alternative or proprietary products, follow manufacturer's instructions.
10. At the completion of the concrete work, remove remaining leavings and dispose of in an approved disposal facility. Fill pit, if applicable, and stabilize any disturbance caused by removal of washout.

HERBICIDES, PESTICIDES AND RODENTICIDES

1. Store and apply herbicides, pesticides and rodenticides in accordance with label restrictions.
2. Store herbicides, pesticides and rodenticides in their original containers with the label, which lists directions for use, ingredients and first aid steps in case of accidental poisoning.
3. Do not store herbicides, pesticides and rodenticides in areas where flooding is possible or where they may spill or leak into wells, stormwater drains, ground water or surface water. If a spill occurs, clean area immediately.
4. Do not stockpile these materials onsite.

HAZARDOUS AND TOXIC WASTE

1. Create designated hazardous waste collection areas on-site.
2. Place hazardous waste containers under cover or in secondary containment.
3. Do not store hazardous chemicals, drums or bagged materials directly on the ground.

NCG01 GROUND STABILIZATION AND MATERIALS HANDLING

EFFECTIVE: 04/01/19

WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

DRAFT

Cornbread Valley Mitigation Site
Macon County, North Carolina

NCG01 Details

Revisions:

Date: 12.21.2022
Job Number: WI02191
Project Engineer: JPM
Drawn By: JDW
Checked By: EPN

Sheet 7.12

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APPENDIX 12 – Credit Release Schedule

Appendix 12 - Credit Release Schedule and Supporting Information

All credit releases will be based on the total credit generated as reported in the approved final mitigation plan, unless there are significant discrepancies, in which case an addendum will be proposed to the IRT. Under no circumstances shall any mitigation project be debited until the necessary Department of the Army (DA) authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the Interagency Review Team (IRT), will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard.

The following conditions apply to the credit release schedules:

A. A reserve of 10% of a site's total stream credits will be released after four bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four bankfull events occur during the monitoring period, release of these reserve credits is at the discretion of the NCIRT.

B. After the second milestone, the credit releases are scheduled to occur on an annual basis, assuming that the annual monitoring report has been provided to the USACE in accordance with the Section IV (General Monitoring Requirements) of the Wilmington District Stream and Wetland Compensatory Mitigation (NCIRT, 2016) document, and that the monitoring report demonstrates that interim performance standards are being met and that no other concerns have been identified on-site during the visual monitoring. All credit releases require written approval from the USACE.

C. The credits associated with the final credit release milestone will be released only upon a determination by the USACE, in consultation with the NCIRT, of functional success as defined in the Mitigation Plan.

The schedules below list the updated credit release schedules for stream and wetland mitigation projects developed by bank and ILF sites in North Carolina:

Table 1: Stream Credit Release Schedule

Credit Release Schedule and Milestones for Streams				
Credit Release Milestone	**Monitoring Year**	**Release Activity**	**ILF/NCDMS**	
			Interim Release	**Total Released**
1*	0	Site Establishment	0%	0%
2	0	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	1	Year 1 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	40%

Table 1: Stream Credit Release Schedule

Credit Release Schedule and Milestones for Streams				
Credit Release Milestone	**Monitoring Year**	**Release Activity**	**ILF/NCDMS**	
			Interim Release	**Total Released**
4	2	Year 2 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	50%
5	3	Year 3 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	60%
6	4**	Year 4 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	65% (75%***)
7	5	Year 5 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	75% (85%***)
8	6**	Year 6 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	80% (90%***)
9	7	Year 7 monitoring report demonstrates that channels are stable, performance standards have been met	10%	90% (100%***)

*For ILF sites (including all NCDMS projects), no initial release of credits (Milestone 1) is provided because ILF programs utilized advance credits, so no initial release is necessary to help fund site construction. To account for this, the 15% credit release associated with the first milestone (bank establishment) is held until the second milestone, so that the total credits release at the second milestone is 30%. In order for NCDMS to receive the 30% release (shown in the schedules as Milestone 2), they must comply with the credit release requirements stated in Section IV(I)(3) of the approved NCDMS Instrument.

**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.

Table 2: Wetland Credit Release Schedule

Credit Release Schedule and Milestones for Wetlands				
Credit Release Milestone	**Monitoring Year**	**Release Activity**	**ILF/NCDMS**	
			Interim Release	**Total Released**
1*	0	Site Establishment	0%	0%
2	0	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	1	Year 1 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	40%
4	2	Year 2 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	50%

Table 2: Wetland Credit Release Schedule

Credit Release Schedule and Milestones for Wetlands				
Credit Release Milestone	**Monitoring Year**	**Release Activity**	**ILF/NCDMS**	
			Interim Release	**Total Released**
5	3	Year 3 monitoring report demonstrates that channels are stable and interim performance standards have been met	15%	65%
6	4**	Year 4 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	70%
7	5	Year 5 monitoring report demonstrates that channels are stable and interim performance standards have been met	15%	85%
8	6**	Year 6 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	90%
9	7	Year 7 monitoring report demonstrates that channels are stable, performance standards have been met	10%	100%

*For ILF sites (including all NCDMS projects), no initial release of credits (Milestone 1) is provided because ILF programs utilized advance credits, so no initial release is necessary to help fund site construction. To account for this, the 15% credit release associated with the first milestone (bank establishment) is held until the second milestone, so that the total credits release at the second milestone is 30%. In order for NCDMS to receive the 30% release (shown in the schedules as Milestone 2), they must comply with the credit release requirements stated in Section IV(I)(3) of the approved NCDMS Instrument.

**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.