MITIGATION PLAN
FINAL

November 2022

Bridgefork Dairy Mitigation Site
Cleveland County, NC
NCDEQ Contract No. 0301-01
DMS ID No. 100171

Broad River Basin
HUC 03050105

USACE Action ID No. 2020-01962
RFP #: 16-20190301 (Issued: 12/20/2019)

PREPARED FOR:

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

MITIGATION PLAN

BRIDGEFORK DAIRY MITIGATION SITE

Cleveland County, NC
NCDEQ Contract No. 0301-01
DMS Project No. 100171
DWR Project No. 2020-18441
Broad River Basin
HUC 03050105

USACE Action ID No. 2020-01962

PREPARED BY:

Wildlands Engineering, Inc.
167-B Haywood Rd,
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).
- North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS) 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:

Eric Neuhaus, PE, *Project Manager*
Shawn Wilkerson, *Principal in Charge*
Christine Blackwelder, *Lead Quality Assurance*
Greg Turner, PE, *Stream and BMP Design*
Win Taylor, PWS, *Wetland Delineations*
Jeffrey Turner, *Project Scientist*
Emily Israel, *Land Stewardship*
Catherine Warner, *Construction Documents*

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

REPLY TO
ATTENTION OF:

October 24, 2022

Regulatory Division

Re: NCIRT Review and USACE Approval of the NCDMS Bridgefork Dairy Mitigation Site / Cleveland County

USACE ID: SAW-2020-01962
NCDMS Project # 100171
NCDWR # 2020-1841

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 Bridgefork Dairy Draft Mitigation Plan, which closed on August 20, 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
for Tyler Crumbley, Deputy Chief
USACE Regulatory Division

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Marc Recktenwald, Matthew Reid—NCDMS
Shawn Wilkerson, Eric Neuhaus--WEI

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

REPLY TO
ATTENTION OF:

CESAW-RG/Browning October 5, 2022

MEMORANDUM FOR RECORD

SUBJECT: NCDMS Bridgefork Dairy Mitigation Site - NCIRT Comments during 30-day Mitigation Plan Review, Cleveland County, NC

PURPOSE: The comments listed below were received during the 30-day comment period in accordance with Section 332.8(g) of the 2008 Mitigation Rule in response to the Notice of NCDMS Mitigation Plan Review.

USACE AID#: SAW-2020-01962
NCDMS #: 100171
NCDWR#: 20201841
30-Day Comment Deadline: August 20, 2022

DWR Comments, Erin Davis:

1. Page 5, Section 3.3.1 – Has any evidence of past/present beaver activity been observed onsite?
2. Page 5, Bridgefork Creek Reach 1a – Is the existing culvert under Patterson Road perched?
3. Page 19, Section 3.5 –
    a. The new alignment of UT1 was designed to avoid working in the deepest pond sediments, but is this location the appropriate natural valley low point?
    b. Please describe what's ultimately done with pond bottom sediments in the MY0 As-built Baseline Report.
    c. As part of the site constraints assessment and coordination, did NCDOT, Kings Mountain Water or the electric utility company note any future maintenance plans? DWR is concerned that stream credit appears to abut others' outfall structures along UT2 and UT6. Was a credit setback considered in order to minimize the impact/risk of a future encroachment request?
    d. Also, there was no mention in Section 3.3.1-UT3 of the existing culvert being located within the proposed project easement or in Section 6.6.7 that the culvert is proposed to remain in place (Sheet 1.4.1). Why does the project easement include this structure rather than start downstream of it? Dependent on the justification, DWR may request that the easement be modified or require communication that DEQ Stewardship and Kings Mountain Water have developed an acceptable plan for future structure maintenance involving minimal buffer disturbance.
4. Page 20, Section 4.2 – Wetland credit areas appear to extend to the project conservation easement boundary. Is there any risk of hydrologic trespass from these areas?

5. Page 23, Table 19 – The approaches and activities for UT4 Reach 1 and UT4 Reach 2 are in the incorrect rows. Please update.
6. Page 29, Section 6.5 – DWR appreciates the reference to the Cleveland County Comprehensive Land Use Plan.
7. Page 31, Section 6.6.1 - Please clarify supplemental planting “as needed”. If supplemental planting of understory/shrub species is being proposed to support an enhancement credit ratio, DWR expects that all designated areas shown as Shaded Planting Zone on Figure 10 will be supplementally planted with the listed Partially Forested Buffer Planting Zone species. And if requesting a 2.5:1 ratio, DWR requires survival data be collected during monitoring. This comment also applies to Bridgefork Creek Reach 2 and UT4 Reach 1. This was a discussion point on enhancement reaches during the IRT site walk.
8. Page 31, Section 6.6.2 – Please show on a figure the extent of the P2 bench cut area(s) greater than 12 inches within or adjacent to any wetlands, as well as any areas where P2 benches overlap proposed wetland credit areas. Is there a drainage effect concern with proposing wetland credit within or adjacent to P2 bench cuts? Will removed hydric soil be reused onsite?
9. Page 32, Section 6.6.5 – Please confirm whether the entire pond dam footprint will be removed during construction after dewatering.
10. Page 32, Section 6.6.8 – The included design sheets do not callout any bank grading or debris removal areas along UT4. Without knowing the extent of the functional uplift proposed, DWR cannot support the requested 2.5:1 ratio. Based on the information provided, we believe a 4:1 ratio is more appropriate. Please submit any additional information for consideration prior to finalizing the final mitigation plan. Also, please refer to the IRT site walk meeting minutes, “it was noted that if bank work/grading were done as part of the work along UT4, the IRT would require representative monitoring cross-sections be performed along the reach”.
11. Page 34, Section 6.8 – General section note, DWR appreciates that pre-construction baseline groundwater gauge data was collected, and we were glad to see a reference wetland identified.
12. Page 34, Section 6.8.1 – Please confirm that reestablishment area Wetland 2A does not overlap the pond dam footprint.
13. Page 34, Section 6.8.2 – Wetland K was evaluated to have a High NCWAM score. To account for existing high wetland functions and lack of proposed monitoring stations to demonstrate uplift, DWR believes an enhancement ratio of 2.5:1 is more appropriate for Wetland 2B. Wetland approaches/ratios was a discussion point at the IRT site walk.
14. Page 34, Section 6.8.2 – Figure 2 shows three existing drainage ditches. Please add callouts to fill ditches on design sheets.
15. Page 35, Section 6.8.3 – Regarding the preliminary/detailed soil investigation, is the single soil profile provided representative of all nine proposed wetland credit areas? Why were no borings taken within proposed wetland rehab areas? Also, has a sampling effort or any investigation of the pond bottom sediments been performed?
16. Page 36, Section 6.8.3 – Is the proposed sediment cap expected to assist with access to properly install bareroot plantings during construction and/or avoid sediment cracking during monitoring? These are two challenges that DWR has observed in past proposed pond bottom wetland credit areas.
17. Page 36, 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. In addition to the pond bottom and P2 bench cut areas, there are several steep slopes

shown on the design sheets within and immediately adjacent to the project proposed for re-grading and stabilization.

18. Page 37, Section 6.9 – In the MY0 Baseline Report, please summarize what species were treated prior to and during construction. The presence of Murdannia Keisak is particularly concerning, so please provide a bit more information on the planned treatment of this species.
19. Page 37, Section 6.10 –
    a. Given the site proximity to previously timbered areas, is pine or sweet gum colonization a concern? Is veg management anticipated?
    b. DWR recommends adding “no mow” signs along any internal utility crossings not bordered by fence.
20. Page 38, Table 28 –
    a. Dimension - Please add the entrenchment ratio for proposed B channels.
    b. Hydrology - Please shift the semi-colon. Bankfull events are to be in separate years. Minimum consecutive flow days is an annual performance standard.
    c. Wetland – Please add start/end dates for the preliminary growing season.
    d. Vegetation – Considering 70% of plantings for the Wetland Planting Zone are canopy species, DWR does not agree with the proposed vigor standard modification without further justification. DWR would support a vigor exemption for shrub and subcanopy species across planting zones.
21. Page 40, Table 29 –
    a. DWR requests a representative cross section be added to the approx. 200-ft restoration reach of UT2.
    b. In addition to permanent and mobile plots within the Figure 10 Open Planting Zone and Wetland Planting Zone (which have an associated performance standard), DWR requires stem survival data for supplemental planting within the Shaded Planting Zone to support the 2.5:1 enhancement ratios. (Potential monitoring approaches were recently discussed with Wildlands at the DMS Honey Mill IRT site visit)
22. General Comment – Please make sure to QAQC spelling, spacing, and formatting in the plan narrative.
23. Figures 2 & 10 – Have red box comments already been incorporated into the figures? In the future, DWR would appreciate figures at this scale and with this much detail to be saved/printed as 11x17.
24. Figure 10 –
    a. Please change the UT3 preservation line color to match the legend.
    b. There appear to be green and red groundwater gauges shown, which is confusing, and they don’t add up to the eight gauges noted in Table 29. Due to this discrepancy, DWR may request changes to the number/locations of gauges once a revised figure is submitted for review.
25. Sheet 0.3 –
    a. Is the proposed log sill meant to be the angle log drop shown in the details? No log sill detail was provided.
    b. Since there are no callouts or details for channel/ditch plugs or partial backfilling, the assumption is that all old channels and ditches will be backfilled to meet grade. Correct?
26. Sheet 1.2.3 – Please confirm with USACE, but I don’t believe a vernal pool and stone outlet BMP can be excavated out of an existing jurisdictional wetland area.
27. Sheet 2.7 – Please confirm whether the proposed floodplain pool is the same as the proposed shallow vernal pool. If not, please provide a legend icon and typical detail for the floodplain pool (including information on max. depth, outlet, materials/stone, planting/seeding).

28. Sheet 3.0.0 –
    a. Please add CE lines to all wetland grading sheets.
    b. This sheet shows Wetland Area 1B not abutting the CE line in the northeast corner near the utility break. This makes sense based on the topography shown on Sheet 1.1.1. Figures 8 & 10 appear to show the wetland credit area extending to the easement line. This is likely just a scale thing, but I wanted to confirm.
    c. I appreciate the inclusion of wetland grading sheets. However, I find it very difficult to assess proposed changes when the icon pattern covers the existing topography. What's most helpful for me is a figure showing categorized proposed changes in wetland elevations 0-6", 6-12" and >12" (often color-coded), so I can quickly assess minor to moderate to more substantial changes in elevation and soil characteristics.
29. Sheet 4.0.0 –
    a. Please double check species identified in the subcanopy stratum, particularly whether swamp rose and elderberry should be considered shrubs.
    b. Willow live stakes are included in the wetland planting zone percent stems total. Please clarify if you're proposing to count live stakes as part of the density and vigor performance standard monitoring.
    c. Please consider adding milkweed species to seed mixes (as appropriate) for pollinator habitat.
    d. Regarding the sheet note, please see DWR comment on "as needed" buffer planting.
    e. DWR greatly appreciates the attention given to species diversity and planting zones.
    f. Please add CE lines to all planting plan sheets.
30. Sheet 7.8 (Educational Inquiry) – What is the purpose of the cattle slats?
31. Sheet 7.9 – Why isn't a single culvert feasible or a baseflow/floodplain pipe pairing? DWR would prefer either of these options over a double culvert set at the same elevation in the stream bed, which may over-widen the channel and scour the banks.
32. General Comment – With all the vernal pool outlets and BMPs, please try to embed the stone lined areas as much as possible to limit layered stone voids that may become wildlife traps.

NCWRC Comments, Travis Wilson:

1. The ford crossings show the use of cattle slats; are these being used for structural stability to help retain substrate in the ford? Or, are they intended to deter cattle from crossing the stream?

2. Crossing at the top of UT4 states the crossing will be determined in the final mit plan. The type of crossing and configuration should be available in the draft mit plan. It's understood structure sizes may not be known until a more detailed design and hydraulic analysis has been completed.

3. The culvert Detail on page 7.9 shows two lines of smaller diameter (24") pipe conveying the normal flow channel. A single line of larger pipe, sized to carry the normal/low flow should be used in this detail, if additional high flow pipes are necessary to convey flood flow they can be incorporated within the cross-section at a higher elevation.

NCWRC Comments, Olivia Munzer:

1. We recommend planting only crimson clover rather than white clover for temporary and permanent seeding (outside easement). White clover is a more aggressive, perennial species compared to the annual crimson clover. White clover forms mats and can outcompete native species.

2. Consider adding another 1-2 flowering herbaceous species to your wetland seed mix.

USACE Comments, Kim Browning:

1. Please include a grading map in the figures that shows the different depths that will be graded. You can use different colors/patterns to show 0-6", 6-12', greater than 12".
2. Figure 10:
    a. Please move the stream gauge on UT4A to the upper 1/3 of the restoration reach, closer to the photo point.
    b. The legend doesn't clarify what the redish-pink dots in the wetlands represent. Are the existing groundwater gauges? Will they remain? If not, please add additional gauges to wetland 1B and 2A, and shift the gauge near 4B so that it captures the wetland.
    c. Is the preservation portion of UT3 supposed to be preservation for no credit? If so, please adjust the map; this figure contradicts what's depicted on Figure 8.
    d. Random plots will be requested in the supplemental planting areas throughout monitoring, particularly along UT4 where invasives are removed.
    e. UT2: Section 3.3 lists this reach as perennial and the DWQ ID Form lists it as intermittent, and the pJD map shows the reach as perennial. Please clarify. If UT2 is intermittent and has a 16-acre drainage area, please place a flow gauge near the photo point.
3. Page 34 and Sheet 1.2.3: The shallow vernal pool/retention pond and stone outlet cannot be placed in a jurisdictional area.
4. At the IRT site visit, the IRT questioned whether UT4 would remain stable after the extensive removal of invasives with an EII approach and requested cross sections on this reach.
5. Section 3.3: I appreciate the detailed existing conditions. This is helpful with the review.
6. Page 19: In addition to DWR's comments above on this section, please clarify that the overhead utility crossings and the variable width waterline easement on UT1 are external to the conservation easement. The design sheets indicate that the crossings are external, but Table 16 and Figures 8 & 10 show these as internal easements. Our preference is to exclude all existing utility easements, primary roads (i.e., NCDOT, city/county roads), maintained residential driveways, greenways, or access corridors reserved for future development. Additionally, why does the conservation easement boundary extend to Patterson Rd, to include a 68' wide utility easement? This should be removed from the easement. Please give me a call if you need to discuss.
7. Section 4.1: Was the pedestrian survey that was completed on March 9, 2020 conducted during the appropriate survey window? Most are conducted during the growing season. Also, keep in mind that plant surveys are only valid for 1-2 years, depending on the species. Due to the presence of suitable habitat for *Hexastyllis naniflora*, but lack of onsite evidence for the species' presence, the probability for project-mediated loss is insignificant and discountable. I would concur with a "may affect, not likely to adversely affect" determination for this species, not a "no effect.". I would encourage you to reach out to USFWS for written concurrence because The Corps will need this to process the 404-permit.
8. Table 19: I think the descriptions for UT4 Reach 1 and 2 are mixed up. Reach 1 should be EII.
9. Section 6.5, page 29: What is the potential for future development to contribute additional sediment? It appears that there are several developments close to the project currently.
10. Section 6.6.8: Please estimate the amount of bank grading that is proposed on UT4 in order to justify the 2.5:1 ratio.
11. Section 6.8: On future projects, please keep wetland labels consistent with the pJD map. It's confusing to have to refer to both Figures 2 and 8 in order to understand which wetlands this section is referencing.

12. Section 6.10: What is the potential for hydrologic trespass onto adjacent fields? Stream restoration work may have an impact on the hydrology of the adjacent land, resulting in increased flooding and/or reestablishment of wetlands on those parcels. Given that the soils and topography on the site do not immediately change at the edge of the conservation easement, it seems logical that wetland reestablishment right next to the property line will impact both sides of the boundary. There is also no way of ensuring that the adjacent landowners will not construct new ditches immediately adjacent to your project that would result in drainage of wetlands restored on your site. With no guarantee that the adjacent parcel will not be transferred to a different landowner in the future, this potential site constraint should be discussed in the text.
13. Table 28, page 38:
    a. Please include the Entrenchment Ratio of no less than 1.4 for B channels.
    b. If you would like to use a modified growing season that is not listed in the WETS tables, you will need to measure the soil temperature using a continuous monitoring device, and document vegetative indicators such as bud burst and leaf drop. Ideally, this data would be collected prior to submitting the final mitigation plan so you have accurate dates, similar to collecting pre-data for hydroperiods. If you decide to use a modified growing season, once you establish the dates (assuming it's a normal year), you will need to stick with those dates throughout the life of the project for consistency.

Kim Isenhour
Mitigation Project Manager
Regulatory Division

WILDLANDS
ENGINEERING

MEMORANDUM

TO: Kim Isenhour, USACE

FROM: Eric Neuhaus, PE

DATE: November 2, 2022

RE: Bridgefork Dairy Mitigation Site
Broad River Basin HUC 03050105
Cleveland County, NC
DMS ID No. 100171
DEQ ID No. 0301-01
RFP Number 16-20190301
SAW-2020-01962
Response to NCIRT Mitigation Plan Comments

Wildlands received NCIRT comments on the Bridgefork Dairy Mitigation plan via Kim Isenhour's October 5, 2022 letter. We have made the necessary revisions to the draft documents and are submitting revised versions of the documents along with this memorandum. Below we provide your comments followed by our responses in italics.

DWR Comments, Erin Davis

1) Page 5, Section 3.3.1 – Has any evidence of past/present beaver activity been observed onsite?

   a) Beaver activity has been observed at the Site along Bridgefork Creek Reach 3 from the confluence with UT5 downstream to below the project's extent. Wildlands will work with USDA on beaver management if needed during the monitoring period.

2) Page 5, Bridgefork Creek Reach 1a – Is the existing culvert under Patterson Road perched?

   a) The culvert at the upstream extent of Bridgefork Creek is perched approximately 8-inches. The stream channel downstream of the pipe is heavily influenced by existing bed rock that provides stable grade control.

3) Page 19, Section 3.5

   a) The new alignment of UT1 was designed to avoid working in the deepest pond sediments, but is this location the appropriate natural valley low point?

      - *The stream is placed at the lowest elevation of the proposed valley. The valley is being extensively re-graded with average widths of 75 to 100 feet. While the stream will be built further towards the left valley wall, the channel will maintain floodprone widths exceeding 30-feet and entrenchment ratios greater than 5.0 through this section of the reach.*

   b) Please describe what's ultimately done with pond bottom sediments in the MY0 As-built Baseline Report.

      - *Discussion of pond sediments will be included in the MY0 Report.*

c) As part of the site constraints assessment and coordination, did NCDOT, Kings Mountain Water or the electric utility company note any future maintenance plans? DWR is concerned that stream credit appears to abut others' outfall structures along UT2 and UT6. Was a credit setback considered in order to minimize the impact/risk of a future encroachment request?

- *NCDOT, Kings Mountain, and Duke Energy will have rights to maintain their associated easements per their own standards. Special coordination or altered maintenance plans were not discussed with any of these parties. Work abutting the water line at the upstream extent of UT1 has been coordinated with King's Mountain Water, including a previous site visit with the utility.*

- *A credit setback at the crossing locations was evaluated and it was determined that there is adequate space within the internal breaks to maintain the utilities and farm crossings without encroachments on the conservation easement. Wetland crediting was offset from internal crossings/utilities by at least 3 feet in all locations to avoid potential encroachment within the floodplain.*

d) Also, there was no mention in Section 3.3.1-UT3 of the existing culvert being located within the proposed project easement or in Section 6.6.7 that the culvert is proposed to remain in place (Sheet 1.4.1). Why does the project easement include this structure rather than start downstream of it? Dependent on the justification, DWR may request that the easement be modified or require communication that DEQ Stewardship and Kings Mountain Water have developed an acceptable plan for future structure maintenance involving minimal buffer disturbance.

- *Wildlands determined it was best to extend the conservation easement to the associated boundaries (property, utility easement) to capture the headwater of UT3. The culvert is proposed to remain in place as majority of the pipe is covered in earth. No credit is sought for the first 387 LF of UT3 and minor maintenance related to the culvert would not impact credited assets or buffer. Wildlands can facilitate contact for Kings Mountain Water maintenance with long term stewardship as needed.*

4) Page 20, Section 4.2 – Wetland credit areas appear to extend to the project conservation easement boundary. Is there any risk of hydrologic trespass from these areas?

- *Wetland credit is offset a minimum of 3-feet, and an average of 5-feet, from the conservation easement line in all locations. This buffer, along with increases in topography beyond the conservation easement, mitigate risk for hydrologic trespass.*

5) Page 23, Table 19 – The approaches and activities for UT4 Reach 1 and UT4 Reach 2 are in the incorrect rows. Please update.

- *Approaches for UT4 Reach 1 and UT4 Reach 2 were corrected in Table 19.*

6) Page 29, Section 6.5 – DWR appreciates the reference to the Cleveland County Comprehensive Land Use Plan.

- *Wildlands attempts to gather all available documentation and incorporate information into the design as applicable.*

7) Page 31, Section 6.6.1 - Please clarify supplemental planting "as needed". If supplemental planting of understory/shrub species is being proposed to support an enhancement credit ratio, DWR

expects that all designated areas shown as Shaded Planting Zone on Figure 10 will be supplementally planted with the listed Partially Forested Buffer Planting Zone species. And if requesting a 2.5:1 ratio, DWR requires survival data be collected during monitoring. This comment also applies to Bridgefork Creek Reach 2 and UT4 Reach 1. This was a discussion point on enhancement reaches during the IRT site walk.

a) *Zones shown for supplemental planting on the planting plan and Figure 10 will be supplementally bare rooted based on disturbance from invasive removal, debris removal, or if the areas are currently unforested. Species and quantities will be recorded. Additional mobile vegetation plots have been proposed within these areas as depicted in Figure 10. Text within the report was update accordingly.*

8) Page 31, Section 6.6.2 – Please show on a figure the extent of the P2 bench cut area(s) greater than 12 inches within or adjacent to any wetlands, as well as any areas where P2 benches overlap proposed wetland credit areas. Is there a drainage effect concern with proposing wetland credit within or adjacent to P2 bench cuts? Will removed hydric soil be reused onsite?

   a) *Colored coded grading depth of P2 cuts adjacent to and within proposed and existing wetlands for credit are now shown on the wetland grading sheets (3.0-3.2.1). Grading over 12" shown within Wetland 3A is attributed to side cast material left from ditch excavation. Existing bed elevations, along with bench and bankfull indicators at the downstream extents of Bridgefork Creek Reach 1B ultimately dictated stream elevation and associated floodplain grading within Wetland 4. Hydric soils will be harvested, reapplied, and proposed Wetland 4 will be roughened to promote extended retention times and microtopography upon grading completion.*

9) Page 32, Section 6.6.5 – Please confirm whether the entire pond dam footprint will be removed during construction after dewatering.

   a) *The entire dam and pond footprint is being re-graded as part of the project. The goal is to restore a natural valley shape along UT1 while stabilizing and maintaining the existing stormflow from Andrew Jackson Highway (NC-74) south of the project.*

10) Page 32, Section 6.6.8 – The included design sheets do not callout any bank grading or debris removal areas along UT4. Without knowing the extent of the functional uplift proposed, DWR cannot support the requested 2.5:1 ratio. Based on the information provided, we believe a 4:1 ratio is more appropriate. Please submit any additional information for consideration prior to finalizing the final mitigation plan. Also, please refer to the IRT site walk meeting minutes, "it was noted that if bank work/grading were done as part of the work along UT4, the IRT would require representative monitoring cross-sections be performed along the reach".

    a) *Enhancement measures along UT4 including bank grading, debris removal, and intensive invasive treatment were added to the design plans (Sheets 1.5.1 and 1.5.2) to support the proposed 2.5:1 credit ratio. A monitoring cross section was added along the reach where bank grading will occur, per IRT request.*

11) Page 34, Section 6.8 – General section note, DWR appreciates that pre-construction baseline groundwater gauge data was collected, and we were glad to see a reference wetland identified.

    - *Thank you for your comment. Wildlands makes every effort to accurately evaluate the baseline hydrologic conditions of the Site.*

12) Page 34, Section 6.8.1 – Please confirm that reestablishment area Wetland 2A does not overlap the pond dam footprint.

- *Wetland 2A boundary was revised slightly to ensure none of the credited boundary overlaps the existing pond dam footprint.*

13) Page 34, Section 6.8.2 – Wetland K was evaluated to have a High NCWAM score. To account for existing high wetland functions and lack of proposed monitoring stations to demonstrate uplift, DWR believes an enhancement ratio of 2.5:1 is more appropriate for Wetland 2B. Wetland approaches/ratios was a discussion point at the IRT site walk.

    - *Wetland K (Proposed Wetland 2B) was revised to a wetland enhancement approach at a 2.5:1 mitigation credit ratio. Section 6.8.3 - Wetland Enhancement was added to the report and mitigation crediting was revised throughout the report.*

14) Page 34, Section 6.8.2 – Figure 2 shows three existing drainage ditches. Please add callouts to fill ditches on design sheets.

    - *Callouts to fill ditches have been added to plan sheets.*

15) Page 35, Section 6.8.3 – Regarding the preliminary/detailed soil investigation, is the single soil profile provided representative of all nine proposed wetland credit areas? Why were no borings taken within proposed wetland rehab areas? Also, has a sampling effort or any investigation of the pond bottom sediments been performed?

    - *The provided soil profile is representative of soil conditions found within proposed Wetlands 1A, 1B, 1C, 3A, 3B, 4A, and 4B. Wetland Area 2 is primarily within the pond. No soil profiles were done within the pond, but a basic probe was done to estimate depth of sediment/leaf pack within the pond for construction. Wetland Re-habilitation boundaries are based on the jurisdictional determination. Given the level of detail and ACOE involvement on the PJD, including a field investigation, additional soil borings are not provided by an LSS for wetland rehab areas.*

16) Page 36, Section 6.8.3 – Is the proposed sediment cap expected to assist with access to properly install bareroot plantings during construction and/or avoid sediment cracking during monitoring? These are two challenges that DWR has observed in past proposed pond bottom wetland credit areas.

    - *Generally, the sediment cap is to help with workability of the material within the proposed wetland area, including grading and channel construction. It will also help provide a workable surface for proposed bareroot/herbaceous plantings.*

17) Page 36, 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. In addition to the pond bottom and P2 bench cut areas, there are several steep slopes shown on the design sheets within and immediately adjacent to the project proposed for regrading and stabilization.

    - *The Land Management Section has been updated to include discussion of soil amendments and ripping of compacted soils.*

18) Page 37, Section 6.9 – In the MY0 Baseline Report, please summarize what species were treated prior to and during construction. The presence of *Murdannia keisak* is particularly concerning, so please provide a bit more information on the planned treatment of this species.

a) *Discussion of invasive treatments prior to and during construction will be included in the MY0 Report. During construction treatment will include privet and invasive vines, both mechanical removal and cut stump by contractors. Murdannia cannot be treated in dormant season but will primarily be treated in-stream and where it is threatening woody vegetation.*

19) Page 37, Section 6.10 –

a) Given the site proximity to previously timbered areas, is pine or sweet gum colonization a concern? Is veg management anticipated?

- *There is potential pine and/or sweet gum colonization due to previously timbered adjacent areas. This is low risk and should colonization begin to occur, Wildlands will follow the Maintenance Plan (Appendix 10) to address the issue.*

(1) *The previously timbered parcel is adjacent to UT4 (Enhancement II) and UT4A (Restoration).*

(2) *Treatments would include cutting or foliar using 3% Triclopyr 3.*

b) DWR recommends adding "no mow" signs along any internal utility crossings not bordered by fence.

- *"No-Mow" Conservation easement signs will be placed along internal utility crossings not bordered by a fence.*

20) Page 38, Table 28 –

a) Dimension - Please add the entrenchment ratio for proposed B channels.

- *Table 28 has been updated to include an entrenchment ratio of greater than or equal to 1.4 for B channels.*

b) Hydrology - Please shift the semi-colon. Bankfull events are to be in separate years. Minimum consecutive flow days is an annual performance standard.

- *Table 28 was updated to say that the bankfull event criteria is required for separate monitoring years.*

c) Wetland – Please add start/end dates for the preliminary growing season.

- *Start and end dates of 3/1 and 11/20 were added for the preliminary growing season defined within Table 28.*

d) Vegetation – Considering 70% of plantings for the Wetland Planting Zone are canopy species, DWR does not agree with the proposed vigor standard modification without further justification. DWR would support a vigor exemption for shrub and subcanopy species across planting zones.

- *The vigor standard modification for wetland zones was removed from Table 28.*

21) Page 40, Table 29 –

a) DWR requests a representative cross section be added to the approx. 200-ft restoration reach of UT2.

- *One riffle cross-section was added to UT2. Table 29 and Figure 10 were updated accordingly.*

b) In addition to permanent and mobile plots within the Figure 10 Open Planting Zone and Wetland Planting Zone (which have an associated performance standard), DWR requires stem survival data for supplemental planting within the Shaded Planting Zone to support the 2.5:1 enhancement ratios. (Potential monitoring approaches were recently discussed with Wildlands at the DMS Honey Mill IRT site visit)

- *Mobile vegetation plots were added to supplemental planting areas as shown on Figure 10 to monitor vegetation within supplementally planted areas. Species and quantities will be recorded.*

22) General Comment – Please make sure to QAQC spelling, spacing, and formatting in the plan narrative.

- *A QA/QC review was done of the revised report.*

23) Figures 2 & 10 – Have red box comments already been incorporated into the figures? In the future, DWR would appreciate figures at this scale and with this much detail to be saved/printed as 11x17.

- *Red box comments shown on Figure 2 and 10 were from a previous internal review and were removed from the figures.*
- *Figures 2 and 10 are included as 11x17 exports within the report.*

24) Figure 10 –

a) Please change the UT3 preservation line color to match the legend.

- *UT3 is a preservation (no credit) reach, as stated in Table 19. The color was updated accordingly on Figure 10.*

b) There appear to be green and red groundwater gauges shown, which is confusing, and they don't add up to the eight gauges noted in Table 29. Due to this discrepancy, DWR may request changes to the number/locations of gauges once a revised figure is submitted for review.

- *Groundwater gauges were all updated to green on Figure 10. There are nine proposed groundwater gages shown on Figure 10 and indicated in Table 29.*

25) Sheet 0.3 –

a) Is the proposed log sill meant to be the angle log drop shown in the details? No log sill detail was provided.

- *Detail 1 on Sheet 7.5, labeled "Angled Log Drop" corresponds to the Proposed Log Sill symbol on Sheet 0.3. The detail has been relabeled as "Log Sill" for consistency.*

b) Since there are no callouts or details for channel/ditch plugs or partial backfilling, the assumption is that all old channels and ditches will be backfilled to meet grade. Correct?

- *Ditches/old channel will be filled as part of the project. No partial backfilling or plugging of channels/ditches will be done at the Site.*

26) Sheet 1.2.3 – Please confirm with USACE, but I don't believe a vernal pool and stone outlet BMP can be excavated out of an existing jurisdictional wetland area.

- *All vernal/floodplain pools and associated outlets were removed from jurisdictional wetland features.*

27) Sheet 2.7 – Please confirm whether the proposed floodplain pool is the same as the proposed shallow vernal pool. If not, please provide a legend icon and typical detail for the floodplain pool (including information on max. depth, outlet, materials/stone, planting/seeding).

    - *The "Proposed Floodplain Pool" on Sheet 2.7 is the same as the "Proposed Shallow Vernal Pool." The label on Sheet 2.7 has been changed for consistency.*

28) Sheet 3.0.0 –

    a) Please add CE lines to all wetland grading sheets.

        - *The CE lines are now shown on the wetland grading sheets.*

    b) This sheet shows Wetland Area 1B not abutting the CE line in the northeast corner near the utility break. This makes sense based on the topography shown on Sheet 1.1.1. Figures 8 & 10 appear to show the wetland credit area extending to the easement line. This is likely just a scale thing, but I wanted to confirm.

        - *The wetland crediting polygons have a 3-foot buffer from the existing utility easement. For Figures 8 and 10 it is a scale issue. They do not extend into the utility easement.*

    c) I appreciate the inclusion of wetland grading sheets. However, I find it very difficult to assess proposed changes when the icon pattern covers the existing topography. What's most helpful for me is a figure showing categorized proposed changes in wetland elevations 0-6", 6-12" and >12" (often color-coded), so I can quickly assess minor to moderate to more substantial changes in elevation and soil characteristics.

        - *The color coding in the increments requested is now included on the wetland grading sheets 3.0-3.2.1.*

29) Sheet 4.0.0 –

    a) Please double check species identified in the subcanopy stratum, particularly whether swamp rose and elderberry should be considered shrubs.

        - *The stratum for swamp rose and elderberry was updated to "shrub". -*

    b) Willow live stakes are included in the wetland planting zone percent stems total. Please clarify if you're proposing to count live stakes as part of the density and vigor performance standard monitoring.

        - Stems planted in the floodplain will be counted towards the density and vigor performance standard. Vegetation plots are located so as to avoid including any live stakes placed on the stream banks.

    c) Please consider adding milkweed species to seed mixes (as appropriate) for pollinator habitat.

        - *Swamp milkweed was added to the Permanent Wetland Seeding mix.*

    d) Regarding the sheet note, please see DWR comment on "as needed" buffer planting.

        - *See response to DWR comment 7 above.*

    e) DWR greatly appreciates the attention given to species diversity and planting zones.

        - *Thank you for your comment. Wildlands tries to develop a species list that is representative of the target community and includes a large amount of species diversity.*

f) Please add CE lines to all planting plan sheets.

- *The CE lines are now included in the planting plan sheets.*

30) Sheet 7.8 (Educational Inquiry) – What is the purpose of the cattle slats?

- *The cattle slats provide a hardened bed for vehicle and animal crossings while allowing fine instream sediments to pass through the fords. Animals prefer the slats to large sub pavement material within the fords.*

31) Sheet 7.9 – Why isn't a single culvert feasible or a baseflow/floodplain pipe pairing? DWR would prefer either of these options over a double culvert set at the same elevation in the stream bed, which may over-widen the channel and scour the banks.

- *A single round or pipe arch culvert is not feasible at the UT4 crossing because the road elevation above the culvert would be too high for the required maximum crossing side slopes, road width, and easement break width. However, the crossing has been redesigned with a large central culvert and smaller, parallel, culverts on either side. The side culverts have invert elevations set 6" higher than the adjacent thalweg.*

32) General Comment – With all the vernal pool outlets and BMPs, please try to embed the stone lined areas as much as possible to limit layered stone voids that may become wildlife traps.

- *Stone within outlets and BMPs will be embedded where possible.*

NCWRC Comments, Travis Wilson

1. The ford crossings show the use of cattle slats; are these being used for structural stability to help retain substrate in the ford? Or, are they intended to deter cattle from crossing the stream?

- *The cattle slats provide a hardened bed for vehicle and animal crossings while allowing fine instream sediments to pass through the fords. Animals prefer the slats to large sub pavement material within the fords.*

2. Crossing at the top of UT4 states the crossing will be determined in the final mit plan. The type of crossing and configuration should be available in the draft mit plan. It's understood structure sizes may not be known until a more detailed design and hydraulic analysis has been completed.

- *A detail of the UT4 crossing was/is shown on Sheet 7.9. The note referred to in the comment above was a carryover from Draft submittal to NCDMS and was removed from the plan set.*

3. The culvert Detail on page 7.9 shows two lines of smaller diameter (24") pipe conveying the normal flow channel. A single line of larger pipe, sized to carry the normal/low flow should be used in this detail, if additional high flow pipes are necessary to convey flood flow they can be incorporated within the cross-section at a higher elevation.

- *The UT4 crossing has been redesigned to use a single central pipe that is embedded and can efficiently convey baseflow as well as two flanking, smaller diameter pipes for additional capacity. The smaller pipes have inverts set 6" higher than the adjacent thalweg elevations.*

NCWRC Comments, Olivia Munzer:

1. We recommend planting only crimson clover rather than white clover for temporary and permanent seeding (outside easement). White clover is a more aggressive, perennial species compared to the annual crimson clover. White clover forms mats and can outcompete native species.
    - *White clover is wildlife and pollinator friendly, landowners request it, and it helps suppress other weeds. At 5lbs/acre, we do not foresee it outcompeting the native species. The Permanent Seeding Outside Easement ladino clover rate was reduced from 10lbs/acre to 5lbs/acre.*

2. Consider adding another 1-2 flowering herbaceous species to your wetland seed mix.
    - *Swamp milkweed was added to the Permanent Wetland Seed mix.*

USACE Comments, Kim Browning:

1. Please include a grading map in the figures that shows the different depths that will be graded. You can use different colors/patterns to show 0-6", 6-12', greater than 12".
    - *Color coded grading figures are included on the wetland grading sheets 3.0-3.2.1.*
2. Figure 10:
    a. Please move the stream gauge on UT4A to the upper 1/3 of the restoration reach, closer to the photo point.
        - *A stream gage was added on UT4A in the upper third of the reach, just below the photo point. The riffle cross-section will still have a crest gage to monitor bankfull events.*

- The legend doesn't clarify what the redish-pink dots in the wetlands represent. Are the existing groundwater gauges? Will they remain? If not, please add additional gauges to wetland 1B and 2A, and shift the gauge near 4B so that it captures the wetland.
    - *The red gages shown on Figure 10 were from a previous internal review and were removed from the figure. Groundwater gauges were all updated to green on Figure 10. There are nine proposed groundwater gages shown on Figure 10 and indicated in Table 29. Wetlands 1B and 2A both include a groundwater gage. The gage originally placed near wetland 4B was relocated and the other gages were moved slightly so that it is included within a wetland boundary. Wetland 1B now has two gages.*
- Is the preservation portion of UT3 supposed to be preservation for no credit? If so, please adjust the map; this figure contradicts what's depicted on Figure 8.
    - *UT3 is a preservation (no credit) reach, as stated in Table 19. The color was updated accordingly on all other Figures.*
- Random plots will be requested in the supplemental planting areas throughout monitoring, particularly along UT4 where invasives are removed.
    - *As discussed above (7.a), mobile vegetation plots were added to supplemental planting areas.*
- UT2: Section 3.3 lists this reach as perennial and the DWQ ID Form lists it as intermittent, and the pJD map shows the reach as perennial. Please clarify. If UT2 is intermittent and has a 16-acre drainage area, please place a flow gauge near the photo point.

- *UT2 is a perennial stream. The stream was revised during the JD permitting process from an intermittent to a perennial stream, but the old DWQ form was mistakenly included in the report. The JD was approved on 10/14/2021. The updated DWQ form for UT2 is included in the report.*

3. Page 34 and Sheet 1.2.3: The shallow vernal pool/retention pond and stone outlet cannot be placed in a jurisdictional area.
    - *All vernal/floodplain pools and associated outlets were removed from jurisdictional wetland features.*

4. At the IRT site visit, the IRT questioned whether UT4 would remain stable after the extensive removal of invasives with an EII approach and requested cross sections on this reach.
    - *At the IRT visit, Wildlands had anticipated doing wholesale grinding/clearing of understory invasives along UT4 based on preliminary evaluation of the site at the proposal phase. After evaluation with our internal adaptive management team, it was determined that the best approach along most of the reach was to use multiple rounds of heavy hand cutting and painting along UT4 to address the invasive vegetation while preserving existing native vegetation. Based on this approach stability should not be compromised along UT4.*
    - *At the downstream extents of UT4 a monitoring cross-section was added to monitor stability along banks proposed for grading/disturbance.*

5. Section 3.3: I appreciate the detailed existing conditions. This is helpful with the review.

6. Page 19: In addition to DWR's comments above on this section, please clarify that the overhead utility crossings and the variable width waterline easement on UT1 are external to the conservation easement. The design sheets indicate that the crossings are external, but Table 16 and Figures 8 & 10 show these as internal easements. Our preference is to exclude all existing utility easements, primary roads (i.e., NCDOT, city/county roads), maintained residential driveways, greenways, or access corridors reserved for future development. Additionally, why does the conservation easement boundary extend to Patterson Rd, to include a 68' wide utility easement? This should be removed from the easement. Please give me a call if you need to discuss.
    - *The variable width waterline easement at the upstream extent of UT1 is external to the conservation easement. The overhead utility along UT1 is an internal crossing as described in Table 16 and shown within the plans and figures. It was determined best to include this area as an internal crossing in case of future relocation of the utility line in this area and in case of future cattle/livestock use. The overhead electric line appears as though it could be moved to run along Patterson Road and/or US-74 based on the existing layout. Currently, cattle have access to the left floodplain of UT1 and in the future the property owner may extend cattle use to the pastures beyond the right floodplain. Considering both potential project threats, the utility crossing was included as internal to the recorded conservation easement.*
    - *The 68' wide utility easement is included as an internal crossing at the 1a/1b reach break of Bridgefork Creek. Utility corridors along Bridgefork Creek were included as internal crossings because they overlap proposed cattle fords. Leaving these areas external to the conservation easement would leave long sections of stream within the middle of the mitigation project subject to cattle wallowing.*
    - *At the project's upstream extent, the proposed conservation easement extends to the Patterson Road right-of-way via an internal utility crossing because it is in the best interest*

of the project. If this area was not included as an internal crossing, there would be a 35-to-40-foot gap at the upstream extent of the project that would be vulnerable to livestock wallowing and watering. This was seen as a major threat to ecological uplift and overall mitigation goals at the Site. A portion of the existing pipe is included within the conservation easement; however, the pipe is within an internal easement break to allow NCDOT to maintain or repair/replace the pipe as needed without violating the terms of the conservation easement.

- *Wildlands understands regulatory preference and concerns regarding potential encroachment issues at utility crossings. In the future, more detailed maps and discussion will be provided during the post contract IRT walk and/or prior to mitigation plan review to allow for more discussion and resolution of potential conservation easement issues.*

7. Section 4.1: Was the pedestrian survey that was completed on March 9, 2020 conducted during the appropriate survey window? Most are conducted during the growing season. Also, keep in mind that plant surveys are only valid for 1-2 years, depending on the species. Due to the presence of suitable habitat for *Hexastyllis naniflora*, but lack of onsite evidence for the species' presence, the probability for project-mediated loss is insignificant and discountable. I would concur with a "may affect, not likely to adversely affect" determination for this species, not a "no effect.". I would encourage you to reach out to USFWS for written concurrence because The Corps will need this to process the 404-permit.
    - *The pedestrian survey was conducted at the proper time of the year. The only listed species for the project were Northern Long Eared Bat and Dwarf-flowered Heartleaf. The survey window for the heartleaf is from March-May, corresponding to its blooming window. Because of the possibility that the survey would expire before construction, the Site was reassessed on May 24, 2022. The determination for the Hexastyllis was updated to "may affect, not likely to adversely affect." We received written concurrence from USFWS on 10/13. This correspondence was added to Appendix 6.*
8. Table 19: I think the descriptions for UT4 Reach 1 and 2 are mixed up. Reach 1 should be EII.
    - *The descriptions for UT4 Reaches 1 and 2 in Table 19 have been corrected.*
9. Section 6.5, page 29: What is the potential for future development to contribute additional sediment? It appears that there are several developments close to the project currently.
    - *The potential for future development to contribute additional sediment is minimal. There is minor residential development within the watershed, which is primarily conversion of agricultural landuse. This landuse conversion does not typically include a major sediment input regime change.*
10. Section 6.6.8: Please estimate the amount of bank grading that is proposed on UT4 in order to justify the 2.5:1 ratio.
    - *Enhancement measures along UT4 including bank grading, debris removal, and intensive invasive treatment were added to the design plans (Sheets 1.5.1 and 1.5.2) to support the proposed 2.5:1 credit ratio. A monitoring cross section was added along where bank grading will occur, per IRT request.*
11. Section 6.8: On future projects, please keep wetland labels consistent with the pJD map. It's confusing to have to refer to both Figures 2 and 8 in order to understand which wetlands this section is referencing.

- *This will be considered in future reports, but existing and proposed wetlands vary in size, shape, and boundary so using the same labels typically leads to confusion.*

12. Section 6.10: What is the potential for hydrologic trespass onto adjacent fields? Stream restoration work may have an impact on the hydrology of the adjacent land, resulting in increased flooding and/or re-establishment of wetlands on those parcels. Given that the soils and topography on the site do not immediately change at the edge of the conservation easement, it seems logical that wetland reestablishment right next to the property line will impact both sides of the boundary. There is also no way of ensuring that the adjacent landowners will not construct new ditches immediately adjacent to your project that would result in drainage of wetlands restored on your site. With no guarantee that the adjacent parcel will not be transferred to a different landowner in the future, this potential site constraint should be discussed in the text.
    - *There is very limited to no potential for hydrologic trespass onto adjacent fields at the Site. Proposed wetland areas across the site are low-lying compared to adjacent pastures outside the conservation easement. All wetland restoration and enhancement zones are buffered a minimum of 3 feet from the conservation easement line. Based on the topography of proposed wetland restoration areas, as well as adjacent areas outside the conservation easement, ditching outside the conservation easement would not be effective to drain proposed wetlands post-construction. No text was added to Section 6.10.*

13. Table 28, page 38:
    a. Please include the Entrenchment Ratio of no less than 1.4 for B channels.
        - *Table 28 has been updated to include an entrenchment ratio of greater than or equal to 1.4 for B-type streams.*

    b. If you would like to use a modified growing season that is not listed in the WETS tables, you will need to measure the soil temperature using a continuous monitoring device, and document vegetative indicators such as bud burst and leaf drop. Ideally, this data would be collected prior to submitting the final mitigation plan so you have accurate dates, similar to collecting pre-data for hydroperiods. If you decide to use modified growing season, once you establish the dates (assuming it's a normal year), you will need to stick with those dates throughout the life of the project for consistency.
        - *Wildlands altered the text within Table 28 to propose a modified growing season based on soil temperature and vegetative indicators as defined above. Text from Table 28 is include below:*
            - *"Free groundwater surface within 12 inches of the ground surface for a minimum of 11% (29 consecutive days) of the growing season under normal precipitation conditions. In accordance with the Wilmington 2016 Guidance, soil probe temperature data and documentation of new vegetative growth and flowering was used to determine an appropriate growing season. Based on the documentation provided within Appendix 4, the growing season for the site is proposed as 3/1 to 11/20 (264 days)."*

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MARC RECKTENWALD
Director

NORTH CAROLINA
Environmental Quality

May 2, 2022

Mr. Eric Neuhaus, PE
Wildlands Engineering, Inc.
167-B Haywood Road
Asheville, NC 28806

Subject: Draft Mitigation Plan Comments for the
Bridgefork Dairy Mitigation Site
Broad River Basin – CU# 03050105
Cleveland County
DMS Project ID No. 100171
Contract # 0301-01

Dear Mr. Neuhaus:

On April 1, 2022 the Division of Mitigation Services (DMS) received the draft mitigation plan for the Bridgefork Dairy Mitigation Site from Wildlands Engineering, Inc. (WEI).

The report establishes the proposed mitigation activities on the project site. Anticipated mitigation on the site includes 10,932.036 Stream Mitigation Units and 2.975 Wetland Mitigation Units. The following are our comments on the draft mitigation plan report and preliminary plan set:

General:

- Recent IRT comments have requested providers ensure that when measuring the centerline of the channel for crediting purposes that only one channel is measured at the confluence. Currently the tributaries are calculated to the centerline of the receiving stream. Please revise report, tables and plans as necessary.
- Many details are not included in the Draft Mitigation Plan. Ford detail, culvert detail, BMP detail, wetland grading plans, etc. Please include these items in future draft mitigation plans and definitely include in the revised Mitigation Plan for IRT review.
- There are several proposed culverted crossings. Based on recent material costs/availability, does WEI anticipate the possibility of using bridges as alternatives? If so, please include a short discussion and general detail in the Mitigation Plan.

Title Page and Second Page:

- Please include the DWR project number: ***DWR# 2020-1841***
- Please also provide the date of issuance with the RFP#: ***RFP#: 16-20190301 (Issued: 12/20/2019***)

3.1 Watershed Conditions

- The last sentence in this section mentions timber practices between UT4 and UT4a. Recommend adding further discussion that the timber practices were discussed at the Post Contract IRT Site Visit and documented in point #4 of the meeting minutes.

3.5 Site Constraints to Functional Uplift

- Does WEI plan to remove pond sediments after dewatering and bringing in new material prior to constructing the new channel? Please add further discussion in this section regarding the pond removal and channel construction.

4.3 401/404

- Section indicates wetlands within the conservation easement or along travel routes will be flagged and/or marked with safety fence to prevent unintended impacts. Draft plans do not show these areas delineated with safety fence or other means. Please verify that revised plans for IRT review will include this measure.

6.5 Sediment Transport Analysis

- Please revise the statement "A review of historic aerials from 1938 to 2016 showed that watershed sizes and land uses have not changed considerably…" to exclude watershed sizes since the watershed size are not usually subject to change.
- Given the location of the project in the watershed and the similar land use history upstream of the project, the contributing area above the project is a likely source of sediment. Please describe how the restored streams will process the sand/gravel (bedload) and/or finer fraction of sediment inputs from eroding banks upstream of the project. The statement 'After construction, bedload supply will not be high enough to cause the project streams to be capacity limited' does not acknowledge the upstream source.
- Rather than 'the near future', please provide a more specific time frame for development (or absence of development) in the watershed, e.g., 10yrs, 25yrs.

6.6.2 Bridgefork Creek Reach 1b and 6.6.4 Bridgefork Creek Reach 3

- Drain tiles within the conservation easement will be removed. If drain tiles extend beyond the conservation easement, an ephemeral pool will be placed within the conservation easement. Can WEI quantify the number of drain tiles and expected ephemeral pools that will be within the conservation easement? Will these ephemeral pools require maintenance? One drain tile is located on Figure 2; if others are known, please include on figure and plans.

6.6.3 Bridgefork Creek Reach 2

- The text for Bridgefork Creek Reach 2 is somewhat unclear, the Simon evolutionary phase is indicated as V, aggradation and widening and the BHR is 2.5 but the summary of work proposed in section 6.6.3 indicates stable sinuosity and a bankfull bench forming at current bed elevation and references overall channel stability. Please review and revise as necessary.

6.6.5 UT1

- Section describes the pond removal on UT1 and indicates the dam may be left in place and the pond dewatered; please verify that the approach of leaving the dam partially in place

was proposed at the post contract site visit and approved by DMS and the IRT. Section 6.6.4 indicates the pond will be removed but states the dam will only be breeched.

- Two "Proposed Shallow Vernal Pools" are shown on the plan (sheet 1.2.2 and 1.2.3) but not discussed. Please include a short discussion of these features. What is the expected depth, will they dry seasonally, maintenance, type of outlet: rip-rap, etc.
- Recommend referring the BMP in this discussion as BMP 3 as shown on sheet 1.2.5.
- Does WEI plan to bring in new material to construct the channel through pond bottom? Please add discussion.

6.6.7 UT3

- Recommend noting that the last 70' of UT3 will consist of restoration level work consisting of a series of constructed riffles and boulder structures; however, the reach will receive a standard EII ratio.

6.6.8 UT4

- Description indicates that EII work will consist of invasive species management and debris removal. Section 11.0 Determination of Credits states that the 2.5:1 EII ratio will include cattle exclusion and minor bank grading as well. Recommend revising section 6.6.8 and discuss bank grading activities. Also, please add locations of bank grading and debris removal (if isolated areas) to sheets 1.5.1 and 1.5.2.

6.6.9 UT4a

- Two vernal pools are shown on this reach (sheet 1.6.4 and 1.6.5). Same comment as above.
- Recommend referring to BMP as BMP 1 as shown on sheet 1.6.2.

UT5

- There is an existing conditions discussion of UT5 in section 3.3 of the draft, but there is no discussion of the work proposed for UT5 in section 6.6. Please add a section describing the work for this reach. The IRT requested this reach be discussed in the Post Contract Meeting Minutes item number 22.
- There are discrepancies in how UT5 is presented in the Mitigation Plan. It is not labeled on the monitoring map although has a monitoring station and appears to be entirely preservation. The Project Credit Table indicates it has two reaches, one being restoration and one being preservation. Table 19 also does not indicate any restoration. The valley for project reach appears to be unconfined based on topo lines but is described as confined/unconfined in the Project Attribute Table. Please QA/QC Mitigation Plan to ensure maps, figures, tables and discussions accurately depict existing and proposed work on UT5.

6.6.11 UT6A

- Recommend referring to BMP as BMP 2 as shown on sheet 1.9.1.

6.8 Wetland Design

- Section mentions wetland grading plan. However, no grading plan was included. Please update section with additional information regarding depth of grading and material removed. Please include grading plan with revised draft for IRT review.

6.8.4 Existing Hydrology

- Please identify the county's growing season. Gage data shows the growing season defined as 3/26 – 11/6.
- Section indicates all gages failed to meet the wetland criteria of 25 days as *defined by DMS*. DMS does not establish performance standards; it is assumed the 11% standard was approved by the IRT based on the 2016 USACE guidance which lists acceptable standards for Chewacla soils beginning at 10% and Wehadkee soils at 12%. Please revise or explain.

6.10 Project Risk Management:

- Please also describe the site specific conservation easement marking and type of fencing that will be utilized to restrict livestock from encroachment.
- Will the fords be subject to livestock use? Will there be end gates?
- Consider adding discussion regarding hydrologic trespass potential to any area outside of the conservation easement. Specifically, where drain tiles are cut back to the conservation easement.

7.0 Performance Standards

- Please consider utilizing the most recent DMS templates, guidance and tools for the as-built survey, record drawings, and MY0-MY7 reports. These are available on the DMS website.

Table 29 Monitoring Components:

- Nine ground water gages were used for pre-construction wetland hydrology data, but only three gages are being proposed for monitoring. DMS recommends adding ground water gages to wetland 1B and 2A. Please consider well placement so pre-construction data can be compared to current year wetland gage data.

Figure 2

- There are two GWG 8 shown and no GWG6.

Figure 8, 9, 10

- UT5 appears to be shown as preservation only on these figures. Restoration reach may be too short to display correctly. Please verify.
- Figure 8 and 10 indicates a reach break on UT1; however, no break is indicated on the Project Credit Table or elsewhere in the report. Please update as necessary.

Figure 10

- Label UT5

Fencing: Fencing plan appears to show fence offset from conservation easement. This is the preferred method of installation of fences. Please ensure all fencing is installed on the conservation easement line or outside.

Fescue: The plan indicates fescue will be treated prior to or during construction. Thank you for including this in the plan. Please consider ring spraying during monitoring if fescue persists to reduce planted tree competition and ensure vegetative success.

Digital Spatial Data Review Comments:

- The conservation easement submitted with Mitigation Plan digital files differs from CE boundary submitted for Task II review and displayed in the report figures, specifically the easement boundary along Bridgefork Creek Reach 3 as well as internal crossings are missing from mitigation plan submission.
    - The 68 ft. wide Duke Energy and 20 ft wide AT&T ROWs are shown as internal crossings. These should be indicated as ROWs
    - The 30-foot Duke ROW on upper UT 1 is missing from the digital drawings
- Please ensure the most up to date and accurate easement is applied to the finalized Mitigation Plan and design sheets.
- Please verify there is no need to separate Wetland 3A into separate polygons.
- Please note that UT 5 Reach 2 is designated in the Mitigation Plan as restoration but in the digital data as preservation; this break will need to be included in a revised submission.
- Reach 1 and 2 designations will need to be added to UT 4 to separate reaches by including a break due to EII and R treatment.

Digital Data: Excel Templates

- Please refer to template for Project Attribute Table and use current template. At a minimum, the required information as specified in the template should be included in the table.
- The Morphological Tables Essential Parameters varies in nomenclature, format, and minimally in content from the template.

At your earliest convenience, please provide a written response letter addressing the DMS comments provided and a revised/updated electronic copy of the Draft Mitigation Plan. The comment response letter should be included in the revised Draft Mitigation Plan after the report cover. If you have any questions, please contact me at any time at (828) 231-7912 or email me at matthew.reid@ncdenr.gov.

Sincerely,

Matthew Reid

Matthew Reid
Project Manager – Western Region
NCDEQ – Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801
(828) 231-7912 Mobile

WILDLANDS
ENGINEERING

MEMORANDUM

TO: Matthew Reid, Project Manager

FROM: Eric Neuhaus, PE

DATE: July 12, 2022

RE: Bridgefork Dairy Mitigation Site
Cleveland County, NC
Broad River Basin 03050105
Response to NCDMS DRAFT Mitigation Plan Review Comments

This memo documents NCDMS's review comments of the Draft Mitigation Plan for the Bridgefork Dairy Mitigation Site (*in italics*) received from Matthew Reid on 5/2/2022, the project team's responses, and any associated revisions required within the report.

General:

- *Recent IRT comments have requested providers ensure that when measuring the centerline of the channel for crediting purposes that only one channel is measured at the confluence. Currently the tributaries are calculated to the centerline of the receiving stream. Please revise report, tables and plans as necessary.*
    - Tributary crediting was trimmed to the bankfull alignments of Bridgefork Creek or larger drainage tributary at all confluences. Crediting was updated in Table 31 in the mitigation plan and in the submitted digital files. End of crediting was added to the plan sheets at confluences.
- *Many details are not included in the Draft Mitigation Plan. Ford detail, culvert detail, BMP detail, wetland grading plans, etc. Please include these items in future draft mitigation plans and definitely include in the revised Mitigation Plan for IRT review.*
    - These items have been added to the mitigation plan for IRT review.
- *There are several proposed culverted crossings. Based on recent material costs/availability, does WEI anticipate the possibility of using bridges as alternatives? If so, please include a short discussion and general detail in the Mitigation Plan.*
    - Wildlands does not intend on using bridge alternatives for any of the proposed crossings.

Title and Second Page:

- *Please include the DWR project number: DWR# 2020-1841*
    - The DWR project number had been added to page 2.
- *Please also provide the date of issuance with the RFP#: RFP#: 16-20190301 (Issued: 12/20/2019)*
    - The issued RFP date was added to the title page.

3.1 Watershed Conditions

- *The last sentence in this section mentions timber practices between UT4 and UT4a. Recommend adding further discussion that the timber practices were discussed at the Post Contract IRT Site Visit and documented in point #4 of the meeting minutes.*
    - Text was added to Section 3.1 referencing the post contract meeting minutes and timbering discussions.

3.5 Site Constraints to Functional Uplift

- *Does WEI plan to remove pond sediments after dewatering and bringing in new material prior to constructing the new channel? Please add further discussion in this section regarding the pond removal and channel construction*
    - The following information was added to Section 3.5 of the mitigation plan: 'Removal and replacement of pond sediments will be determined based on site conditions during construction. If pond sediments are determined unsuitable for channel construction, material will be supplemented with dirt from other portions of the project. The alignment of UT1 was designed along the left edge of the existing pond bed in an attempt to avoid the deepest pond sediments while allowing for adequate floodplain width for the channel.'

4.3 401/404

- *Section indicates wetlands within the conservation easement or along travel routes will be flagged and/or marked with safety fence to prevent unintended impacts. Draft plans do not show these areas delineated with safety fence or other means. Please verify that revised plans for IRT review will include this measure.*
    - The section indicates wetlands within the conservation easement but outside the limits of disturbance will be fenced for protection from unintended impacts. Final limits of disturbance (LOD) are determined during Erosion and Sediment control (ESC) permitting. Once the LOD is finalized and shown within project plans, safety fence will be added to any jurisdictional wetland areas which abut the limits of disturbance and aren't permitted for impact.

6.5 Sediment Transport Analysis

- *Please revise the statement "A review of historic aerials from 1938 to 2016 showed that watershed sizes and land uses have not changed considerably…" to exclude watershed sizes since the watershed size are not usually subject to change.*
    - The referenced statement has been revised to exclude mention of watershed sizes.
- *Given the location of the project in the watershed and the similar land use history upstream of the project, the contributing area above the project is a likely source of sediment. Please describe how the restored streams will process the sand/gravel (bedload) and/or finer fraction of sediment inputs from eroding banks upstream of the project. The statement 'After construction, bedload supply will not be high enough to cause the project streams to be capacity limited' does not acknowledge the upstream source.*
    - Text has been added and revised to describe how restored streams will process sediment from eroding banks upstream of the project.

- *Rather than 'the near future', please provide a more specific time frame for development (or absence of development) in the watershed, e.g., 10yrs, 25yrs.*
    - The referenced statement has been revised to specify a time frame of 25 years.

6.6.2 Bridgefork Creek Reach 1b and 6.6.4 Bridgefork Creek Reach 3

- *Drain tiles within the conservation easement will be removed. If drain tiles extend beyond the conservation easement, an ephemeral pool will be placed within the conservation easement. Can WEI quantify the number of drain tiles and expected ephemeral pools that will be within the conservation easement? Will these ephemeral pools require maintenance? One drain tile is located on Figure 2; if others are known, please include on figure and plans.*
    - Drain tiles were only identified at the site in the one location shown on Figure 2 (right floodplain of Bridgefork Creek Reach 1b, within Wetland Area 4B). After further evaluation of this area, it is not anticipated that drain tiles will be encountered outside of the conservation easement. Language within the mitigation plan discussing the ephemeral pool and drain tiles outside the conservation easement was removed from Section 6.6.2.

6.6.3 Bridgefork Creek Reach 2

- *The text for Bridgefork Creek Reach 2 is somewhat unclear, the Simon evolutionary phase is indicated as V, aggradation and widening and the BHR is 2.5 but the summary of work proposed in section 6.6.3 indicates stable sinuosity and a bankfull bench forming at current bed elevation and references overall channel stability. Please review and revise as necessary.*
    - Bridgefork Creek Reach 2 has isolated areas of instability but is generally stable and does not warrant restoration. The text has been revised to include a Simon evolutionary phase of VI, quasi equilibrium.

6.6.5 UT1

- *Section describes the pond removal on UT1 and indicates the dam may be left in place and the pond dewatered; please verify that the approach of leaving the dam partially in place was proposed at the post contract site visit and approved by DMS and IRT. Section 6.6.4 indicates the pond will be removed but states the dame will only be breeched.*
    - The dam will be graded out as part of construction. Sheets 1.2.4 and 1.2.5 show the removal/grading out of the dam. Language within Section 6.6.4 and 6.6.5 outline the dewatering activities which will occur either prior to and/or during construction. These efforts are intended to dewater the pond prior to removal of the dam to dry pond sediments as much as possible prior to channel construction.

- *Two "Proposed Shallow Vernal Pools" are shown on the plan (sheet 1.2.2 and 1.2.3) but not discussed. Please include a short discussion of these features. What is the expected depth, will they dry seasonally, maintenance, type of outlet: rip-rap, etc.*
    - Proposed shallow vernal pools are included to provide habitat diversity and to help reduce the quantity of soil needed to be trucked throughout the project site. The proposed shallow vernal pools range from 0 to 1.5 feet deep and are expected to dry seasonally. They will have shallow outlet swales up to 0.5 feet deep that will be lined with native stone. These features will not require maintenance.

- *Recommend referring the BMP in this discussion as BMP 3 as shown on sheet 1.2.5.*
    - Text has been revised to refer to the BMP in this discussion as BMP 3. BMP 3 has been labeled in the figures.

- *Does WEI plan to bring in new material to construct the channel through pond bottom? Please add discussion.*
    - See response to comment above addressing Section 3.5 Site Constraints to Functional Uplift discussing pond sediments.

6.6.7 UT3

- *Recommend noting that the last 70' of UT3 will consist of restoration level work consisting of a series of constructed riffles and boulder structures; however, the reach will receive a standard EII ratio.*
    - Language within Section 6.6.7 was revised to note the additional work proposed along UT3.

6.6.8 UT4

- *Description indicates that EII work will consist of invasive species management and debris removal. Section 11.0 Determination of Credits states that the 2.5:1 EII ratio will include cattle exclusion and minor bank grading as well. Recommend revising section 6.6.8 and discuss bank grading activities. Also, please add locations of bank grading and debris removal (if isolated areas) to sheets 1.5.1 and 1.5.2.*
    - Language within Section 6.6.8 was updated to include minor bank grading as part of the approach along UT4 Reach 1. Text within Section 11.0 was referring to general enhancement II activities sitewide. Language was updated within Section 11.0 to clarify. Approximate bank grading and debris removal locations will be included with the final mitigation plan but will likely be field designed once intensive invasive removal is completed along the reach and active instabilities are identified.

6.6.9 UT4a

- *Two vernal pools are shown on this reach (sheet 1.6.4 and 1.6.5). Same comment as above.*
    - See above response to comment regarding Section 6.6.5.

- *Recommend referring to BMP as BMP 1 as shown on sheet 1.6.2.*
    - Text has been revised to refer to the BMP in this discussion as BMP 1. BMP 1 has been labeled in the figures.

6.6.9 UT5

- *There is an existing conditions discussion of UT5 in section 3.3 of the draft, but there is no discussion of the work proposed for UT5 in section 6.6. Please add a section describing the work for this reach. The IRT requested this reach be discussed in the Post Contract Meeting Minutes item number 22.*
    - Section 6.6.10 outlining stream design implementation along UT5 Reaches 1 and 2 was added to the mitigation plan.

- *There are discrepancies in how UT5 is presented in the Mitigation Plan. It is not labeled on the monitoring map although has a monitoring station and appears to be entirely preservation. The Project Credit Table indicates it has two reaches, one being restoration and one being*

preservation. Table 19 also does not indicate any restoration. The valley for project reach appears to be unconfined based on topo lines but is described as confined/unconfined in the Project Attribute Table. Please QA/QC Mitigation Plan to ensure maps, figures, tables and discussions accurately depict existing and proposed work on UT5.

- UT5 Reaches 1 and 2 are now labeled in Figure 10 and included in Table 19. Valley confinement was updated to Unconfined in Table 12 for UT5.

6.6.11 UT6A

- *Recommend referring to BMP as BMP 2 as shown on sheet 1.9.1.*
  - Text has been revised to refer to the BMP in this discussion as BMP 2. BMP 2 has been labeled in the figures.

6.8 Wetland Design

- *Section mentions wetland grading plan. However, no grading plan was included. Please update section with additional information regarding depth of grading and material removed. Please include grading plan with revised draft for IRT review.*
  - A wetland grading plan has been added to the draft plan set (Sheets 3.1.0 to 3.2.1). Section 6.8.5 has been added to the report text outlining proposed wetland grading approaches for wetland areas.

6.8.4 Existing Hydrology

- *Please identify the county's growing season. Gage data shows the growing season defined as 3/26 – 11/6.*
  - The county's growing season was added to text within Section 6.8.4 and updated within Gage Plots provided in Appendix 5.
- *Section indicates all gages failed to meet the wetland criteria of 25 days as defined by DMS. DMS does not establish performance standards; it is assumed the 11% standard was approved by the IRT based on the 2016 USACE guidance which lists acceptable standards for Chewacla soils beginning at 10% and Wehadkee soils at 12%. Please revise or explain.*
  - Sections 6.8.4 was revised to remove language about performance standards. All proposed performance standards text was moved to Section 7.0, including wetland hydrologic performance standards.

6.10 Project Risk Management

- *Please also describe the site specific conservation easement marking and type of fencing that will be utilized to restrict livestock from encroachment.*
  - Text was added to Section 6.10 referencing adherence to DMS conservation easement marking guidance.
  - Specific fencing types are included in the fencing plan in Appendix 13 (Sheets 6.0.0 to 6.5.2); however, it should be noted that these are preliminary and dependent on property owner needs.
- *Will the fords be subject to livestock use? Will there be end gates?*
  - Ford's will be fenced and gated where livestock are present. Table 16 indicates where gated ford crossings are proposed at the site.

- *Consider adding discussion regarding hydrologic trespass potential to any area outside of the conservation easement. Specifically, where drain tiles are cut back to the conservation easement.*
    - The area of drain tiles is isolated and anticipated to be within the conservation easement. Areas adjacent to existing drain tiles to be removed increase in elevation quickly and hydrologic trespass is not a concern. See Wildlands response to NCDMS comment regarding Section 6.6.2 and 6.6.4 and drain tiles above.

7.0 Performance Standards

- *Please consider utilizing the most recent DMS templates, guidance and tools for the as-built survey, record drawings, and MY0-MY7 reports. These are available on the DMS website.*
    - The most recent DMS templates, guidance, and tools will be used for the as-built survey, record drawings, and MY0-MY7 reports.

Table 29 Monitoring Components:

- *Nine ground water gages were used for pre-construction wetland hydrology data, but only three gages are being proposed for monitoring. DMS recommends adding ground water gages to wetland 1B and 2A. Please consider well placement so pre-construction data can be compared to current year wetland gage data.*
    - Number and location of proposed monitoring groundwater gages was revised. Table 28 and Figure 10 were revised accordingly.

Figure 2

- *There are two GWG 8 shown and no GWG6.*
    - Figure 2 was revised to correct the error.

Figures 8,9, 10

- *UT5 appears to be shown as preservation only on these figures. Restoration reach may be too short to display correctly. Please verify.*
    - Figures 8, 9, and 10 have been updated to show both reaches and approaches for UT5.
- *Figure 8 and 10 indicates a reach break on UT1; however, no break is indicated on the Project Credit Table or elsewhere in the report. Please update as necessary.*
    - UT1 is broken into two reaches throughout the report and figures, including Table 31, Figure 8, and Figure 10.

Figure 10

- *Label UT5*
    - Figure 10 has been updated to include a UT5 label.

Fencing: *Fencing plan appears to show fence offset from conservation easement. This is the preferred method of installation of fences. Please ensure all fencing is installed on the conservation easement line or outside.*

- Yes, typically fence is offset one foot from the conservation easement.

Fescue: *The plan indicates fescue will be treated prior to or during construction. Thank you for including this in the plan. Please consider ring spraying during monitoring if fescue persists to reduce planted tree competition and ensure vegetative success.*

- Wildlands will monitor bare roots and need for ring sprays in heavily grassed areas.

Digital Spatial Data Review Comments:

- *The conservation easement submitted with Mitigation Plan digital files differs from CE boundary submitted for Task II review and displayed in the report figures, specifically the easement boundary along Bridgefork Creek Reach 3 as well as internal crossings are missing from mitigation plan submission.*
    - The conservation easement file was updated to the approved Task 2 boundary.
- *The 68 ft. wide Duke Energy and 20 ft wide AT&T ROWs are shown as internal crossings. These should be indicated as ROWs*
    - The Duke Energy and AT&T ROWs were updated to be shown as ROWs in the digital files. They are also included in the internal crossing areas, as they were approved to be within the internal crossing as part of State Property Office review.
- *The 30-foot Duke ROW on upper UT 1 is missing from the digital drawings*
    - The Duke Energy ROW on UT1 Reach 1 was added to the digital drawings.
- *Please ensure the most up to date and accurate easement is applied to the finalized Mitigation Plan and design sheets.*
    - The state property office approved conservation easement has been used in the finalized Mitigation Plan and design sheets.
- *Please verify there is no need to separate Wetland 3A into separate polygons.*
    - Wetland 3A has been converted into a single polygon.
- *Please note that UT 5 Reach 2 is designated in the Mitigation Plan as restoration but in the digital data as preservation; this break will need to be included in a revised submission.*
    - The digital data has been updated to designate UT5 Reach 2 as restoration.
- *Reach 1 and 2 designations will need to be added to UT 4 to separate reaches by including a break due to EII and R treatment.*
    - UT4 Reach 1 and Reach 2 designations, corresponding approaches, and a reach break have been added.

Digital Data: Excel Templates

- *Please refer to template for Project Attribute Table and use current template. At a minimum, the required information as specified in the template should be included in the table.*
    - The Project Attribute Table provided follows the template linked on the NCDEQ website dated 10/1/2020. Pre-project lengths and areas are not provided as previously this has caused confusion during data review.
- *The Morphological Tables Essential Parameters varies in nomenclature, format, and minimally in content from the template.*
    - While the nomenclature and format vary, data provided is beyond the required data within the NCDMS format.

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FIGURES

APPENDICES

1.0 Introduction

The Bridgefork Dairy Mitigation Site (Site) is in Cleveland County approximately 2.5 miles northwest of Kings Mountain and approximately 8.8 miles southeast of Shelby (Figure 1). The project is located within the Hydrologic Unit Code (HUC) 03050105100020 and is being submitted for credit in the Broad River Basin Catalog Unit 03050105. The project proposes to restore, enhance, and preserve approximately 12,745 linear feet of streams. Wetland re-establishment and rehabilitation are proposed to restore a riparian wetland corridor and best management practices (BMPs) are proposed at points of concentrated agricultural runoff to reduce water quality stressors. Existing site conditions are shown in Figure 2. The proposed work will provide 10,826.390 stream credits and 2.900 wetland credits. The Site will be protected in perpetuity by an approximately 43-acre conservation easement.

Table 1: Project Attribute Table Part 1

Project Information	
Project Name	Bridgefork Dairy Mitigation Site
County	Cleveland
Project Area (acres)	42.9
Project Coordinates (latitude and longitude)	35°15'32.5"N, 81°23'24.2"W
Planted Acreage (acres of woody stems planted)	22.1

2.0 Basin Characterization and Site Selection

The Site is within the Division of Water Resources (DWR) subbasin 03-08-05 and within catchment 12034601, which is identified as a Target Resource Area (TRA) for hydrology, habitat, and water quality by the NC Department of Environmental Quality Division of Mitigation Services (NCDEQ DMS) as shown in Figure 1. The Site drains to Pott Creek, which is listed as a Class C waters, ultimately draining to Buffalo Creek.

The Broad River Basin is dominated by forested or shrubland (73%) and agricultural land (22%). Soils within the Piedmont portion of the basin contain greater percentages of sand and clay, with channel bedform dominated by sandy and silted runs and pools. As stated in the 2015 North Carolina Wildlife Action Plan (NCWAP), sedimentation is the main water quality issue within the Piedmont portion of the basin and the overall lack of riparian vegetation is noted as widespread throughout the basin. Poorly managed pasture lands that contribute substantially to soil and streambank erosion, land clearing activities, and runoff from unpaved rural roads and eroding road grades are the major causes of sedimentation within the basin. The DWR developed the 2008 Broad River Basinwide Quality Plan which notes common watershed stressors such as naturally erodible soils, erosion from construction/ agricultural/ land disturbing activities, fecal coliform bacteria, and low pH. The 2009 Broad River Basin Restoration Priorities (RBRP) also notes habitat degradation from excess sedimentation is a widespread concern within the basin. Other stressors within the basin include large and small impoundments, point source pollution, stormwater runoff, and agricultural pollutants. The RBRP presents broad river basin water quality and restoration goals, including:

- implementing stream and wetland restoration projects that reduce sediment and nutrient sources;
- restoring and protecting habitat for priority fish, mussel, snails, and crayfish species;
- protecting high quality habitats; and
- improving management of stormwater runoff volume and pollutants.

The Site was selected due to its ability to support local watershed objectives and goals by excluding livestock, creating stable stream banks, restoring a forest in agriculturally maintained buffer areas, and implementing agricultural BMPs. These actions will reduce fecal, nutrient, and sediment inputs to project streams, and ultimately to Potts Creek, Buffalo Creek, and the Broad River, and will reconnect instream and terrestrial habitats on the Site. Restoration of the Site is directly in line with recommended management strategies outlined in the RBRP.

3.0 Baseline and Existing Conditions

3.1 Watershed Conditions

The Site topography, as is indicated on the Waco, NC USGS 7.5-minute topographic quadrangle, shows a moderately sloped and broad valley along Bridgefork Creek. Valleys for project tributaries are shown as steeper and more confined, which is typical of smaller drainages and headwater tributaries for this region (Figure 3).

Drainage areas for the project reaches were delineated using 2-foot contour internals derived from the 2016/2017 North Carolina Emergency Management Light Detection and Ranging (LiDAR) data (Figure 4). Land uses draining to the project reaches are a mix of forest and agricultural pasture/hay fields, with development in the upper parts of the watersheds. The land use was calculated using the National Land Cover Database (NLCD) for 2016. The watershed areas and current land uses are summarized in Table 2 below.

Current land use at the Site is a mix of agriculture including active cattle, active horse pasture, and hay pasture. A portion of the project property was an active dairy farm prior to 1953 and historic infrastructure can still be seen within existing pastures. Evidence of dairy farm operations, including a sludge pond with apparently active drainage can be seen as far back as 1961 in historic aerial imagery. Dairy farm operations appear to have ceased by 1976, per historic aerial imagery, which agrees with timelines provided by the property owners. A review of historic aerials from 1938 to 2016 (Appendix 1) shows the streams have existed in their approximate locations over the years. The farm pond along UT1 can be seen as far back as 1961. Most of the property has been in cattle or hay pasture since as far back as 1938. The Site appears to have been contour plowed and terraced prior to 1938 and terracing is still present at the Site. Historically terraced fields are still present directly upstream of Bridgefork Creek, UT4, UT4A, UT6, and UT6A. On the Dellinger and Judd properties, Bridgefork Creek appears to have been straightened sometime before 1938 and both floodplains of the stream were cleared with only minor vegetation left along the stream. UT4 and UT4A appear to have also been cleared up to top of bank prior to the 1938 aerial photograph. The left floodplain of Bridgefork Creek and UT4 revegetated sometime between 1964 and 1976. Timbering practices between UT4 and UT4A can be observed in the 2016 aerial photograph. Timbering practices along UT4 and UT4A were discussed with the IRT at the post contract site walk (Appendix 7, Item 4). It was noted that only the high terrace between the two streams was timbered and that buffers were left intact. Additionally it was noted that there were no future plans for timbering on the property.

Table 2: Project Attribute Table Part 2

Project Watershed Summary Information	
Physiographic Province	Piedmont
Ecoregion	Southern Outer Piedmont
River Basin	Broad River
USGS HUC (8-digit, 14-digit)	03050105, 03050105100020
NCDWR Sub-basin	03-08-05

Project Watershed Summary Information					
NCDWR Water Quality Classification	C				
Stream Thermal Regime	Warm				
	Bridgefork Creek	**UT1**	**UT2**	**UT3**	**UT4**
Drainage Area (acres)	1,498	17	16	12	205
2011 NLCD Land Use Classification					
Agricultural	44.5%	25.0%			66.7%
Developed	20.0%	56.7%			10.1%
Forest	32.8%	18.3%			23.2%
Grassland	0.9%	0.0%			0.0%
Shrubland	1.2%	0.0%			0.0%
Open Water	0.1%	0.0%			0.0%
Impervious	3.9%	9.4%			2.2%

Project Watershed Summary Information				
	UT4A	**UT5**	**UT6**	**UT6A**
Drainage Area (acres)	95	14	316	16
2011 NLCD Land Use Classification				
Agricultural	58.1%	0.0%	51.5%	71.9%
Developed	16.6%	42.5%	11.0%	0.0%
Forest	25.3%	57.5%	35.9%	28.1%
Grassland	0.0%	0.0%	0.5%	0.0%
Shrubland	0.0%	0.0%	1.0%	0.0%
Open Water	0.0%	0.0%	0.0%	0.0%
Impervious	4.1%	2.1%	1.8%	0.0%

Notes: Land Use Source – National Land Cover Database 2011 (NLCD 2011) provided by USGS

3.2 Landscape Characteristics

The Site is located in the Cat Square terrane of the Piedmont physiographic province (NCGS, 2015). The Piedmont is characterized by gently rolling, well-rounded hills with long low ridges, with elevations ranging from 300 to 1500 feet above sea level. The Cat Square terrane is composed of metamorphic rocks that have been intruded by younger granitic rocks. According to the Geologic Map of North Carolina (NCGS, 1985), the underlying geology of the Site is mapped as Late Proterozoic-Cambrian (500 to 900 million years in age) mica schist (CZms) and Cherryville Granite (Mc). The Mc unit is massive to weakly foliated, contains pegmatites, and is lithium-bearing on the east side. The CZms unit includes garnet, staurolite, kyanite, or sillimanite locally with lenses and layers of quartz schist, micaceous quartzite, calc-silicate rock, biotite gneiss, amphibolite, and phyllite. Shallow bedrock outcroppings were observed and mapped in Site streams and floodplains (Figure 2). Reaches with exposed bedrock showed limited stream downcutting and were vertically stable. These reaches were proposed for enhancement.

The Site is mapped by the Soil Survey of Cleveland County. The primary project area soils are described below in Table 3. Figure 5 provides a soil map of the Site. While Wehadkee soils were not shown on the Cleveland County survey, investigations by a Licensed Soils Scientist (LSS) identified Site floodplain soils as most like Wehadkee; therefore, this soil type and description are included the Table 3. Upland soils surrounding the Site are primarily sandy loams. The surrounding agricultural land contributes to erosion

of the sandy upland and floodplain soils as described in Section 3.1. The upland erosion is consistent with the high sand volumes Wildlands observed within the existing Site streams.

Table 3: Project Soil Types

Soil Name	Description
Chewacla loam	Chewacla loam is typically found on floodplains or at toe of slopes. Typical slopes are between 0 and 2 percent. The soil unit is frequently flooded and is somewhat poorly drained.
Grover gravelly sandy loam	Grover gravelly sandy loam is found on hillslopes and ridges with slopes between 15 and 30 percent. The soil unit is typically rocky and well drained.
Madison-Bethlehem complex	Madison-Bethlehem complex is found on hillslopes and ridges with slopes ranging from 8 to 15 percent. The soil unit is typically stony, moderately eroded, and well drained.
Hulett gravelly sandy loam	Hulett gravelly sandy loam is found on interfluves with slopes between 2 and 8 percent. The soil unit is considered stony and well drained.
Wehadkee	Wehadkee soils are typically found on floodplains with slopes ranging from 0 to 2 percent. The soil unit is frequently flooded and is poorly or very poorly drained.

Source: *Soil Survey of Cleveland County, North Carolina, USDA-NRCS,* https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

The wetlands on the Site occur within the riparian corridor of Bridgefork Creek and extend outward to the toe of the hill slope. A LSS determined that the areas proposed for wetland crediting have existing and/or relic hydric soil indicators (Appendix 5). Areas proposed for wetland re-establishment are not currently jurisdictional due to a lack of wetland vegetation and hydrology. Wetland hydrology has been disrupted by a combination of channel incision, ditching, and use of tile drains. Through Priority 1 stream restoration, plugging and filling ditches, creating surface roughness, and removing existing tile drains, wetland hydrology can be re-established. These activities will work to improve hydrologic functioning of proposed re-establishment areas. The rehabilitation areas generally have functioning hydrology but are hydraulically disconnected from the streams. Restoring streams adjacent to the rehabilitation areas will hydrologically reconnect all Site wetlands to the streams.

Bridgefork Creek's right floodplain is used as cattle or horse pasture and lacks adequate riparian buffer. Unnamed tributaries UT1, UT2, UT3, UT4, UT4A, UT5, UT6, and UT6A have some established hardwood forests in their floodplains. In the forested areas of the Site, the vegetation is dominated by species indicative of prior agricultural disturbance such as tulip poplar (*Liriodendron tulipifera*), sycamore (*Platanus occidentalis*), red cedar (*Juniperus virginiana*), and sweet gum (*Liquidambar styraciflua*). Other canopy species include a mix of American beech (*Fagus grandifolia*), green ash (*Fraxinus pennsylvanica*), white oak (*Quercus alba*), red oak (*Quercus rubra*), water oak (*Quercus nigra*), river birch (*Betula nigra*), and persimmon (*Diospyros virginiana*). The understory, scrub/shrub, and groundcover within forested areas is typically dominated by invasive species such as Chinese privet (*Ligustrum sinense*), multiflora rose (*Rosa multiflora*), periwinkle (*Vinca minor*), and Japanese honeysuckle (*Lonicera japonica*), but also includes American holly (*Ilex opaca*), elderberry (*Sambucus canadensis*), Christmas fern (*Polystichum acrostichoides*), wild ginger (*Hexastylis shuttleworthii*), and river cane (*Arundinaria gigantea*). Vegetation in areas managed for livestock is dominated by common pasture grasses such as tall fescue (*Festuca arundinacea*) with soft rushes (*Juncus effuses*) in wet, low-lying areas. The natural vegetation community on the Site strongly indicates disturbance but shows indications as classifying as Piedmont Alluvial Forest and Piedmont Basic Mesic Forest as described by Schafale (2012). Other natural community types that surround the project area include the Basic Mesic Forest, Dry-Mesic Oak-Hickory,

and Dry Oak-Hickory Forest plant communities. The plant species selected for the Site target these natural communities and are well suited for the restored ecosystem.

3.3 Project Resources

3.3.1 Existing Streams

Wildlands investigated onsite jurisdictional waters of the United States (US) within the proposed project area. Bridgefork Creek, UT2, UT3, UT4, UT5 and UT6 were identified as perennial within the project limits. Headwater tributaries UT4A and UT6A begin as ephemeral channels within the project limits, score as an intermittent for a portion of project length, and eventually become perennial streams as drainage area increases. UT1 upstream extents begins as an intermittent stream and becomes perennial mid-reach. Jurisdictional stream features are shown on Figure 2 and supporting documentation, including the approved jurisdictional determination, is provided in Appendices 2 and 3.

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 and reach specific cross sections and geomorphic summaries are provided in Appendix 4.

Bridgefork Creek Reach 1a and 1b

Bridgefork Creek Reach 1a flows onto the Site from a culvert under Patterson Road. The reach flows through a moderately confined valley with some mature vegetation. This reach of Bridgefork Creek is characterized by low banks, low sinuosity, and bedrock influence which has prevented downcutting. A riffle cross section evaluated for the reach had a high width to depth ratio with stable bed and banks Livestock access and invasive vegetation are the major stressors for this portion of the project. As the stream flows under an overhead utility, the bedform deteriorates and signs of active erosion are evident.

Bridgefork Creek Reach 1b begins at the overhead utility easement. The channel becomes incised as the floodplain widens and the slope increases. The banks and floodplain lack native vegetation and signs of mass wasting and active erosion are evident. Cattle impacts become more prevalent as cattle runs and wallows appear throughout the reach. The pattern is characterized by tortuous meanders, which are actively migrating downstream indicating lateral instability. Bedform along the reach is dominated by long sandy runs, with little to no covered pool habitat. A trampled relic riparian wetland in the right floodplain (Wetland C) exhibits historic ditching to drain toe of slope hydrology from upland pastures. The left and right floodplain at the upstream extent is predominantly fescue grasses (*festuca* spp.). As the stream flows southwest, it enters a section of mature hardwood species, many of which are falling or are undermined due to active bank erosion. UT1, UT2, and UT3 enter from the left floodplain as the valley narrows and the stream flows west. The stream is wide in areas that lack woody bank vegetation.

An existing riffle cross section evaluated for the reach had a bank height ratio (BHR) of 3.3 and an entrenchment ratio of 1.8, indicating the stream is incised and disconnected from its current floodplain.

Table 4: Bridgefork Creek Reach 1a and 1b Attribute Table

Reach Summary Information		
Parameters	**Bridgefork Creek Reach 1a**	**Bridgefork Creek Reach 1b**
Length of Reach (linear feet)	272	3,093
Valley confinement (confined, moderately confined, unconfined)	Moderately confined	Unconfined
Drainage area (acres)	544	781
Perennial, Intermittent, Ephemeral	Perennial	Perennial
NCSAM Score/Stream Function	Medium	Low
NCDWR Water Quality Classification	C	C
Width to Depth Ratio (ft/ft)	17.2	19.4
Bank Height Ratio (ft/ft)	2.4	3.3
Gradient (ft/ft)	0.0020	0.0060
Reachwide d50 (mm)	--	8.7
Stream Classification (existing → proposed)	B4/1c → B4c	B4c → C4
Evolutionary Trend	VI – Quasi equilibrium	IV – Degradation and widening
FEMA Zone Classification	N/A	N/A


Bridgefork Creek Reach 1a


Bridgefork Creek Reach 1b

Bridgefork Creek Reach 2

Bridgefork Creek Reach 2 begins approximately 400 feet downstream of the confluence of UT3 and continues past the confluence with UT4 and UT4A to an existing bedrock slide. The pattern and stream dimensions are more stable along Bridgefork Reach 2 than along Reaches 1b and 3. Reach 2 is characterized by smaller meander radii, bedrock influence, and lower bank heights than Reach 1b. Historic impacts from cattle access, invasive vegetation, and narrow riparian buffers are major water quality stressors identified along Bridgefork Creek Reach 2. Bedform is influenced by sand, but bedrock slides, riffles, short sandy runs, step pools, and meander pool habitat are present in some locations. Bankfull benches are beginning to form in isolated sections of riffle dimension. A section of this reach runs through a managed overhead utility line.

Table 5: Bridgefork Creek Reach 2 Attribute Table

Reach Summary Information	
Parameters	**Bridgefork Creek Reach 2**
Length of Reach (Linear Feet)	1,511
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	1,037
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	High
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	16.4
Bank Height Ratio (ft/ft)	2.5
Gradient (ft/ft)	0.0070
Reachwide d50 (mm)	--
Stream Classification (existing → proposed)	B4/1c → C4
Evolutionary Trend	VI – Quasi equilibrium
FEMA Zone Classification	N/A

Bridgefork Creek Reach 3

Downstream of an existing bedrock feature within Bridgefork Creek Reach 2, Bridgefork Creek Reach 3 is characterized by tortuous meanders and lateral instability. Bedrock grade control is largely absent and, as a result, the stream has downcut and has become disconnected from the adjacent floodplain (BHR 1.8). While there is a narrow wooded riparian corridor, the understory is dominated by invasive vegetation and the overstory is at risk based on actively eroding banks and channel migration. The bedform is heavily influenced by active bank erosion upstream with long sandy runs and pools filled with fine sediment.

Table 6: Bridgefork Creek Reach 3 Attribute Table

Reach Summary Information	
Parameters	**Bridgefork Creek Reach 3**
Length of Reach (Linear Feet)	2,709
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	1,498
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	14.0
Bank Height Ratio (ft/ft)	1.8
Gradient (ft/ft)	0.0060
Reachwide d50 (mm)	4.3
Stream Classification (existing → proposed)	Incised C4 → C4
Evolutionary Trend	IV – Degradation and widening
FEMA Zone Classification	N/A

UT1

UT1 originates from a low sloped wetland seep (Wetland A) and extends to its confluence with Bridgefork Creek. Bank heights are low near the wetland and increase as the stream drops over a series of headcuts. UT1 becomes progressively incised downstream and has been manipulated and impacted by infrastructure and farming. The stream has been rerouted to parallel US-74 and the Kings Mountain Water Easement. Two stormwater outlets discharge into UT1 just upstream of an online farm pond. Based on aerial photography, a large gully formed in the left floodplain as a result of the stormwater outfalls between 2015 and 2017. A portion of the stream flows through the farm pond and the gully has cut around the pond and joins UT1 downstream of the dam. Downstream of the pond, UT1 is incised, actively eroding, and disconnected from its current floodplain. A series of debris jams have caused the stream to go subsurface along this section of the project reach. Bedform along UT1 is dominated by long sandy runs and fine sediment deposits. Pools are present in areas where headcuts and debris jams cause scour.

Table 7: UT1 Attribute Table

Reach Summary Information	
Parameters	**UT1**
Length of Reach (Linear Feet)	1,331
Valley confinement (Confined, moderately confined, unconfined)	Confined
Drainage area (acres)	17
Perennial, Intermittent, Ephemeral	Intermittent/ Perennial
NCSAM Score/Stream Function	Low/Medium
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	3.7
Bank Height Ratio (ft/ft)	2.8
Gradient (ft/ft)	0.0380
Reachwide d50 (mm)	2.7
Stream Classification (existing → proposed)	G4 → B4
Evolutionary Trend	III – Degradation
FEMA Zone Classification	N/A


UT1 Gully


UT1 Routed to Pond

UT2

UT2 enters the Site from a culvert under US-74 within Kings Mountain Water easement. Within 25-feet of the culvert outlet, the stream drops over a headcut and becomes deeply incised and disconnected from the adjacent floodplain with a BHR of 3.8. UT2 exhibits steep, eroded stream banks and is severely channelized with an entrenchment ratio of 1.0. The stream winds through mature woody vegetation and root mats are present throughout the channel. Large amounts of fine sediment have deposited in the downstream portion of UT2, negatively impacting the existing bedform habitats.

Table 8: UT2 Attribute Table

Reach Summary Information	
Parameters	**UT2**
Length of Reach (linear feet)	217
Valley confinement (confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	16
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	9.4
Bank Height Ratio (ft/ft)	3.8
Gradient (ft/ft)	0.0360
Reachwide d50 (mm)	--
Stream Classification (existing → proposed)	G4 → B4
Evolutionary Trend	III – Degradation
FEMA Zone Classification	N/A


UT2 Stormwater Outfall


UT2

UT3

UT3 enters the Site from a culvert under US-74 within the Kings Mountain Water easement. UT3 flows through a confined, wooded valley with a moderate slope. The reach is in moderate condition, with one active headcut, low banks, moderate bedform, and some invasive understory vegetation within the woods. As UT3 approaches Bridgefork Creek, fine sediments are aggrading the channel bed, resulting in braiding and a loss of channel dimension.

Table 9: UT3 Attribute Table

Reach Summary Information	
Parameters	**UT3**
Length of Reach (Linear Feet)	604
Valley confinement (Confined, moderately confined, unconfined)	Confined/ Unconfined
Drainage area (acres)	12
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Medium
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	3.5
Bank Height Ratio (ft/ft)	1.3
Gradient (ft/ft)	0.0320
Reachwide d50 (mm)	--
Stream Classification (existing → proposed)	E4b → B4
Evolutionary Trend	IV – Degradation and widening
FEMA Zone Classification	N/A


UT3 Confined Wooded Valley


UT3 Braided System

UT4

UT4 flows through a moderately confined, moderately sloped valley. At the upstream end, a series of bedrock slides and step pools maintain grade control and provide excellent bedform and habitat. As the stream flows southwest towards Bridgefork Creek, the sinuosity increases as the slope decreases. There is minor bank erosion along the reach, but generally the banks are low and stable with habitat features and bedform including step pools, pocket pools, undercut banks, leafy debris packs, short sandy runs, and coarse riffles. The major stressor to this reach is an infestation of Chinese privet and Japanese honeysuckle in the understory of the riparian corridor and debris that has been placed in the channel and on the banks. Aggradation is smothering benthic flora and fauna and is causing the channel to become overly wide.

Table 10: UT4 Attribute Table

Reach Summary Information	
Parameters	**UT4**
Length of Reach (linear feet)	1,464
Valley confinement (confined, moderately confined, unconfined)	Moderately confined/ Unconfined
Drainage area (acres)	205
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	High
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	10.9 / 11.1
Bank Height Ratio (ft/ft)	3.9 / 2.2
Gradient (ft/ft)	0.0110
Reachwide d50 (mm)	3.5
Stream Classification (existing → proposed)	B4c → C4
Evolutionary Trend	V – Aggradation and widening
FEMA Zone Classification	N/A

UT4A

UT4A begins on Site as an ephemeral channel at a series of headcuts and transitions to intermittent and then perennial prior to its confluence with UT4. At the upstream ephemeral extent, historic contour plowing, and terracing has altered the natural drainage patterns and directs much of the drainage to one location, resulting in headcuts and erosion as surface water drains to the gully-type valley. Over the years, the property owners have tried to stabilize the headcuts with concrete rubble and debris. The intermittent and perennial sections of stream flow over a series of smaller headcuts, and UT4A is incised with actively eroding banks. The stream lacks floodplain connection and relic bankfull benches that have formed over the years have been abandoned as the stream continues to incise. Bedform is embedded with fines throughout most of the reach. An approximate 15-foot-wide buffer is fenced from livestock along the left upper terrace. Mature woody vegetation is present along the right floodplain and aids in stabilizing the existing valley wall; however, the understory is dominated by invasive species.

Table 11: UT4A Attribute Table

Reach Summary Information	
Parameters	**UT4A**
Length of Reach (linear feet)	961
Valley confinement (confined, moderately confined, unconfined)	Confined
Drainage area (acres)	95
Perennial, Intermittent, Ephemeral	Intermittent/ Perennial
NCSAM Score/Stream Function	Low/Low
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	5.2
Bank Height Ratio (ft/ft)	3.9
Gradient (ft/ft)	0.0360
Reachwide d50 (mm)	2.9
Stream Classification (existing → proposed)	Incised E4b → B4
Evolutionary Trend	IV – Degradation and widening
FEMA Zone Classification	N/A


UT4A Intermittent


UT4A Perennial

UT5

UT5 enters the Site from a small, confined valley before reaching the broad flat floodplain of Bridgefork Creek. The short reach flows through an established hardwood forest, but the understory is dominated by Chinese privet. Livestock do not have access to UT5. The stream has low banks and is stable and functioning with a high NCSAM score.

Table 12: UT5 Attribute Table

Reach Summary Information	
Parameters	**UT5**
Length of Reach (linear feet)	174
Valley confinement (confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	14
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	High
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	N/A
Bank Height Ratio (ft/ft)	N/A
Gradient (ft/ft)	N/A
Reachwide d50 (mm)	N/A
Stream Classification (existing → proposed)	E4 → E4
Evolutionary Trend	VI – Quasi equilibrium
FEMA Zone Classification	N/A


UT5 Upstream


UT5 at Bridgefork Creek Confluence

UT6

UT6 enters the Site as a perennial channel from an adjacent property and flows through a low sloped, unconfined, alluvial valley. The stream is incised and overly wide with eroding stream banks. Fine sediments overwhelm the existing bedform, particularly downstream of the UT6 and UT6A confluence. Channel incision is most pronounced upstream of the Dillon Road culvert crossing, with a BHR of 2.2. The floodplain is vegetated with a mix of hardwood species and invasive understory. While livestock do not currently have access to this stream, water quality and habitat stressors include sediment and lack of bedform diversity.

Table 13: UT6 Attribute Table

Reach Summary Information	
Parameters	**UT6**
Length of Reach (linear feet)	2,257
Valley confinement (confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	316
Perennial, Intermittent, Ephemeral	Perennial
NCSAM Score/Stream Function	Low
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	10.0
Bank Height Ratio (ft/ft)	2.2
Gradient (ft/ft)	0.0079
Reachwide d50 (mm)	38.9
Stream Classification (existing → proposed)	Moderately entrenched G4c → C4
Evolutionary Trend	V – Aggradation and widening
FEMA Zone Classification	N/A

UT6A

UT6A begins on Site as an ephemeral channel and transitions to intermittent and then perennial prior to its confluence with UT6. UT6A flows through a moderately confined, gully-type valley that has been filled with agricultural debris over the years, similar to UT4A. Based on topographic mapping and Site observations, UT6A used to flow in a valley north of its current alignment, and at some point cut a new valley south of its prior location and re-entered the relic valley approximately halfway down the reach. UT6A has now completely abandoned the northern relic valley completely and is flowing in the new, southern valley alignment. Floodplain vegetation includes a mix of hardwood species with an invasive understory. UT6A has multiple headcuts and is actively eroding, incised, and littered with farm debris and rubble. The valley and stream bank erosion are likely major sources of fine sediment for downstream UT6.

Table 14: UT6A Attribute Table

Reach Summary Information	
Parameters	**UT6A**
Length of Reach (linear feet)	416
Valley confinement (confined, moderately confined, unconfined)	Confined
Drainage area (acres)	16.0
Perennial, Intermittent, Ephemeral	Intermittent/ Perennial
NCSAM Score/Stream Function	Low/Medium
NCDWR Water Quality Classification	C
Width to Depth Ratio (ft/ft)	5.4
Bank Height Ratio (ft/ft)	5.3
Gradient (ft/ft)	0.0400
Reachwide d50 (mm)	--
Stream Classification (existing → proposed)	Moderately entrenched G4 → B4 & B4c
Evolutionary Trend	III – Degradation
FEMA Zone Classification	N/A

3.3.2 Existing Wetlands

Wildlands delineated potential wetland and waters of the United States within and immediately adjacent to the proposed project easement (assessment area) using the USACE Routine Onsite 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) package was submitted in September 2021 and approved in October 2021. The pJD package and approval, including the USACE Wetland Determination Data Sheets, is included in Appendix 2. Existing wetland data is summarized in Table 15.

A total of 12 existing jurisdictional wetland features (Wetlands A-L) and one open water (Open Water) 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 observed

in existing wetlands include algal mats or crust, high water table, iron deposits, water-stained leaves, saturation, and surface water; secondary indicators present included surface soil cracks, crayfish burrows, geomorphic position, sparsely vegetated concave surface, and FAC-neutral test. Dominant hydrophytic vegetation species within wetlands include dotted smartweed (*Persicaria punctata*), fall sneezeweed (*Helenium autumnale*), Gray's sedge (*Carex grayi*), jointed rush (*Juncus articulatus*), red maple (*Acer rubrum*), shallow sedge (*Carex lurida*), and soft rush (*Juncus effuses*). Soils within onsite wetlands exhibit one of the following hydric soil indicators: depleted matrix, stratified layers, or depleted below dark surface.

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 all classified as headwater forest and seep wetlands. Overall NCWAM ratings range from low to high. Most onsite wetlands scored as low functioning systems when compared to reference conditions based on impairments to two of the three primary functions (hydrology, water quality, and habitat). Water quality and habitat functions generally received low scores due to cattle grazing, lack of native vegetative communities, and poor connectivity to other natural areas. NCWAM field assessment forms and the rating calculator outputs are included in Appendix 3.

Table 15: Existing Jurisdictional Wetland Project Attribute Table

Wetland	Size of Wetland (acres)	Wetland Type	Mapped Soil Series	Drainage Class	Soil Hydric Status	Source of Hydrology	NCWAM Score	Method: Restoration or Enhancement Method
A	0.052	Headwater Forest	Hulett gravelly sandy loam, stony (HtC); Grover gravelly sandy loam, rocky (GrD)	Well drained	No	Groundwater	Low	--
B	0.005	Headwater Forest	Chewacla loam (ChA)	Poorly drained	No	Overbank/ Groundwater	Low	--
C	0.197	Seep	Madison-Bethlehem complex, very stony (McC2); Chewacla loam (ChA)	Well drained; Poorly drained	No	Overbank/ Groundwater	Low	Hydrologic, Vegetation
D	0.239	Seep	Chewacla loam (ChA); Grover gravelly sandy loam, rocky (GrD)	Poorly drained; Well drained	No	Overbank/ Groundwater	Medium	Hydrologic, Vegetation
E	0.030	Headwater Forest	Chewacla loam (ChA)	Poorly drained	No	Overbank/ Groundwater	Low	Hydrologic, Vegetation
F	0.108	Seep	Chewacla loam (ChA)	Poorly drained	No	Overbank/ Groundwater	Low	--

Wetland	Size of Wetland (acres)	Wetland Type	Mapped Soil Series	Drainage Class	Soil Hydric Status	Source of Hydrology	NCWAM Score	Method: Restoration or Enhancement Method
G	0.153	Seep	Chewacla loam (ChA)	Poorly drained	No	Overbank/ Groundwater	Medium	--
H	0.112	Seep	Chewacla loam (ChA); Grover gravelly sandy loam, rocky (GrD)	Poorly drained; Well drained	No	Overbank/ Groundwater	Low	--
I	0.006	Seep	Chewacla loam (ChA)	Poorly drained	No	Overbank/ Groundwater		--
J	0.005	Seep	Chewacla loam (ChA)	Poorly drained	No	Overbank/ Groundwater	High	--
K	0.107	Headwater Forest	Grover gravelly sandy loam, rocky (GrD)	Well drained	No	Groundwater	High	Hydrologic
L	0.006	Seep	Chewacla loam (ChA)	Poorly drained	No	Overbank/ Groundwater	Low	--
Open Water	0.543	Pond/ Impoundment	Grover gravelly sandy loam, rocky (GrD)	Well drained	No	Groundwater/ Surface water	--	Hydrologic, Vegetation

3.4 Overall Functional Uplift Potential

The primary stressors on site are incision, active stream erosion, maintenance and drainage of wetland areas, livestock access, lack of buffers, areas of low bedform diversity, and active degradation of headwater stream systems. These stressors led to low to medium NCSAM scores for most project stream reaches. Without intervention, Bridgefork Creek and its tributaries will continue to widen and degrade, which will further diminish riparian wetland hydrology. Functional uplift for the site will be achieved through the following:

- Restoring degraded stream channels to reduce erosion and hydrologically connect streams and wetlands;
- Eliminating bank erosion and associated pollutants;
- Planting riparian buffers to shade streams; stabilize stream banks, floodplains, and valley walls; and promote woody debris in the system;
- Exclude livestock;
- Establishing BMPs to provide additional treatment of upland runoff; and
- 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 site 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.

Due to the degree of incision onsite, some Priority 2 and Priority 1.5 restoration will be necessary. Establishing vegetation on Priority Level 2 stream restoration can be a challenge. Wildlands has

prepared a Vegetation and Planting Plan (Section 6.9) to address this potential constraint. Priority Level 1.5 restoration may have a limited floodplain on some reaches. As described in Section 6.6 Stream Design Implementation, Wildlands will construct floodplains that are at least the minimum floodplain width for their respected stream type entrenchment ratio.

Construction of restored streams through dewatered pond beds can pose constraints to stream design and construction. A pond breach overview (Sheet 6.8, Appendix 13) was developed for the proposed pond removal along UT1. Currently, it is anticipated that the existing pond will be drained down using an existing pipe outlet, and then siphoned down to the lowest possible water level several months prior to construction. Once dewatered, organic bed material in the pond will be allowed to dry out for several months to facilitate construction of the newly proposed channel. If it is determined that the existing pond dam must be breached to lower water levels within the existing pond, erosion and sediment control methods will be implemented to prevent excessive pond sediments from traveling downstream. Removal and replacement of pond sediments will be determined based on site conditions during construction. If pond sediments are determined unsuitable for channel construction, material will be supplemented with dirt from other portions of the project. The ultimate use or treatment of the pond sediment will be discussed in the MY0 report. The alignment of UT1 was designed along the left edge of the existing pond bed in an attempt to avoid the deepest pond sediments while allowing for adequate floodplain width for the channel.

One external easement break and seven internal easement breaks are proposed at the Site to maintain landowner access and allow for overhead and underground utility crossings, maintain use of adjoining tracts, and maintain existing public transportation right-of-way. Ford and culvert crossings are proposed to be fenced and gated for livestock exclusion. Livestock will only be permitted within the internal ford crossing breaks during supervised pasture rotation events. Culverts will be designed with the restored stream bed profile to permit aquatic organism passage. Vegetative maintenance along the overhead utility breaks may cause some fragmentation, but maintenance is expected to be infrequent. Where possible, overhead utility crossings and proposed ford/culvert crossings were combined to limit the number of riparian corridor breaks and reduce the overall amount of habitat fragmentation. The crossings are summarized and numbered below in Table 16 and depicted on Figure 8.

Table 16: Proposed Easement Crossings

No.	Width (ft)	Location	Internal or External	Crossing Type
1	30	Bridgefork Creek Reach 1a	Internal	Overhead Utility
2	88	Bridgefork Creek Reach 1b	Internal	Overhead Utility Gated Ford Crossing
3	50	Bridgefork Creek Reach 1b	Internal	Proposed Culvert Crossing
4	88	Bridgefork Creek Reach 2	Internal	Overhead Utility Gated Ford Crossing
5	50	Bridgefork Creek Reach 3	Internal	Gated Ford Crossing
6	30	UT1	Internal	Overhead Utility
7	40	UT4	Internal	Proposed Culvert Crossing
8	60	UT6	External	Existing Dillion Road Culvert Crossing

4.0 Regulatory Considerations

Table 17, below, is a summary of regulatory considerations for the Site. These considerations are expanded upon in Sections 4.1-4.3.

Table 17: 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 6
Historic Preservation Act	Yes	Yes	Appendix 6
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 approved by USACE on 10/14/2021. 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 April 23, 2021 (Appendix 6). The document included investigation into the presence of threatened and endangered species on Site protected under the Endangered Species Act of 1973, as well as any historical resources protected under the National Historic Preservation Act of 1966. The United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation database (IPaC) list of endangered species for the Site includes the northern long-eared bad (NLEB) (*Myotis septentrionalis*) and the dwarf-flowered heartleaf (*Hexastylis* naniflora). The biological conclusion for the Site, per the Categorical Exclusion research and response by USFWS is that "any incidental take that may result from associated activities [from the project] is exempt under the 4(d) rule. The USFWS also requested a survey for dwarf-flowered heartleaf in areas with proposed impacts. Wildlands conducted a pedestrian survey on March 9, 2020 and identified suitable habitat within the project area; however, no populations resembling the species were found. The conclusion for cultural resources per the Categorical Exclusion research and response by the State Historic Preservation Office (SHPO) is that there are no historic resources that would be affected by this project.

4.2 FEMA Floodplain Compliance and Hydrologic Trespass

The Site is represented on the City of Kings Mountain Flood Insurance Rate Map Panel 2585 and 2586, with a revised date of February 20, 2008. The entire Site is outside of a Special Flood Hazard Area (SFHA) regulatory floodplain. Cleveland County does not require a floodplain development permit for projects outside of the SFHA.

The proposed Site design has limited or no risk of potential hydrologic trespass since the project encompasses steep headwater streams. The Bridgefork Creek restoration design begins several hundred feet downstream of the Patterson Road culvert, so no upstream trespass will occur as a result of stream construction.

4.3 401/404

Wetlands within the floodplain and adjacent to the existing streams will be partially impacted during realignment of the stream channel. Removal of an impoundment and stream and valley restoration of UT1 will permanently impact the existing pond. Wetlands on the Site that are within the conservation easement or long travel routes and outside of the limits of disturbance will be flagged and/or marked

with safety fence during construction to prevent unintended impacts. The Pre-Construction Notification including this data, will be submitted to the NCIRT with the Final Mitigation Plan. Wildlands will reverify the extent of jurisdiction in Monitoring Year 7 (MY7) for the purpose of confirming no net loss of wetlands as a result of ecological restoration.

5.0 Mitigation Site Goals and Objectives

The project will improve stream functions through stream restoration, the removal of an impoundment, conversion of maintain agricultural fields into riparian buffer, and through developing wetlands within the floodplain of Bridgefork Creek and UT1. 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, and expected outcomes are the implied results of completing objectives and are not directly monitored. The project will be monitored after construction to evaluate performance as described in Section 8 of this report. The project goals and related objectives are described in Table 18.

Table 18: Mitigation Goals and Objectives

Goal	Objective	Expected Outcomes	Functions Supported
Exclude livestock from stream channels.	Install livestock fencing as needed to exclude livestock from stream channels, wetlands, and riparian areas, or remove livestock from adjacent fields.	Reduce agricultural inputs to project. Reduce ongoing compaction of floodplain soils from livestock access. Reduce sediment inputs from bank erosion and degradation, reducing accumulated fines in the stream bed and excessive algal blooms from nutrients. Provide riparian and wetland habitat.	Geomorphology, Physicochemical, Biology
Restore and enhance native floodplain vegetation.	Plant active pasture with native riparian species along all Site streams, which will slow and treat sediment laden runoff from adjacent pastures fields before entering streams. Protect and enhance existing forested riparian buffers. Treat invasive species.	Reduce sediment inputs from bank erosion and pasture runoff. Reduce floodplain velocities and increase retention of flood flows on the floodplain. Increase nutrient cycling and storage in floodplain. Provide riparian and wetland habitat. Increase shading of stream channels, increasing dissolved oxygen concentrations. Provide a source of LWD and organic material to stream.	Hydrology (local), Hydraulic, Geomorphology, Physicochemical, Biology
Improve the stability of stream channels.	Reconstruct stream channels slated for restoration with stable dimensions and appropriate depth relative to the existing floodplain and wetland re-establishment areas. Provide floodplain relief for severely incised channels. Add bank revetments and instream structures to protect restored/ enhanced streams.	Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary.	Hydraulic, Geomorphology, Physicochemical, Biology

Goal	Objective	Expected Outcomes	Functions Supported
Treat concentrated agricultural runoff.	Install stormwater BMPs in areas of concentrated agricultural runoff to treat runoff before it enters the stream channel.	Reduce agricultural and sediment inputs to the project, which will reduce likelihood of accumulated fines and excessive algal blooms from nutrients.	Hydrology, Hydraulic, Geomorphology, Physicochemical, Biology
Improve instream habitat.	Install habitat features such as constructed steps, cover logs, and brush toes on restored reaches. Add woody materials 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
Permanently protect the Site from harmful uses.	Establish a conservation easement on the Site. Exclude livestock from Site streams and remove pasture fields from the riparian buffer. Remove impoundments.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands. Support all stream functions.	Hydrology, Hydraulic, Geomorphic, Physicochemical, Biology

6.0 Design Approach and Mitigation Work Plan

6.1 Stream Design Approach Overview

The stream 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 planned for restoration will be reconnected with an active floodplain and the channels will be reconstructed with stable dimension, pattern, and profile that will transport the water and sediment delivered to the system. Where buffer restoration or enhancement is needed, the adjacent floodplains and riparian wetlands will be planted with native tree species. Instream structures will be built in the channels to help maintain stable channel morphology and improve aquatic habitat. The entire project area will be protected in perpetuity by a conservation easement.

The design approach for this Site utilizes a combination of analog and analytical approaches for stream and wetland restoration and relies on empirical data and prior experiences and observations. Reference reaches were identified to serve as an acceptable range 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. 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 19 summaries the primary stressors, restoration approach and mitigation activities for the project reaches.

Table 19: Stream Stressors and Restoration Approach

Project Reach	Primary Stressors/Impairments	Approach	Mitigation Activities
Bridgefork Creek Reach 1a	Livestock access, lack of buffer, invasive vegetation	EII	Planting buffers, treating invasive vegetation, excluding cattle, protecting with conservation easement
Bridgefork Creek Reach 1b	Livestock access, lack of or sparse buffers, bank erosion, debris jams, low bedform diversity	R	Restoring dimension, pattern, and profile, replanting buffers, excluding cattle, protecting with conservation easement
Bridgefork Creek Reach 2	Livestock access, narrow buffers	EII	Restoring dimension, pattern and profile under utility easement, replanting buffers/supplemental planting, excluding cattle, and protecting with conservation easement
Bridgefork Creek Reach 3	Livestock access, lack of or sparse buffers, bank erosion, debris jams, low bedform diversity	R	Restoring dimension, pattern, and profile, replanting buffers, excluding cattle, protecting with conservation easement
UT1 Reaches 1 and 2	Severe erosion and incision, channelization, active headcuts, low bedform diversity, impoundment	R	Removing impoundment, restoring dimension, pattern, and profile in historic valley, planting buffers, BMP installation, protecting with conservation easement
UT2	Severe erosion and incision, active headcuts, low bedform diversity	R	Restoring dimension, pattern, and profile, planting buffers, protecting with conservation easement
UT3	Active headcut, excessive sediment and loss of dimension on the downstream extent	P (no credit), EII	Restoring dimension, pattern, and profile of the downstream extent, supplemental planting, protecting with conservation easement. Conservation easement will only be placed on right riparian buffer along the no credit preservation section.
UT4 Reach 1	Invasive vegetation, localized areas of bank erosion, farm debris in adjacent floodplain	EII	Supplemental planting, treating invasive vegetation, isolated bank grading, debris removal, protecting with conservation easement.
UT4 Reach 2	Invasive vegetation, livestock access, active headcuts and bank erosion	R	Supplemental planting, treating invasive vegetation, restoring dimension, pattern, and profile, excluding cattle, protecting with conservation easement
UT4A	Severe erosion and incision, channelization, active headcuts, low bedform diversity, debris/trash, concentrated runoff, invasive vegetation	R	Restoring dimension, pattern, and profile, planting buffers, treating invasive vegetation, BMP installation, protecting with conservation easement
UT5 Reach 1	Invasive vegetation	P	Treating invasive vegetation, protecting with conservation easement
UT5 Reach 2	Active headcut, invasive vegetation	R	Restoring dimension, pattern, and profile, planting buffers, protecting with conservation easement
UT6	Severe erosion and incision, active headcuts, low bedform diversity	R	Restoring dimension, pattern, and profile, planting buffers, protecting with conservation easement

Project Reach	Primary Stressors/Impairments	Approach	Mitigation Activities
UT6A	Severe stream and valley erosion, incision, channelization, active headcuts, low bedform diversity, debris/trash, concentrated runoff, invasive vegetation	R	Restoring dimension, pattern, and profile, planting buffers, treating invasive vegetation, BMP installation, protecting with conservation easement

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. Seven reference reaches were identified for this Site (Figure 6) and used to support the design of Bridgefork Creek and its tributaries. These reference reaches were chosen because of their similarities to the Site streams including drainage area, valley slope, morphology, and bed material. All reference reaches are located within the piedmont physiographic province. Geomorphic parameters for these reference reaches are summarized in Appendix 4. The references to be used for the specific streams are shown in Table 20 along with a description of each reference reach.

Table 20: Stream Reference Data Used in Development of Design Parameters

Reference Reach	Stream Type	Landscape Position	Chosen For	Used For	Used on streams
UT to Sandy Run	E4	Connects adjacent steep wooded valley to flat Broad River floodplain.	Landscape position, habitat structures, pattern	Q, Dimension, Pattern, Profile	Bridgefork Creek, UT1 Reach 2, UT4
Box Creek Mainstem	C4	Broad, alluvial valley, low slope	Channel dimensions, landscape position, habitat structures, pattern, slope	Q, Dimension, Pattern, Profile	Bridgefork Creek
Deep Creek Mitigation Site	C5	Low slope through wetland complex	Landscape position, dimensions, pattern, slope, previous mitigation site	Q, Dimension, Pattern, Profile	Bridgefork Creek, UT1 Reach 2, UT4
Foust Upstream	C4	Low slope through a mature forest	Bedform diversity and bank stability	Q, Dimension	Bridgefork Creek
UT to Catawba River Reach 2	E3b/C3b	Connects floodplain to invert of Catawba River	Bedform diversity, well developed pools and riffles, habitat diversity	Q, Dimension	Bridgefork Creek, UT3, UT4, UT4A
Timber Tributary	B4	Confined valley and alluvial confluence with larger stream	Moderate slope in a confined valley with sinuosity and varied habitat	Q, Dimension, Profile	UT1 Reach 1, UT2, UT3, UT4A
Pilot Mountain Tributary	B4	High slope headwater tributary	Bedform diversity, steep riffles, in-line pools, boulder steps, slope	Q, Dimension, Profile	UT1 Reach 1, UT2, UT3, UT4A

6.3 Design Discharge Analysis

Multiple methods were used to estimate bankfull discharges for restoration reaches including regional curve data (Harman et al. 2000 and Walker, unpublished), a regional flood frequency analysis using U.S. Geological Survey (USGS) gage sties, and reference reach data. The methods were compared, and a design discharge was selected based on the results of the different methods. For this analysis, emphasis was placed on the results from the regional flood frequency (1.2-year event) and the piedmont regional curve in selecting a design discharge. Results of each method and the final design discharges are shown in Table 21 and illustrated in Figure 7.

Table 21: Summary of Design Bankfull Discharge Analysis

Discharge Estimate Method \ Stream		Bridgefork Creek R1b/2	Bridgefork Creek R3	UT1 R1 & R2	UT2	UT3	UT4	UT4A	UT6	UT6A
Alan Walker Curve (cfs)		66	85	3	3	2	23	12	32	3
NRCS Piedmont/Mountain Regional Curve (cfs)		103	132	6	6	5	39	22	54	6
Regional Flood Frequency Analysis (cfs)	1.2- year event	91	116	5	5	4	34	19	46	5
	1.5-year event	128	163	8	8	6	48	28	66	8
Reference Reach Regional Curve (cfs)		86	83	11	11	9	37	30	45	11
Final Design Q (cfs)		**90**	**115-145**	**6**	**6**	**6**	**35**	**20**	**35-41**	**6**

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, and portions of enhancement II sections. Key morphological parameters are summarized in Tables 22-26. Complete design morphological parameters are included in Appendix 4.

Table 22: Summary of Design Morphologic Parameters for Bridgefork Creek (Reaches 1b, 2, and 3)

Parameter	Existing Parameters			Reference Parameters					Proposed Parameters		
	Bridgefork Creek			UT To Sandy Run	Box Creek	Deep Creek Mitigation Site	Foust Upstream	UT to Catawba River Reach 2	Bridgefork Creek		
	Reach 1b	Reach 2	Reach 3						Reach 1b	Reach 2	Reach 3
Contributing Drainage Area (acres)	787	1,037	1,498	96	1,363	422	896	1,024	787	1,037	1,101-1,498
Channel/Reach Classification	B4c	B4/1c	Incised C4	E4	C4	C5	C4	E3b/C3b	C4	C4	C4
Design Discharge Width (ft)	17.7	25.7	22.7	7.3-7.8	7.9	12.9	18.5-19.4	12.3	21.0	21.0	25.0
Design Discharge Depth (ft)	0.9	1.6	1.6	1.1-1.4	1.2	2.3	1.2-1.3	1.1	1.8	1.8	1.5
Design Discharge Area (ft^2)	16.2	40.4	36.9	5.7-6.2	28.9	17.1	23.9-24.1	13.2	25.2	25.2	36.8
Design Discharge Velocity (ft/s)	2.5	--	3.7	3.4	3.0	2.4	4.0	6.1	3.5	--	3.2-3.9
Design Discharge (cfs)	90.0	--	145.0	20.0	95.0	41.0	95.0	80.0	90.0	--	115.0-145.0
Channel Slope (ft/ft)	0.0059	0.0070	0.0057	0.0150	0.0084	0.0028	0.0090	0.0270	0.0073	--	0.0027-0.0096
Sinuosity	1.3	--	1.2	1.6	1.3	1.6	-	1.1	1.1	1.1	1.3
Width/Depth Ratio	19.4	16.4	14.0	6.6-9.8	19.1	9.6	14.3-15.7	11.5	17.5	17.5	17.0
Bank Height Ratio	3.3	2.5	1.8	1.7-2.6	1.5	0.9-1.1	1.0	1.0-1.3	1.0-1.1	1.0-1.1	1.0-1.1
Entrenchment Ratio	1.8	1.4	2.8	1.6-2.1	3.3	10.5	2.9-5.3	4.3	3.1+	3.1+	4.0+
d50 (mm) reachwide	8.7	--	4.3	19.0	-	0.2	61.0	75.9	--	--	--

Table 23: Summary of Design Morphologic Parameters for UT1 Reach 2, UT4, and UT6

Parameter	Existing Parameters			Reference Parameters					Proposed Parameters		
	UT1 Reach 2	UT4	UT6	UT To Sandy Run	Box Creek	Deep Creek Mitigation Site	Foust Upstream	UT to Catawba River Reach 2	UT1 Reach 2	UT4	UT6
Contributing Drainage Area (acres)	19	205	316	96	1,363	422	896	1,024	19	205	267-316
Channel/Reach Classification	G4	B4c	G4c	E4	C4	C5	C4	E3b/C3b	C4	C4	C4
Design Discharge Width (ft)	5.8	10.2	14.3	7.3-7.8	7.9	12.9	18.5-19.4	12.3	5.5	12.5	15.0-17.0
Design Discharge Depth (ft)	1.6	0.9	1.4	1.1-1.4	1.2	2.3	1.2-1.3	1.1	0.4	0.7	0.9-1.1
Design Discharge Area (ft^2)	9.2	9.3	20.6	5.7-6.2	28.9	17.1	23.9-24.1	13.2	2.1	8.9	12.7-18.6
Design Discharge Velocity (ft/s)	--	--	4.0	3.4	3.0	2.4	4.0	6.1	2.7	3.8	2.1-3.6
Design Discharge (cfs)	6.0	35.0	41.0	20.0	95.0	41.0	95.0	80.0	6.0	35.0	35.0-41.0
Channel Slope (ft/ft)	0.0380	0.0130	0.0079	0.0150	0.0084	0.0028	0.0090	0.0270	0.0020	0.0160	0.0030-0.0150
Sinuosity	--	--	1.4	1.6	1.3	1.6	--	1.1	1.1	1.1	1.2
Width/Depth Ratio	3.7	11.1	10.0	6.6-9.8	19.1	9.6	14.3-15.7	11.5	14.0	17.7	13.5-17.7
Bank Height Ratio	2.8	2.2	2.2	1.7-2.6	1.5	0.9-1.1	1.0	1-1.26	1.0-1.1	1.0-1.1	1.0-1.1
Entrenchment Ratio	1.7	1.3	1.8	1.6-2.1	3.3	10.5	2.9-5.3	4.3	5.0+	3.5+	2.2+
d50 (mm) reachwide	2.7	3.5	38.9	19.0	--	0.2	61.0	75.9	--	--	--

Table 24: Summary of Design Morphologic Parameters for UT1 Reach 1 and UT2

Parameter	Existing Parameters		Reference Parameters		Proposed Parameters	
	UT1 Reach 1	UT2	Timber Tributary	Pilot Mountain Tributary	UT1 Reach 1	UT2
Contributing Drainage Area (acres)	17	16	26	173	17	16
Channel/Reach Classification	G4	G4	B4	B4	B4	B4a
Design Discharge Width (ft)	5.8	6.2	8.9	8.6	5.5	5.5
Design Discharge Depth (ft)	1.6	0.9	0.7	1.0	0.4	0.4
Design Discharge Area (ft^2)	9.2	4.1	4.6	6.0	2.1	2.1
Design Discharge Velocity (ft/s)	--	--	3.7	5.3	4.0	3.8
Design Discharge (cfs)	6.0	6.0	17.0	32.0	6.0	6.0
Channel Slope (ft/ft)	0.0320	0.0580	0.0330	0.0378	0.0390	0.0520
Sinuosity	--	--	1.1	1.1	1.1	1.1
Width/Depth Ratio	3.7	9.4	17.0	12.5	14.2	14.2
Bank Height Ratio	2.8	3.8	1.0	1.0	1.0-1.1	1.0-1.1
Entrenchment Ratio	1.7	1.0	1.5	1.5	2.2+	5.4+
d50 (mm)	2.7	--	6.5	20.1	--	--

Table 25: Summary of Design Morphologic Parameters for UT3 and UT4A

Parameter	Existing Parameters		Reference Parameters		Proposed Parameters	
	UT3	UT4A	Timber Tributary	Pilot Mountain Tributary	UT3*	UT4A
Contributing Drainage Area (acres)	12	95	26	173	12	95
Channel/Reach Classification	E4b	Incised E4b	B4	B4	B4	B4
Design Discharge Width (ft)	3.3	8.2	8.9	8.6	5.5	9.0
Design Discharge Depth (ft)	0.9	2.6	0.7	1.0	0.4	0.6
Design Discharge Area (ft2)	3.1	12.9	4.6	6.0	2.1	5.5
Design Discharge Velocity (ft/s)	--	8.3	3.7	5.3	3.4	3.5
Design Discharge (cfs)	6.0	20.0	17.0	32.0	6.0	20.0
Channel Slope (ft/ft)	0.0639	0.0360	0.0330	0.0378	0.0270	0.0260
Sinuosity	--	1.1	1.1	1.1	1.0	1.1
Width/Depth Ratio	3.5	5.2	17.0	12.5	14.2	15.0
Bank Height Ratio	1.3	3.9	1.0	1.0	1.0-1.1	1.0-1.1
Entrenchment Ratio	2.9	2.3	1.5	1.5	5.0+	1.4+
d50 (mm)	--	2.9	6.5	20.1	--	--

*Applies to restored section only

Table 26: Summary of Design Morphologic Parameters for UT6A

Parameter	Existing Parameters	Reference Parameters		Proposed Parameters
		Timber Tributary	Pilot Mountain Tributary	
Contributing Drainage Area (acres)	16	26	173	16
Channel/Reach Classification	Moderately entrenched G4	B4	B4	B4
Design Discharge Width (ft)	7.4	8.9	8.6	6.0
Design Discharge Depth (ft)	1.4	0.7	1.0	0.4
Design Discharge Area (ft^2)	10.3	4.6	6.0	2.0
Design Discharge Velocity (ft/s)	--	3.7	5.3	3.0
Design Discharge (cfs)	6.0	17.0	32.0	6.0
Channel Slope (ft/ft)	0.0280	0.0330	0.0380	0.0210-0.0760
Sinuosity	--	1.1	1.1	1.0
Width/Depth Ratio	5.4	17.0	12.5	15.1
Bank Height Ratio	5.3	1.0	1.0	1.0-1.1
Entrenchment Ratio	1.7	1.5	1.5	1.4+
d50 (mm)	--	6.5	20.1	--

6.5 Sediment Transport Analysis

To gain an understanding of the quantity of sediment supplied to the design reaches, Wildlands performed a qualitative assessment of the historic, current, and potential future conditions of the watershed through aerial photography and field reconnaissance. Current land use at the Site is mostly active cattle pasture, active horse pasture, and hay fields. Project watershed land uses are a mix of forest, agricultural pasture/hay fields, and development. A review of historic aerials from 1938 to 2016 showed that watershed sizes and land uses have not changed considerably in recent decades except for the construction of US-74 and Kings Mountain Water Easement, with UT1, UT2, and UT3 being directly affected. UT1 was realigned to parallel US-74 and, over time, formed a gully that contributes fine sediment to system. Based on the 2021 Comprehensive Land Use Plan for Cleveland County, growth is expected to occur primarily on the western edge of the City of Kings Mountain. Land use within the watershed and Site is not expected to change in the near future.

One of the goals of the assessment was to identify sources of fine-grained sediment delivered to project reaches to determine if capacity was an important consideration in channel design or if the proposed channels would likely be supply-limited. The main sources of sediment were identified as existing bank erosion and runoff from adjacent agricultural fields.

Proposed vegetated buffers and stormwater BMPs designed to intercept concentrated flow paths will filter most fine sediment from their contributing watersheds. Onsite sediment delivery through bank erosion and runoff will be addressed through stabilization of stream banks and planting of riparian buffers. After construction, bedload supply will not be high enough to cause the project streams to be capacity limited. Therefore, the focus of the sediment transport analysis for this design was to verify that the designed channels will be stable over time and that they can pass the sizes of sediment supplied from the watersheds.

Competence analyses were performed iteratively during design for representative restoration reaches by comparing shear stress associated with the design bankfull discharges, proposed channel dimensions, and proposed channel slopes with the size distribution of the existing bed load. The analysis used standard equations based on a methodology using the Shields (1936) curve and Andrews (1984) equation described by Rosgen (2001) to determine movable particle sizes for given shear stresses. Proposed stream design conditions were evaluated to determine the largest movable particle sizes for the design shear stresses and compare them to the existing channel material. The goal was to have the D50 size design material be mobile while the Dmax size design material remains stable. This approach will provide grade control while allowing for continued sediment transport processes. Competence analyses results are shown in Table 27, below.

In situ material will be supplemented with harvested material from existing channels, with appropriately sized material from onsite rock deposits, and with supplemental imported quarry stone, as necessary. The final plans and specifications will specify that both the sizes and mixtures of materials must be conducive to the formation of stable and diverse bedforms. Restored streambanks will be gently sloped at 3:1 to 3.5:1 to allow for adjustment of channel sediment transport efficiency to the incoming flows and sediment loads.

Table 27: Results of Competence Analysis

	Bridgefork Creek Reach 1b	Bridgefork Creek Reach 3	UT4	UT6
Dbkf (ft)	1.2	1.5	0.71	0.85
Energy Grade line Slope (ft/ft)	0.0090	0.0045	0.017	0.015
Bankfull Shear Stress, t (lb/sq ft)	0.66	0.41	0.74	0.78
Largest movable particle size (mm)	110	78	130	180
Existing D50	8.0	16	22	21
Existing Dmax Bar/Subpavement (mm)	51	76	76	76
Proposed D50	19	32	21	36
Proposed Dmax	110	110	130	180

6.6 Stream Design Implementation

The proposed Site includes a combination of stream restoration, enhancement, and preservation as well as wetland rehabilitation and re-establishment. Project stream reaches proposed for restoration and enhancement are currently impacted by riparian management, past and/or present livestock access, bank erosion and/or incision. Stream and wetland activities have been selected to provide the highest degree of ecological uplift to the system. Figure 8 and Figure 9 provide an overview of the proposed mitigation activities on the Site.

Restoration reaches will be restored using a Priority 1 and/or a Priority 2 approach. Priority 2 sections of channel will be constructed in areas with high incision and/or in transition zones. Restoration reaches have been designed to create stable, functional stream channels based on reference reach parameters and design discharge analysis. Dimension, pattern, and profile have been designed for all restoration reaches to provide a cross-sectional area sized for frequent overbank flows, a stable bed with variable bedforms, and well-vegetated bank slopes. Improved vertical and lateral stability will reduce stream channel erosion. Diverse bedforms will be established using in-stream structures appropriate for the geomorphic settings. These structures will provide grade control to prevent incision and serve as habitat features. Pools will have varied depths to increase habitat diversity and mimic natural streams.

In-stream structures for all reaches will include constructed rock and log riffles, rock and log sills, rock and log J-hooks, log vanes, brush toe, geolifts, and cover logs. Constructed riffles will be built from rock excavated onsite when possible. Quarry stone may be used if an onsite source cannot be found. Constructed riffles will incorporate woody material and logs, which will provide varied pore spaces within the riffles and benefit hyporheic exchange processes and habitat formation. The diverse range of constructed riffle types will provide grade control, habitat diversity, and will create varied flow vectors. Log and rock j-hooks will deflect flow vectors away from banks while increasing habitat diversity. Log and rock sills will be used to allow for grade drops across pools. At select outer meander bends, the channel banks will be constructed with brush toe revetments to reduce erosion potential, encourage pool maintenance, and provide varied pool habitat. Cover logs will also be used in some meander bends to provide pool habitat variability and stream bank protection. Sod harvested onsite and/or coir fiber matting will be used to provide bank protection.

Detailed discussed for each restoration and enhancement II design reach is provided below. Enhancement II reaches will generally include livestock exclusion, bank repairs where necessary, invasive species treatment, planting with native tree species, and permanent protection in a conservation easement.

6.6.1 Bridgefork Creek Reach 1a

Bridgefork Creek Reach 1a is a stable stream with low banks and extensive bedrock influence grade control. This reach is proposed for enhancement II. Cattle will be excluded and the reach will be treated for invasive vegetation, specifically along the left floodplain. The right buffer will be planted with riparian species and the left buffer will be supplemented with native plantings.

6.6.2 Bridgefork Creek Reach 1b

Bridgefork Creek Reach 1b will be restored to a Rosgen C-type stream. Due to the existing incision, the project reach will be restored using a combination of Priority 1 and Priority 2 restoration. The existing channel grade will be raised through most of the reach for a Priority 1 approach and will transition to a Priority 2-like approach for the transition to Reach 2. The channel will be slightly raised, and a floodplain bench will be excavated. Cut was minimized in areas with existing and/or proposed wetlands. Raising the channel will support proposed wetland approaches. Banks will be designed with 3.5:1 side slopes. Drain tiles entering Bridgefork Creek Reach 1b and draining proposed Wetland Area 4B will be removed within the conservation easement. It is not anticipated that drain tiles extend past the conservation easement based on site topography and property owner discussions. One permanent culvert crossing is proposed on this reach, just downstream of the confluence with UT1.

6.6.3 Bridgefork Creek Reach 2

Bridgefork Creek Reach 2 is proposed for enhancement II. The reach exhibits stable sinuosity for most of its length; a bankfull bench is forming in an area with that has a stable bed but an increased bank height ratio. The reach will be restored under the overhead utility easement and a permanent ford crossing will be installed within that easement. Because of the overall channel stability and good bedform, proposed work on this reach consists of planting and treatment of invasive vegetation. Supplemental plantings along Bridgefork Creek Reach 2 will occur according to the included planting plan. Riparian species will be planted in open areas of little to no buffer, particularly along the right floodplain.

6.6.4 Bridgefork Creek Reach 3

Bridgefork Creek Reach 3 will be restored to a Rosgen C-type stream using Priority 1 restoration, with a short length of Priority 2 restoration beginning at the UT6 confluence to step the stream down to the existing stream elevation at the end of the project. Riffles are designed with 3.5:1 side slopes to allow for gentle flow transitions between channel and floodplain. As with Reach 1b, any drain tiles

encountered during construction will be removed within the conservation easement. If the drain tiles extend beyond the conservation easement, an ephemeral pool will be placed at the outlet of the drain tiles within the easement to capture and still the flow. One permanent culvert crossing is proposed near the start of Reach 3.

6.6.5 UT1

UT1's valley has been extensively manipulated and valley restoration guided the stream design. The existing pond will be removed and the valley will be restored through the old pond bottom. Beginning at the stream's jurisdictional origin, UT1 will be realigned through the new valley using Priority 1 restoration. UT1 Reach 1 is designed as a B-type stream due to the slope of the valley through the pond. The reach exhibits sections of step-pools and steep cascading riffles. UT1 Reach 2 begins just downstream of the existing pond and is designed as a C-type stream. Cut has been minimized in areas of existing and proposed wetlands. A riparian buffer will be established along the project reach.

The abandoned UT1 gully will become a BMP for the existing storm drainage culverts along the Kings Mountain Water Easement. The existing storm drainage culverts will be raised and reset to the maximum extent possible, allowing for the old channel to be partially filled. Downstream of the culverts the left bank will be graded out for a smooth transition into the existing floodplain and a series of check dams will be installed. The right bank will remain untouched where possible to help preserve the existing woody vegetation. A series of rock cascades will transition from the check dams, into a sediment basin that will ultimately drain into UT1.

Removal of the pond will involve dewatering either through pumping, dam notching, or a combination thereof. Unconsolidated sediments in the dewatered pond bottom deemed unsuitable for construction will be excavated. . Stream construction will begin after the pond is fully dewatered and the embankment notched to prevent ponding.

6.6.6 UT2

UT2 originates from an existing storm drainage culvert from the Kings Mountain Water Easement. The channel is designed as a Ba-type channel with gentle pattern. A Priority 1 restoration approach is used from the culvert to about mid-channel, where it transitions to a Priority 2 to tie to Bridgefork Creek. The design incorporates rock and log steps, steep riffles, and rock cascades to stabilize the system while providing habitat. A riparian buffer will be established along the project reach.

6.6.7 UT3

UT3 originates from an existing storm drainage culvert and is a stable channel that flows through a confined, wooded valley. The right buffer for this section of reach will be incorporated into the conservation easement and will be preserved for no credit. The valley flattens and widens as both banks of the stream enter the project property and approach Bridgefork Creek. The reach is proposed for enhancement II approach and crediting. At the confluence with Bridgefork Creek, the downstream most 70 linear feet of UT3 will receive restoration level work including realignment to tie the tributary to the newly restored channel. In stream structures will be installed to addressing the existing headcut. This reach will be treated for invasive vegetation and livestock will be excluded. Supplemental planting will occur within the conservation easement along the enhancement II portion of the stream.

6.6.8 UT4

UT4 Reach 1 is proposed for an enhancement II approach. UT4 begins off-site and flows through a stable, moderately confined valley, through a series of bedrock slides and step pools. Along this section of reach, work will include invasive species management, debris removal, and minor bank grading. Once the reach approaches the UT4A confluence, UT4 Reach 2 will transition to a Priority 2 restoration approach. A permanent culvert crossing will be installed just downstream of the UT4A confluence. UT4

Reach 2 will be built as a C-type channel and will be meandered with an appropriate pattern, dimension, and profile to the confluence with Bridgefork Creek. The channel grade will be raised subtly and a floodplain bench will be excavated. Supplamental plantings will/not occur in UT4 Reach 1. [Eric, will these areas be supplementally planted? It is not indicated on the plan sheets.]. In Reach 2, supplemental planting will occur upstream of the crossing in areas to establish a full 50-foot buffer. Riparian species will be planted downstream of the crossing to establish a native buffer.

6.6.9 UT4A

UT4A's flows through a deep, actively eroding gully. The stream will be restored to a B-type channel with a narrow but natural meander. UT4A's bed will be raised, and a floodplain bench will be established within the eroded gully. Floodplain pools will be constructed in areas where the valley has widened. A step pool stormwater conveyance BMP and a series of check dams will be constructed upstream of the jurisdictional start of UT4A to address the eroded, ephemeral swale and to capture and treat runoff and flow from the adjacent pasture and terraces. Invasive species will be treated along the reach. Riparian species will be planted to establish a buffer and supplemental planting will occur in areas with existing woody vegetation.

6.6.10 UT5

UT5 flows from a small, confined valley before reaching the broad flat floodplain of Bridgefork Creek. An existing headcut has formed as the channel approaches the mainstem. Upstream of the existing headcut (UT5 Reach 1) the channel is proposed for invasive treatment and stream preservation. Downstream of the existing headcut (UT5 Reach 2), the stream will be restored with a new dimension, profile, and alignment to tie the channel to the new alignment of Bridgefork Creek. An instream structure (riffle) will be used to stabilize the headcut while increasing in stream habitat

6.6.11 UT6

UT6 will be restored as a Rosgen C4-type stream with slopes ranging from the from 0.3% to 1.8%. Multiple riffle and pool typical cross sections have been designed within this project reach to suit the range of channel slopes. A Priority 1 approach will be used for the majority of UT6 with a Priority 1.5 approach implemented at the start of the reach and immediately upstream and downstream of the Dillon Road culvert to smoothly transition to and from existing elevations. Invasive plant species will be treated within the easement and supplemental planting will occur throughout.

6.6.12 UT6A

UT6A carries runoff from row crop agricultural fields and as such is expected to receive sediment and nutrient loads. To address these stream stressors, a step-pool type stormwater BMP will be constructed immediately above the ephemeral-to-intermittent transition point. Beginning at the outlet of the BMP, UT6A will be restored as a B4 stream with boulder step-pools to drop grade through the valley and dissipate energy. Riffle-pool sequences will be constructed in the areas with lower channel slope, mostly midway down the project reach.

6.7 Stormwater Best Management Practices (BMP)

Three stormwater BMPs are proposed for the Site, as depicted in Figure 8 and Figure 9. Runoff from historically altered terraces and contour plowed drainages have caused severe headcutting and erosion as surface water drains to the upstream extents of UT4A and UT6A. BMPs 1 and 2, respectively, will be established within the conservation easement in the existing gullies to capture and treat the drainage from this area. Step pool stormwater conveyances (SPSCs) will be constructed to stabilize the eroded, ephemeral channels and to transition from upland areas down to the valley bottoms. BMPs 1 and 2 will both provide initial volume storage and energy dissipation. BMP 1 will also have a series of check dams constructed within the valley bottom to help establish a linear wetland complex to aid in runoff

treatment. These series of check dams are expected to slowly accumulate with sediment and vegetation, transitioning to a vegetated swale over time with no long-term maintenance after stabilization.

The abandoned UT1 gully will be converted into BMP 3. The existing storm drainage culverts will be raised and reset to the maximum extent possible, allowing for the gully to be partially filled. Downstream of the culverts, the left banks will be graded out for a smooth transition into the existing floodplain and a series of check dams will be installed. The right banks will remain untouched to help preserve the existing woody vegetation. A series of rock cascades will transition from the check dam into a retention pond, which will then ultimately drain into UT1. Like BMP 1, the series of check dams is expected to slowly accumulate with vegetation and sediment transitioning into a vegetated swale over time. It is also expected that the retention pond will accumulate sediment and vegetation over time, creating a vegetative buffer. No long-term maintenance is proposed after stabilization. The majority of BMP 3 will be located outside of the conservation easement, with only the rock cascade and retention pond located within the easement.

6.8 Wetland Design

The proposed design includes the re-establishment of 2.65-acres and the rehabilitation of 0.48-acres of historically altered wetlands through the bottomland floodplain of Bridgefork Creek Reach 1b and UT1. Wildlands performed a multilevel analysis of the proposed wetland area to holistically understand the ditching, farming, and anthropogenic effects, current and proposed hydrologic conditions, and current and potential hydric soil development in the proposed wetland areas. Hydric soil investigations, along with site observations and existing groundwater gauge data, were used to guide proposed wetland grading and design.

6.8.1 Wetland Re-establishment

Relic wetland areas will be re-established on the Site through hydrologic uplift, establishment of forested wetland plant communities, cattle exclusion, and roughening to promote increased retention times. Hydrology within proposed wetland re-establishment areas has been altered through agricultural ditching and increased drainage effects of incised channels at the downstream extent. The existing pond adjacent to UT1 will be converted to wetlands. Restoration of the adjacent stream channels will promote increased hydrology and overbank events. Vegetation within wetland re-establishment areas has been maintained as pasture and grazed by cattle. Increased roughness from vegetation will reduce surface drainage effects within the wetland and allow for development of facultative herbaceous and woody species.

6.8.2 Wetland Rehabilitation

Jurisdictionally delineated areas including wetlands C, D, E and K are slated for rehabilitation. Existing hydrology within these areas will be improved by filling the existing network of drainage ditches and roughening the surface of these aeras to promote increased retention times. The restoration of existing incised streams will raise overall water table elevations within the existing wetland areas which will also improve hydrologic function. Rehabilitation areas which are dominated by herbaceous vegetation and grasses will be planted with appropriate woody species to establish a forested wetland system. Invasives

will be treated if present. Cattle will also be excluded from all existing wetland areas, eliminating wallow areas which are currently acting as nutrient and sediment sources for the project receiving waters.

6.8.3 Hydric Soils Investigation

To ensure adequate potential for the development of hydric soils within the proposed wetland restoration areas, an initial evaluation of Site soils was performed using Natural Resources and Conservation Services (NRCS) web soil survey online. Soils within the proposed wetland areas are mapped as Chewacla loam, Grover gravelly sandy loam, and Madison-Bethlehem Complex. Chewacla loam is typically found on floodplains or at toe of slopes. Typical slopes are between 0 and 2 percent and the soil unit is frequently flooded and are somewhat poorly drained. Grover gravelly sandy loam is typically found on hillslopes and ridges with slopes between 15 and 30 percent. The soil unit is typically rocky and well drained. Madison-Bethlehem Complex is typically found on shoulders and backslopes of hills with slopes from 8 to 15 percent. The soil complex is very rocky and well drained.

A detailed hydric soils investigation was conducted in March of 2020 by a licensed soil scientist (LSS) to determine the extent and depth of hydric soil indicators on site. 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 to alter hydrology. Approximately 41 soil borings were performed within the study area as part of the hydric soil investigations. Soils borings were classified as non-hydric or hydric soils. Areas considered hydric soils contained hydric soil indicator F3 within the 10" of the current land surface. Based on the LSS results it was suggested that all hydric soils observed onsite were likely Wehadkee soil series. The preliminary hydric soils investigation can be found in Appendix 5.

Representative Soil Boring

6.8.4 Existing Hydrology

Nine groundwater gages were installed throughout the proposed wetland restoration areas to monitor the existing hydrology of each location (Figure 2). Data was collected from March 20th to September 9th, 2021. Per the Gaston County WETS Table (data from 1970 to 2000) the growing season for a 50% probability that soil temperature will be above 28° F is defined as March 29th to November 2nd. Based on Wildlands recent experience monitoring soil temperature at nearby locations, soil temperatures are greater than 28° F as early or earlier than March 1 and as late or later than November 30th in Cleveland County. To evaluate the existing gage data preconstruction, the growing season within the included Gage Plots, is defined as 3/29 to 11/2. Gages 8 and 9 were not considered suitable for uplift and were removed from the wetland crediting areas. Gages 1 through 7 are in areas of proposed wetland re-establishment. Only wells 2 and 5 had the groundwater within the top 12 inches for at least a day; gage 2 had shallow groundwater for three days, and gage 5 for 18 days. Generally, the existing gage data shows hydrology within wetland re-establishment areas lacks adequate inundation to provide wetland conditions and that proposed wetland areas have seen major drainage effects from adjacent incised channels. Hydrographs and a wetland performance summary table are presented in Appendix 5.

6.8.5 Wetland Grading

Grading within proposed wetland restoration areas is focused on restoring stream and floodplain connectivity and restoring a natural flooding regime. Detailed wetland grading plans are included in Section 3.0 of the provided plans in Appendix 13.

Wetland Area 1 (areas A, B, and C) has very minimal grading, most of which is related to stream restoration along Bridgefork Creek Reach 1. Two existing agricultural ditches which currently drain Wetland Area 1C, will be filled as part of the grading, material to fill these ditches will be generated from stream restoration grading along Bridgefork Creek. Like Wetland Area 1, Wetland Area 3(A and B) have very minor grading, specifically related to the stream restoration. As show in the plan and profile design included within the plans, Bridgefork Creek Reach 1's bed elevation is increasing approximately 2 or more feet throughout the profile. Grading within these adjacent floodplain wetlands is intended to accommodate the increased channel elevation while reconnecting the stream and floodplains.

Grading within Wetland Area 2(A and B) is necessary to remove the existing pond. Majority of Wetland Area 2 is being filled to decommission the existing farm pond and return the valley landscape to a natural shape. Fill material within the old pond will be capped with potentially or active hydric soils if available from on-site grading. Wetland Area 4(A and B) will receive the most grading. At this location, Bridgefork Creek Reach 1 ties down to Bridgefork Creek Reach 2 with a priority 2 transition zone which requires cutting a floodplain bench. Soils within Wetland Area 4 were found to be hydric at or near the surface, and grading proposed within the wetland is not related to overburden removal. The bench was maximized laterally to include the wetland area because it is the best solution when considering both stream access to the floodplain, current and future hydrologic conditions, and overall project function.

6.8.6 Reference Wetland

Wildlands' current Owl's Den Mitigation Site project is located approximately 17 aerial miles from the proposed Site. There is currently an onsite reference wetland within a forested area upstream of the project tributaries. The area is a mature Piedmont Bottomland Forest that is located within the floodplain of a small tributary and within the larger floodplain of Howard's Creek. The hydrology of this system is intermittently, temporarily, or seasonally flooded. The reference area has not been disturbed by clearing or ditching and was not altered during the mitigation work. Mature vegetation including woody species exist within the reference wetland. The soils within the Owl's Den reference are mapped as Chewacla. The vegetation at the reference site was used as a basis to develop the planting plan for the wetland restoration on the Site. A groundwater monitoring gauge was also installed on the reference site to document the reference wetland hydrology. Reference gauge data is included in Appendix 5. In the future, this information will be used to provide a comparison for the re-established and rehabilitated wetland hydrology throughout the monitoring period.

6.9 Vegetation, Planting Plan, and Land Management

Non-forested areas within the conservation easement will be planted, including additional buffer areas beyond the minimum requirement of 50 feet from top of bank. Riparian buffers will be planted with native vegetation chosen to develop a forested riparian zone. The specific species composition was selected based on the community type, observation of occurrence of species in riparian buffers adjacent to the Site, and best professional judgement on species establishment and anticipated Site conditions in the early years following project implementation. The current natural community types that exist on site include Piedmont Alluvial Forest and Mesic Mixed Hardwood Forest communities, identified by Wildlands Engineering staff using the *Guide to the Natural Communities of North Carolina, Fourth Approximation* (Schafale, 2012). These community types were used as models in species selections for the planting plan, and species chosen are listed on Table 28 below and on Sheet 3.0.0 of the Preliminary Plans located in Appendix 13.

The riparian buffers will be planted with bare root seedlings. Streambanks will be planted with live stakes, and the channel toe will be planted with multiple herbaceous species. Permanent herbaceous seed will be spread on streambanks, floodplain areas, and wetlands including all disturbed areas within the project easement.

Upon grading completion, the project floodplains will be prepared for seeding and planting by applying stockpiled topsoil between bankfull elevations of the streams and the grading limits. To help ensure tree growth and survival, soil tests will be performed in areas of cut and in the area of the existing pond bottom on UT1. Fertilizer and lime will be applied based on the results. All haul roads and other areas of compacted soil within the easement boundary will be ripped prior to planting.

Invasive species within the conservation easement will be treated using a combination of techniques. Existing invasive plant populations on the site include Chinese privet, Japanese honeysuckle, English ivy (*Hedera helix*), kudzu (*Pueraria montana*), marsh dewflower (*Murdannia keisak*), multiflora rose, tree of heaven (*Ailanthus altissima*), Bradford pear (*Pyrus calleryana*), autumn olive (*Elaeagnus umbellate*), periwinkle (*Vinca* sp.), and fescue. Some invasive species along restoration and enhancement reaches will be treated pre-construction, while others will be treated by mechanical removal during construction. *Murdannia* cannot be treated in dormant season but will primarily be treated in-stream and where it is threatening woody vegetation. During construction treatment will include privet and invasive vines, both mechanical removal and cut stump by contractors. A discussion of invasive treatments which occurred during construction will be included in the MY0 Report.

The extent of invasive species coverage will be monitored, mapped, and controlled as necessary throughout the required monitoring period. Please refer to Appendix 8 for the post-construction invasive species plan. Additional monitoring and maintenance issues regarding vegetation are in Sections 8 and 9 and Appendix 10.

6.10 Project Risk and Uncertainties

In general, this project is low risk. The land surrounding the project is currently being utilized as an active cattle farm and horse pasture. Following construction, livestock will be precluded from accessing the conservation easement. There are seven internal breaks in the easement designated for agricultural crossings and/or utility easements. Within the seven internal crossings, there will be a total of three fords and two culverts. Details of these ford and culvert crossings is included within the design plans provided in Appendix 13. There will be an external crossing where UT6 passes through an existing culvert under Dillon Road.

There is low risk of hydraulic trespass from the project due to the current and designed slopes of the project channels. This project has a high risk of sedimentation due to the sandy floodplain soils and off-site sediment sources. Sediment transport has been analyzed and streams are expected to be competent to move the existing bedload over time. Valley slope transitions can naturally function as aggradational areas. Existing fine sediment sources, including stream bank erosion and farm runoff, will be reduced through stream bank repair and BMP installation, reducing the risk of aggradation in these valley transitions. There is a slight risk residential development could occur within the project watershed, altering the hydrology. If development does occur, more frequent bankfull and out-of-bank events may occur as a result. The risks associated with increased flood frequencies will be mitigated by the reconnected project floodplains. Reconnected floodplains will limit the about of potential shear stress on project streams by reducing channel flood stages, relative to existing conditions.

There is potential for utility line maintenance where the lines cross the easement on Bridgefork Creek and UT1. No poles are located within the conservation easement, so anticipated impacts are limited to vegetation maintenance, and these areas were excluded from mitigation crediting. Should

utility/roadway maintenance work occur in the future and encroach within the conservation easement, Wildlands will follow the Maintenance Plan to repair disturbed signage or damaged stream areas.

To help prevent potential encroachment the conservation easement will be marked according to the Boundary Marking Requirements outlined in the DMS Protection Mechanism Guidance and Deliverables dated April 5, 2022. Fence posts will be used as witness posts for conservation easement signage where possible.

There is potential pine and/or sweet gum colonization due to previously timbered adjacent areas. This is low risk and should colonization begin to occur, Wildlands will follow the Maintenance Plan (Appendix 10) to address the issue.

All stream and wetland projects have some risk for beaver colonization. There is evidence of current or past beaver activity on the downstream extent of Bridgefork Creek within the project limits. If beaver move into the project areas, Wildlands will follow the Maintenance Plan (Appendix 10) 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 28.

Table 28: Summary of Performance Standards

Parameter	Monitoring Feature	Performance Standard
STREAM SPECIFIC PERFOMANCE STANDARDS[1, 2]		
Dimension	Cross Section Survey	BHR $\leq$1.2 for all channel types; ER $\geq$2.2 for C channels and ER$\geq$1.4 for 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; 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 11% (29 consecutive days) of the growing season under normal precipitation conditions. In accordance with the Wilmington 2016 Guidance, soil probe temperature data and documentation of new vegetative growth and flowering was used to determine an appropriate growing season. Based on the documentation provided within Appendix 4, the growing season for the site is proposed as 3/1 to 11/20 (264 days).

Parameter	Monitoring Feature	Performance Standard
SITE PERFOMANCE STANDARDS		
Vegetation	Vegetation Plots	MY3 success criteria: 320 planted stems per acre, MY5 success criteria: 260 planted stems per acre, average of 7 feet in height in each plot within Riparian Planting Zones and Partially Vegetated Planting Zones or 4 feet in height in Wetland Planting Zones as identified in Figure 10. MY7 success criteria: 210 planted stems per acre, average of 10 feet in height in each plot within Riparian Planting Zones, Partially Vegetated Planting Zones, or Wetland Planting Zones as identified in Figure 10.
Photo Documentation	Cross section Photos Photo Points Wetland Gage Photos	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 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 contributing watershed sediment sources.
3: Remedial action would not be taken if channel changes indicate a movement toward stability.
4: Vegetation performance will be evaluated in the open planting areas.

8.0 Monitoring Plan

Project monitoring components are listed in Table 29. Approximate locations of the proposed vegetation plots and cross section locations are illustrated in Figure 10.

Table 29: Monitoring Components - Bridgefork Dairy Mitigation Site

Parameter	Monitoring Feature	Quantity/Length by Reach														Frequency	Notes
		BFC R1a	BFC R1b	BFC R2	BFC R3	UT1 R1	UT1 R2	UT2	UT3	UT4 R1	UT4 R2	UT4A	UT5	UT6	UT6A		
Dimension	Riffle Cross-sections	N/A	3	N/A	3	1	1	1	N/A	1	1	1	N/A	2	1	Year 1, 2, 3, 5, and 7	1
	Pool Cross-sections	N/A	2	N/A	2	N/A	1	N/A	N/A	N/A	N/A	1	N/A	2	N/A		
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	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	N/A	N/A	N/A	
Stream Hydrology	Crest Gage (CG) and/or Transducer (SG)	N/A	1 CG	N/A	1 CG	1 SG	1 CG	N/A	1 SG	N/A	N/A	1 SG 1 CG	1 SG	1 CG	1 SG	Semi-Annual	3
Wetland Hydrology	Groundwater Gage (GWG)	9 GWG														Semi-Annual	--
Vegetation	Shiny App/Mobile Plots	22 Total (12 Permanent, 10 Mobile)														Year 1, 2, 3, 5, and 7	4
Visual Assessment		Y														Semi-Annual	--
Exotic and nuisance vegetation																Semi-Annual	5
Project Boundary																Semi-Annual	6
Ref Photos	Photographs	39														Annual	--

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 to 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. Planted shaded areas will be visually assessed. Number indicates total number of plots for the entire site.
5. Locations of exotic and nuisance vegetation will be mapped
6. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

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. Any livestock or associated fencing or permanent crossings will be the responsibility of the owner of the underlying fee to maintain.

The Site Protection Instrument can be found in Appendix 9.

Table 30: 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 10). 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 31 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 approved February 6, 2021. This correspondence is included in Appendix 7.

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.
2. The entire restored length of UT1 (Reach 1 and Reach 2) is proposed for restoration at a 1:1 ratio. No credit is sought for BMP3, but extensive work will be done to the altered drainage to promote stability and stop active erosion. Based on landowner discussions, livestock will be excluded from the BMP.
3. The requested enhancement II credit ratio is 2.5:1 for mitigation activities that include cattle exclusion (Bridgefork Creek Reach 1a, UT3), invasive species treatment (all enhancement II reaches, debris removal (UT4 Reach 1) and minor bank grading (UT4 Reach 1, Bridgefork Creek Reach 2).
4. The requested wetland re-establishment credit ratio is 1:1 for areas that are currently not jurisdictional wetland but will be restored to functioning riparian wetland systems. This includes Wetland 2A which is currently an open water pond which will be restored to riparian wetland.
5. Stream preservation is proposed at 10:1 credit ratio for UT5 Reach 1. UT5 Reach 2 is proposed for restoration at a 1:1 ratio based on IRT discussions outlined in the meeting minutes approved February 6, 2021.
6. No credit is sought for the upstream extent of UT3 where no buffer is available along the left bank.
7. No direct credit is sought for the BMPs, but BMP installation was considered when setting the mitigation ratios.

Buffers proposed throughout the Site meet the minimum required 50-foot standard width for piedmont streams.

Table 31: Project Asset Table

Project Segment	Mitigation Plan (Ft/Ac)	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits
Stream					
Bridgefork Creek Reach 1A	239.460	Warm	EII	2.500	95.784
Bridgefork Creek Reach 1B	2252.600	Warm	R	1.000	2,252.600
Bridgefork Creek Reach 2	1441.290	Warm	EII	2.500	576.516
Bridgefork Creek Reach 3	2499.000	Warm	R	1.000	2,499.000
UT1 Reach 1	749.180	Warm	R	1.000	749.180
UT1 Reach 2	329.600	Warm	R	1.000	329.600
UT2	198.380	Warm	R	1.000	198.380
UT3	191.430	Warm	EII	2.500	76.572
UT4 Reach 1	1148.300	Warm	EII	2.500	459.320
UT4 Reach 2	279.360	Warm	R	1.000	279.360
UT4A	844.010	Warm	R	1.000	844.010
UT5 Reach 1	117.580	Warm	P	10.000	11.758
UT5 Reach 2	31.160	Warm	R	1.000	31.160
UT6	2100.750	Warm	R	1.000	2,100.750
UT6A	322.400	Warm	R	1.000	322.400
					10,826.390
Wetland					
Wetland 1A	0.834	R	REE	1.00000	0.834
Wetland 1B	0.393	R	REE	1.00000	0.393
Wetland 1C	0.175	R	RH	1.50000	0.117
Wetland 2A	0.309	R	REE	1.00000	0.309
Wetland 2B	0.045	E	E	2.50000	0.018
Wetland 3A	0.408	R	REE	1.00000	0.408
Wetland 3B	0.239	R	RH	1.50000	0.159
Wetland 4A	0.645	R	REE	1.00000	0.645
Wetland 4B	0.025	R	RH	1.50000	0.017
				Total:	**2.900**

Project Credits						
	Stream			**Riparian**	**Non-Rip**	**Coastal**
Restoration Level	**Warm**	**Cool**	**Cold**	**Wetland**	**Wetland**	**Marsh**
Restoration	9,606.440					
Re-Establishment				2.589		
Rehabilitation				0.293		
Enhancement				0.018		
Enhancement I						
Enhancement II	1,208.192					
Creation						
Preservation	11.758					
Totals	10,826.390			2.900		
Total Stream Credit	**10,826.390**					
Total Wetland Credit	**2.900**					

12.0 References

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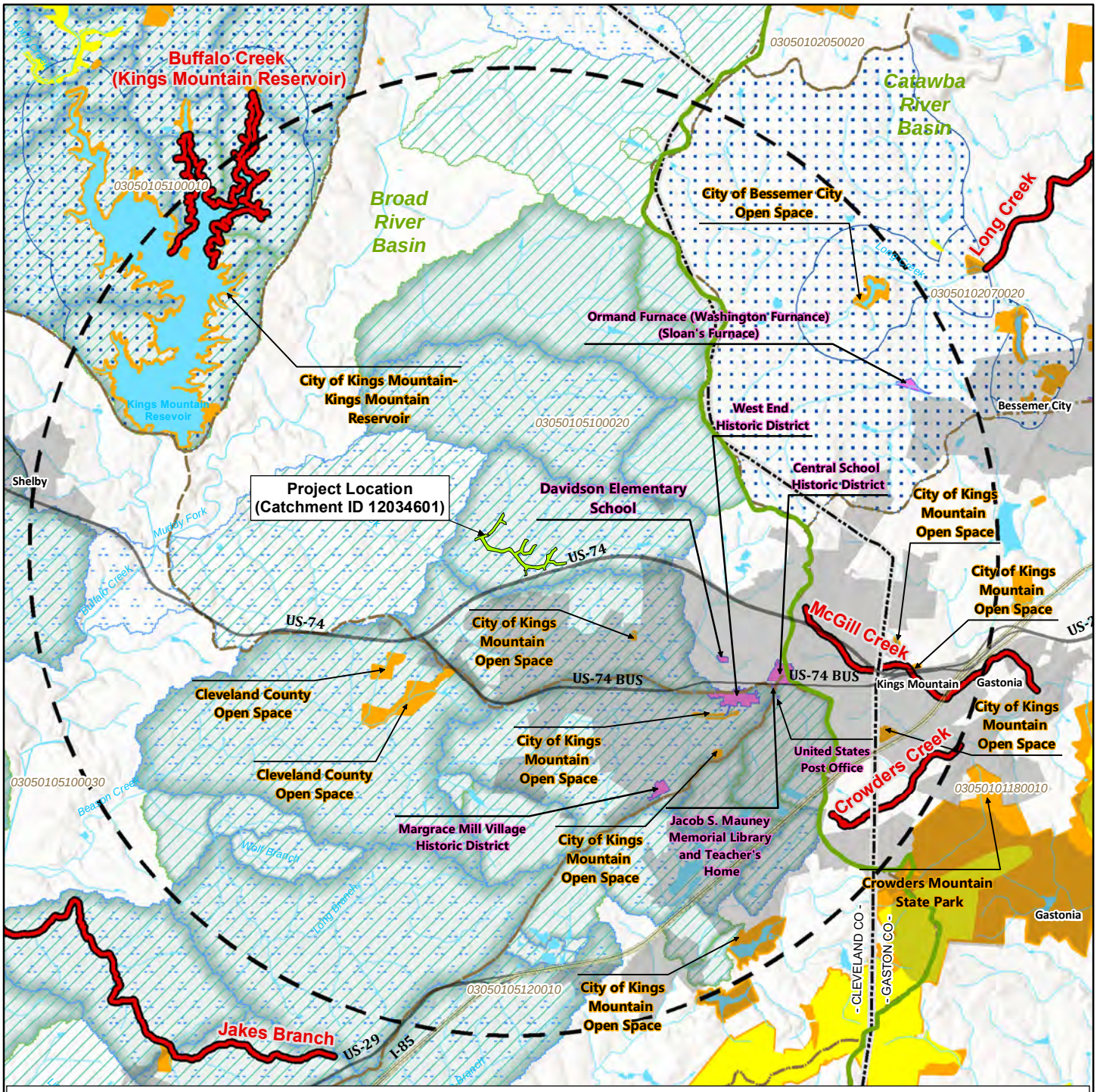
FIGURES



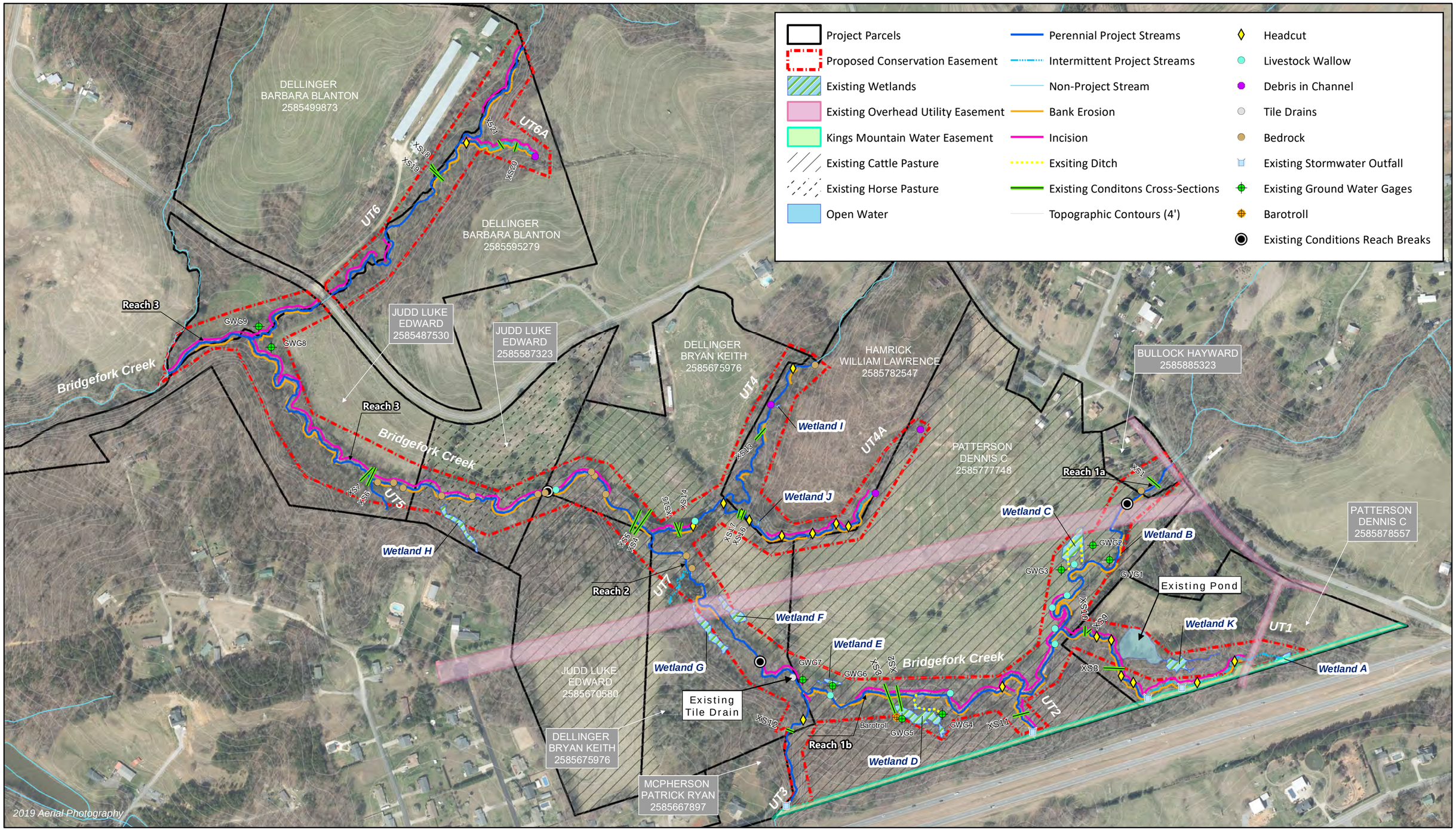
WILDLANDS ENGINEERING

0 0.75 1.5 Miles

N

Figure 1 Vicinity Map
Bridgefork Dairy Mitigation Site
Broad River Basin 03050105

Cleveland County, NC



WILDLANDS ENGINEERING

0 400 800 Feet

N

Figure 2 Site Map
Bridgefork Dairy Mitigation Site
Broad River Basin 03050105

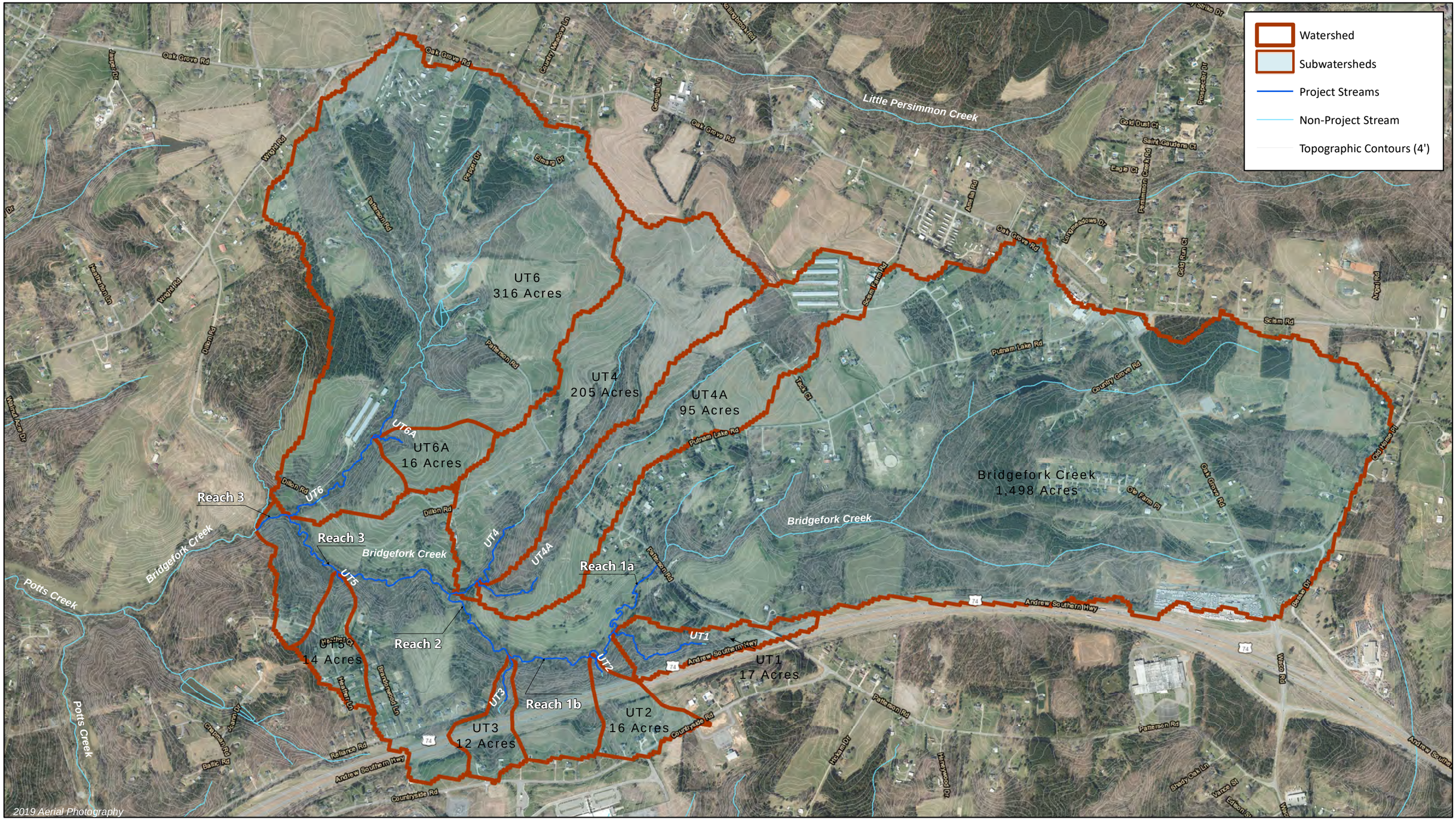
Cleveland County, NC

WILDLANDS ENGINEERING

0 400 800 Feet

Figure 3 USGS Topographic Map
Bridgefork Dairy Mitigation Site
Broad River Basin 03050105

Cleveland County, NC



WILDLANDS ENGINEERING

0 1,000 2,000 Feet

N

Figure 4 Watershed Map
Bridgefork Dairy Mitigation Site
Broad River Basin 03050105

Cleveland County, NC

Project Parcels
Proposed Conservation Easement
Existing Pond
Project Streams
Non-Project Streams

Soils

ChA - Chewacla Loam, 0-2% Slopes, Frequently Flooded
GrD - Grover Gravelly Sandy Loam, 15-30 % Slopes, Rocky
HtC - Hulett Gravelly Sandy Loam, 8-15% Slopes, Stony
McC2 - Madison-Bethlehem Complex, 8-15% Slopes, Very Stony, Moderately Eroded

Dillon Rd
Bridgefork Creek
UT6
UT6A
UT5
UT7
UT4
UT4A
UT3
UT2
UT1
Patterson Rd
Heather Ln
Heather Ct
Brandonwood Ln
Andrew Southern Hwy
Countryside Rd
74

2019 Aerial Photography

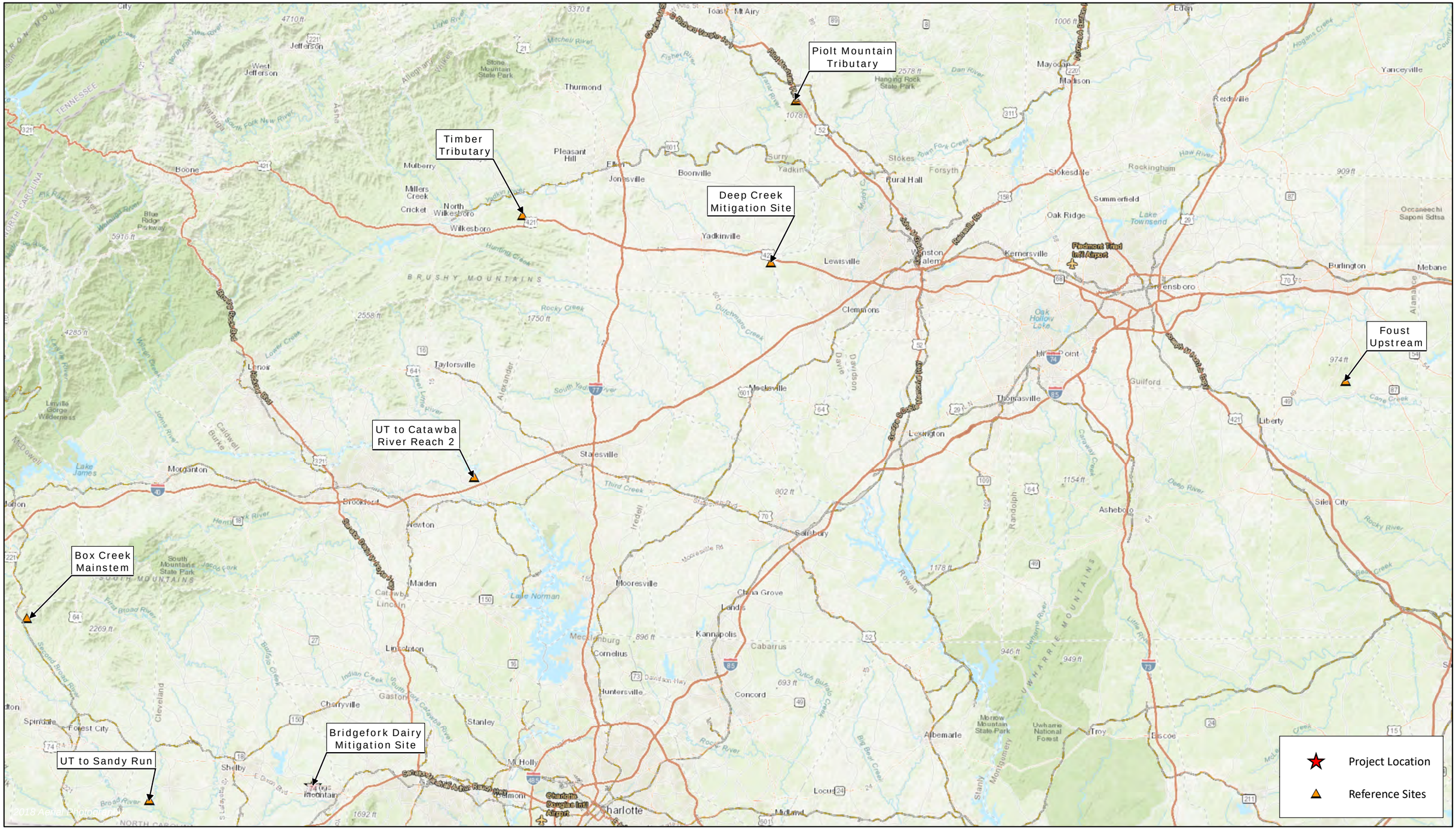
0 400 800 Feet

N

WILDLANDS ENGINEERING

Figure 5 Soils Map
Bridgefork Dairy Mitigation Site
Broad River Basin 03050105

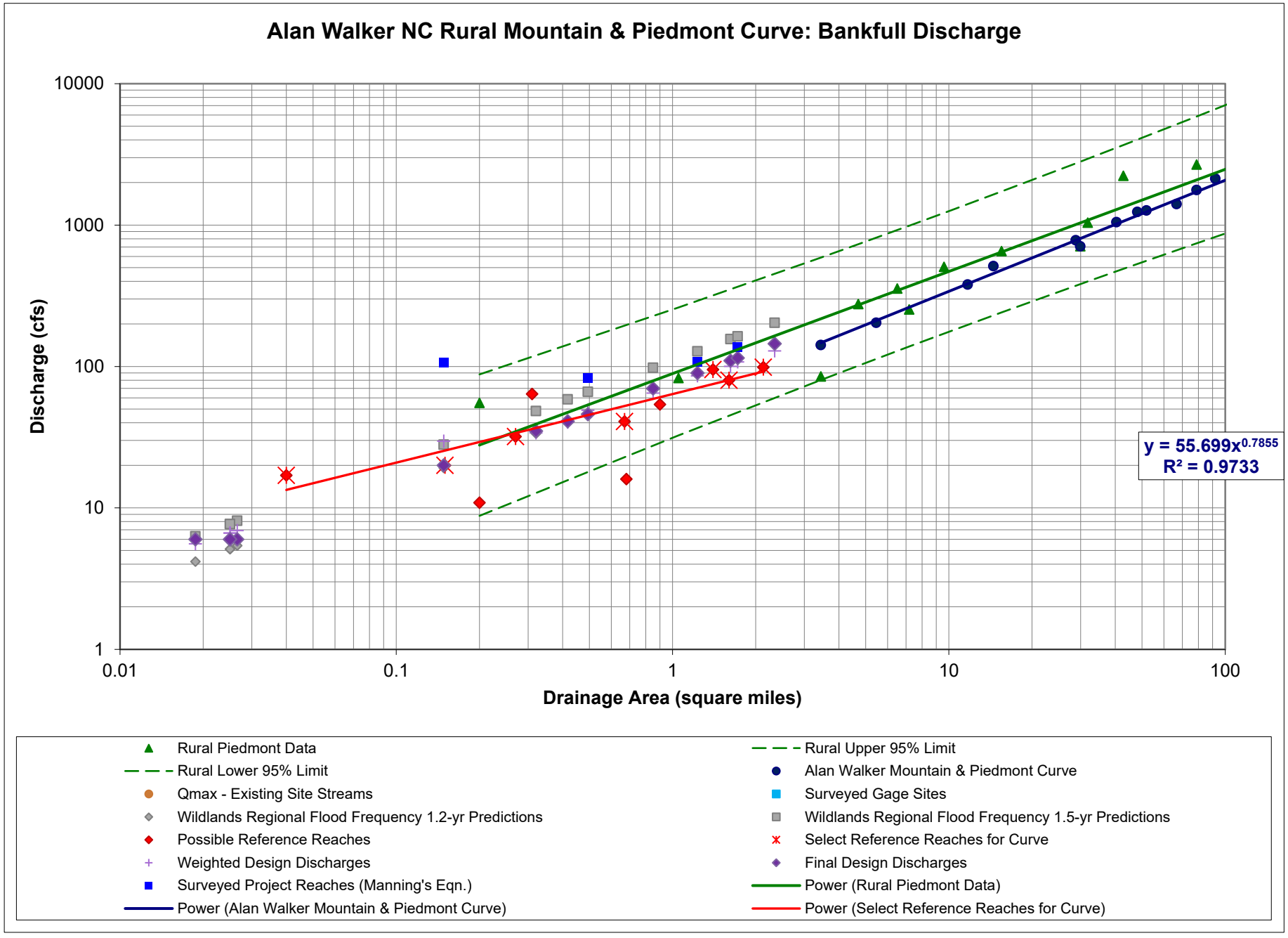
Cleveland County, NC



WILDLANDS ENGINEERING

Figure 6 Reference Reach Map
Bridgefork Dairy Mitigation Site
Broad River Basin 03050105

Cleveland County, NC


Alan Walker NC Rural Mountain & Piedmont Curve: Bankfull Discharge
Discharge (cfs)
10000
1000
100
10
1
0.01
0.1
1
10
100
Drainage Area (square miles)
y = 55.699x^0.7855
R² = 0.9733
Rural Piedmont Data
Rural Upper 95% Limit
Rural Lower 95% Limit
Alan Walker Mountain & Piedmont Curve
Qmax - Existing Site Streams
Surveyed Gage Sites
Wildlands Regional Flood Frequency 1.2-yr Predictions
Wildlands Regional Flood Frequency 1.5-yr Predictions
Possible Reference Reaches
Select Reference Reaches for Curve
Weighted Design Discharges
Final Design Discharges
Surveyed Project Reaches (Manning's Eqn.)
Power (Rural Piedmont Data)
Power (Alan Walker Mountain & Piedmont Curve)
Power (Select Reference Reaches for Curve)

Project Parcels
Proposed Conservation Easement
Proposed Wetland Re-Establishment
Proposed Wetland Rehabiliation
Proposed Wetland Enhancement
Existing Wetlands - No Credit
Internal Crossings
Kings Mountain Water Easement
Existing Overhead Utility Easement
Proposed Stream Restoration
Proposed Stream Enhancement II
Proposed Stream Preservation
Proposed Stream Preservation - No Credit
Proposed Stormwater BMP
No Credit
Non-Project Streams
Topographic Contours (4')
Reach Breaks

Dillon Rd
UT6A
BMP2
UT6
Reach 3
Bridgefork Creek
UT4
Reach 1
BMP1
Patterson Rd
Reach 1a
Wetland Area 1C
Wetland Area 1B
Wetland Area 2A
Wetland Area 2B
Wetland Area 1A
Wetland Area 4B
Wetland Area 4A
Wetland Area 3A
Wetland Area 3B
Reach 2
Reach 1b
UT4A
UT7
UT5
UT3
UT2
UT1
BMP3
Heather Ln
Heather Ct
Brandonwood Ln
Andrew Southern Hwy
Countryside Rd
74
2019 Aerial Photography

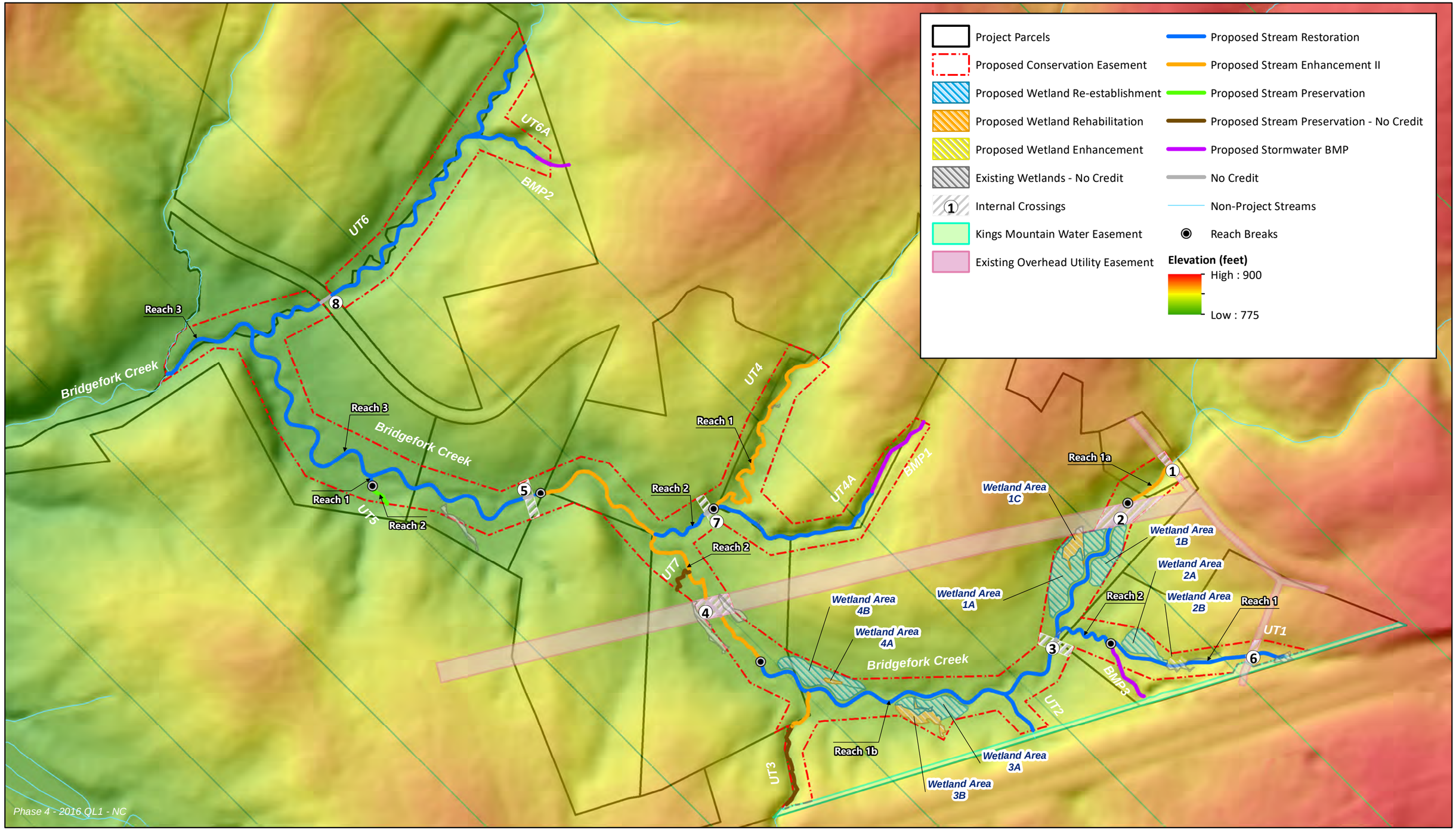
WILDLANDS ENGINEERING

0 400 800 Feet

N

Figure 8 Concept Design Map
Bridgefork Dairy Mitigation Site
Broad River Basin 03050105

Cleveland County, NC



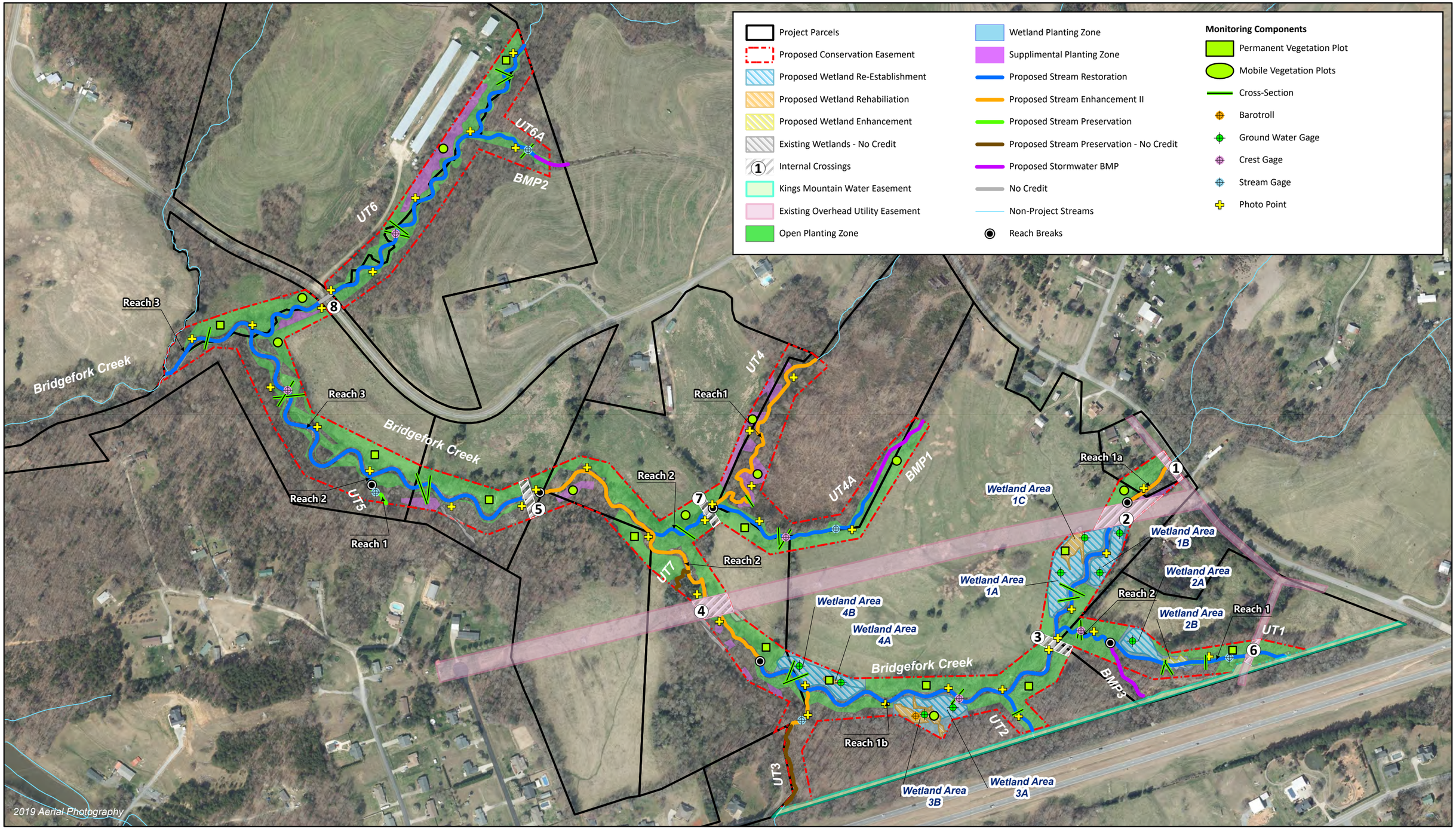
WILDLANDS ENGINEERING

0 400 800 Feet

N

Figure 9 Concept Design Map with LiDAR
Bridgefork Dairy Mitigation Site
Broad River Basin 03050105

Cleveland County, NC



WILDLANDS ENGINEERING

0 400 800 Feet

N

Figure 10 Monitoring Components Map
Bridgefork Dairy Mitigation Site
Broad River Basin 03050105

Cleveland County, NC

APPENDIX 1 – Historic Aerial Photos


INQUIRY #: 5986708.5
YEAR: 2016
= 500'
N
EDR


INQUIRY #: 5986708.5
YEAR: 2012
= 500'
N
EDR


INQUIRY #: 5986708.5
YEAR: 2009
= 500'
N
EDR


INQUIRY #: 5986708.5
YEAR: 2006
= 500'
N
EDR


INQUIRY #: 5986708.5
YEAR: 1983
= 500'
N
EDR


INQUIRY #: 5986708.5
YEAR: 1964
= 500'
N
EDR

INQUIRY #: 5986708.5

YEAR: 1961

= 500'

N

EDR

INQUIRY #: 5986708.5

YEAR: 1950

= 500'

N

EDR


INQUIRY #: 5986708.5
YEAR: 1938
= 500'
N
EDR

APPENDIX 2 – Preliminary Jurisdictional Determination

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2020-01962** County: **Cleveland** U.S.G.S. Quad: **NC-Waco**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Requestor: **NC DEQ Division of Mitigation Services**
Matthew Reid
Address: **5 Ravencroft Dr. Suite 102**
Asheville, NC 28801
Telephone Number: **(828) 231-7912**
E-mail: **Matthew.reid@ncdenr.gov**

Size (acres) **80**
Nearest Waterway **Potts Creek**
USGS HUC **03050105**
Nearest Town **Kings Mountain**
River Basin **Santee**
Coordinates Latitude: **35.259583**
Longitude: **-81.390695**

Location description: **Property is located at 125 Dillion Road, Kings Mountain, Cleveland County, North Carolina. PIN(s): 2585885323, 2585595279, 2585495005, 2585675964, 2585878557, 2586812597, 2585584130, 2585487530, 2585670580, 2585777748**

Indicate Which of the Following Apply:

A. Preliminary Determination

☒ There appear to be **waters** on the above described project area/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). The **waters** have been delineated, and the delineation has been verified by the Corps to be sufficiently accurate and reliable. The approximate boundaries of these waters are shown on the enclosed delineation map dated **10/14/2021**. 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 appear to be **waters** on the above described project area/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** 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** at the project area, which is not sufficiently accurate and reliable to support an enforceable permit decision. We recommend that you have the **waters** on your project area/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 project area/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** on the above described project area/property subject to the permit requirements of Section 404 of the Clean Water Act (CWA) (33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

☐ We recommend you have the **waters** on your project area/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** on your project area/property have been delineated and the delineation has been verified by the Corps. The approximate boundaries of these waters are shown on the enclosed delineation map dated **DATE**. 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** have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on **DATE**. 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/property 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 **Krystynka B Stygar at 252-545-0507 or krystynka.b.stygar@usace.army.mil**.

C. Basis For Determination: Based on information submitted by the applicant and available to the U.S. Army Corps of Engineers, the project area exhibits criteria for waters of the U.S. as defined in 33 CFR 328, Regulatory Guidance Letter 05-05, and the 1987 Wetland Delineation Manual, and/or Regional supplement to the 1987 Manual: Eastern Piedmont and Mountains v2.0 See the preliminary jurisdictional determination form dated 10/14/2021.

D. Remarks: *See attached Delineation Map entitled," Bridgefork Dairy Mitigation Site" 10/14/2021*

E. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

F. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

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
AND
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 **Not applicable**.
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: Krysto Stygar

Date of JD: **10/14/2021** Expiration Date of JD: **Not applicable**

SAW-2020-01962

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 the Customer Satisfaction Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

Copy Furnished

Property Owners:

Barbara Blanton Dellinger
130 Dillon Road
Kings Mountain, NC 28086

Bryan Keith Dellinger
125 Dillon Road
Kings Mountain, NC 28086

Hayward and Nancy Patterson
347 Patterson Road
Kings Mountain, NC 28086

William Lawrence Hamrick
240 Parkview Drive
Cartersville, GA 30120
(770)324-3436

Luke Edward Judd
175 Dillon Road
Kings Mountain, NC 28086
(704) 689-4666

Dennis and Susan Patterson
Patterson Road
Kings Mountain, NC 28086
(704) 860-4787

Agent:	**Wildlands Engineering**
	Win Taylor
Address:	**497 Bramsom Court, Suite 104**
	Mt. Pleasant, SC 29464
Telephone Number:	**843-277-6221**
E-mail:	**wtaylor@wildlandseng.com**

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: **NC DEQ Division of Mitigation Services, Matthew Reid**	File Number: **SAW-2020-01962**	Date: **10/14/2021**

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 or http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx or the Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the district engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.
SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT
REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)
ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.
POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division** **Attn: Krystynka B Stygar** **Charlotte Regulatory Office** **U.S Army Corps of Engineers** **8430 University Executive Park Drive, Suite 615** **Charlotte, North Carolina 28262**	If you only have questions regarding the appeal process you may also contact: MR. PHILIP A. SHANNIN ADMINISTRATIVE APPEAL REVIEW OFFICER CESAD-PDS-O 60 FORSYTH STREET SOUTHWEST, FLOOR M9 ATLANTA, GEORGIA 30303-8803 PHONE: (404) 562-5136; FAX (404) 562-5138 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: Krystynka B Stygar, 8430 University Executive park Drive, Suite 615 , Charlotte, North Carolina, 28262

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. Philip Shannin, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801
Phone: (404) 562-5137

PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: 09/16/2021

B. NAME AND ADDRESS OF PERSON REQUESTING PJD: NC DEQ Division of Mitigation Services, Matthew Reid, 5 Ravencroft Dr. Suite 102, Asheville, NC 28801

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: Wilmington District, Bridgefork Dairy Mitigation Site, SAW-2020-01962

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION: Property is located at 125 Dillion Road, Kings Mountain, Cleveland County, North Carolina. PIN(s): 2585885323, 2585595279, 2585495005, 2585675964, 2585878557, 2586812597, 2585584130, 2585487530, 2585670580, 2585777748

(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: NC County: Cleveland City: Kings Mountain
Center coordinates of site (lat/long in degree decimal format): Latitude: 35.259583 Longitude: -81.390695

Universal Transverse Mercator:
UTM 17

Name of nearest waterbody: Potts Creek

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:

☒ Field Determination. Date(s): October 14, 2021

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)
Bridgefork Creek	35.260218	-81.383580	7585 LF	Non-wetland waters	Section 404
UT 1	35.258288	-81.381434	1331 LF	Non-wetland waters	Section 404
UT 2	35.257299	-81.385103	217 LF	Non-wetland waters	Section 404
UT 3	35.256370	-81.388691	604 LF	Non-wetland waters	Section 404
UT 4	35.261719	-81.388767	1464 LF	Non-wetland waters	Section 404
UT 4 a	35.260266	-81.387805	961 LF	Non-wetland waters	Section 404
UT 5	35.259793	-81.395030	174 LF	Non-wetland waters	Section 404
UT 6	35.265471	-81.392898	2257 LF	Non-wetland waters	Section 404
UT 6a	35.264154	-81.392703	416 LF	Non-wetland waters	Section 404
UT 7	35.258926	-81.390273	219 LF	Non-wetland waters	Section 404
Wetland A	35.258256	-81.381466	0.052 acres	Wetland	Section 404
Wetland B	35.259512	-81.383891	0.005 acres	Wetland	Section 404
Wetland C	35.259595	-81.384577	0.197 acres	Wetland	Section 404
Wetland D	35.257481	-81.386582	0.239 acres	Wetland	Section 404
Wetland E	35.257885	-81.388199	0.030 acres	Wetland	Section 404
Wetland F	35.258819	-81.389744	0.108 acres	Wetland	Section 404

Wetland G	35.258453	-81.389947	0.153 acres	Wetland	Section 404
Wetland H	35.259776	-81.393884	0.112 acres	Wetland	Section 404
Wetland I	35.261196	-81.389064	0.006 acres	Wetland	Section 404
Wetland J	35.259787	-81.389254	0.005 acres	Wetland	Section 404
Wetland K	35.258167	-81.383049	0.107 acres	Wetland	Section 404
Wetland L	35.258813	-81.384682	0.006 acres	Wetland	Section 404
Open Water	35.258308	-81.383449	0.436 acres	Non-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 PJD (check all that apply) Checked items are included in the administrative record and are appropriately cited:

☒ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
Map: **Wildlands for NCDMS**

☒ Data sheets prepared/submitted by or on behalf of the PJD requestor. Datasheets:

☐ Office concurs with data sheets/delineation report.

☐ Office does not concur with data sheets/delineation report. Rationale:_____

☐ Data sheets prepared by the Corps:_____

☐ Corps navigable waters' study:

☐ U.S. Geological Survey Hydrologic Atlas:

☐ USGS NHD data:

☐ USGS 8 and 12 digit HUC maps:

☒ U.S. Geological Survey map(s). Cite scale & quad name: **1:24,000k Waco Quadrangle**

☒ Natural Resources Conservation Service Soil Survey. Citation: **Websoilsurvey Figure 4**

☐ National wetlands inventory map(s). Cite name:

☐ State/local wetland inventory map(s):_____

☐ FEMA/FIRM maps:

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

☒ Photographs: ☐ Aerial (Name & Date):

or ☒ Other (Name & Date): **Site Photographs Taken 10/14/2021**

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

☒ Other information (please specify): **NCDWQ Stream ID Forms, Delineation Map (Figure 3) 10/14/2021**

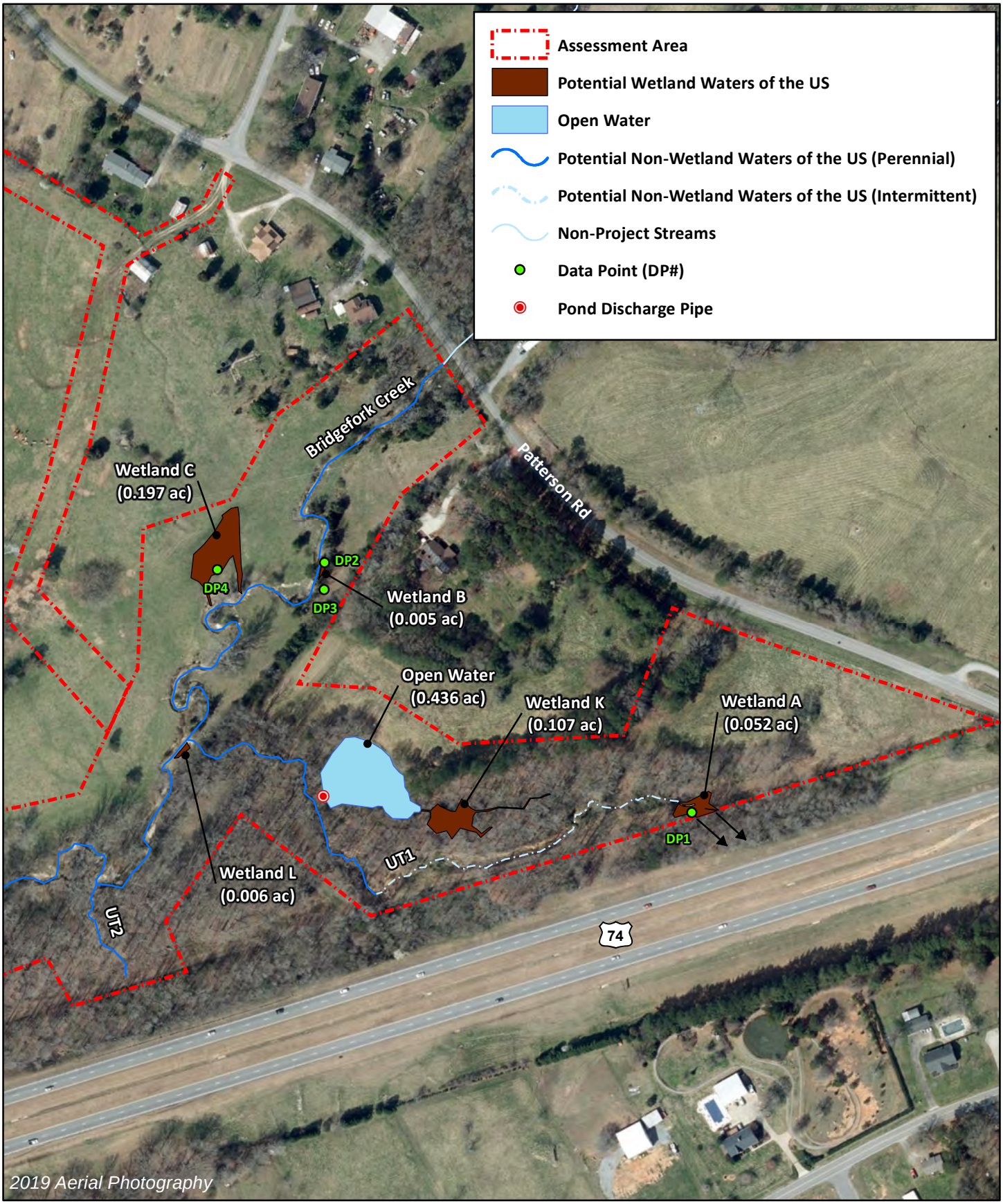
IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Krysta Snyder

Signature and date of Regulatory staff member completing PJD
10/14/2021

Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[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.



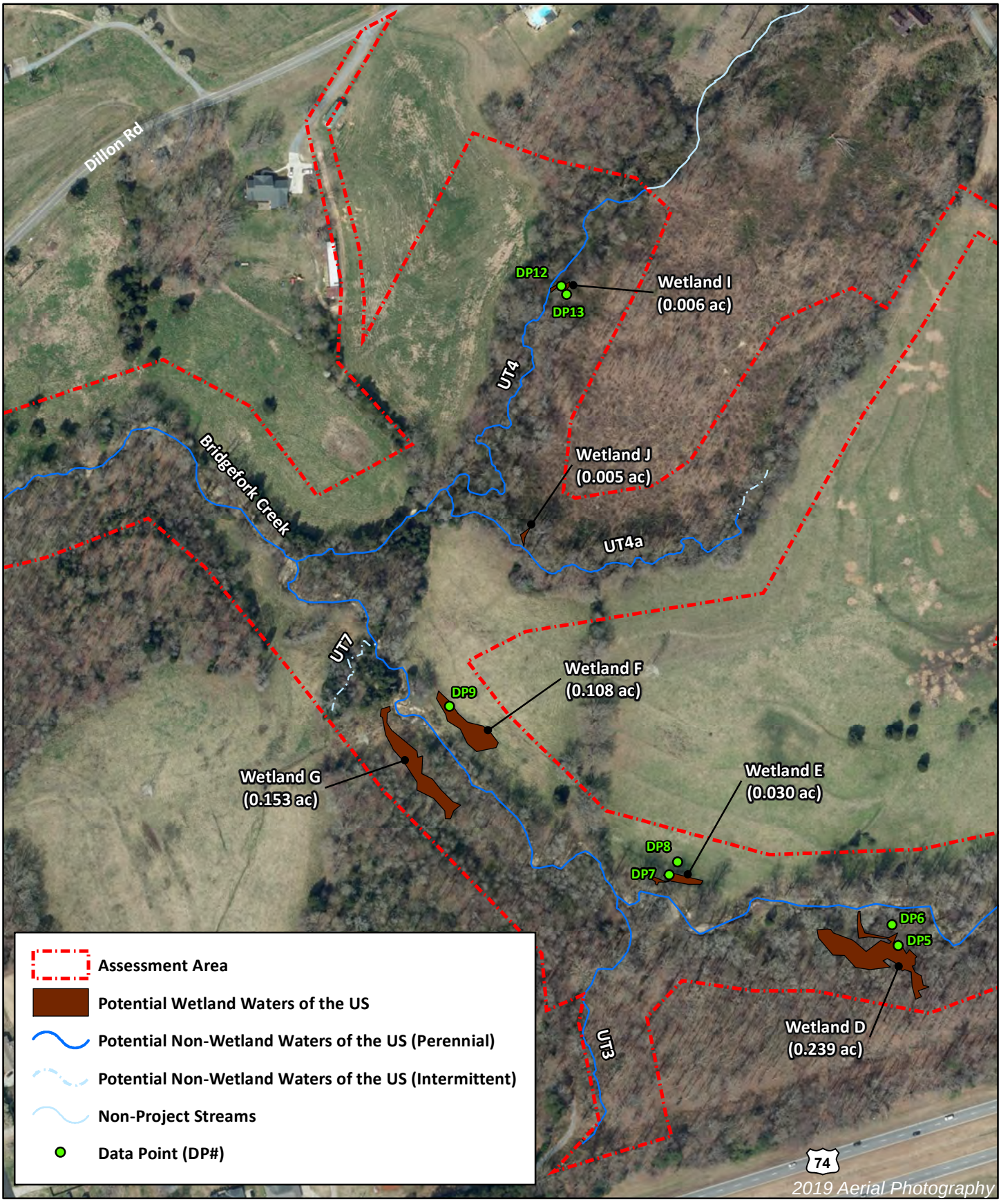
WILDLANDS ENGINEERING

0 500 Feet

N

Figure 3a Delineation Map
Bridgefork Dairy Mitigation Site
Broad River Basin (03050105)

Cleveland County, NC
10/14/2021



WILDLANDS ENGINEERING

0 500 Feet

N

Figure 3b Delineation Map
Bridgefork Dairy Mitigation Site
Broad River Basin (03050105)

Cleveland County, NC
10/14/2021

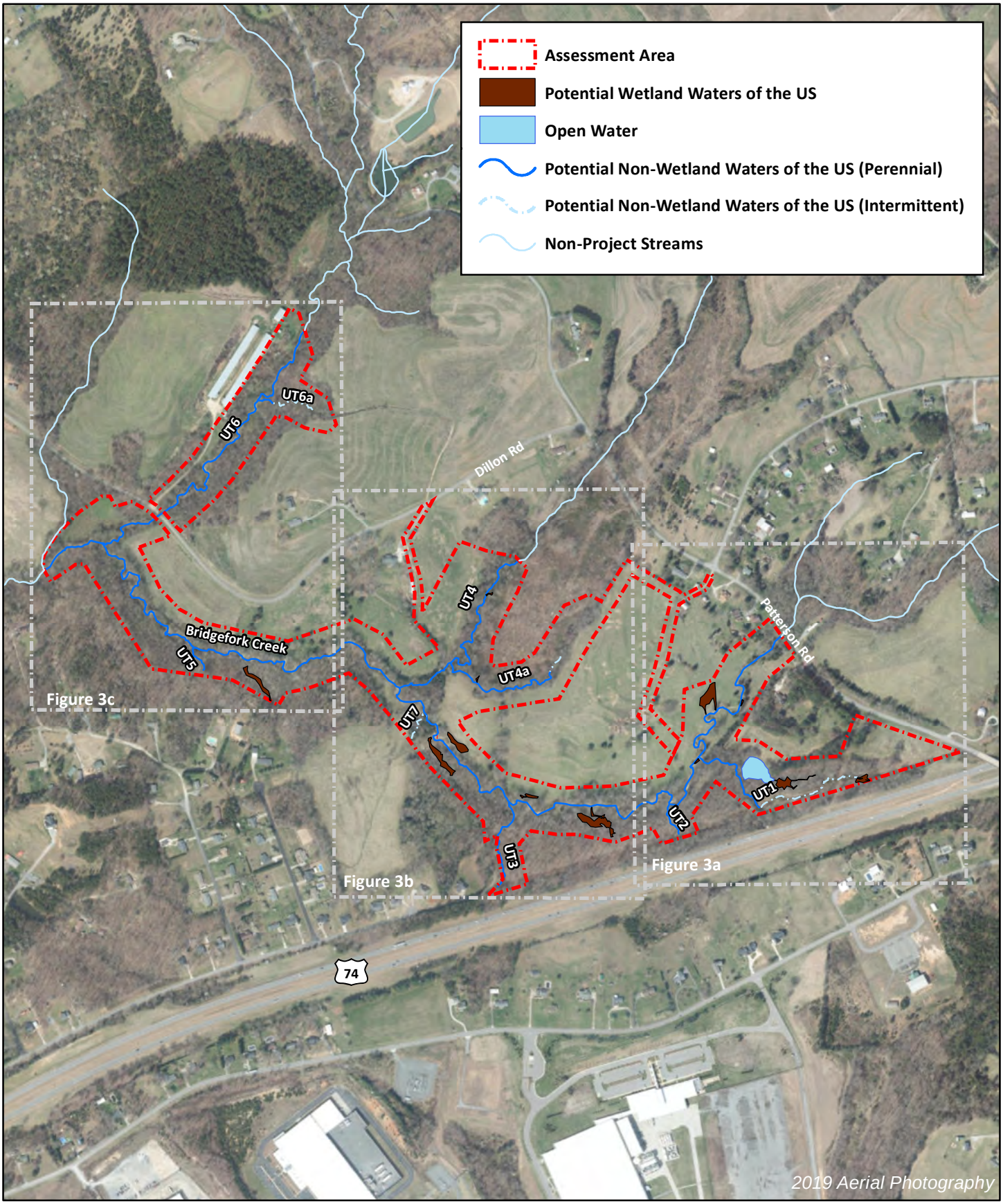
WILDLANDS ENGINEERING

0 500 Feet

N

Figure 3c Delineation Map
Bridgefork Dairy Mitigation Site
Broad River Basin (03050105)

Cleveland County, NC
10/14/2021



WILDLANDS ENGINEERING

0 1,000 Feet

N

Figure 3 Delineation Map (Overview)
Bridgefork Dairy Mitigation Site
Broad River Basin (03050105)

Cleveland County, NC
10/14/2021

APPENDIX 3 – DWR, NCSAM, and NCWAM Identification Forms

NC DWQ Stream Identification Form Version 4.11

Date: 3/9/2020	**Project/Site:** Bridgforth Dairy	**Latitude:** 35.260218
Evaluator: M. Caddell	**County:** Cleveland	**Longitude:** -81.383580
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 49.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* Bridgforth Creek

A. Geomorphology (Subtotal = 25)	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 = 17.5)				
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 = 17)				
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: crayfish(1.5), fish(1.5), caddisfly(5.5),

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 10/12/2021	**Project/Site:** Bridge Fork	**Latitude:** 35.258104
Evaluator: W. Taylor	**County:** Cleveland	**Longitude:** -81.382595
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 20.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** UT 1 - 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 = 5.5)				
12. Presence of Baseflow	(0)	1	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

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

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 3/9/2020	**Project/Site:** Bridge Fork	**Latitude:** 35.258288
Evaluator: M. Caddell	**County:** Cleveland	**Longitude:** 81.381434
Total Points: 35 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* UT1

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

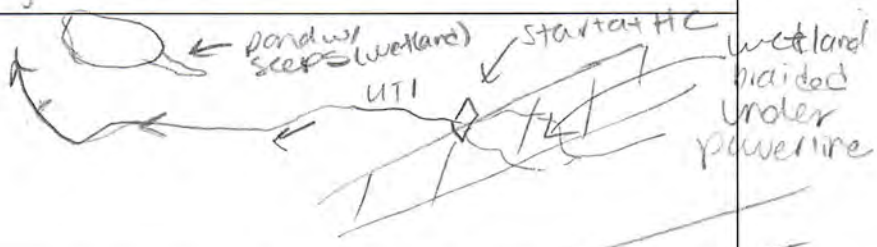
B. Hydrology (Subtotal = 11)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	1	2	(3)
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 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: tadpoles, aquatic worms, algae

Sketch:



14

NC DWQ Stream Identification Form Version 4.11

Date: 10/12/2021	Project/Site: Bridge fork	Latitude: 35.257299
Evaluator: L. Taylor	County: Cleveland	Longitude: -81.385103
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:* UT 2

A. Geomorphology (Subtotal = 16)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	(0.5)	1	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 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 = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

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

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 3/9/2020	**Project/Site:** Bridgelake Dairy	**Latitude:** 35.256370
Evaluator: M. Caddell	**County:** Cleveland	**Longitude:** -81.388691
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 36	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* UT3

A. Geomorphology (Subtotal = 16.5)	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: algae, salamander 5+, crayfish (1)

Sketch: Start at outlet of pipe by bw 74

~~UT1A~~ UT4

NC DWQ Stream Identification Form Version 4.11

Date: 3/11/20	**Project/Site:**	**Latitude:** 35.261719
Evaluator: Scott Gregory	**County:**	**Longitude:** -81.388767
Total Points: 37.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* UT4

A. Geomorphology (Subtotal = 22.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 6.5)				
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:

Sketch:

~~UT4~~ UT4a
Hamrick Fork

NC DWQ Stream Identification Form Version 4.11

Date: 3/11/2	**Project/Site:** B. Fork Dam	**Latitude:** 35.260266
Evaluator: Scott Gregory	**County:** Cleveland	**Longitude:** -81.387803
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 27	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:* UT4a

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 = 6)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	1	(2)	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	3	2	(1)	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	0.5	1	(1.5)
25. Algae	0	0.5	1	(1.5)
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

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

Notes:

Sketch:

~~UT4~~ (2/5)

NC DWQ Stream Identification Form Version 4.11

Date: 3/11/20	**Project/Site:** Tar Fork Tributary	**Latitude:** 35.260266
Evaluator: SJT Gm	**County:** Cleveland	**Longitude:** -81.387803
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 38.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** UT4a *e.g. Quad Name:*

A. Geomorphology (Subtotal = 24)	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 = 2.5)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	1	(2)	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	0	0.5	1	(1.5)
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 7)				
18. Fibrous roots in streambed	3	2	(1)	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	0.5	1	(1.5)
25. Algae	0	0.5	1	(1.5)
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

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

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 3/9/2020	**Project/Site:** Bridge Lake Dairy	**Latitude:** 35.259793
Evaluator: M Caddell	**County:** Cleveland	**Longitude:** -81.395030
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 32	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* ~~UT4~~ UT5

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

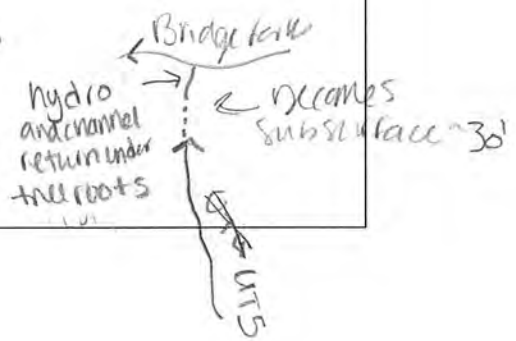
B. Hydrology (Subtotal = 9.5)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	1	(2)	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 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: 4 damsel, 1 dragon, 2 salamanders, algae

Sketch: Eval at property line, continues above as perennial stream



NC DWQ Stream Identification Form Version 4.11

Date: 3/9/2020	**Project/Site:** Bridgefork	**Latitude:** 35.265471
Evaluator: M. Caddell	**County:** Cleveland	**Longitude:** -81.392898
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 40	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** ~~Dethrogor Trib~~ UT6 *e.g. Quad Name:*

A. Geomorphology (Subtotal = 19.5)	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

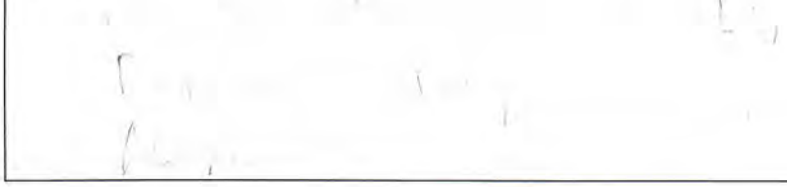
B. Hydrology (Subtotal = 10.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 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: damselfly, caddisfly (2+), mayfly (3+), Salamander

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 3/9/2020	**Project/Site:** Bridgefork Pkwy	**Latitude:** 35.264154
Evaluator: M. Caddell	**County:** Cleveland	**Longitude:** -81.392703
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 25.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** ~~UT to Bellinger~~ *e.g. Quad Name:* UT6a

A. Geomorphology (Subtotal = 11)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	(0)	1	2	3
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	(0)	1	2	3
9. Grade control	(0)	0.5	1	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

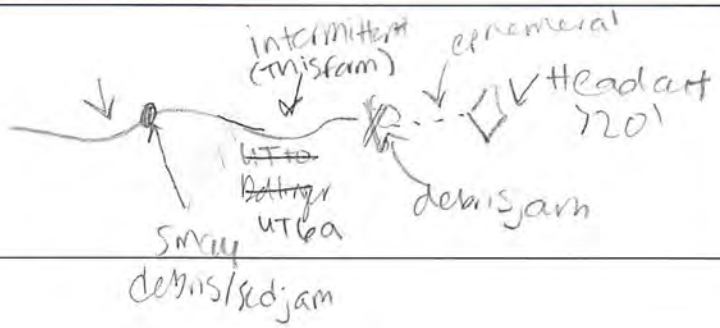
B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

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

Notes: Notice erosional cycle

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 3/9/2020	Project/Site: Bridgefork Dairy	Latitude: 35.264248
Evaluator: M. Caddell	County: Cleveland	Longitude: -81.393456
Total Points: 33 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other ~~UT to Dellinger~~ UT6a *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

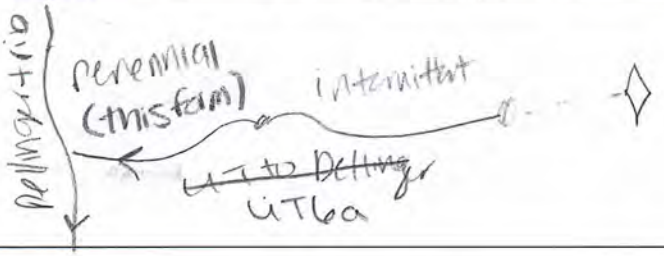
B. Hydrology (Subtotal = 10)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 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: Dragonfly (3), Algae, Stronger bed bank and hyporheic

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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.260074, -81.383861

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): R1a (Bridgefork Creek)
10. Length of assessment reach evaluated (feet): 282
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1.5 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 17
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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb3	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**MEDIUM**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**MEDIUM**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**HIGH**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**HIGH**	
(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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.257909, -81.388653

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Bridgefork Creek R1b
10. Length of assessment reach evaluated (feet): 3,114
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 6 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 35
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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pa3	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**LOW**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(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	**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	**LOW**	
(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	**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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.260359, -81.391859

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): R2 (Bridgefork Creek)
10. Length of assessment reach evaluated (feet): 1,562
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 15-20
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 mi²) ☐Size 2 (0.1 to < 0.5 mi²) ☒Size 3 (0.5 to < 5 mi²) ☐Size 4 (≥ 5 mi²)

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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pa3	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**MEDIUM**	
(4) Wooded Riparian Buffer	**HIGH**	
(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	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**HIGH**	
(3) Upland Pollutant Filtration	**HIGH**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.261484, -81.397896

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): R3 (Bridgefork Creek)
10. Length of assessment reach evaluated (feet): 2,416
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4 ☐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		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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pa3	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**MEDIUM**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(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	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**HIGH**	
(3) Upland Pollutant Filtration	**HIGH**	
(3) Thermoregulation	**HIGH**	
(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	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(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	**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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.257853, -81.383350

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT1 - Intermittent
10. Length of assessment reach evaluated (feet): 737
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 7 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 10-15
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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb1	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**LOW**	**LOW**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Flood Flow	**LOW**	**LOW**
(3) Streamside Area Attenuation	**LOW**	**LOW**
(4) Floodplain Access	**LOW**	**LOW**
(4) Wooded Riparian Buffer	**MEDIUM**	**MEDIUM**
(4) Microtopography	NA	NA
(3) Stream Stability	**LOW**	**LOW**
(4) Channel Stability	**LOW**	**LOW**
(4) Sediment Transport	**LOW**	**LOW**
(4) Stream Geomorphology	**LOW**	**LOW**
(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	**MEDIUM**	**MEDIUM**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Streamside Area Vegetation	**HIGH**	**HIGH**
(3) Upland Pollutant Filtration	**HIGH**	**HIGH**
(3) Thermoregulation	**MEDIUM**	**MEDIUM**
(2) Indicators of Stressors	**YES**	**YES**
(2) Aquatic Life Tolerance	**OMITTED**	**NA**
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	**LOW**	**LOW**
(2) In-stream Habitat	**LOW**	**LOW**
(3) Baseflow	**MEDIUM**	**MEDIUM**
(3) Substrate	**LOW**	**LOW**
(3) Stream Stability	**LOW**	**LOW**
(3) In-stream Habitat	**LOW**	**LOW**
(2) Stream-side Habitat	**MEDIUM**	**MEDIUM**
(3) Stream-side Habitat	**LOW**	**LOW**
(3) Thermoregulation	**HIGH**	**HIGH**
(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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.258542, -81.384662

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT1 - Perennial
10. Length of assessment reach evaluated (feet): 597
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 7 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 17
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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb1	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**LOW**	
(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	**HIGH**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**HIGH**	
(3) Upland Pollutant Filtration	**HIGH**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**OMITTED**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**LOW**	
(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	**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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.257731, -81.385335

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT2
10. Length of assessment reach evaluated (feet): 273
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4 ☐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 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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb1	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**LOW**	
(4) Sediment Transport	**MEDIUM**	
(4) Stream Geomorphology	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**OMITTED**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**LOW**	
(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	**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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.257646, -81.388476

STREAM INFORMATION: (depth and width can be approximations)

UT3-Enhancment

9. Site number (show on attached map): I
10. Length of assessment reach evaluated (feet): 614
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): 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************************************

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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb1	Assessor Name/Organization	Wildlands Engineering

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**MEDIUM**	
(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	**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	**LOW**	
(3) Baseflow	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**LOW**	
(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	**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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.259635, -81.390737

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT4
10. Length of assessment reach evaluated (feet): 614
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): 13
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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb2	Assessor Name/Organization	Wildlands Engineering

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**MEDIUM**	
(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	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**HIGH**	
(3) Upland Pollutant Filtration	**HIGH**	
(3) Thermoregulation	**HIGH**	
(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	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**MEDIUM**	
(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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.259935, -81.387761

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT4a Intermittent
10. Length of assessment reach evaluated (feet): 113
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 12
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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb1	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**LOW**	**LOW**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Flood Flow	**LOW**	**LOW**
(3) Streamside Area Attenuation	**LOW**	**LOW**
(4) Floodplain Access	**LOW**	**LOW**
(4) Wooded Riparian Buffer	**MEDIUM**	**MEDIUM**
(4) Microtopography	NA	NA
(3) Stream Stability	**LOW**	**LOW**
(4) Channel Stability	**LOW**	**LOW**
(4) Sediment Transport	**LOW**	**LOW**
(4) Stream Geomorphology	**MEDIUM**	**MEDIUM**
(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	**MEDIUM**	**MEDIUM**
(3) Upland Pollutant Filtration	**LOW**	**LOW**
(3) Thermoregulation	**HIGH**	**HIGH**
(2) Indicators of Stressors	**YES**	**YES**
(2) Aquatic Life Tolerance	**OMITTED**	**NA**
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	**MEDIUM**	**HIGH**
(2) In-stream Habitat	**LOW**	**MEDIUM**
(3) Baseflow	**MEDIUM**	**MEDIUM**
(3) Substrate	**LOW**	**LOW**
(3) Stream Stability	**LOW**	**LOW**
(3) In-stream Habitat	**LOW**	**HIGH**
(2) Stream-side Habitat	**HIGH**	**HIGH**
(3) Stream-side Habitat	**MEDIUM**	**MEDIUM**
(3) Thermoregulation	**HIGH**	**HIGH**
(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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.259950, -81.389743

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT4a Perennial
10. Length of assessment reach evaluated (feet): 1004
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 5 ☐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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb2	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**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	**MEDIUM**	
(3) Upland Pollutant Filtration	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**OMITTED**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**LOW**	
(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	**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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.260160, -81.395000

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT5
10. Length of assessment reach evaluated (feet): 142
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 8
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☒Perennial flow ☐Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☐ Mountains (M) ☒ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)
16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☒A  (more sinuous stream, flatter valley slope)
☐B  (less sinuous stream, steeper valley slope)
17. Watershed size: **(skip for Tidal Marsh Stream)** ☒Size 1 (< 0.1 mi^2) ☐Size 2 (0.1 to < 0.5 mi^2) ☐Size 3 (0.5 to < 5 mi^2) ☐Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

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

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

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

2. Evidence of Flow Restriction – assessment reach metric

☐A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction 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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pa1	Assessor Name/Organization	Wildlands Engineering

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**HIGH**	
(4) Microtopography	**HIGH**	
(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	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**HIGH**	
(3) Upland Pollutant Filtration	**HIGH**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**OMITTED**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**HIGH**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**LOW**	
(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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.261885, -81.396711

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT6
10. Length of assessment reach evaluated (feet): 2,184
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 15
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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb2	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(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	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**HIGH**	
(3) Upland Pollutant Filtration	**HIGH**	
(3) Thermoregulation	**HIGH**	
(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	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(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	**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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.264275, -81.393421

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT6a Intermittent
10. Length of assessment reach evaluated (feet): 300
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb1	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**LOW**	**LOW**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Flood Flow	**LOW**	**LOW**
(3) Streamside Area Attenuation	**LOW**	**LOW**
(4) Floodplain Access	**LOW**	**LOW**
(4) Wooded Riparian Buffer	**HIGH**	**HIGH**
(4) Microtopography	NA	NA
(3) Stream Stability	**LOW**	**LOW**
(4) Channel Stability	**LOW**	**LOW**
(4) Sediment Transport	**LOW**	**LOW**
(4) Stream Geomorphology	**MEDIUM**	**MEDIUM**
(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	**MEDIUM**	**MEDIUM**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Streamside Area Vegetation	**HIGH**	**HIGH**
(3) Upland Pollutant Filtration	**HIGH**	**HIGH**
(3) Thermoregulation	**MEDIUM**	**MEDIUM**
(2) Indicators of Stressors	**YES**	**YES**
(2) Aquatic Life Tolerance	**OMITTED**	**NA**
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	**LOW**	**LOW**
(2) In-stream Habitat	**LOW**	**LOW**
(3) Baseflow	**MEDIUM**	**MEDIUM**
(3) Substrate	**LOW**	**LOW**
(3) Stream Stability	**LOW**	**LOW**
(3) In-stream Habitat	**LOW**	**LOW**
(2) Stream-side Habitat	**MEDIUM**	**MEDIUM**
(3) Stream-side Habitat	**MEDIUM**	**MEDIUM**
(3) Thermoregulation	**MEDIUM**	**MEDIUM**
(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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.264300, -81.393770

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT6a Perennial
10. Length of assessment reach evaluated (feet): 102
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 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 and 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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pb1	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**HIGH**	
(3) Upland Pollutant Filtration	**HIGH**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**OMITTED**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**LOW**	
(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	**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): Bridgefork Creek Mitigation Site
2. Date of evaluation: 12/02/2021
3. Applicant/owner name: NC DMS
4. Assessor name/organization: Wildlands Engineering
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Potts Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.259146, -81.390266

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): UT7
10. Length of assessment reach evaluated (feet): 215
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 5
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☐Perennial flow ☒Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☐ Mountains (M) ☒ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)
16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**): ☒A  (more sinuous stream, flatter valley slope) ☐B  (less sinuous stream, steeper valley slope)
17. Watershed size: **(skip for Tidal Marsh Stream)** ☒Size 1 (< 0.1 mi^2) ☐Size 2 (0.1 to < 0.5 mi^2) ☐Size 3 (0.5 to < 5 mi^2) ☐Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

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

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

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

2. Evidence of Flow Restriction – assessment reach metric

- ☐A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction 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	Bridgefork Creek Mitigation Site	Date of Assessment	12/02/2021
Stream Category	Pa1	Assessor Name/Organization	Wildlands Engineering

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**HIGH**	**HIGH**
(2) Flood Flow	**HIGH**	**HIGH**
(3) Streamside Area Attenuation	**HIGH**	**HIGH**
(4) Floodplain Access	**HIGH**	**HIGH**
(4) Wooded Riparian Buffer	**HIGH**	**HIGH**
(4) Microtopography	**HIGH**	**HIGH**
(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		
(2) Baseflow	**HIGH**	**HIGH**
(2) Streamside Area Vegetation	**HIGH**	**HIGH**
(3) Upland Pollutant Filtration	**HIGH**	**HIGH**
(3) Thermoregulation	**HIGH**	**HIGH**
(2) Indicators of Stressors	**NO**	**NO**
(2) Aquatic Life Tolerance		**NA**
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	**LOW**	**HIGH**
(2) In-stream Habitat	**LOW**	**MEDIUM**
(3) Baseflow	**HIGH**	**HIGH**
(3) Substrate	**LOW**	**LOW**
(3) Stream Stability	**HIGH**	**HIGH**
(3) In-stream Habitat	**LOW**	**HIGH**
(2) Stream-side Habitat	**HIGH**	**HIGH**
(3) Stream-side Habitat	**HIGH**	**HIGH**
(3) Thermoregulation	**HIGH**	**HIGH**
(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		**HIGH**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland A
Wetland Type	Headwater Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☒B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☒A	☒A	☒A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☐C	☐C	☐C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☒E	☒E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☒C From 15 to < 30 feet
- ☐D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☒G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☐A Sediment deposition is not excessive, but at approximately natural levels.
☒B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☒J	☒J	☒J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☒D	From 10 to < 50 acres
☒E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☒A	☒A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

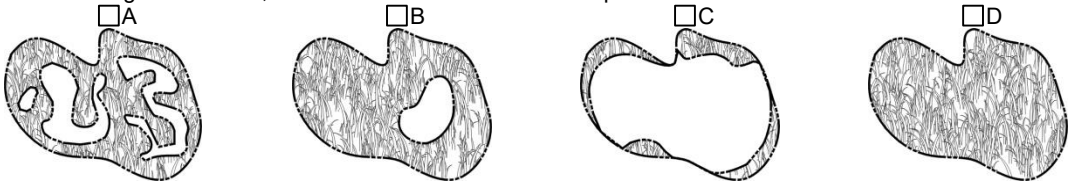
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☒A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland A	Date of Assessment	5/25/2021
Wetland Type	Headwater Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

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

Overall Wetland Rating **MEDIUM**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland B
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☐A	☐A	Not severely altered
☒B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☐A	Water storage capacity and duration are not altered.
☒B	☒B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☒B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☒E	☒E	☒E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☒D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☒B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☐A Sediment deposition is not excessive, but at approximately natural levels.
☒B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☒K	☒K	☒K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☒F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☐B 1 to 4
☒C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

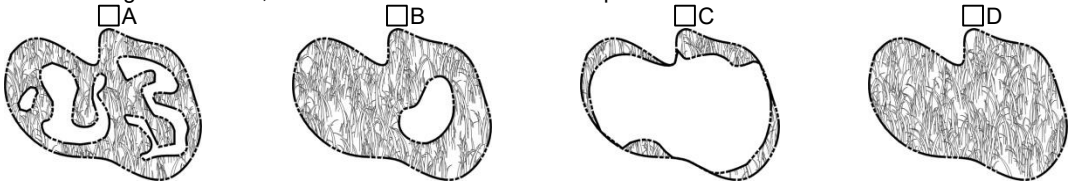
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☒C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland B	Date of Assessment	5/25/2021
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-surface Storage and Retention	Condition	**MEDIUM**
Water Quality	Pathogen Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Physical Change	Condition	**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	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland C
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☐ Yes ☒ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☐A	☐A	Not severely altered
☒B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☐A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☒C	☒C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☒B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☒E	☒E	☒E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☐D From 5 to < 15 feet
- ☒E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☒B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☐A Sediment deposition is not excessive, but at approximately natural levels.
☒B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☒K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☒F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☐B 1 to 4
☒C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☒A	☒A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

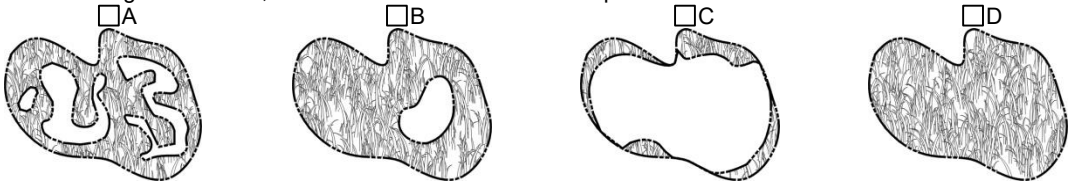
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☒D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland C	Date of Assessment	5/25/2021
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	
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	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland D
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)

Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☐ Yes ☒ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☒A	Water storage capacity and duration are not altered.
☒B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☒B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☒A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☐C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☒D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☒D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☐A Sediment deposition is not excessive, but at approximately natural levels.
☒B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☒I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☒D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☒B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☒A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☒A	☒A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☒A	☒A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☒A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

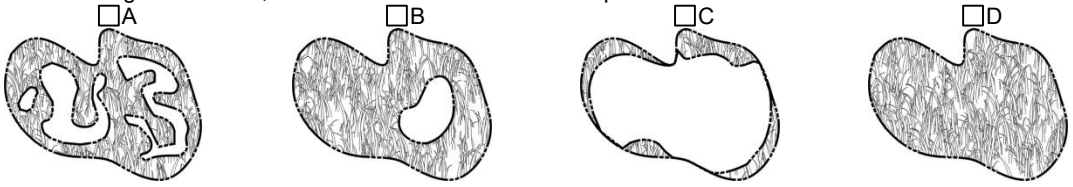
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland D	Date of Assessment	5/25/2021
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		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	**HIGH**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

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

Overall Wetland Rating **MEDIUM**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland E
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☐ Yes ☒ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☐A	☐A	Not severely altered
☒B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☐A	Water storage capacity and duration are not altered.
☒B	☒B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☒B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☒D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☐A Sediment deposition is not excessive, but at approximately natural levels.
☒B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☒J	☒J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☒K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☒D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☒C	☒C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

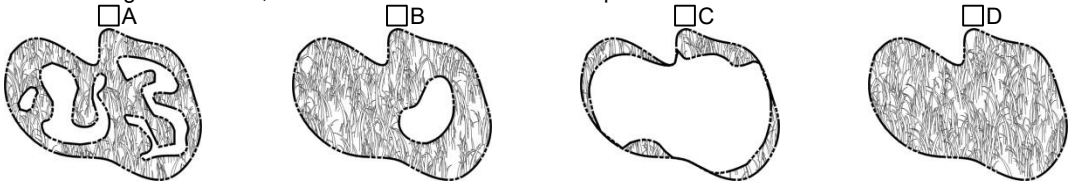
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland E	Date of Assessment	5/25/2021
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**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	**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	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland F
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☐Yes ☐No If Yes, check all that apply to the assessment area.

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☐ Yes ☒ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☐A	Water storage capacity and duration are not altered.
☒B	☒B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☒C	☒C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐D	☐D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☒B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☐D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☒E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☒K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☒D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☐B 1 to 4
☒C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☒A	☒A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

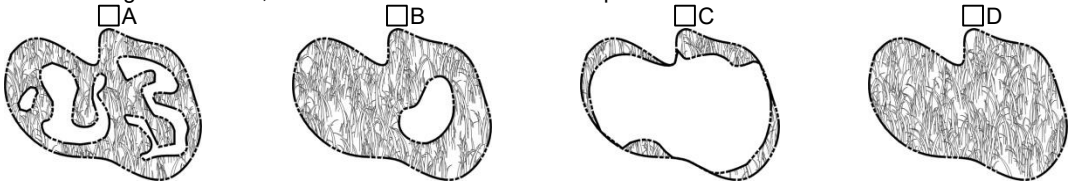
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland F	Date of Assessment	5/25/2021
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**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	**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	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland G
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☐ Yes ☒ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☐A	Water storage capacity and duration are not altered.
☒B	☒B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☐C	☐C	☐C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☒E	☒E	☒E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☒B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☐D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☒E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☒J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☒C	From 50 to < 100 acres
☒D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☒B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☒B	☒B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☒A	☒A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☒A	☒A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☒A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

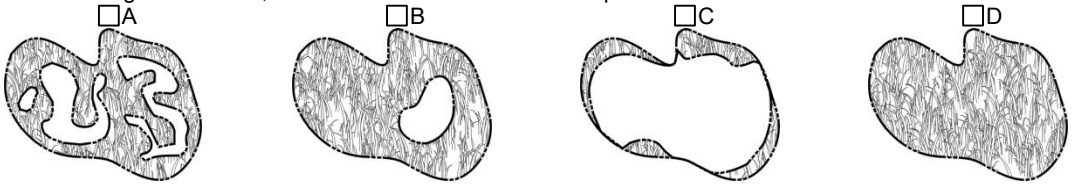
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland G	Date of Assessment	5/25/2021
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		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	**HIGH**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

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

Overall Wetland Rating **MEDIUM**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland H
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☐ Yes ☒ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☐ Yes ☒ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☒A	Not severely altered
☐B	☐B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☐C	☐C	☐C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☒E	☒E	☒E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☒C From 15 to < 30 feet
- ☐D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☒F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☒J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☒D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☒A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☒A	☒A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

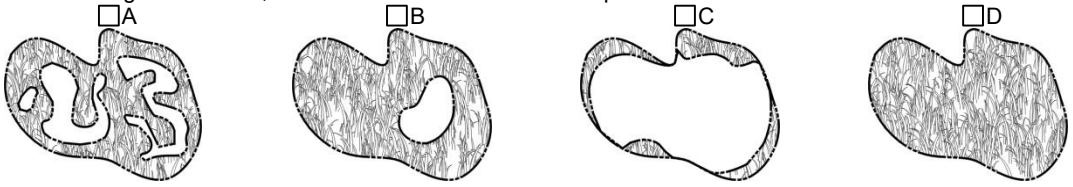
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland H	Date of Assessment	5/25/2021
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	NO
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	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		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	**MEDIUM**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**HIGH**

Function Rating Summary

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

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland L
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☐A	☐A	Not severely altered
☒B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☒A	Water storage capacity and duration are not altered.
☒B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☒B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☒E	☒E	☒E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☒D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☒B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☒K	☒K	☒K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☒D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☒C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☒B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

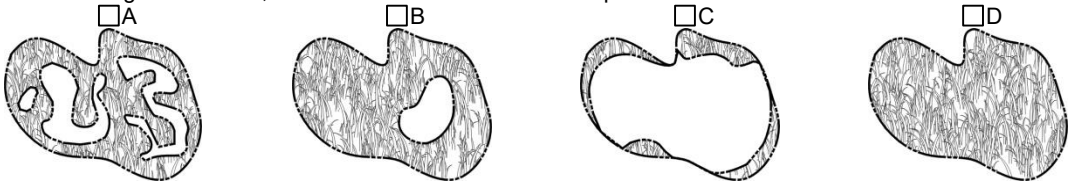
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☒A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland L	Date of Assessment	5/25/2021
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
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	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**YES**
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Physical Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

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

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland J
Wetland Type	Headwater Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☐ Yes ☒ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☐ Yes ☒ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☒A	Not severely altered
☐B	☐B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☐A	Water storage capacity and duration are not altered.
☐B	☒B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☐C	☐C	☐C	≥ 20% coverage of pasture
☒D	☒D	☒D	≥ 20% coverage of agricultural land (regularly plowed land)
☒E	☒E	☒E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☒D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☒K	☒K	☒K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☒D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☒A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☒A	☒A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☒B	☒B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☒C	☒C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☒A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

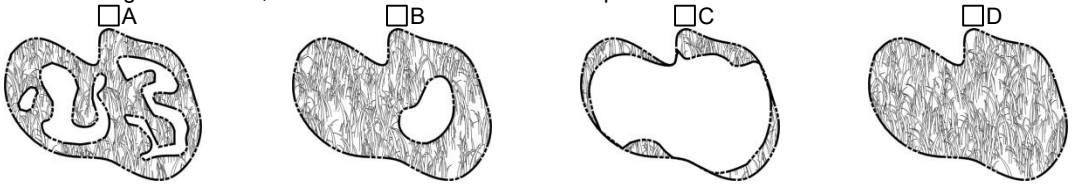
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland J	Date of Assessment	5/25/2021
Wetland Type	Headwater Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	NO
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	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Physical Change	Condition	**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	**HIGH**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**HIGH**

Function Rating Summary

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

Overall Wetland Rating **HIGH**

NC WAM FIELD ASSESSMENT FORM
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USACE AID #		NCDWR#	
Project Name	Bridgefork Mitigation Site	Date of Evaluation	5/25/2021
Applicant/Owner Name	Wildlands Engineering Inc.	Wetland Site Name	Wetland K
Wetland Type	Headwater Forest	Assessor Name/Organization	W. Taylor (WEI)
Level III Ecoregion	Piedmont	Nearest Named Water Body	Potts Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.257901 -81.388498

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

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

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☒A	Not severely altered
☐B	☐B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☒B	☒B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐D	☐D	Depressions able to pond water < 3 inches deep

3b. ☒A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☐C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☒A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☐C	☐C	☐C	≥ 20% coverage of pasture
☐D	☒D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☒E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☒B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☐D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☒E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☒J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☒C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☒B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☒B	☒B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☒C	☒C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

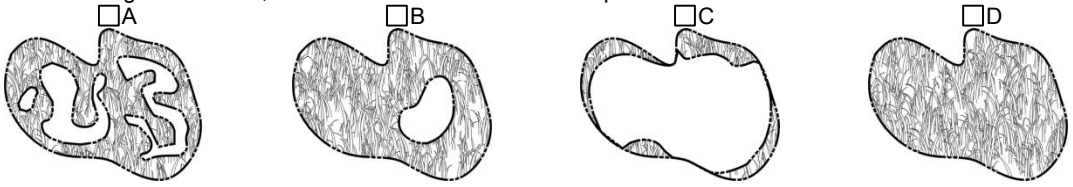
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☒A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland K	Date of Assessment	5/25/2021
Wetland Type	Headwater Forest	Assessor Name/Organization	W. Taylor (WEI)

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**HIGH**
	Sub-surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**MEDIUM**
		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	**MEDIUM**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

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

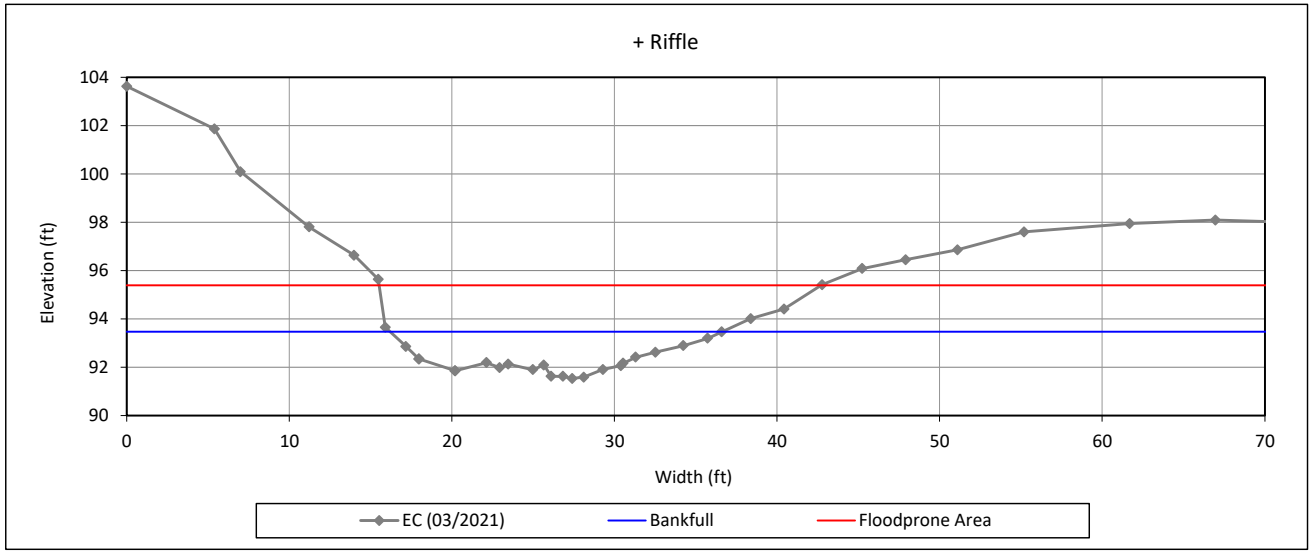
Overall Wetland Rating **HIGH**

APPENDIX 4 – Supplementary Design Information

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 1 - Bridgefork Reach 1A



Bankfull Dimensions

24.1	x-section area (ft.sq.)
20.4	width (ft)
1.2	mean depth (ft)
1.9	max depth (ft)
21.3	wetted perimeter (ft)
1.1	hydraulic radius (ft)
17.2	width-depth ratio
27.2	W flood prone area (ft)
1.3	entrenchment ratio
2.4	low bank height ratio

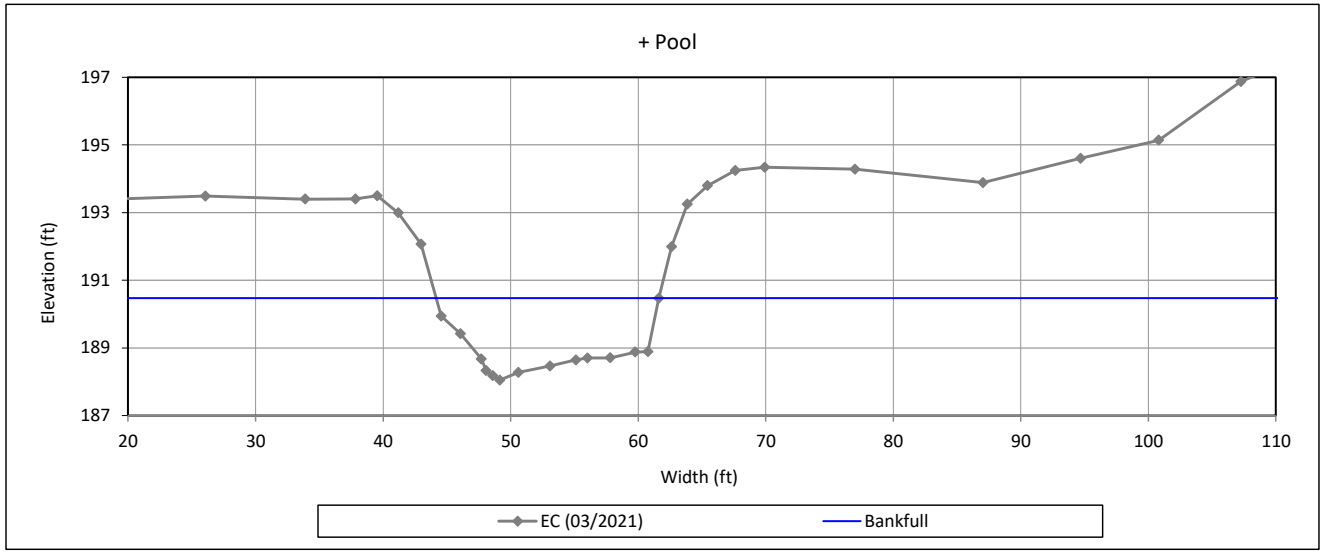
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 2 - Bridgefork Reach 1B



Bankfull Dimensions	
29.6	x-section area (ft.sq.)
17.5	width (ft)
1.7	mean depth (ft)
2.4	max depth (ft)
19.1	wetted perimeter (ft)
1.5	hydraulic radius (ft)
10.3	width-depth ratio

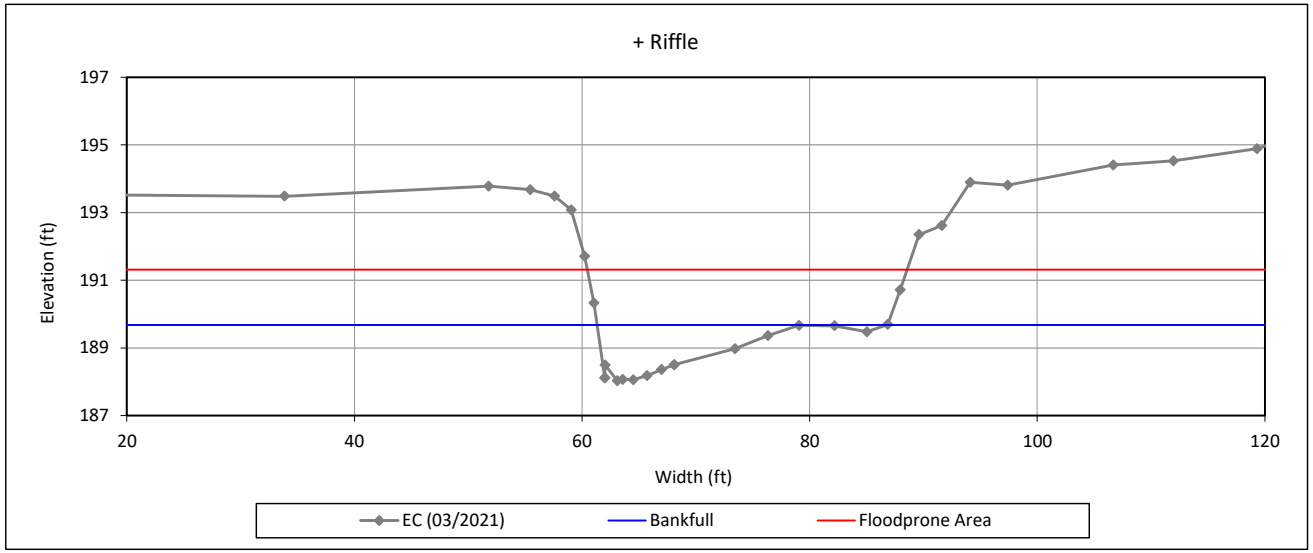
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 3 - Bridgefork Reach 1B



Bankfull Dimensions

16.2	x-section area (ft.sq.)
17.7	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
19.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
19.4	width-depth ratio
32.2	W flood prone area (ft)
1.8	entrenchment ratio
3.3	low bank height ratio

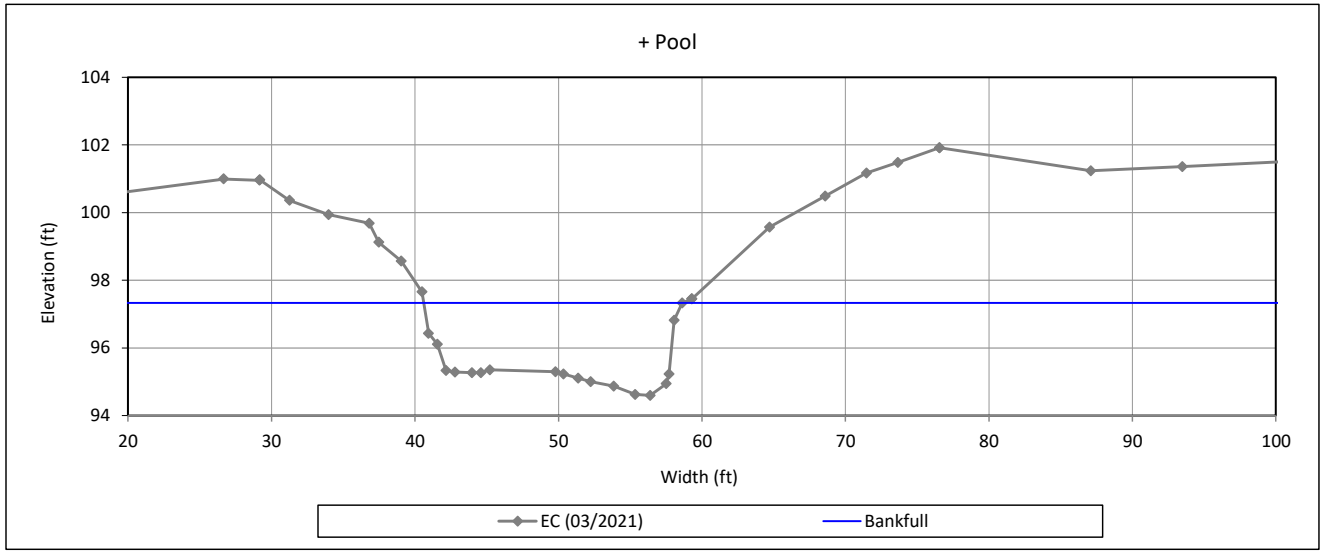
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 4 - Bridgefork Reach 2



Bankfull Dimensions	
37.0	x-section area (ft.sq.)
18.0	width (ft)
2.1	mean depth (ft)
2.7	max depth (ft)
20.8	wetted perimeter (ft)
1.8	hydraulic radius (ft)
8.8	width-depth ratio

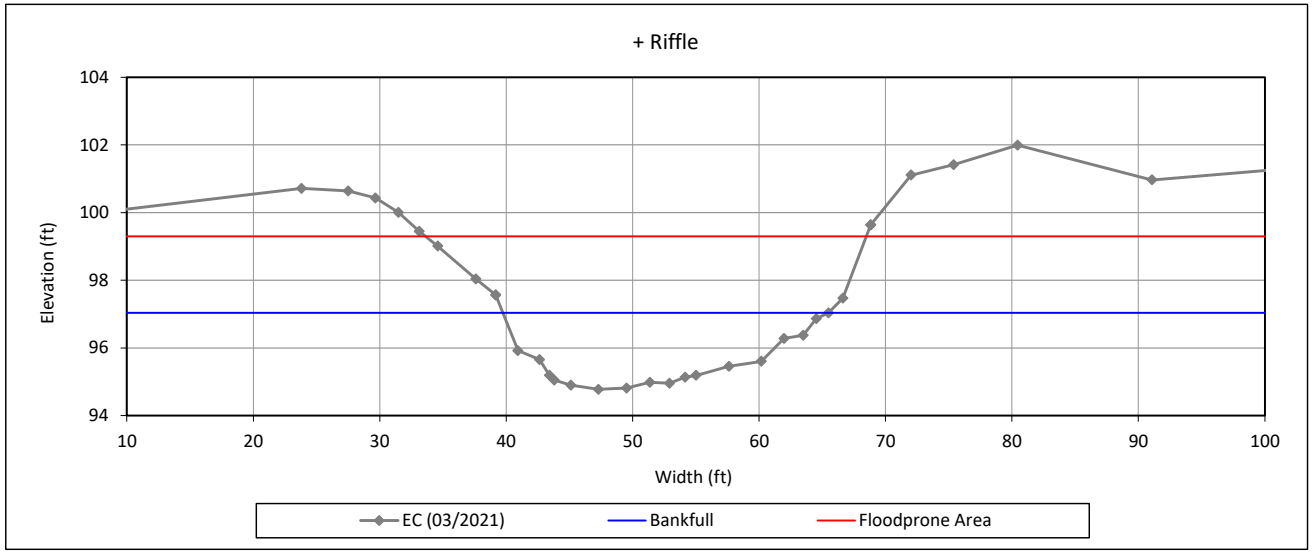
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 5 - Bridgefork Reach 2



Bankfull Dimensions

40.4	x-section area (ft.sq.)
25.7	width (ft)
1.6	mean depth (ft)
2.3	max depth (ft)
26.7	wetted perimeter (ft)
1.5	hydraulic radius (ft)
16.4	width-depth ratio
34.8	W flood prone area (ft)
1.4	entrenchment ratio
2.5	low bank height ratio

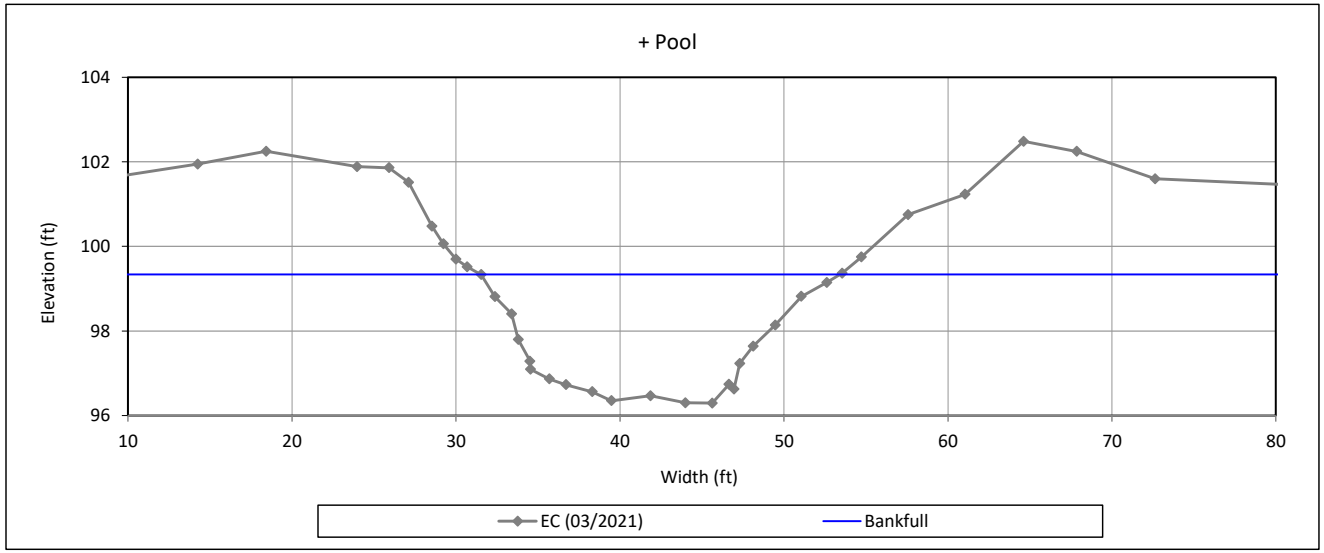
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 6 - Bridgefork Reach 3



Bankfull Dimensions	
44.0	x-section area (ft.sq.)
21.9	width (ft)
2.0	mean depth (ft)
3.0	max depth (ft)
23.7	wetted perimeter (ft)
1.9	hydraulic radius (ft)
10.9	width-depth ratio

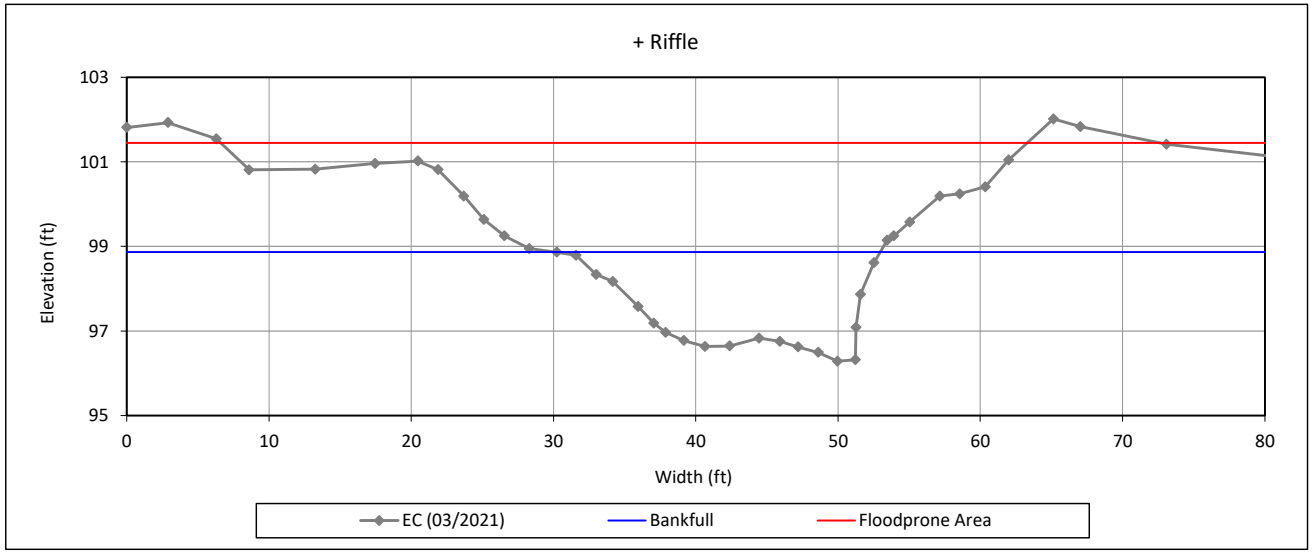
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 7 - Bridgefork Reach 3



Bankfull Dimensions

36.9	x-section area (ft.sq.)
22.7	width (ft)
1.6	mean depth (ft)
2.6	max depth (ft)
24.6	wetted perimeter (ft)
1.5	hydraulic radius (ft)
14.0	width-depth ratio
64.1	W flood prone area (ft)
2.8	entrenchment ratio
1.8	low bank height ratio

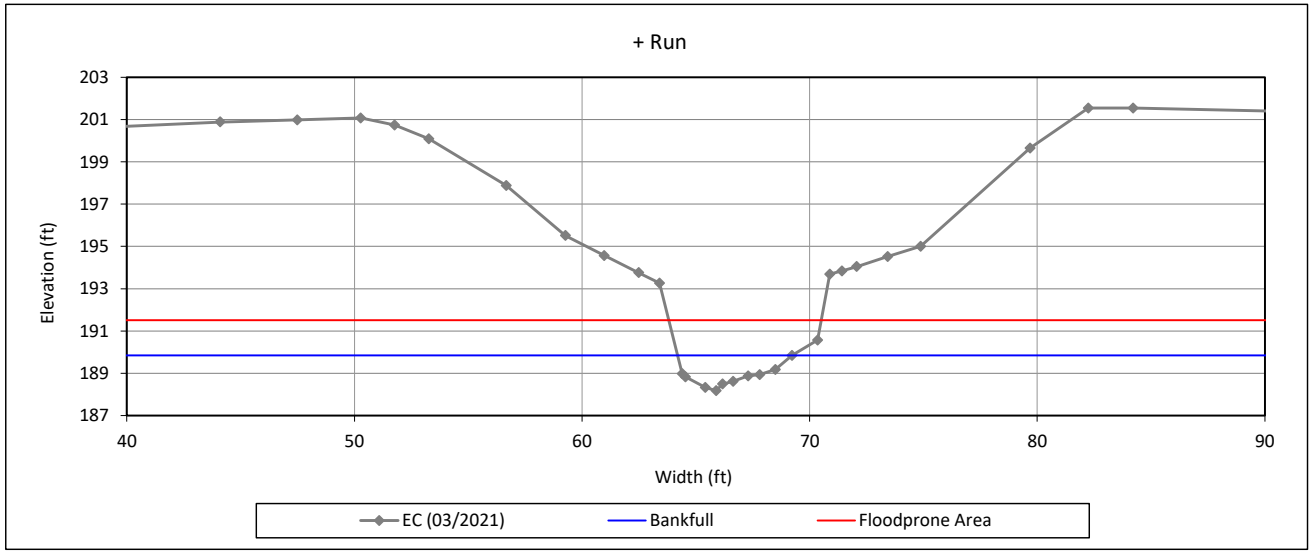
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 8 - UT1



Bankfull Dimensions

5.1	x-section area (ft.sq.)
5.0	width (ft)
1.0	mean depth (ft)
1.7	max depth (ft)
6.4	wetted perimeter (ft)
0.8	hydraulic radius (ft)
4.9	width-depth ratio
6.7	W flood prone area (ft)
1.3	entrenchment ratio
3.1	low bank height ratio

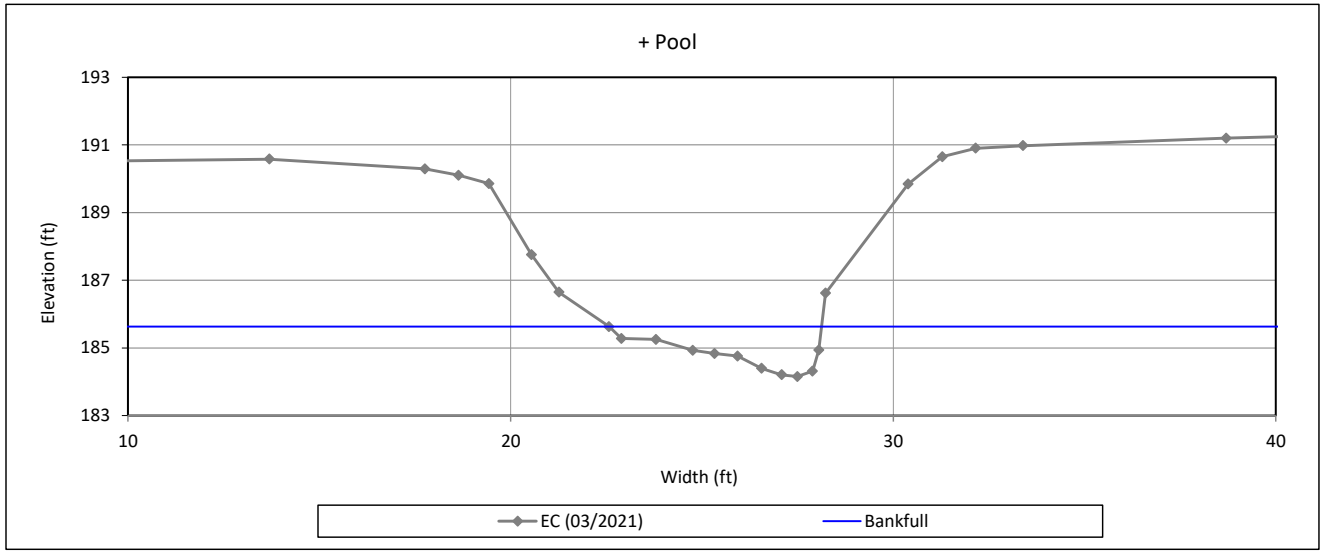
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 9 - UT1



Bankfull Dimensions	
4.5	x-section area (ft.sq.)
5.6	width (ft)
0.8	mean depth (ft)
1.5	max depth (ft)
7.0	wetted perimeter (ft)
0.6	hydraulic radius (ft)
6.8	width-depth ratio

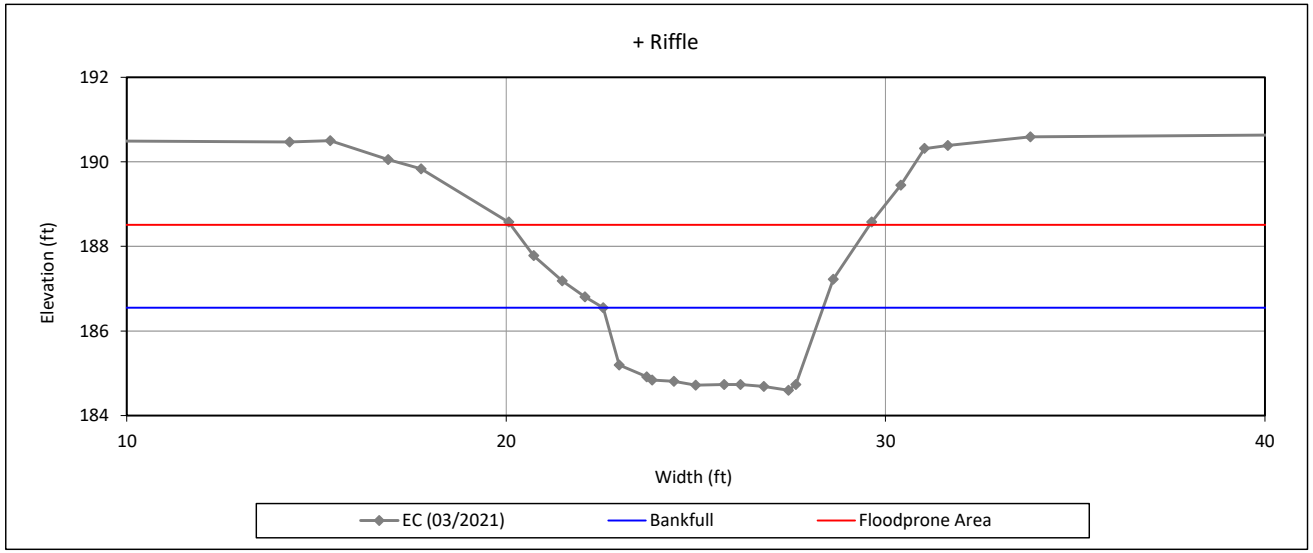
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 10 - UT1



Bankfull Dimensions

9.2	x-section area (ft.sq.)
5.8	width (ft)
1.6	mean depth (ft)
2.0	max depth (ft)
8.2	wetted perimeter (ft)
1.1	hydraulic radius (ft)
3.7	width-depth ratio
9.8	W flood prone area (ft)
1.7	entrenchment ratio
2.8	low bank height ratio

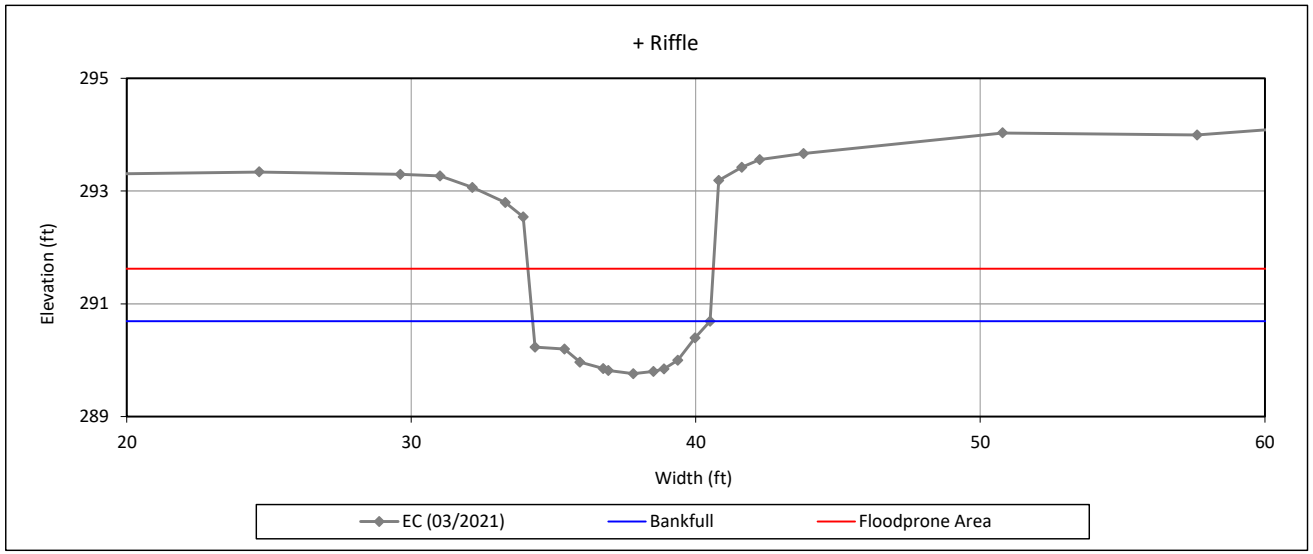
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 11 - UT2



Bankfull Dimensions

4.1	x-section area (ft.sq.)
6.2	width (ft)
0.7	mean depth (ft)
0.9	max depth (ft)
6.9	wetted perimeter (ft)
0.6	hydraulic radius (ft)
9.4	width-depth ratio
6.5	W flood prone area (ft)
1.0	entrenchment ratio
3.8	low bank height ratio

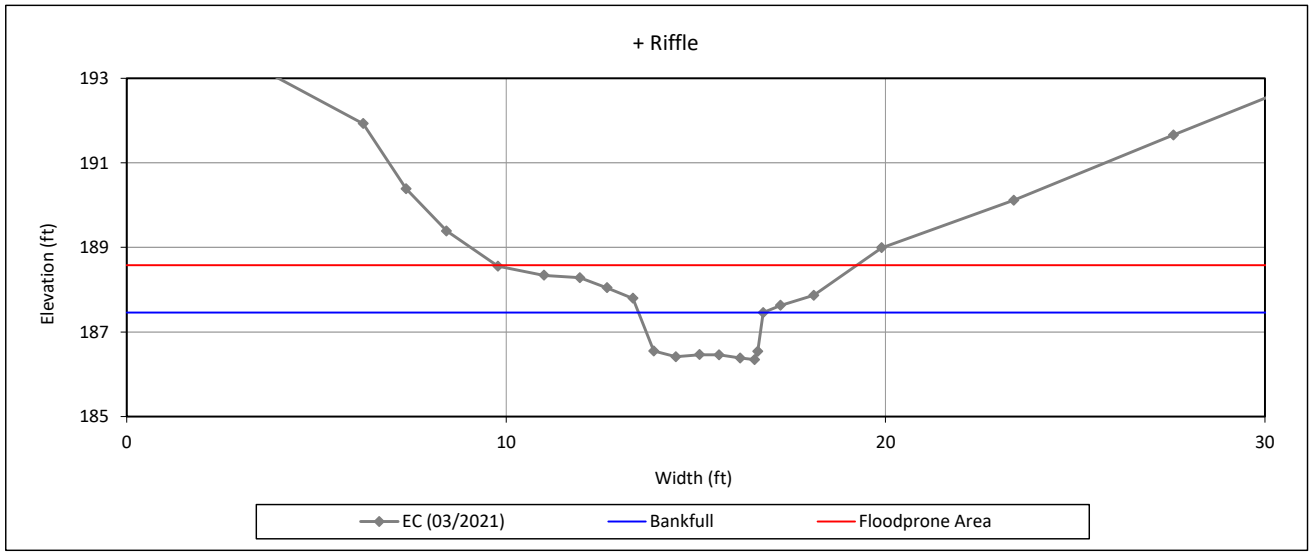
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 12 - UT3



Bankfull Dimensions

3.1	x-section area (ft.sq.)
3.3	width (ft)
0.9	mean depth (ft)
1.1	max depth (ft)
4.8	wetted perimeter (ft)
0.6	hydraulic radius (ft)
3.5	width-depth ratio
9.5	W flood prone area (ft)
2.9	entrenchment ratio
1.3	low bank height ratio

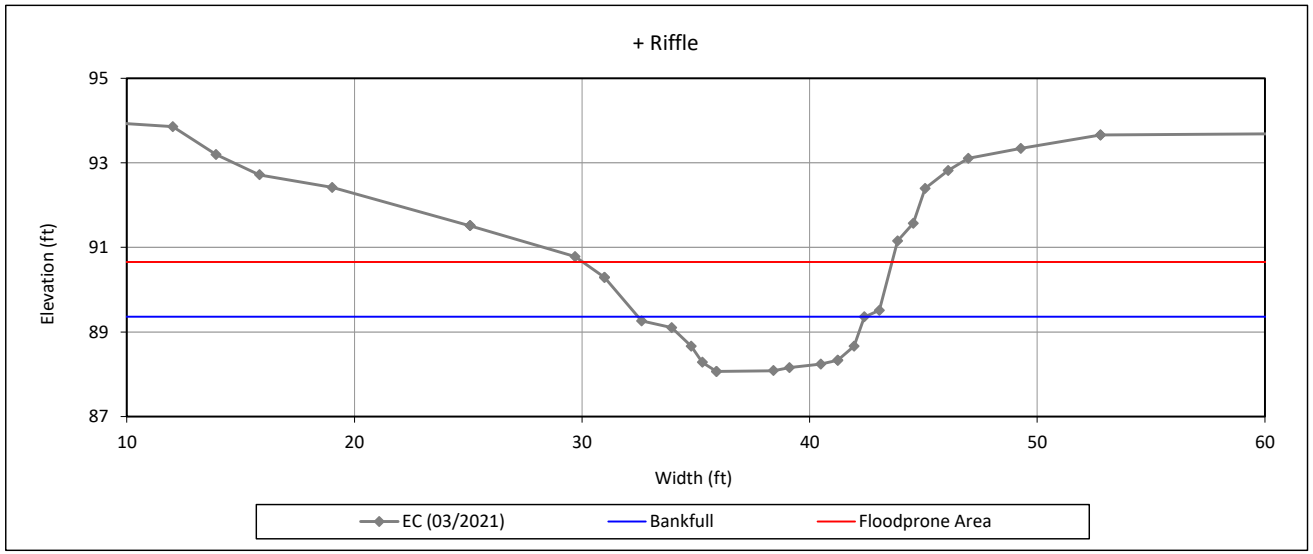
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 13 - UT4 R1



Bankfull Dimensions

9.1	x-section area (ft.sq.)
9.9	width (ft)
0.9	mean depth (ft)
1.3	max depth (ft)
10.7	wetted perimeter (ft)
0.8	hydraulic radius (ft)
10.9	width-depth ratio
13.6	W flood prone area (ft)
1.4	entrenchment ratio
3.9	low bank height ratio

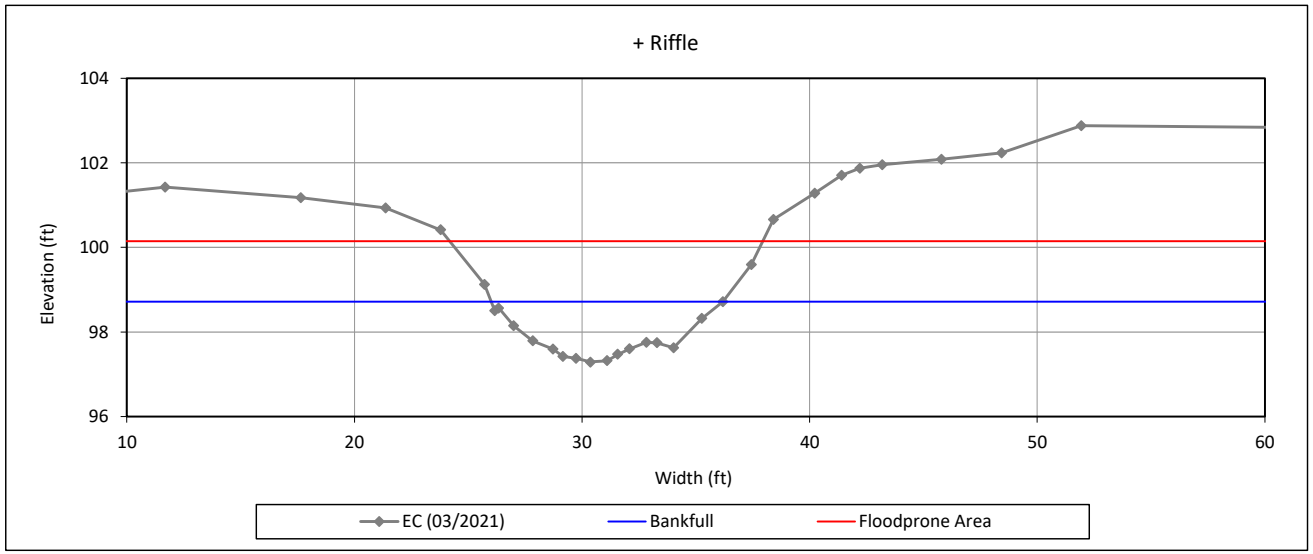
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 14 - UT4 R2



Bankfull Dimensions

9.3	x-section area (ft.sq.)
10.2	width (ft)
0.9	mean depth (ft)
1.4	max depth (ft)
10.9	wetted perimeter (ft)
0.9	hydraulic radius (ft)
11.1	width-depth ratio
13.7	W flood prone area (ft)
1.3	entrenchment ratio
2.2	low bank height ratio

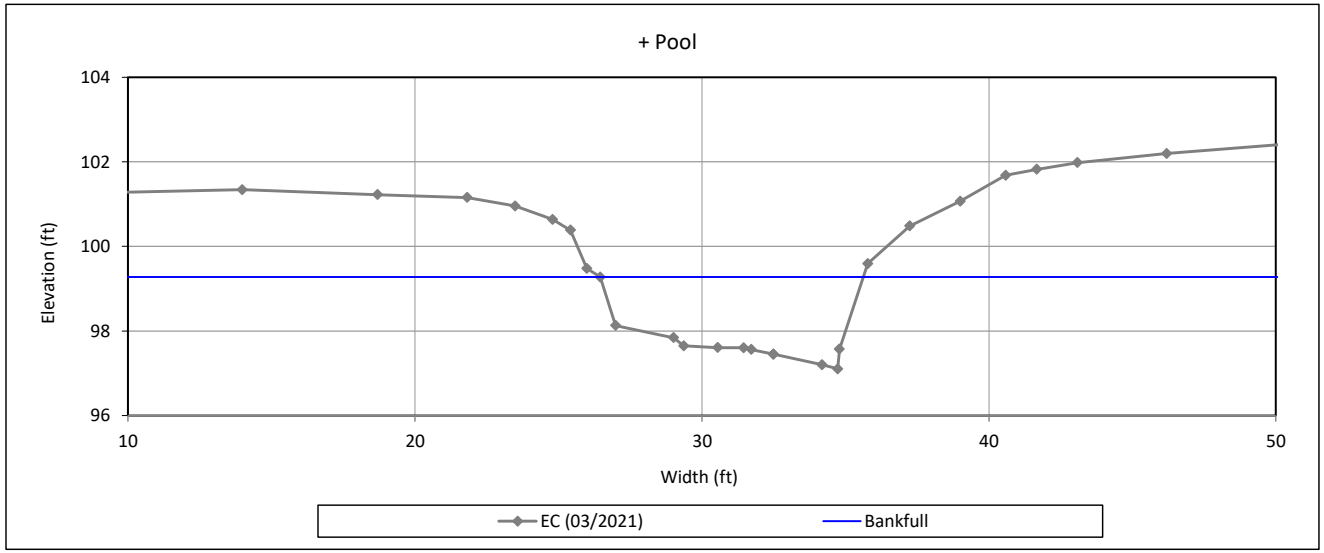
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 15 - UT4 R2



Bankfull Dimensions	
14.0	x-section area (ft.sq.)
9.2	width (ft)
1.5	mean depth (ft)
2.2	max depth (ft)
11.5	wetted perimeter (ft)
1.2	hydraulic radius (ft)
6.0	width-depth ratio

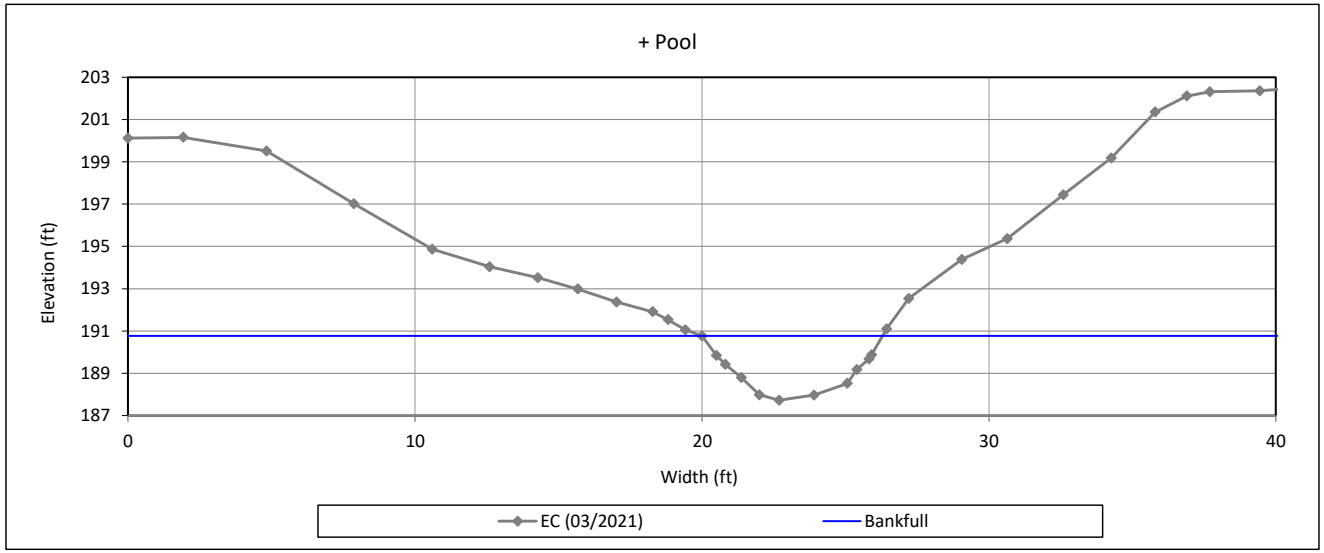
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 16 - UT4A



Bankfull Dimensions	
13.0	x-section area (ft.sq.)
6.3	width (ft)
2.1	mean depth (ft)
3.0	max depth (ft)
9.3	wetted perimeter (ft)
1.4	hydraulic radius (ft)
3.1	width-depth ratio

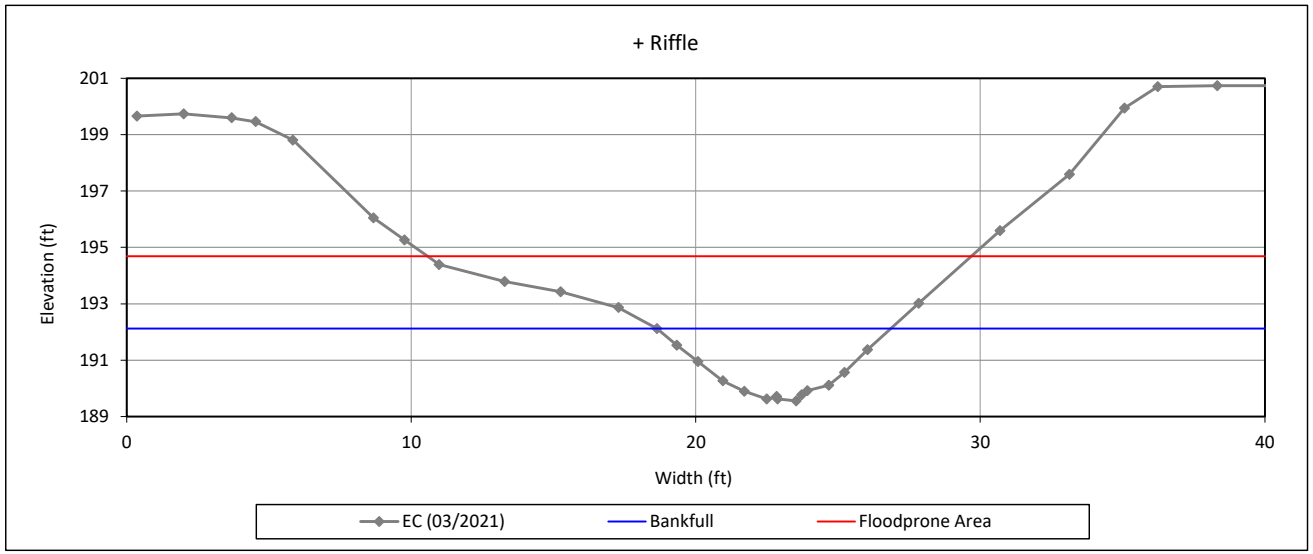
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 17 - UT4A



Bankfull Dimensions

12.9	x-section area (ft.sq.)
8.2	width (ft)
1.6	mean depth (ft)
2.6	max depth (ft)
10.0	wetted perimeter (ft)
1.3	hydraulic radius (ft)
5.2	width-depth ratio
19.1	W flood prone area (ft)
2.3	entrenchment ratio
3.9	low bank height ratio

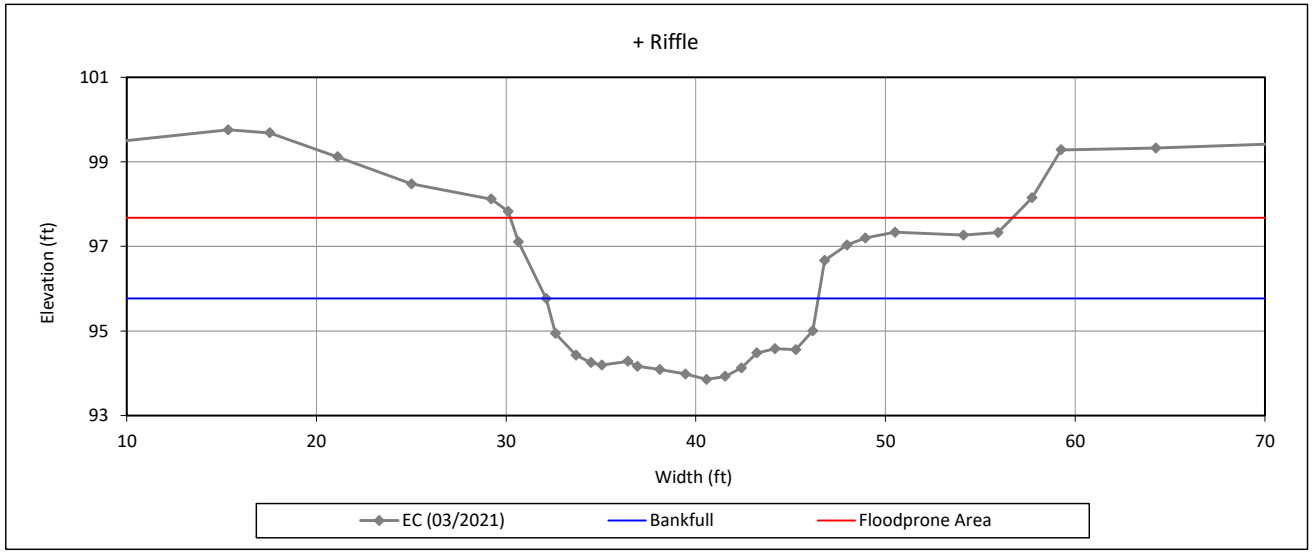
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 18 - UT6



Bankfull Dimensions

20.6	x-section area (ft.sq.)
14.3	width (ft)
1.4	mean depth (ft)
1.9	max depth (ft)
15.7	wetted perimeter (ft)
1.3	hydraulic radius (ft)
10.0	width-depth ratio
26.5	W flood prone area (ft)
1.8	entrenchment ratio
2.2	low bank height ratio

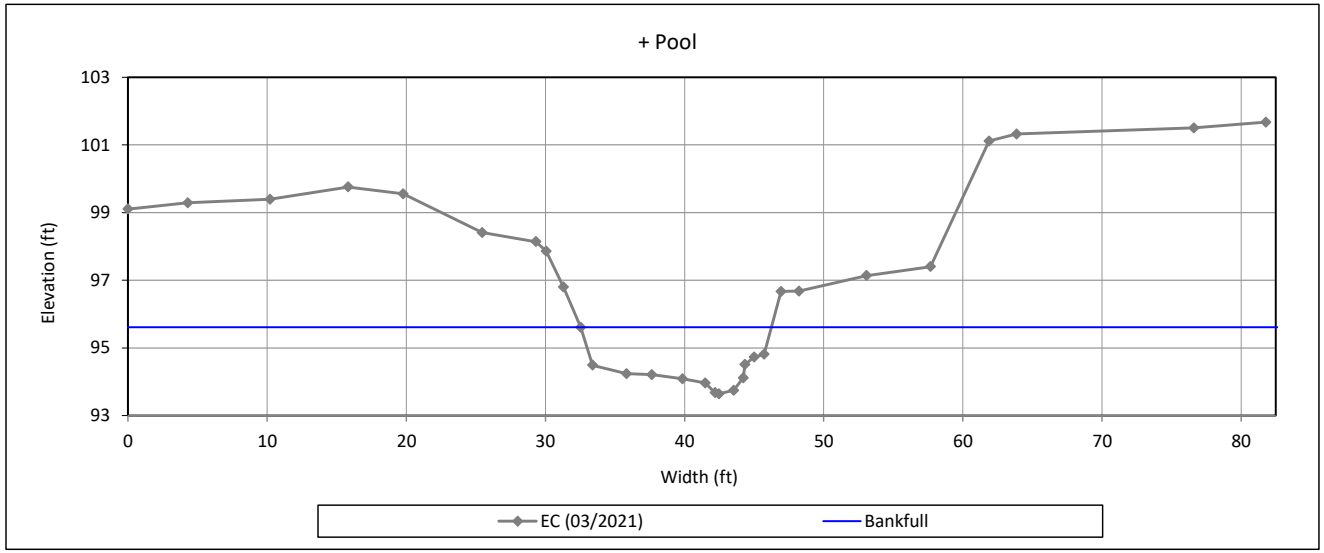
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 19 - UT6



Bankfull Dimensions	
18.5	x-section area (ft.sq.)
13.7	width (ft)
1.3	mean depth (ft)
2.0	max depth (ft)
15.2	wetted perimeter (ft)
1.2	hydraulic radius (ft)
10.2	width-depth ratio

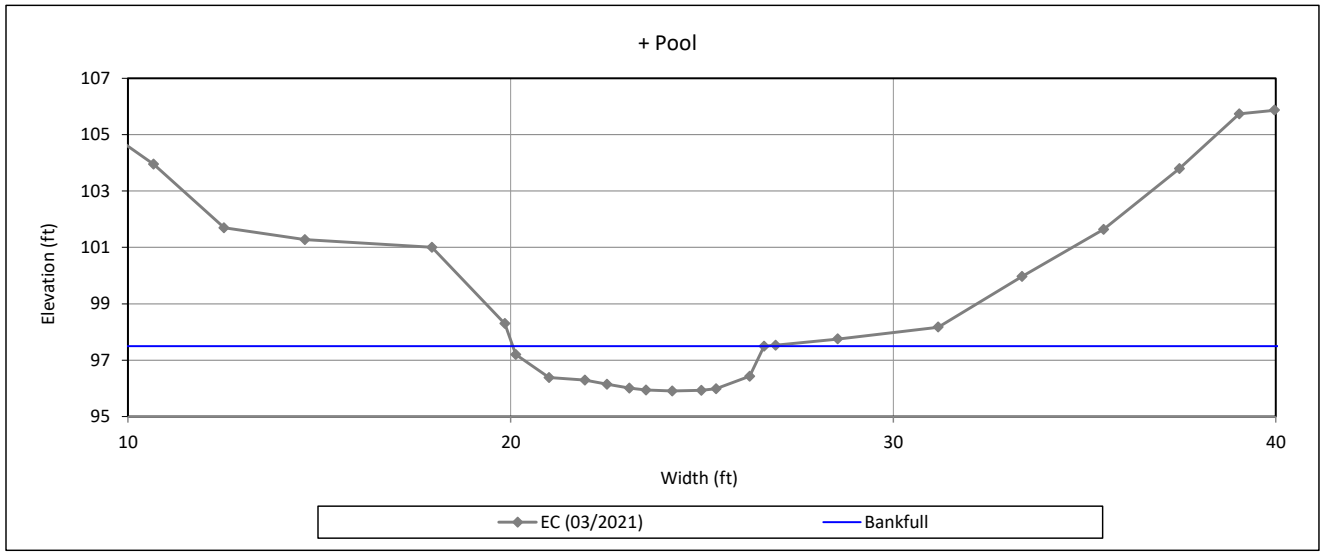
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 20 - UT6A



Bankfull Dimensions	
8.1	x-section area (ft.sq.)
6.6	width (ft)
1.2	mean depth (ft)
1.6	max depth (ft)
8.0	wetted perimeter (ft)
1.0	hydraulic radius (ft)
5.3	width-depth ratio

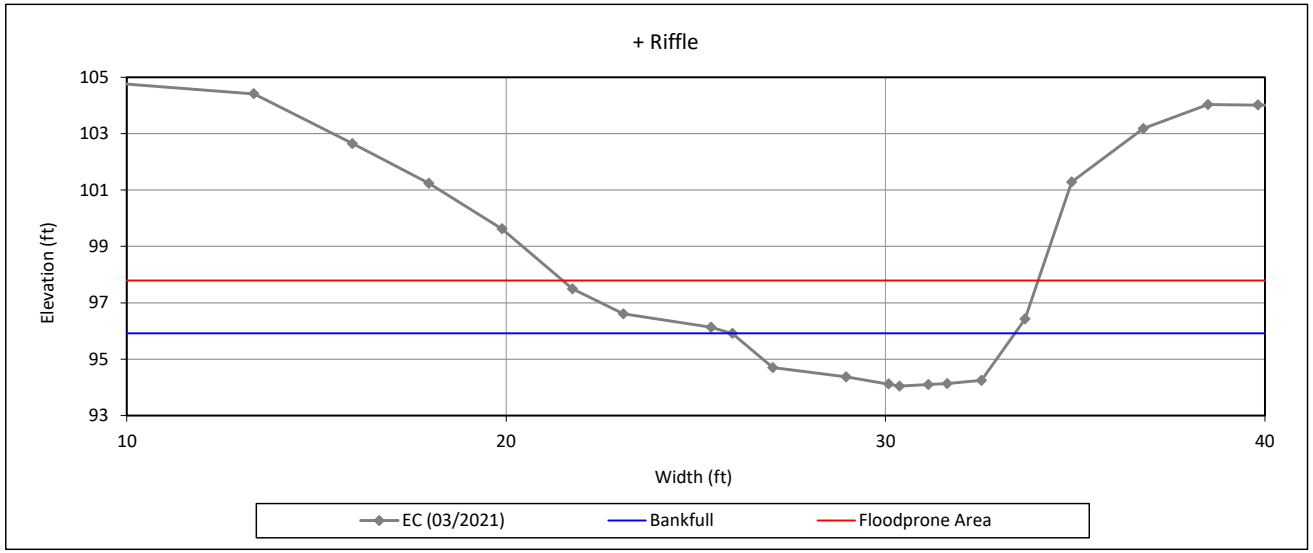
Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Cross-Section 21 - UT6A



Bankfull Dimensions

10.3	x-section area (ft.sq.)
7.4	width (ft)
1.4	mean depth (ft)
1.9	max depth (ft)
9.1	wetted perimeter (ft)
1.1	hydraulic radius (ft)
5.4	width-depth ratio
12.5	W flood prone area (ft)
1.7	entrenchment ratio
5.3	low bank height ratio

Survey Date: 03/2021
Field Crew: Wildlands Engineering

View Downstream

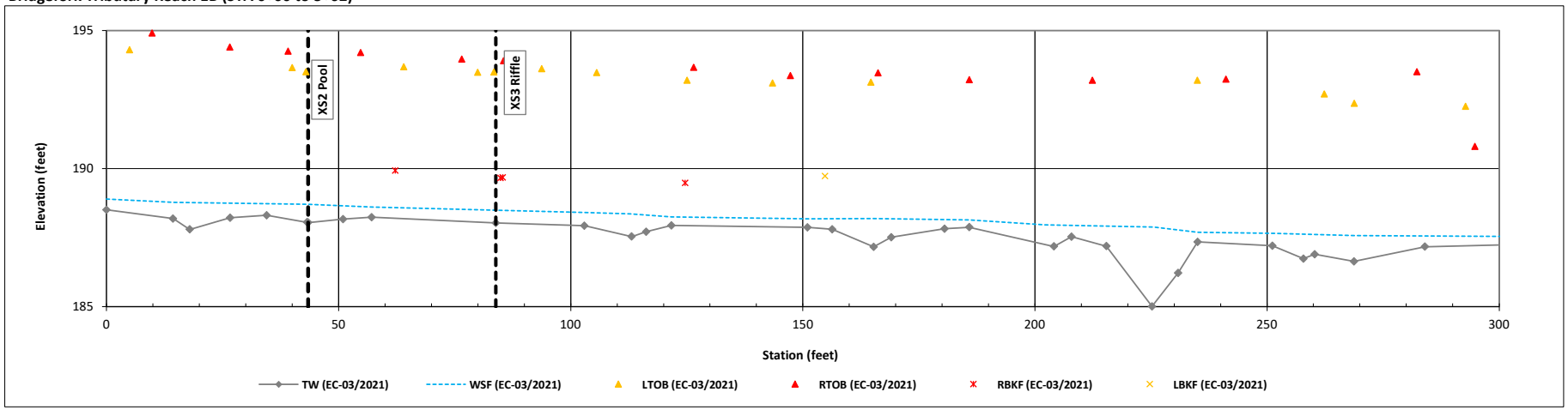
Longitudinal Profile Plots

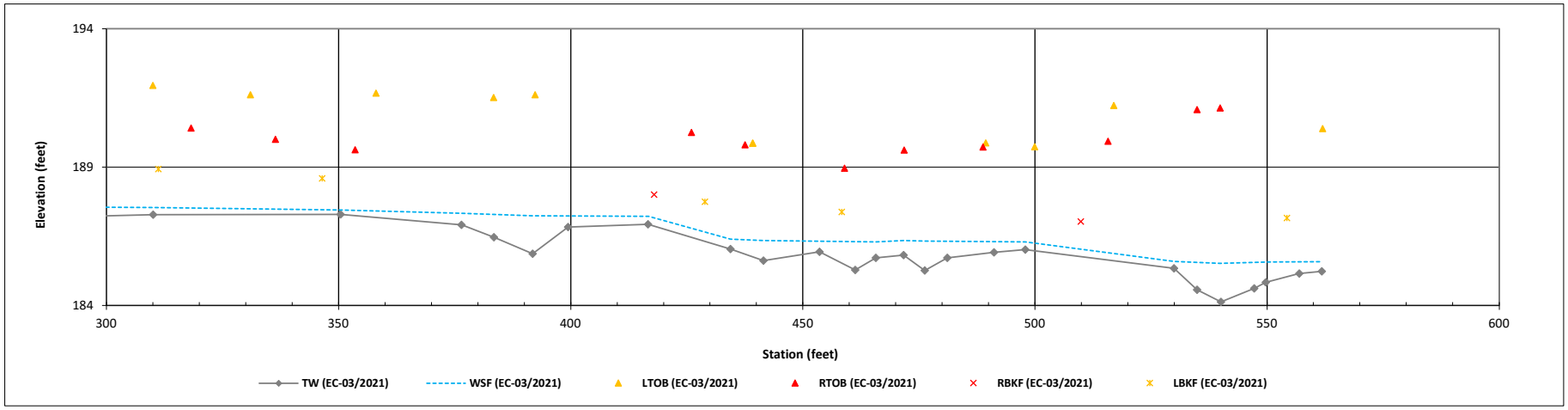
Bridgefork Dairy Mitigation Site

DMS Project No. 100171

Existing Conditions - 2021

Bridgefork Tributary Reach 1B (STA 0+00 to 5+62)





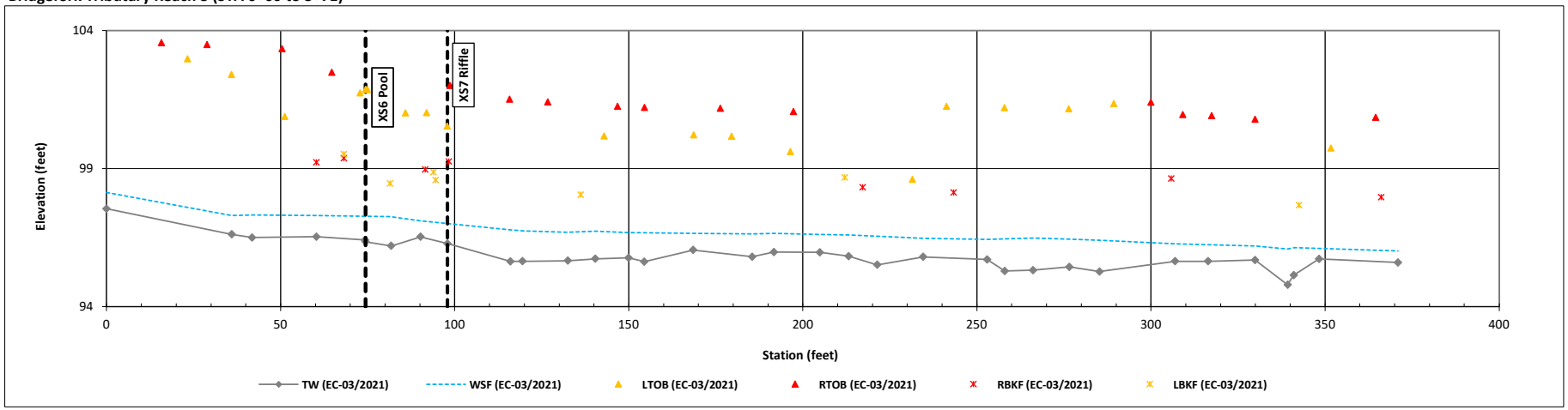
Longitudinal Profile Plots

Bridgefork Dairy Mitigation Site

DMS Project No. 100171

Existing Conditions - 2021

Bridgefork Tributary Reach 3 (STA 0+00 to 3+71)



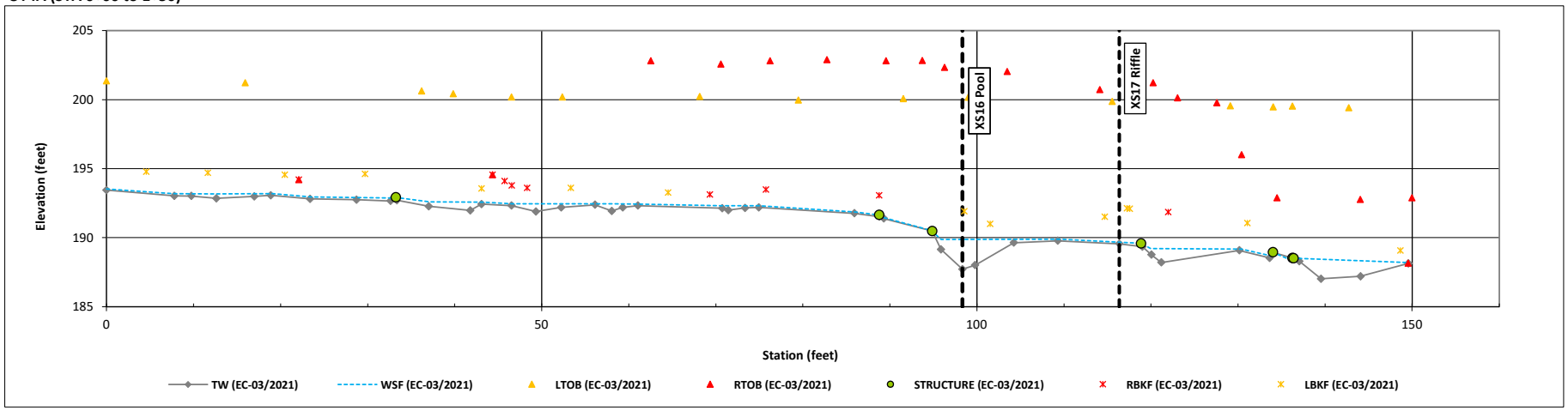
Longitudinal Profile Plots

Bridgefork Dairy Mitigation Site

DMS Project No. 100171

Existing Conditions - 2021

UT4A (STA 0+00 to 1+50)



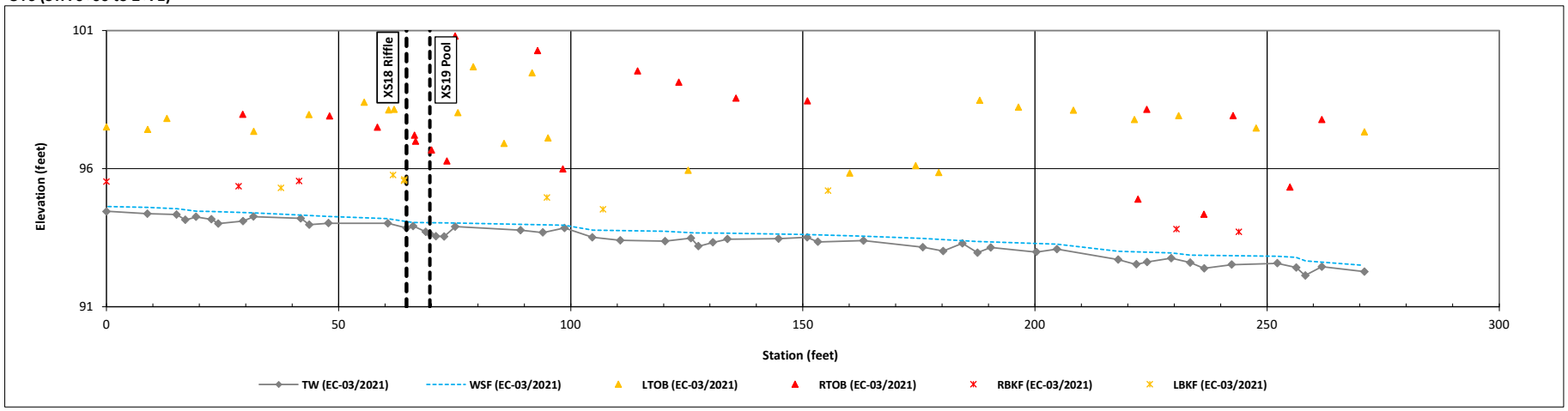
Longitudinal Profile Plots

Bridgefork Dairy Mitigation Site

DMS Project No. 100171

Existing Conditions - 2021

UT6 (STA 0+00 to 2+71)



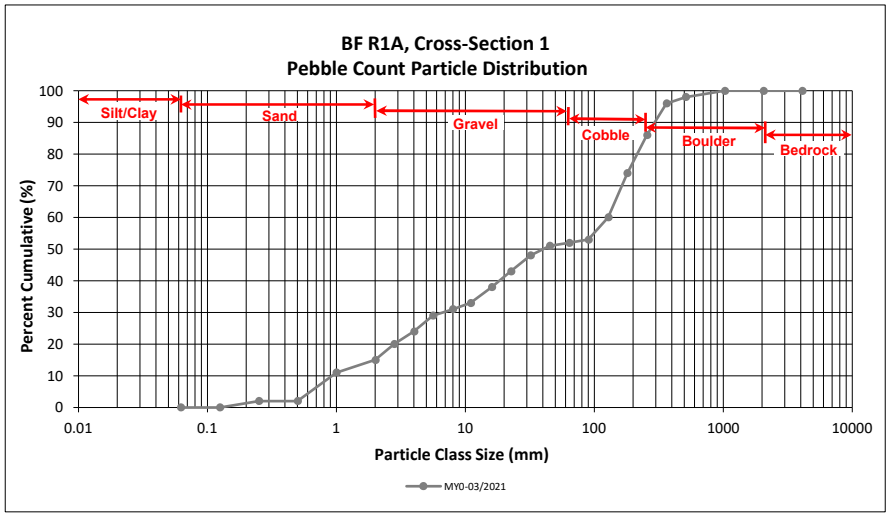
Reachwide and Cross-Section Pebble Count Plots

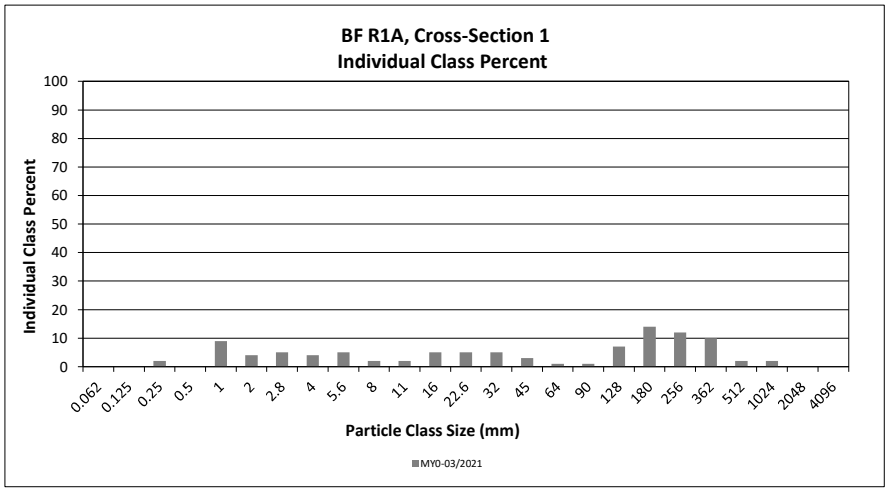
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

BF R1A, Cross-Section 1

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	2	2	2
	Medium	0.25	0.50			2
	Coarse	0.5	1.0	9	9	11
	Very Coarse	1.0	2.0	4	4	15
GRAVEL	Very Fine	2.0	2.8	5	5	20
	Very Fine	2.8	4.0	4	4	24
	Fine	4.0	5.6	5	5	29
	Fine	5.6	8.0	2	2	31
	Medium	8.0	11.0	2	2	33
	Medium	11.0	16.0	5	5	38
	Coarse	16.0	22.6	5	5	43
	Coarse	22.6	32	5	5	48
	Very Coarse	32	45	3	3	51
	Very Coarse	45	64	1	1	52
COBBLE	Small	64	90	1	1	53
	Small	90	128	7	7	60
	Large	128	180	14	14	74
	Large	180	256	12	12	86
BOULDER	Small	256	362	10	10	96
	Small	362	512	2	2	98
	Medium	512	1024	2	2	100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 1	
Channel materials (mm)	
D_{16} =	2.14
D_{35} =	12.78
D_{50} =	40.2
D_{84} =	241.4
D_{95} =	349.7
D_{100} =	1024.0





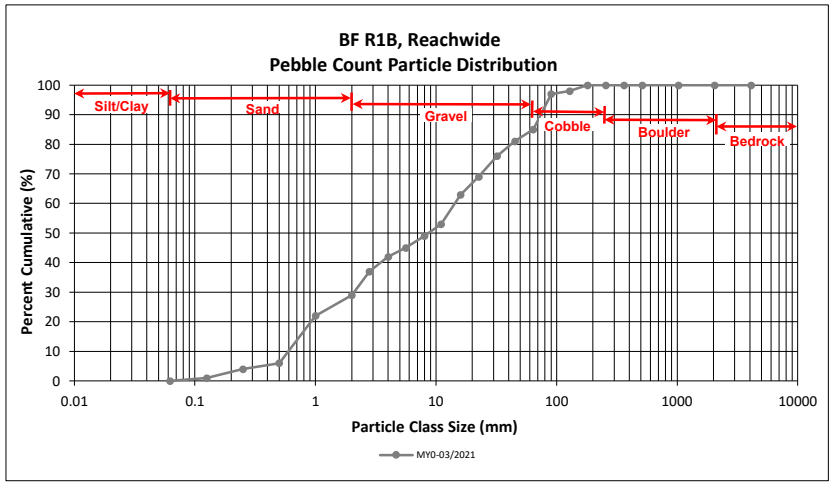
Reachwide and Cross-Section Pebble Count Plots

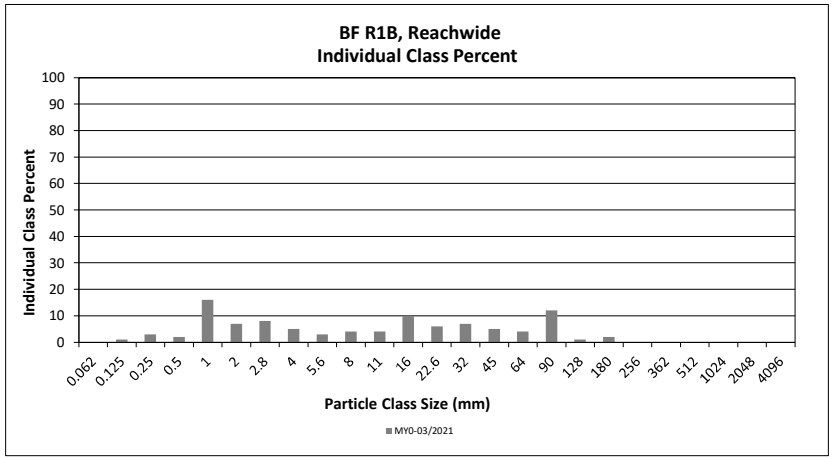
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

BF R1B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125		1	1	1	1
	Fine	0.125	0.250		3	3	3	4
	Medium	0.25	0.50		2	2	2	6
	Coarse	0.5	1.0	1	15	16	16	22
	Very Coarse	1.0	2.0	2	5	7	7	29
GRAVEL	Very Fine	2.0	2.8		8	8	8	37
	Very Fine	2.8	4.0		5	5	5	42
	Fine	4.0	5.6		3	3	3	45
	Fine	5.6	8.0	1	3	4	4	49
	Medium	8.0	11.0	1	3	4	4	53
	Medium	11.0	16.0	9	1	10	10	63
	Coarse	16.0	22.6	5	1	6	6	69
	Coarse	22.6	32	7		7	7	76
	Very Coarse	32	45	5		5	5	81
	Very Coarse	45	64	4		4	4	85
COBBLE	Small	64	90	12		12	12	97
	Small	90	128	1		1	1	98
	Large	128	180	2		2	2	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.77
D_{35} =	2.57
D_{50} =	8.7
D_{84} =	58.6
D_{95} =	85.0
D_{100} =	180.0





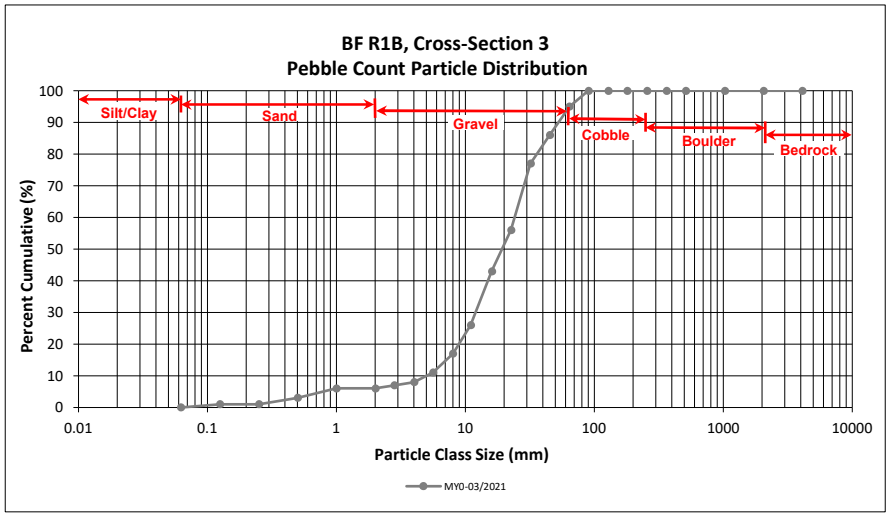
Reachwide and Cross-Section Pebble Count Plots

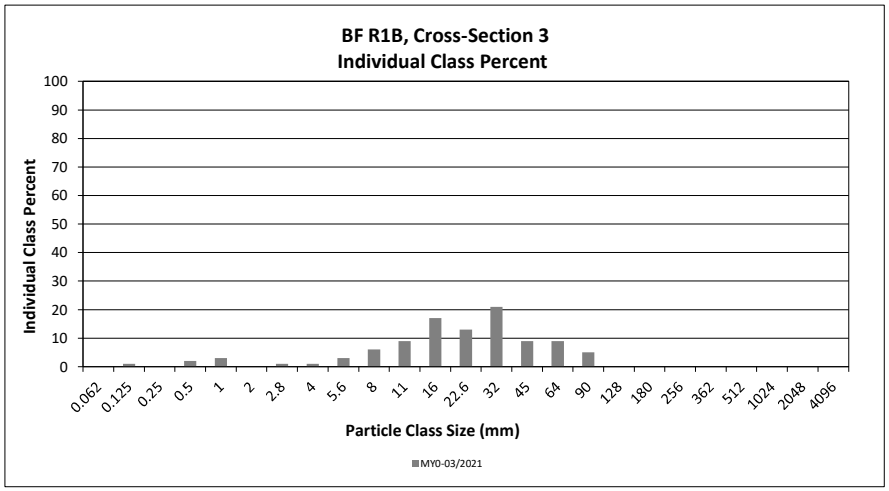
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

BF R1B, Cross-Section 3

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125	1	1	1
	Fine	0.125	0.250			1
	Medium	0.25	0.50	2	2	3
	Coarse	0.5	1.0	3	3	6
	Very Coarse	1.0	2.0			6
GRAVEL	Very Fine	2.0	2.8	1	1	7
	Very Fine	2.8	4.0	1	1	8
	Fine	4.0	5.6	3	3	11
	Fine	5.6	8.0	6	6	17
	Medium	8.0	11.0	9	9	26
	Medium	11.0	16.0	17	17	43
	Coarse	16.0	22.6	13	13	56
	Coarse	22.6	32	21	21	77
	Very Coarse	32	45	9	9	86
	Very Coarse	45	64	9	9	95
COBBLE	Small	64	90	5	5	100
	Small	90	128			100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 3	
Channel materials (mm)	
D_{16} =	7.54
D_{35} =	13.41
D_{50} =	19.3
D_{84} =	41.7
D_{95} =	64.0
D_{100} =	90.0





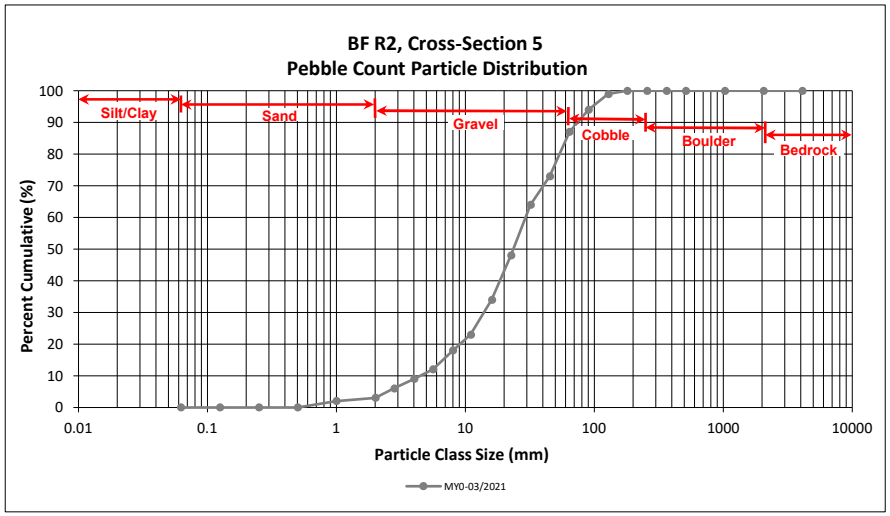
Reachwide and Cross-Section Pebble Count Plots

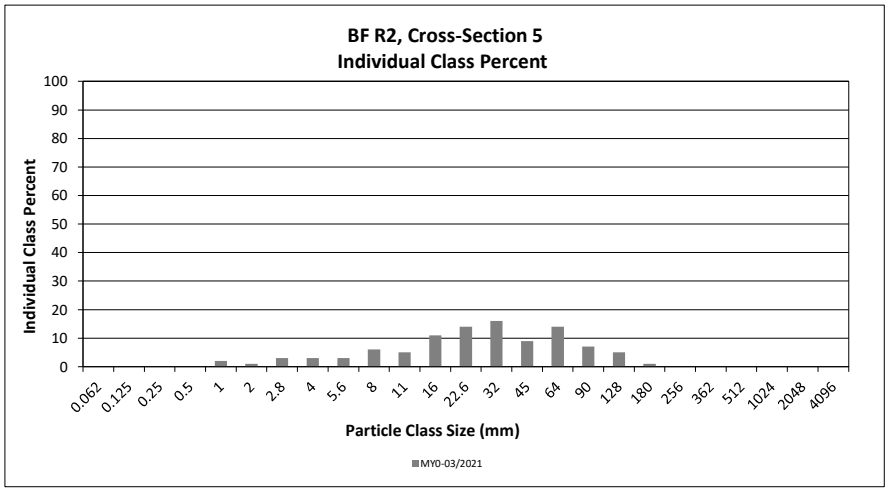
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

BF R2, Cross-Section 5

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0	2	2	2
	Very Coarse	1.0	2.0	1	1	3
GRAVEL	Very Fine	2.0	2.8	3	3	6
	Very Fine	2.8	4.0	3	3	9
	Fine	4.0	5.6	3	3	12
	Fine	5.6	8.0	6	6	18
	Medium	8.0	11.0	5	5	23
	Medium	11.0	16.0	11	11	34
	Coarse	16.0	22.6	14	14	48
	Coarse	22.6	32	16	16	64
	Very Coarse	32	45	9	9	73
	Very Coarse	45	64	14	14	87
COBBLE	Small	64	90	7	7	94
	Small	90	128	5	5	99
	Large	128	180	1	1	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 5	
Channel materials (mm)	
D_{16} =	7.10
D_{35} =	16.40
D_{50} =	23.6
D_{84} =	59.3
D_{95} =	96.6
D_{100} =	180.0





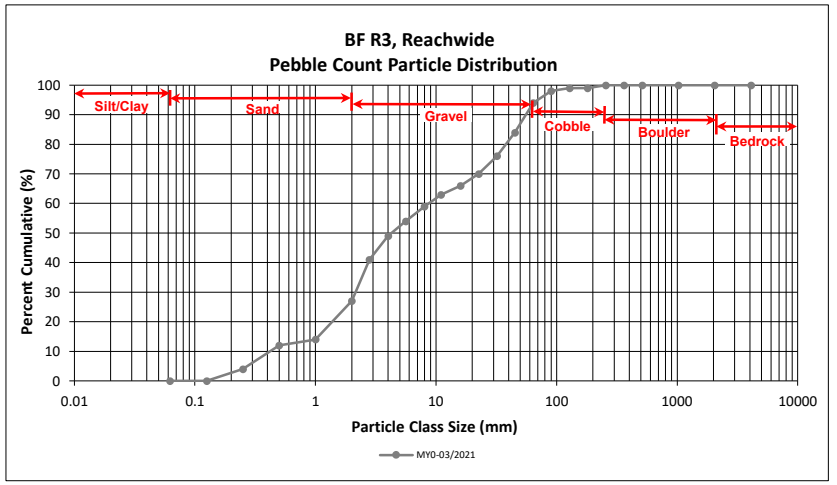
Reachwide and Cross-Section Pebble Count Plots

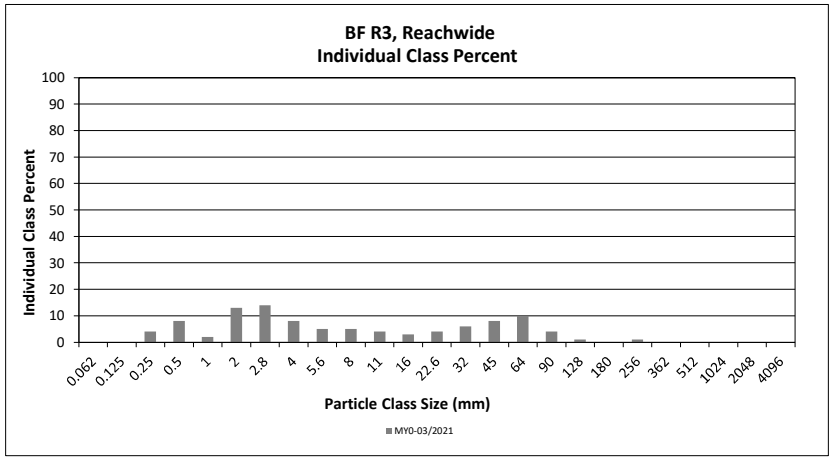
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

BF R3, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125					0
	Fine	0.125	0.250		4	4	4	4
	Medium	0.25	0.50		8	8	8	12
	Coarse	0.5	1.0		2	2	2	14
	Very Coarse	1.0	2.0	2	11	13	13	27
GRAVEL	Very Fine	2.0	2.8	3	11	14	14	41
	Very Fine	2.8	4.0	1	7	8	8	49
	Fine	4.0	5.6	2	3	5	5	54
	Fine	5.6	8.0	3	2	5	5	59
	Medium	8.0	11.0	3	1	4	4	63
	Medium	11.0	16.0	3		3	3	66
	Coarse	16.0	22.6	3	1	4	4	70
	Coarse	22.6	32	6		6	6	76
	Very Coarse	32	45	8		8	8	84
	Very Coarse	45	64	10		10	10	94
COBBLE	Small	64	90	4		4	4	98
	Small	90	128	1		1	1	99
	Large	128	180					99
	Large	180	256	1		1	1	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	1.11
D_{35} =	2.42
D_{50} =	4.3
D_{84} =	45.0
D_{95} =	69.7
D_{100} =	256.0





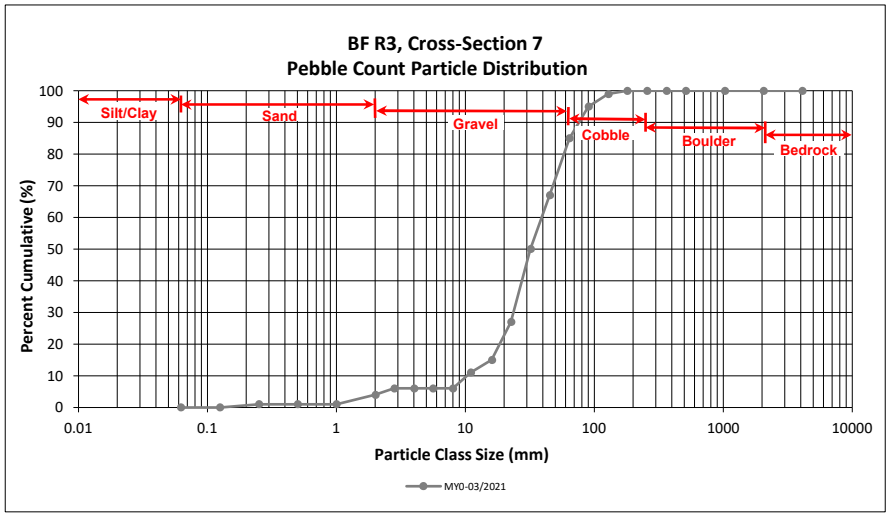
Reachwide and Cross-Section Pebble Count Plots

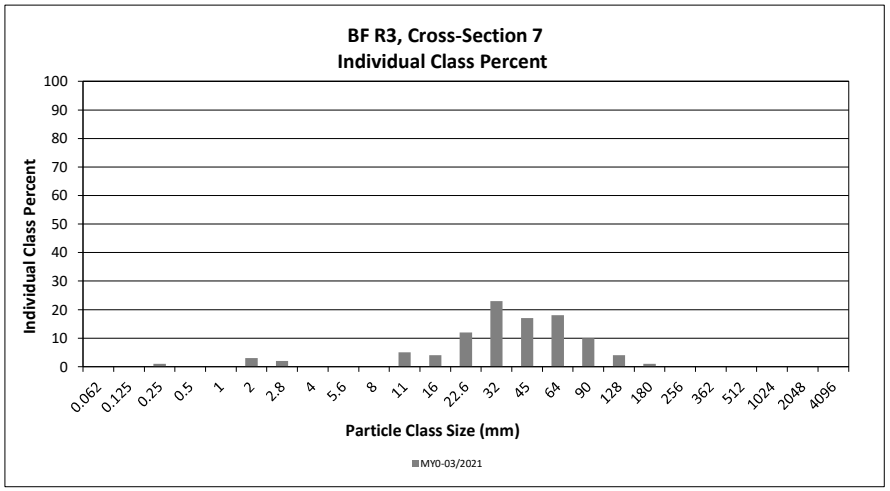
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

BF R3, Cross-Section 7

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	1	1	1
	Medium	0.25	0.50			1
	Coarse	0.5	1.0			1
	Very Coarse	1.0	2.0	3	3	4
GRAVEL	Very Fine	2.0	2.8	2	2	6
	Very Fine	2.8	4.0			6
	Fine	4.0	5.6			6
	Fine	5.6	8.0			6
	Medium	8.0	11.0	5	5	11
	Medium	11.0	16.0	4	4	15
	Coarse	16.0	22.6	12	12	27
	Coarse	22.6	32	23	23	50
	Very Coarse	32	45	17	17	67
	Very Coarse	45	64	18	18	85
COBBLE	Small	64	90	10	10	95
	Small	90	128	4	4	99
	Large	128	180	1	1	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 7	
Channel materials (mm)	
D_{16} =	16.47
D_{35} =	25.51
D_{50} =	32.0
D_{84} =	62.8
D_{95} =	90.0
D_{100} =	180.0





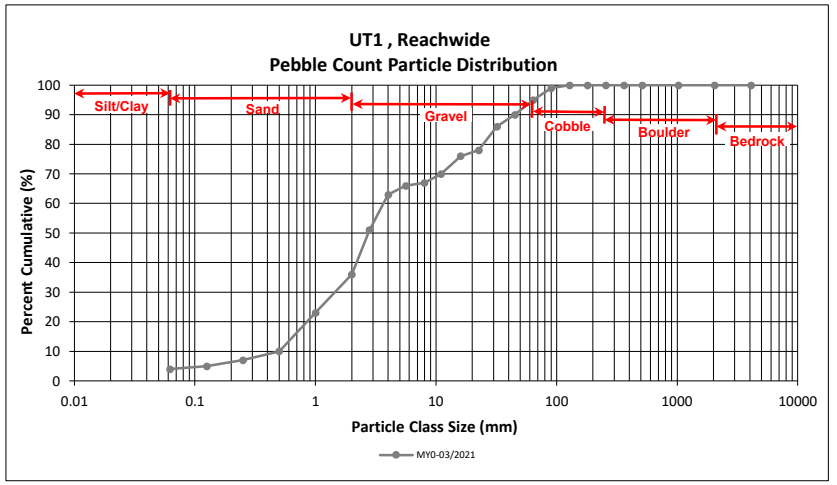
Reachwide and Cross-Section Pebble Count Plots

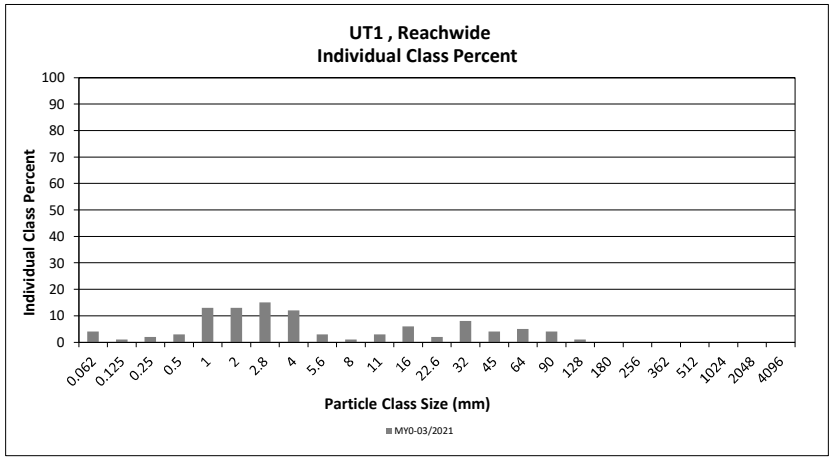
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT1 , Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	2	4	4	4
SAND	Very fine	0.062	0.125	1		1	1	5
	Fine	0.125	0.250	1	1	2	2	7
	Medium	0.25	0.50		3	3	3	10
	Coarse	0.5	1.0		13	13	13	23
	Very Coarse	1.0	2.0	5	8	13	13	36
GRAVEL	Very Fine	2.0	2.8	3	12	15	15	51
	Very Fine	2.8	4.0	4	8	12	12	63
	Fine	4.0	5.6	1	2	3	3	66
	Fine	5.6	8.0	1		1	1	67
	Medium	8.0	11.0	2	1	3	3	70
	Medium	11.0	16.0	6		6	6	76
	Coarse	16.0	22.6	2		2	2	78
	Coarse	22.6	32	8		8	8	86
	Very Coarse	32	45	4		4	4	90
	Very Coarse	45	64	5		5	5	95
COBBLE	Small	64	90	4		4	4	99
	Small	90	128	1		1	1	100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.69
D_{35} =	1.90
D_{50} =	2.7
D_{84} =	29.3
D_{95} =	64.0
D_{100} =	128.0





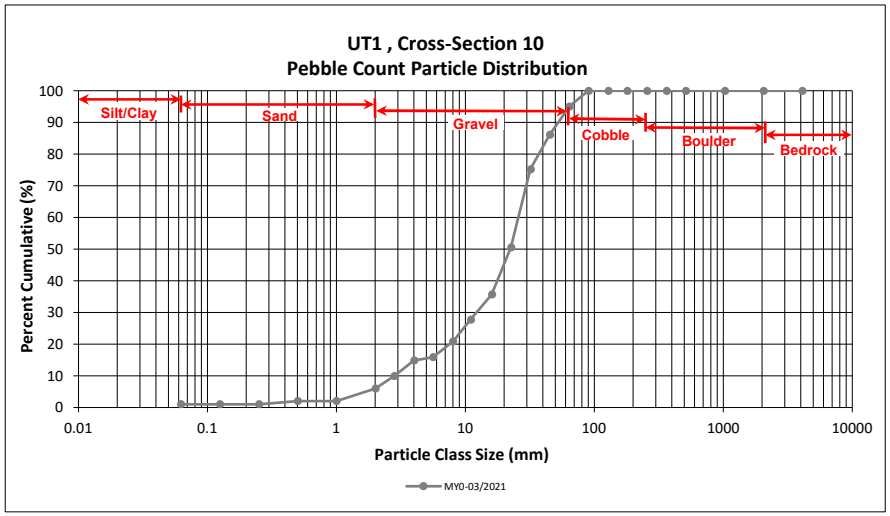
Reachwide and Cross-Section Pebble Count Plots

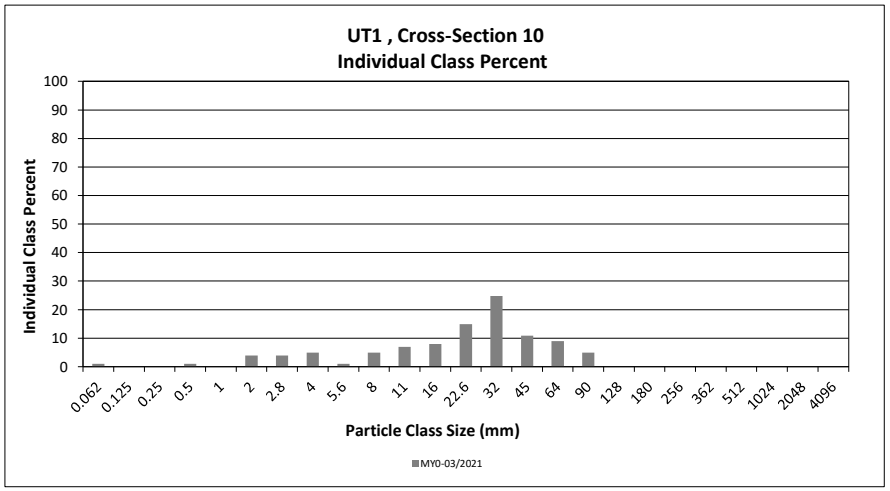
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT1 , Cross-Section 10

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary Class Percentage	Summary Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	1	1
SAND	Very fine	0.062	0.125			1
	Fine	0.125	0.250			1
	Medium	0.25	0.50	1	1	2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0	4	4	6
GRAVEL	Very Fine	2.0	2.8	4	4	10
	Very Fine	2.8	4.0	5	5	15
	Fine	4.0	5.6	1	1	16
	Fine	5.6	8.0	5	5	21
	Medium	8.0	11.0	7	7	28
	Medium	11.0	16.0	8	8	36
	Coarse	16.0	22.6	15	15	50
	Coarse	22.6	32	25	25	75
	Very Coarse	32	45	11	11	86
	Very Coarse	45	64	9	9	95
COBBLE	Small	64	90	5	5	100
	Small	90	128			100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**101**	**100**	**100**

Cross-Section 10	
Channel materials (mm)	
D_{16} =	5.66
D_{35} =	15.52
D_{50} =	22.3
D_{84} =	42.1
D_{95} =	63.9
D_{100} =	90.0





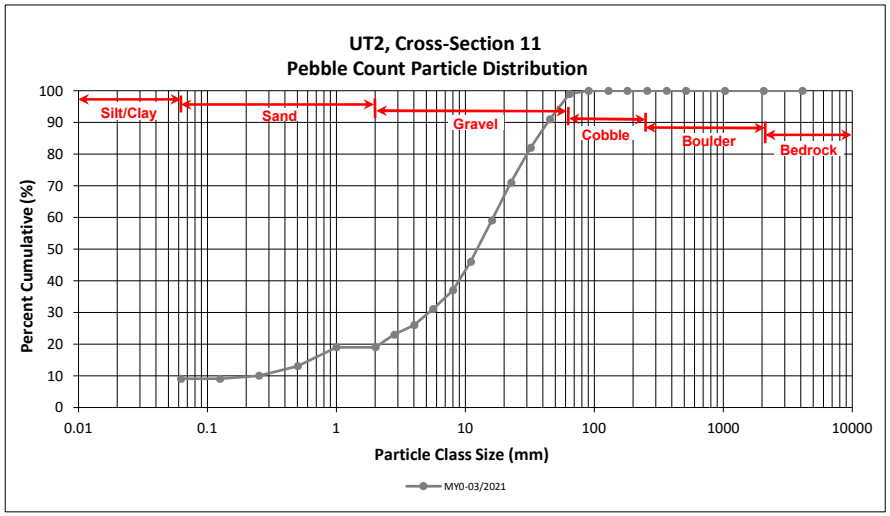
Reachwide and Cross-Section Pebble Count Plots

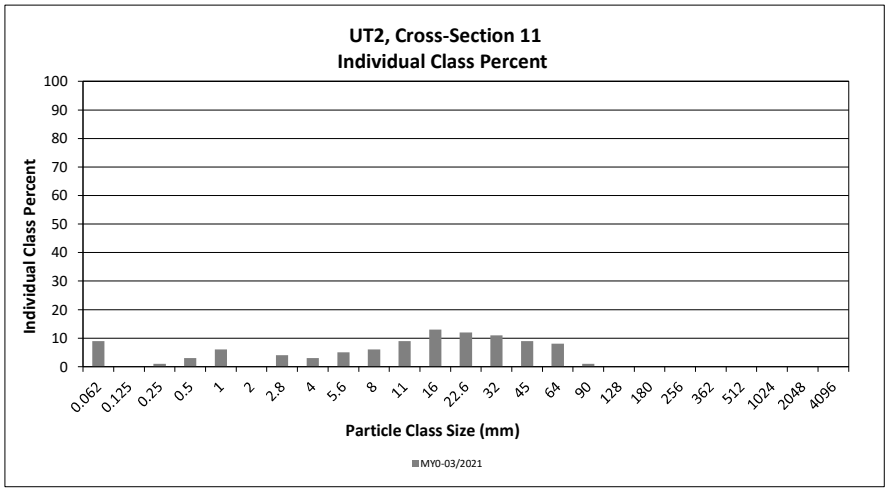
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT2, Cross-Section 11

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	9	9	9
SAND	Very fine	0.062	0.125			9
	Fine	0.125	0.250	1	1	10
	Medium	0.25	0.50	3	3	13
	Coarse	0.5	1.0	6	6	19
	Very Coarse	1.0	2.0			19
GRAVEL	Very Fine	2.0	2.8	4	4	23
	Very Fine	2.8	4.0	3	3	26
	Fine	4.0	5.6	5	5	31
	Fine	5.6	8.0	6	6	37
	Medium	8.0	11.0	9	9	46
	Medium	11.0	16.0	13	13	59
	Coarse	16.0	22.6	12	12	71
	Coarse	22.6	32	11	11	82
	Very Coarse	32	45	9	9	91
	Very Coarse	45	64	8	8	99
COBBLE	Small	64	90	1	1	100
	Small	90	128			100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 11	
Channel materials (mm)	
D_{16} =	0.71
D_{35} =	7.10
D_{50} =	12.3
D_{84} =	34.5
D_{95} =	53.7
D_{100} =	90.0





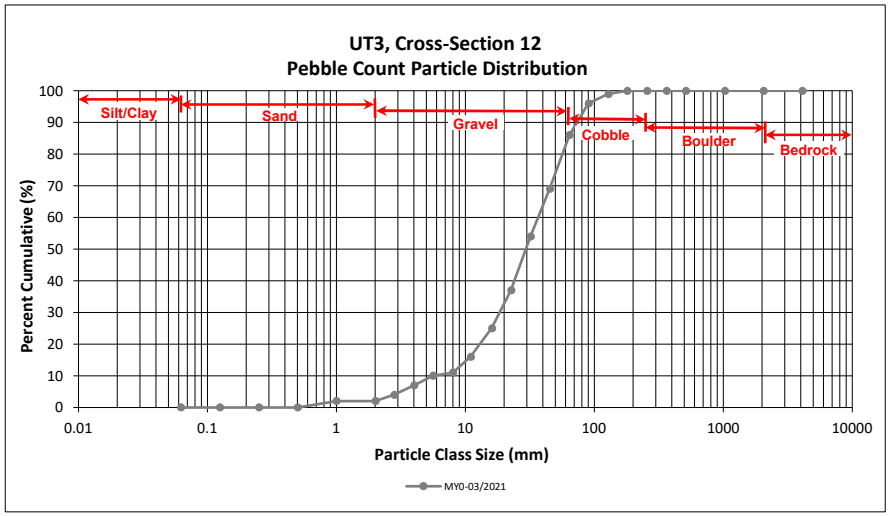
Reachwide and Cross-Section Pebble Count Plots

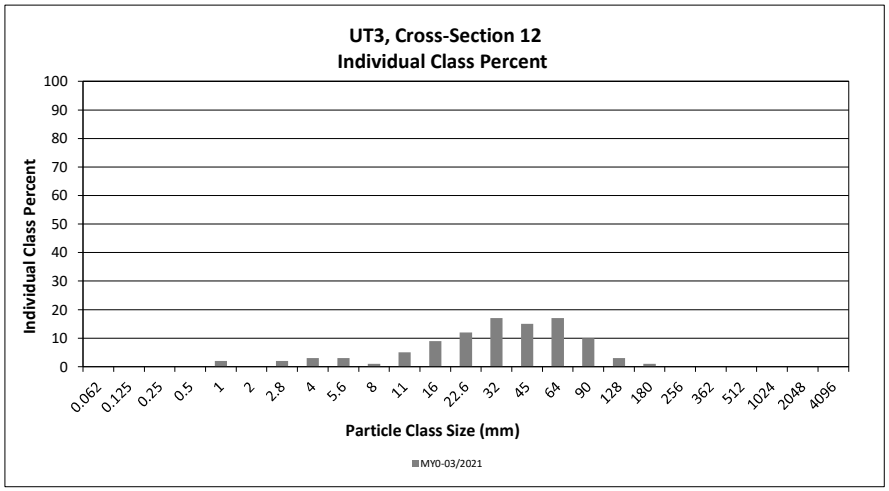
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT3, Cross-Section 12

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0	2	2	2
	Very Coarse	1.0	2.0			2
GRAVEL	Very Fine	2.0	2.8	2	2	4
	Very Fine	2.8	4.0	3	3	7
	Fine	4.0	5.6	3	3	10
	Fine	5.6	8.0	1	1	11
	Medium	8.0	11.0	5	5	16
	Medium	11.0	16.0	9	9	25
	Coarse	16.0	22.6	12	12	37
	Coarse	22.6	32	17	17	54
	Very Coarse	32	45	15	15	69
	Very Coarse	45	64	17	17	86
COBBLE	Small	64	90	10	10	96
	Small	90	128	3	3	99
	Large	128	180	1	1	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 12	
Channel materials (mm)	
D_{16} =	11.00
D_{35} =	21.34
D_{50} =	29.5
D_{84} =	61.4
D_{95} =	87.0
D_{100} =	180.0





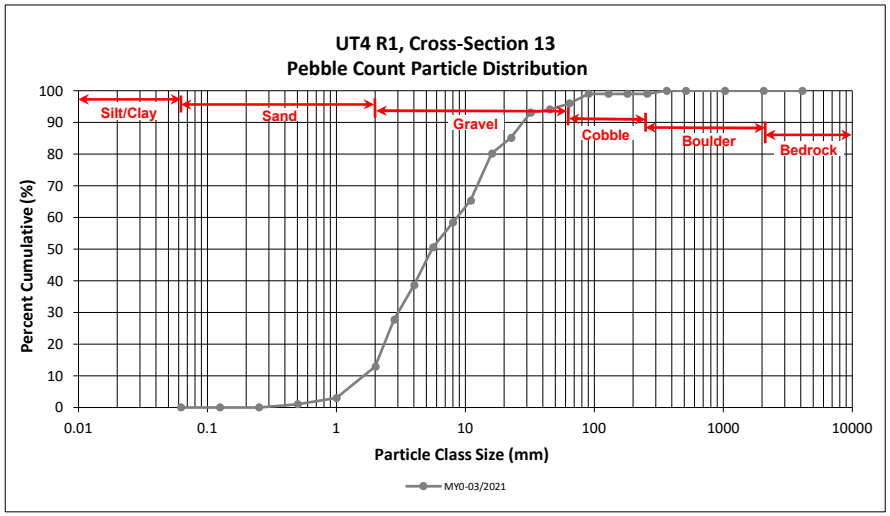
Reachwide and Cross-Section Pebble Count Plots

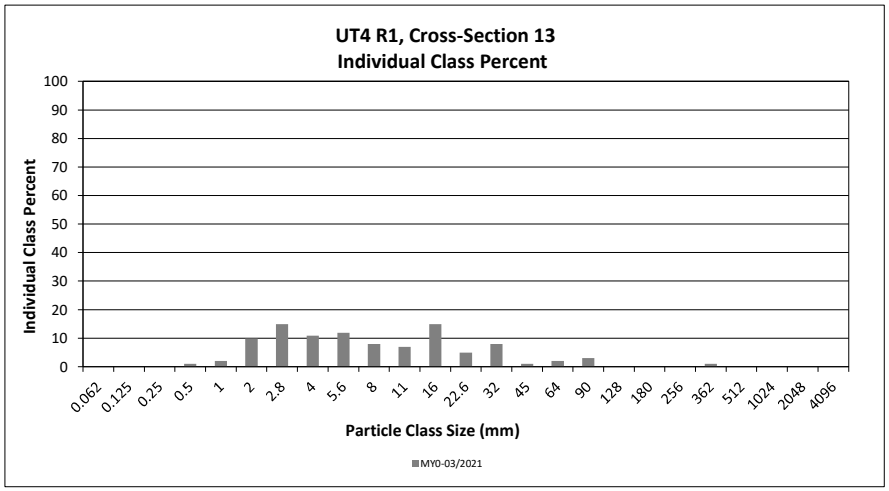
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT4 R1, Cross-Section 13

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	1	1	1
	Coarse	0.5	1.0	2	2	3
	Very Coarse	1.0	2.0	10	10	13
GRAVEL	Very Fine	2.0	2.8	15	15	28
	Very Fine	2.8	4.0	11	11	39
	Fine	4.0	5.6	12	12	50
	Fine	5.6	8.0	8	8	58
	Medium	8.0	11.0	7	7	65
	Medium	11.0	16.0	15	15	80
	Coarse	16.0	22.6	5	5	85
	Coarse	22.6	32	8	8	93
	Very Coarse	32	45	1	1	94
	Very Coarse	45	64	2	2	96
COBBLE	Small	64	90	3	3	99
	Small	90	128			99
	Large	128	180			99
	Large	180	256			99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**101**	**100**	**100**

Cross-Section 13	
Channel materials (mm)	
D_{16} =	2.15
D_{35} =	3.55
D_{50} =	5.5
D_{84} =	20.9
D_{95} =	53.2
D_{100} =	362.0





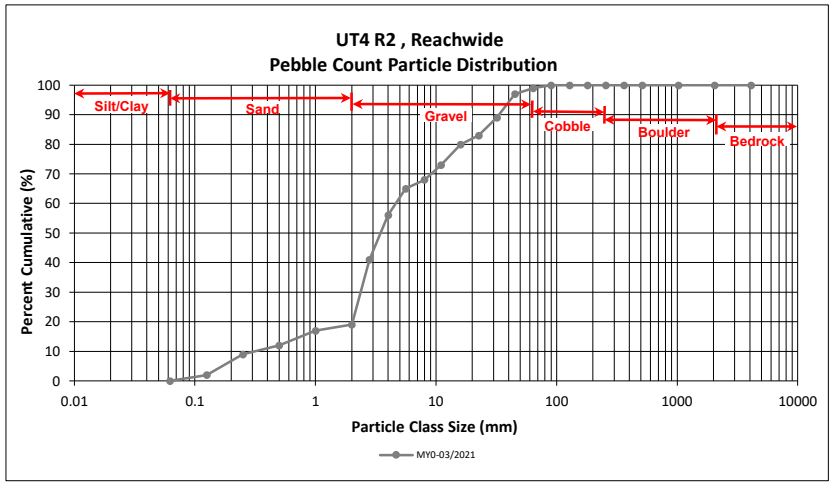
Reachwide and Cross-Section Pebble Count Plots

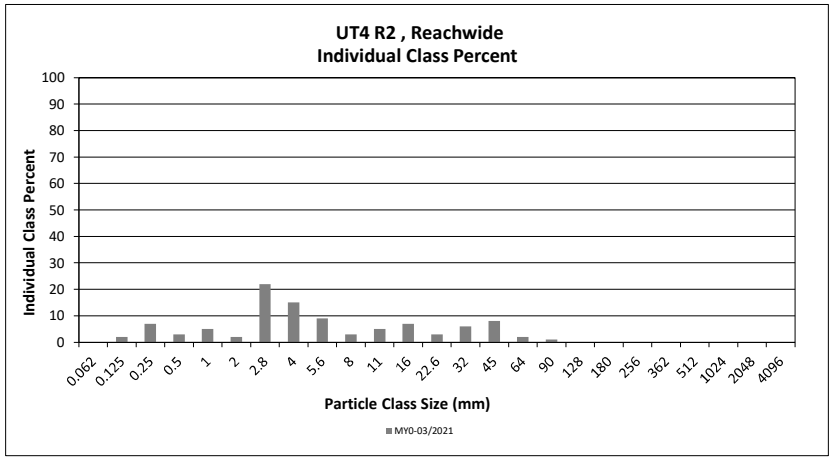
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT4 R2 , Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125		2	2	2	2
	Fine	0.125	0.250		7	7	7	9
	Medium	0.25	0.50	1	2	3	3	12
	Coarse	0.5	1.0	1	4	5	5	17
	Very Coarse	1.0	2.0	1	1	2	2	19
GRAVEL	Very Fine	2.0	2.8	3	19	22	22	41
	Very Fine	2.8	4.0	7	8	15	15	56
	Fine	4.0	5.6	6	3	9	9	65
	Fine	5.6	8.0	2	1	3	3	68
	Medium	8.0	11.0	3	2	5	5	73
	Medium	11.0	16.0	6	1	7	7	80
	Coarse	16.0	22.6	3		3	3	83
	Coarse	22.6	32	6		6	6	89
	Very Coarse	32	45	8		8	8	97
	Very Coarse	45	64	2		2	2	99
COBBLE	Small	64	90	1		1	1	100
	Small	90	128					100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.87
D_{35} =	2.55
D_{50} =	3.5
D_{84} =	23.9
D_{95} =	41.3
D_{100} =	90.0





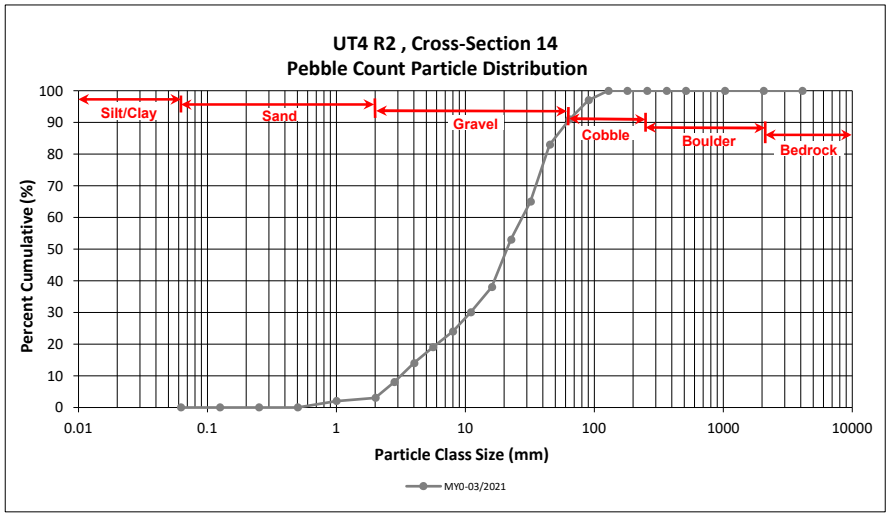
Reachwide and Cross-Section Pebble Count Plots

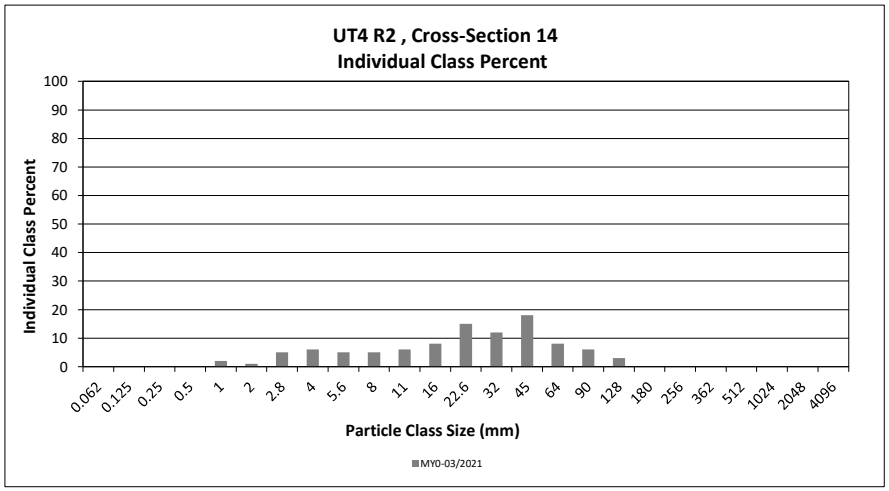
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT4 R2 , Cross-Section 14

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0	2	2	2
	Very Coarse	1.0	2.0	1	1	3
GRAVEL	Very Fine	2.0	2.8	5	5	8
	Very Fine	2.8	4.0	6	6	14
	Fine	4.0	5.6	5	5	19
	Fine	5.6	8.0	5	5	24
	Medium	8.0	11.0	6	6	30
	Medium	11.0	16.0	8	8	38
	Coarse	16.0	22.6	15	15	53
	Coarse	22.6	32	12	12	65
	Very Coarse	32	45	18	18	83
	Very Coarse	45	64	8	8	91
COBBLE	Small	64	90	6	6	97
	Small	90	128	3	3	100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 14	
Channel materials (mm)	
D_{16} =	4.58
D_{35} =	13.90
D_{50} =	21.1
D_{84} =	47.0
D_{95} =	80.3
D_{100} =	128.0





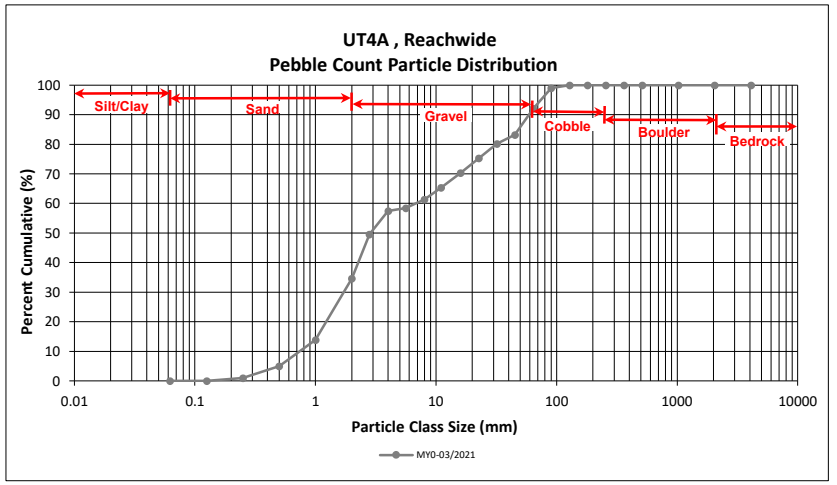
Reachwide and Cross-Section Pebble Count Plots

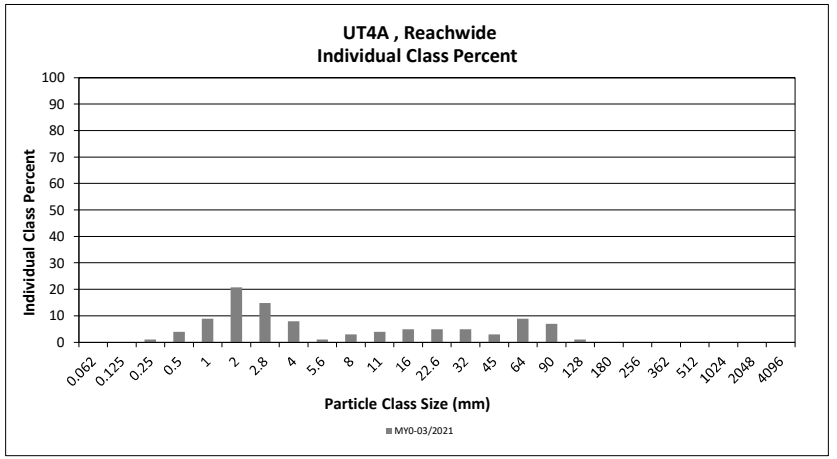
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT4A , Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125					0
	Fine	0.125	0.250		1	1	1	1
	Medium	0.25	0.50	1	3	4	4	5
	Coarse	0.5	1.0	3	6	9	9	14
	Very Coarse	1.0	2.0	2	19	21	21	35
GRAVEL	Very Fine	2.0	2.8	2	13	15	15	50
	Very Fine	2.8	4.0	3	5	8	8	57
	Fine	4.0	5.6		1	1	1	58
	Fine	5.6	8.0	2	1	3	3	61
	Medium	8.0	11.0	4		4	4	65
	Medium	11.0	16.0	4	1	5	5	70
	Coarse	16.0	22.6	5		5	5	75
	Coarse	22.6	32	5		5	5	80
	Very Coarse	32	45	3		3	3	83
	Very Coarse	45	64	9		9	9	92
COBBLE	Small	64	90	7		7	7	99
	Small	90	128	1		1	1	100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**51**	**50**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	1.07
D_{35} =	2.02
D_{50} =	2.9
D_{84} =	46.5
D_{95} =	73.9
D_{100} =	128.0





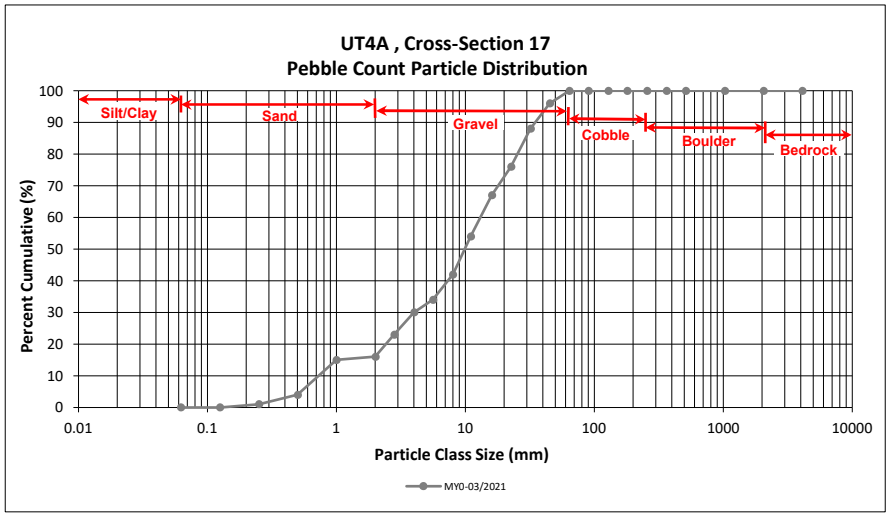
Reachwide and Cross-Section Pebble Count Plots

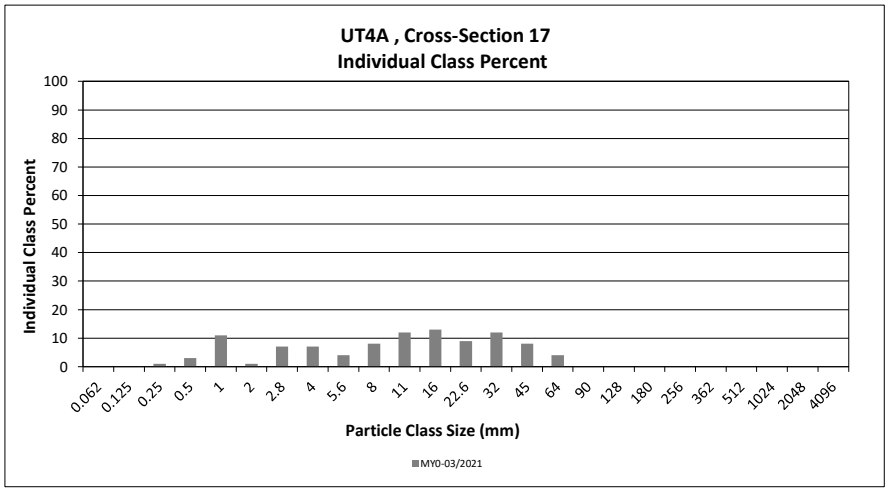
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT4A , Cross-Section 17

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary Class Percentage	Summary Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	1	1	1
	Medium	0.25	0.50	3	3	4
	Coarse	0.5	1.0	11	11	15
	Very Coarse	1.0	2.0	1	1	16
GRAVEL	Very Fine	2.0	2.8	7	7	23
	Very Fine	2.8	4.0	7	7	30
	Fine	4.0	5.6	4	4	34
	Fine	5.6	8.0	8	8	42
	Medium	8.0	11.0	12	12	54
	Medium	11.0	16.0	13	13	67
	Coarse	16.0	22.6	9	9	76
	Coarse	22.6	32	12	12	88
	Very Coarse	32	45	8	8	96
	Very Coarse	45	64	4	4	100
COBBLE	Small	64	90			100
	Small	90	128			100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 17	
Channel materials (mm)	
D_{16} =	2.00
D_{35} =	5.86
D_{50} =	9.9
D_{84} =	28.5
D_{95} =	43.1
D_{100} =	64.0





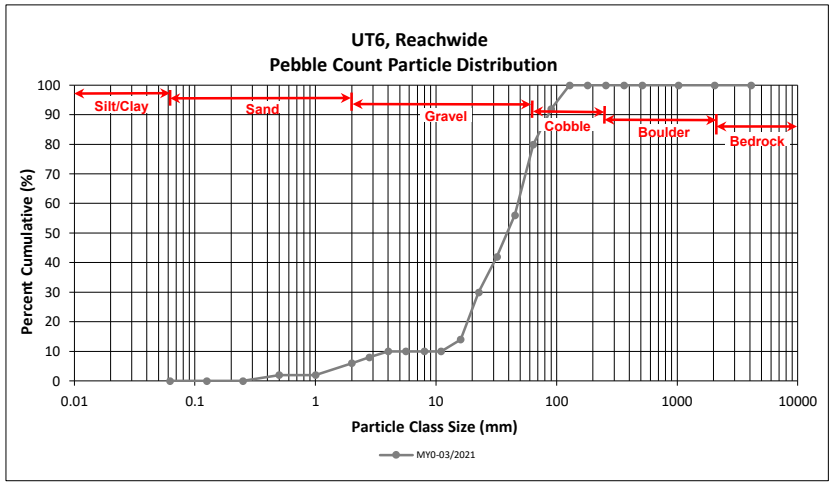
Reachwide and Cross-Section Pebble Count Plots

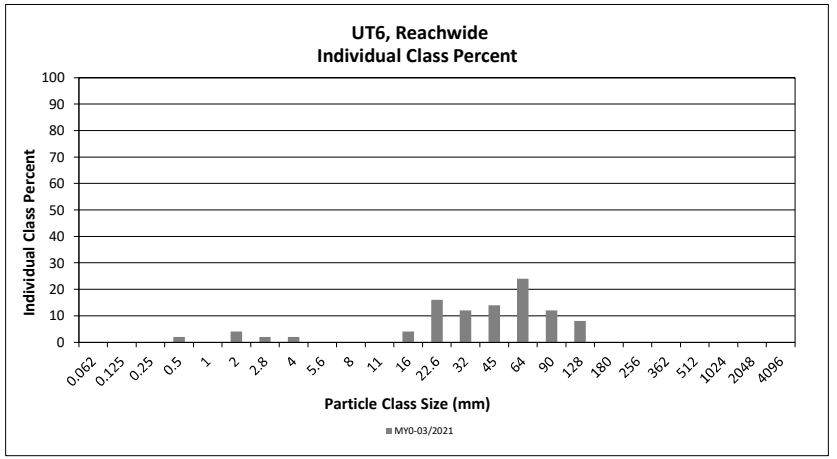
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT6, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125					0
	Fine	0.125	0.250					0
	Medium	0.25	0.50	1		1	2	2
	Coarse	0.5	1.0					2
	Very Coarse	1.0	2.0	2		2	4	6
GRAVEL	Very Fine	2.0	2.8	1		1	2	8
	Very Fine	2.8	4.0	1		1	2	10
	Fine	4.0	5.6					10
	Fine	5.6	8.0					10
	Medium	8.0	11.0					10
	Medium	11.0	16.0	2		2	4	14
	Coarse	16.0	22.6	8		8	16	30
	Coarse	22.6	32	6		6	12	42
	Very Coarse	32	45	7		7	14	56
	Very Coarse	45	64	12		12	24	80
COBBLE	Small	64	90	6		6	12	92
	Small	90	128	4		4	8	100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**0**	**50**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	16.71
D_{35} =	26.12
D_{50} =	38.9
D_{84} =	71.7
D_{95} =	102.7
D_{100} =	128.0





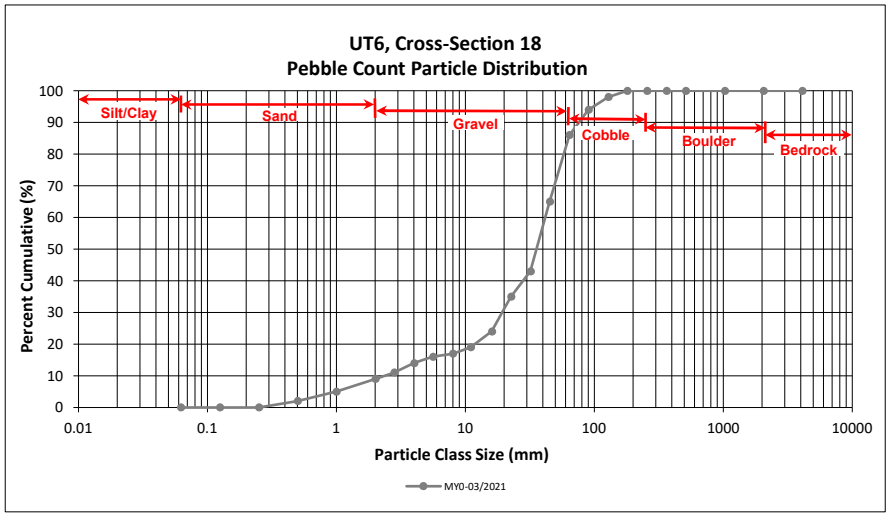
Reachwide and Cross-Section Pebble Count Plots

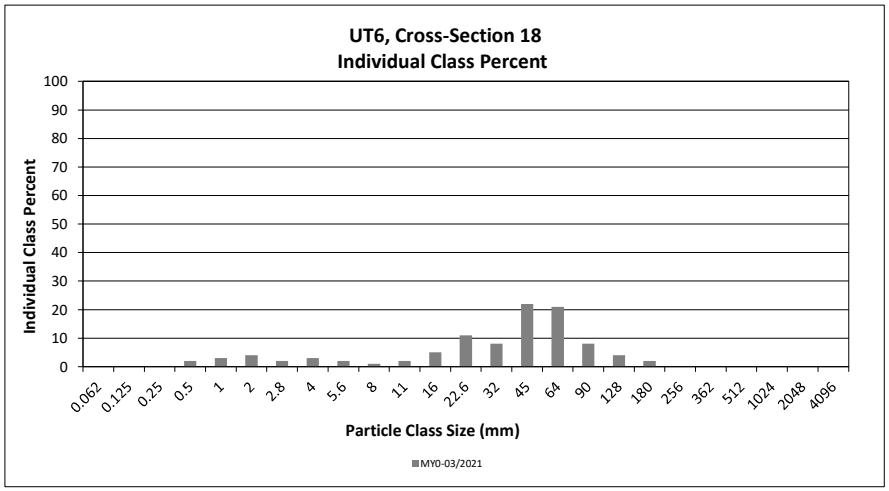
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT6, Cross-Section 18

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	2	2	2
	Coarse	0.5	1.0	3	3	5
	Very Coarse	1.0	2.0	4	4	9
GRAVEL	Very Fine	2.0	2.8	2	2	11
	Very Fine	2.8	4.0	3	3	14
	Fine	4.0	5.6	2	2	16
	Fine	5.6	8.0	1	1	17
	Medium	8.0	11.0	2	2	19
	Medium	11.0	16.0	5	5	24
	Coarse	16.0	22.6	11	11	35
	Coarse	22.6	32	8	8	43
	Very Coarse	32	45	22	22	65
	Very Coarse	45	64	21	21	86
COBBLE	Small	64	90	8	8	94
	Small	90	128	4	4	98
	Large	128	180	2	2	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 18	
Channel materials (mm)	
D_{16} =	5.60
D_{35} =	22.60
D_{50} =	35.7
D_{84} =	61.9
D_{95} =	98.3
D_{100} =	180.0





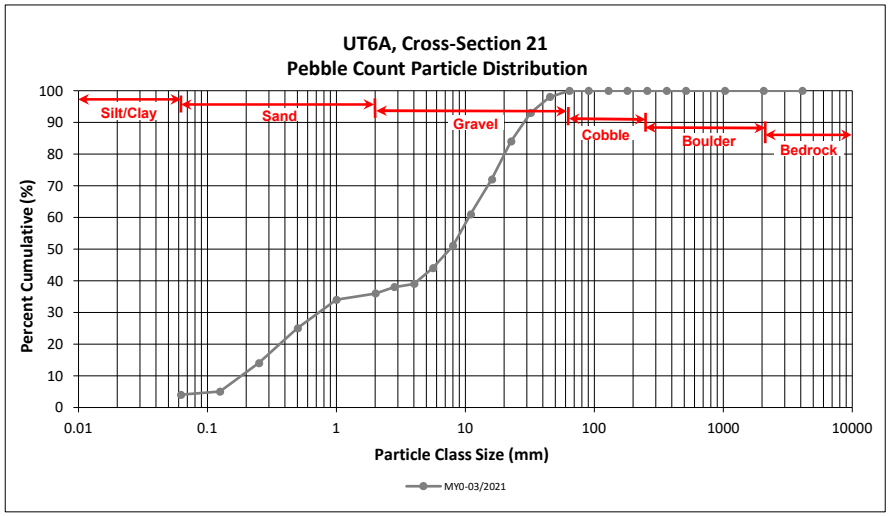
Reachwide and Cross-Section Pebble Count Plots

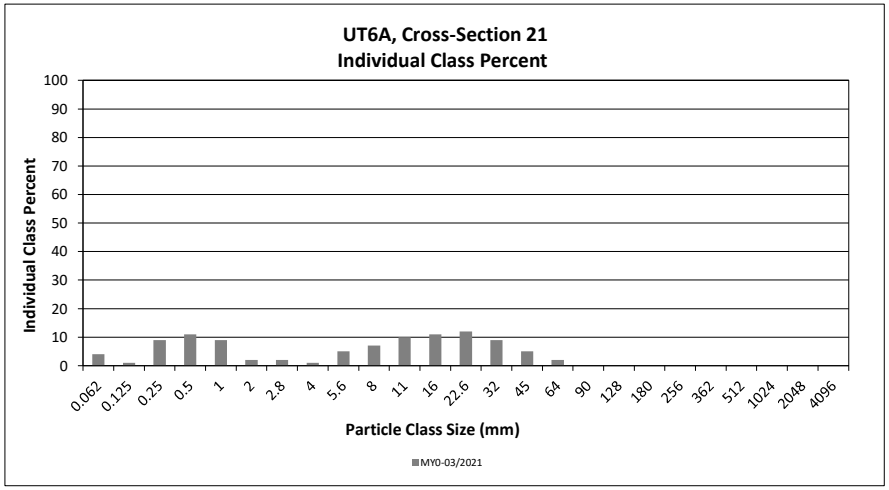
Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021

UT6A, Cross-Section 21

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4	4	4
SAND	Very fine	0.062	0.125	1	1	5
	Fine	0.125	0.250	9	9	14
	Medium	0.25	0.50	11	11	25
	Coarse	0.5	1.0	9	9	34
	Very Coarse	1.0	2.0	2	2	36
GRAVEL	Very Fine	2.0	2.8	2	2	38
	Very Fine	2.8	4.0	1	1	39
	Fine	4.0	5.6	5	5	44
	Fine	5.6	8.0	7	7	51
	Medium	8.0	11.0	10	10	61
	Medium	11.0	16.0	11	11	72
	Coarse	16.0	22.6	12	12	84
	Coarse	22.6	32	9	9	93
	Very Coarse	32	45	5	5	98
	Very Coarse	45	64	2	2	100
COBBLE	Small	64	90			100
	Small	90	128			100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

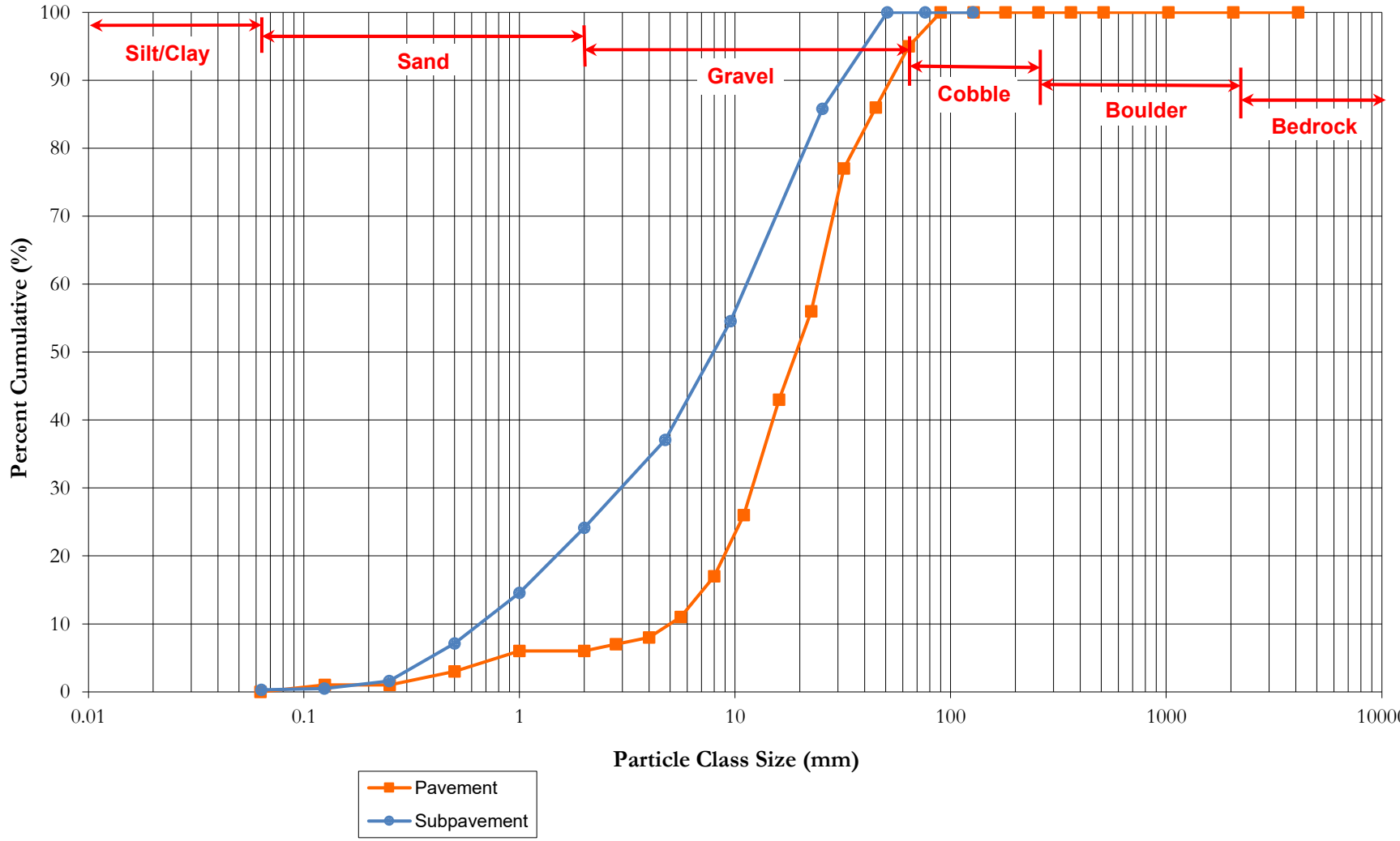
Cross-Section 21	
Channel materials (mm)	
D_{16} =	0.28
D_{35} =	1.41
D_{50} =	7.6
D_{84} =	22.6
D_{95} =	36.7
D_{100} =	64.0





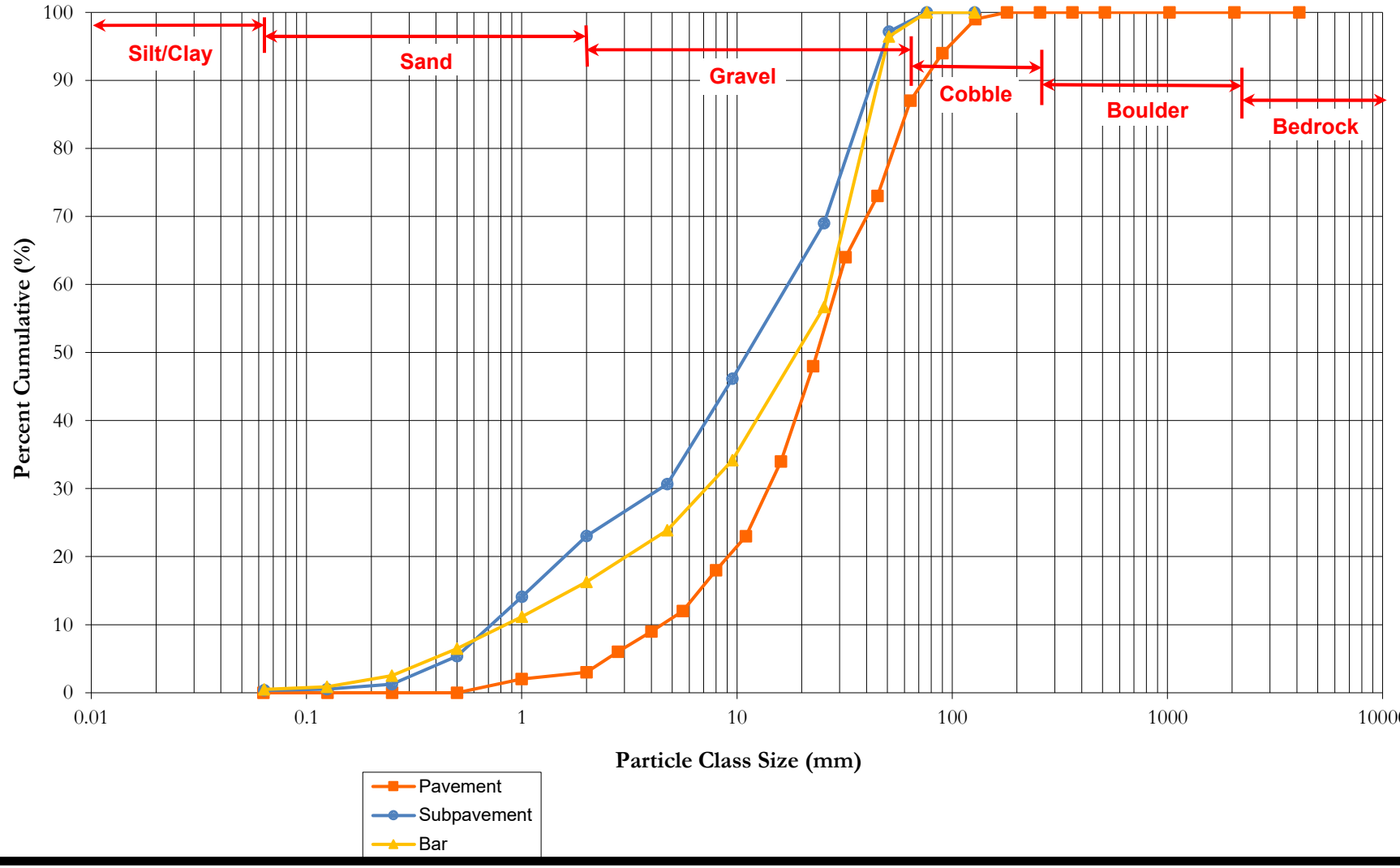
Bridgefork R1B - XS3

Pavement-Subpavement Particle Distribution



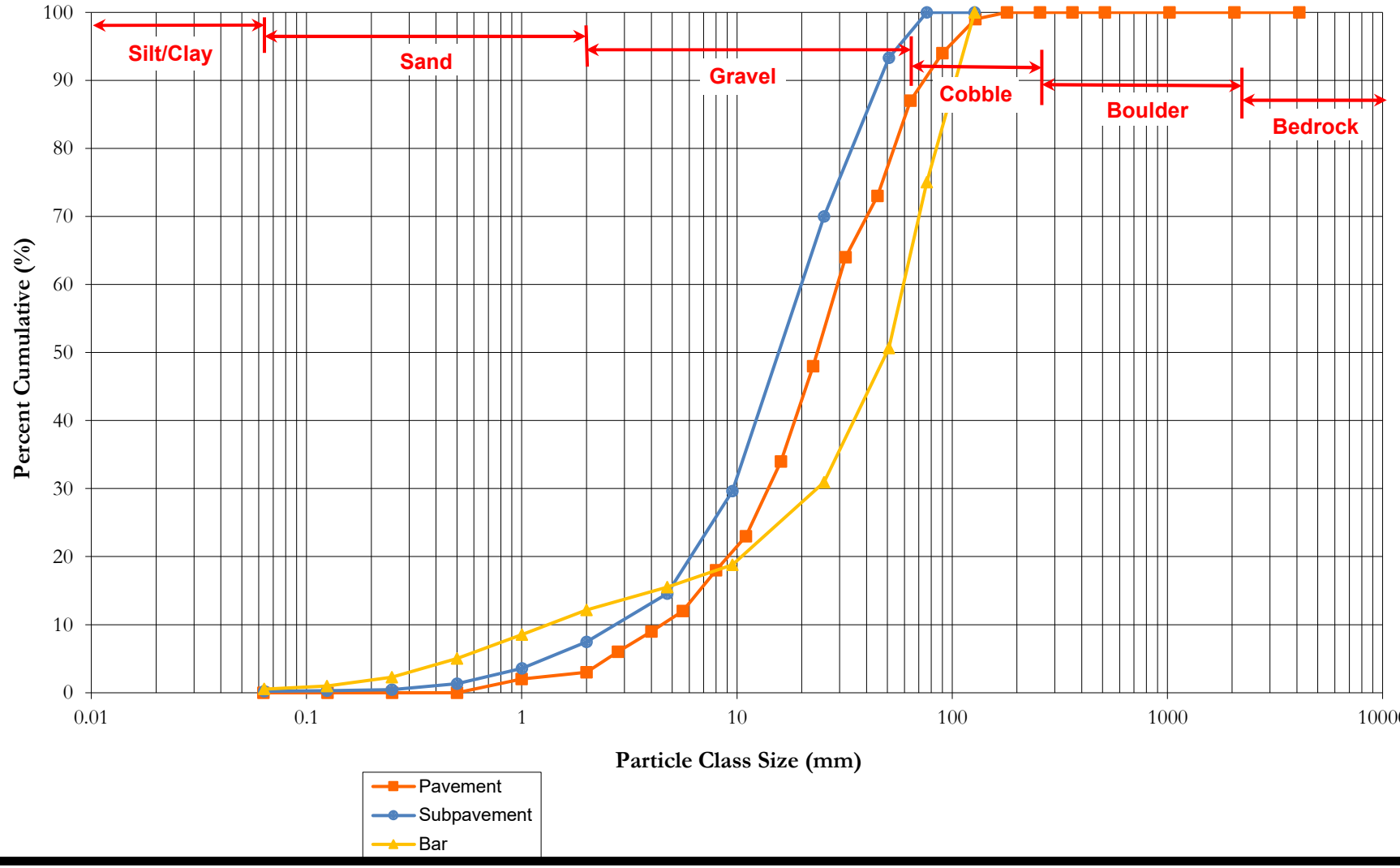
Bridgefork R2 - XS5

Pavement-Subpavement Particle Distribution



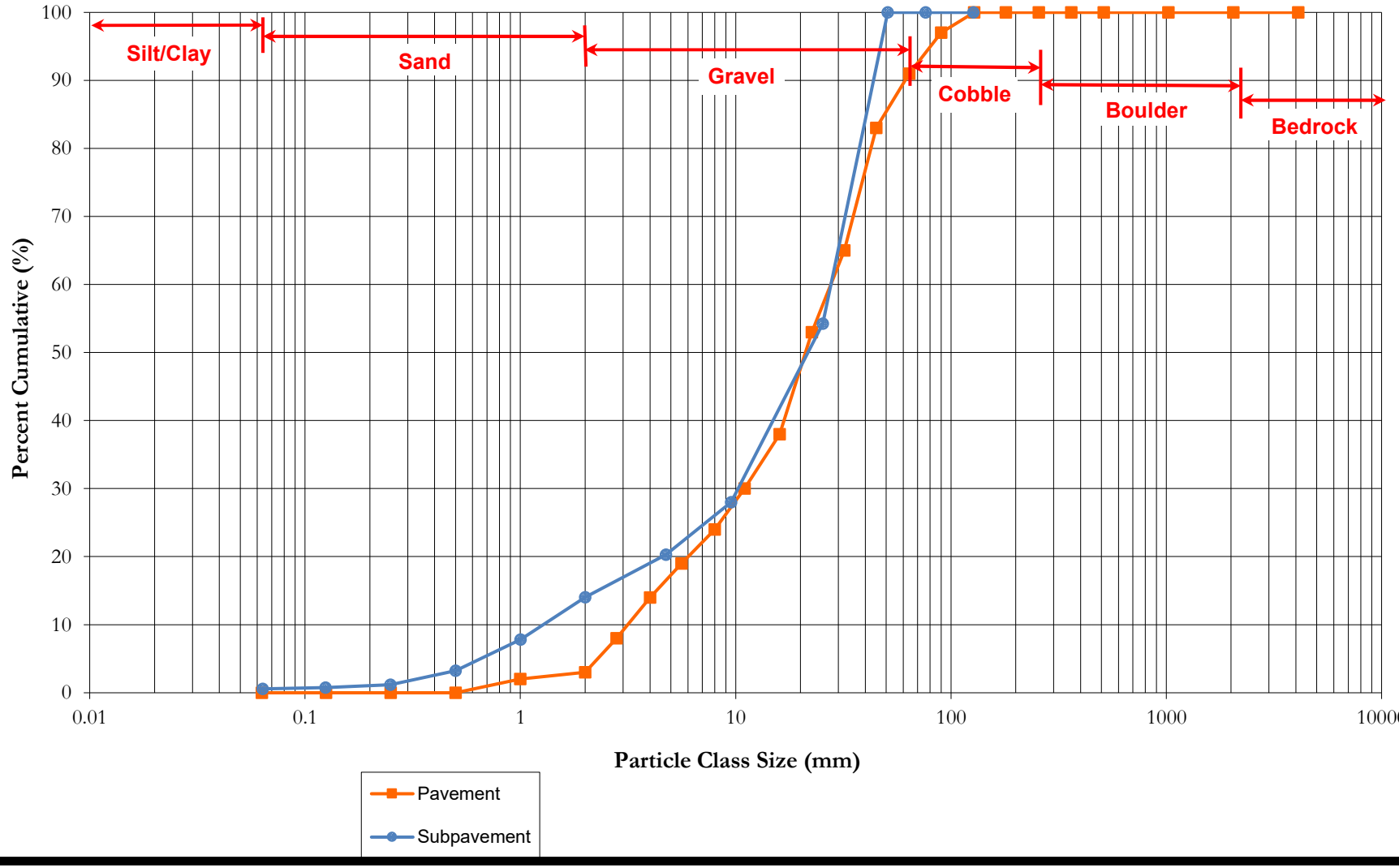
Bridgefork R3 - XS7

Pavement-Subpavement Particle Distribution



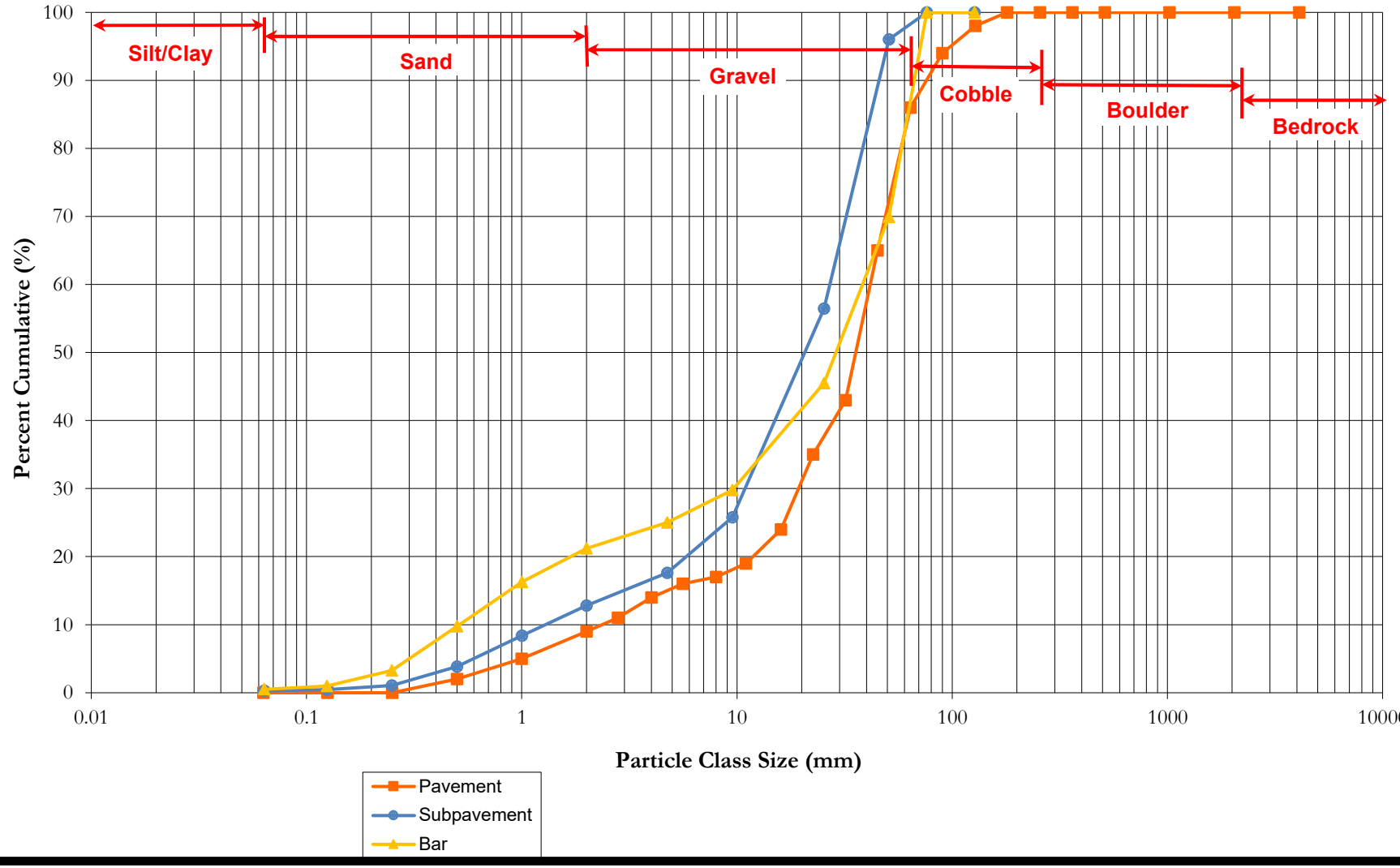
UT4 - XS14

Pavement-Subpavement Particle Distribution



UT6 - XS18

Pavement-Subpavement Particle Distribution



WETLAND & GROWING SEASON DOCUMENTATION

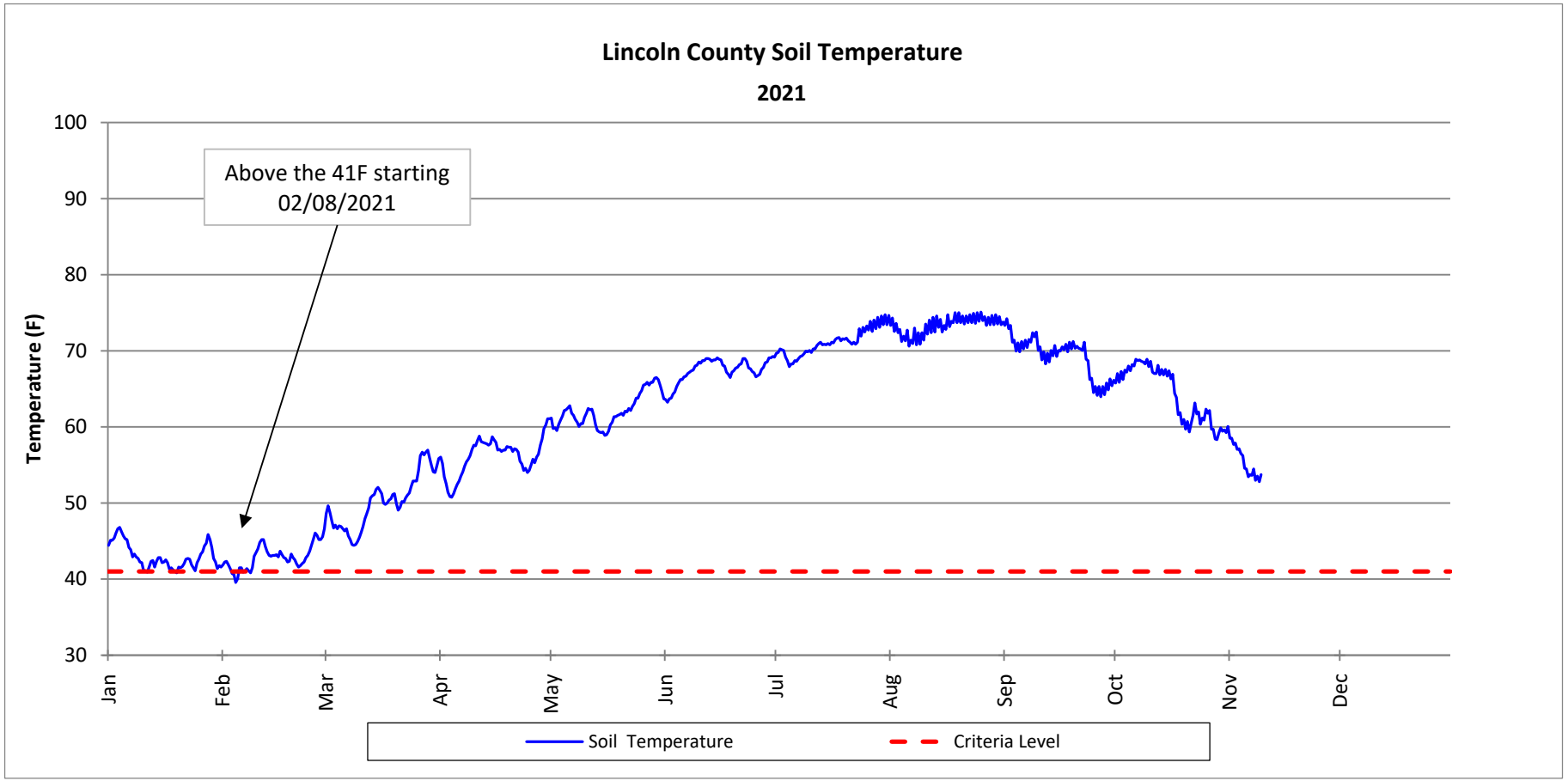
The following photographs support the decision to extend the growing season beyond the dates provided from a nearby WETS station. The photos document new growth after the end of the WETS growing season, and flowering that is occurring before the start of the WETS growing season.

	
Flowering *Sceptridium dissectum.* Cleveland County (Bridgefork Dairy Site). (12/02/2021)	**New Growth -** *Mentha aquatica.* Cleveland County (Bridgefork Dairy Site). (12/02/2021)
	
New Growth - *Ranunculus repens.* Cleveland County (Bridgefork Dairy Site). (12/02/2021)	**New Growth -** *Stellaria media.* Cleveland County (Bridgefork Dairy Site). (12/02/2021)
	
Flowering - *Salix sericea.* Cleveland County (Big Harris Site). (03/01/2022)	**Flowering -** *Acer rubrum.* Cleveland County (Big Harris Site). (03/01/2022)

Soil Temperature Probe Plots

Owl's Den Mitigation Site (DMS Project No. 95808)

Monitoring Year 6 - 2021



APPENDIX 5 – Wetland Design Documents and Data

Wetland Gauge Summary

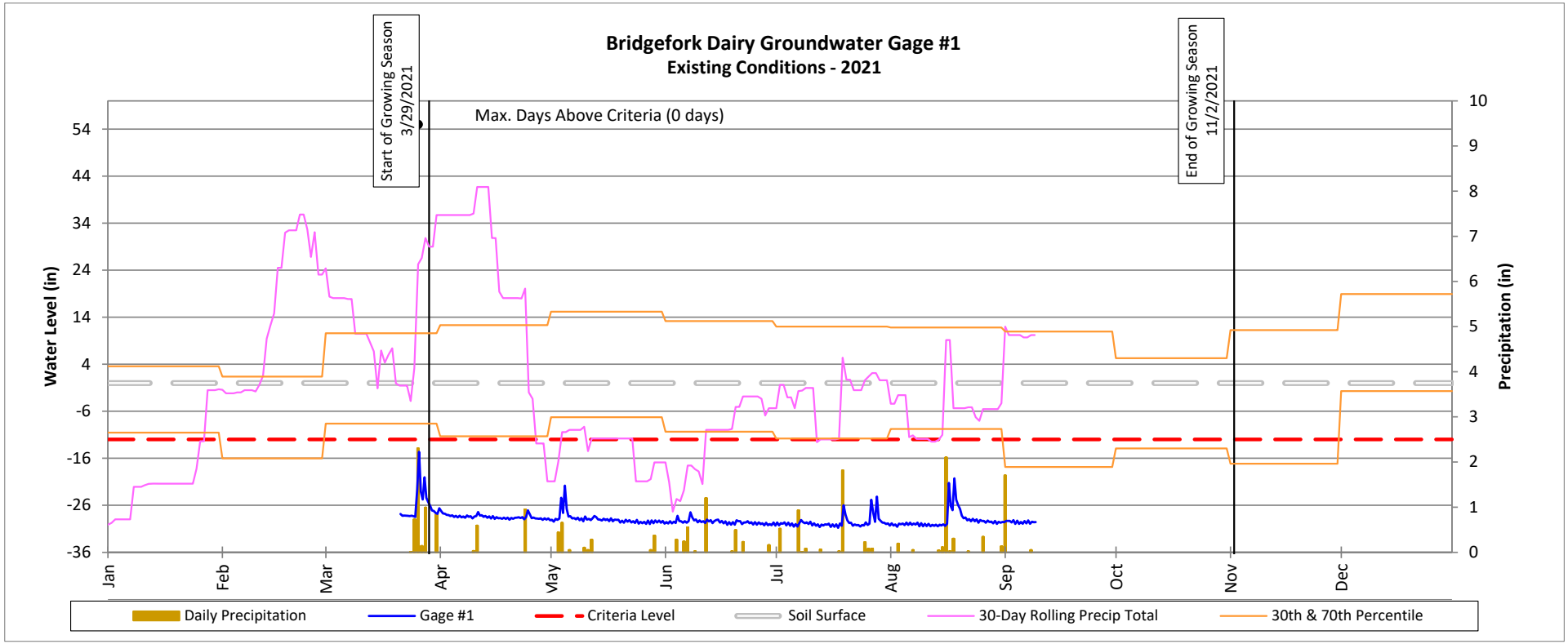
Bridgefork Dairy Mitigation Site
DMS Project No. 100171
Existing Conditions - 2021

Gage	Max. Consecutive Hydroperiod (Percentage)
	Existing Cond. (2021)
GWG1	**0 Days (0%)**
GWG2	**1 Days (0.5%)**
GWG3	**0 Days (0%)**
GWG4	**0 Days (0%)**
GWG5	**16 Days (7.3%)**
GWG6	**0 Days (0%)**
GWG7	**0 Days (0%)**
GWG8	**1 Days (0.5%)**
GWG9	**0 Days (0%)**

Performance Standard: **11%**
WETS Station: **SHELBY 2 NW, NC** Growing Season: **03/29 - 11/02 (218 Days)**

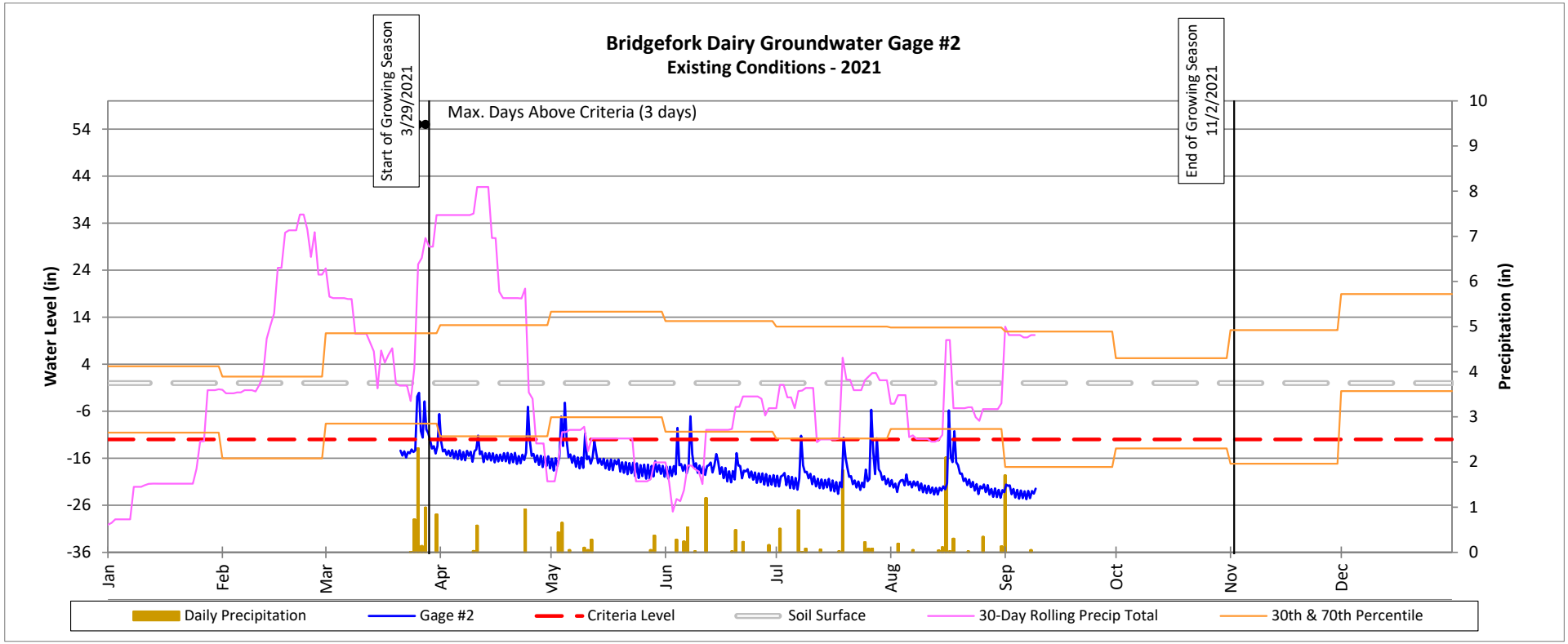
Groundwater Gage Plots

Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021
Wetland GWG1



Groundwater Gage Plots

Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021
Wetland GWG2



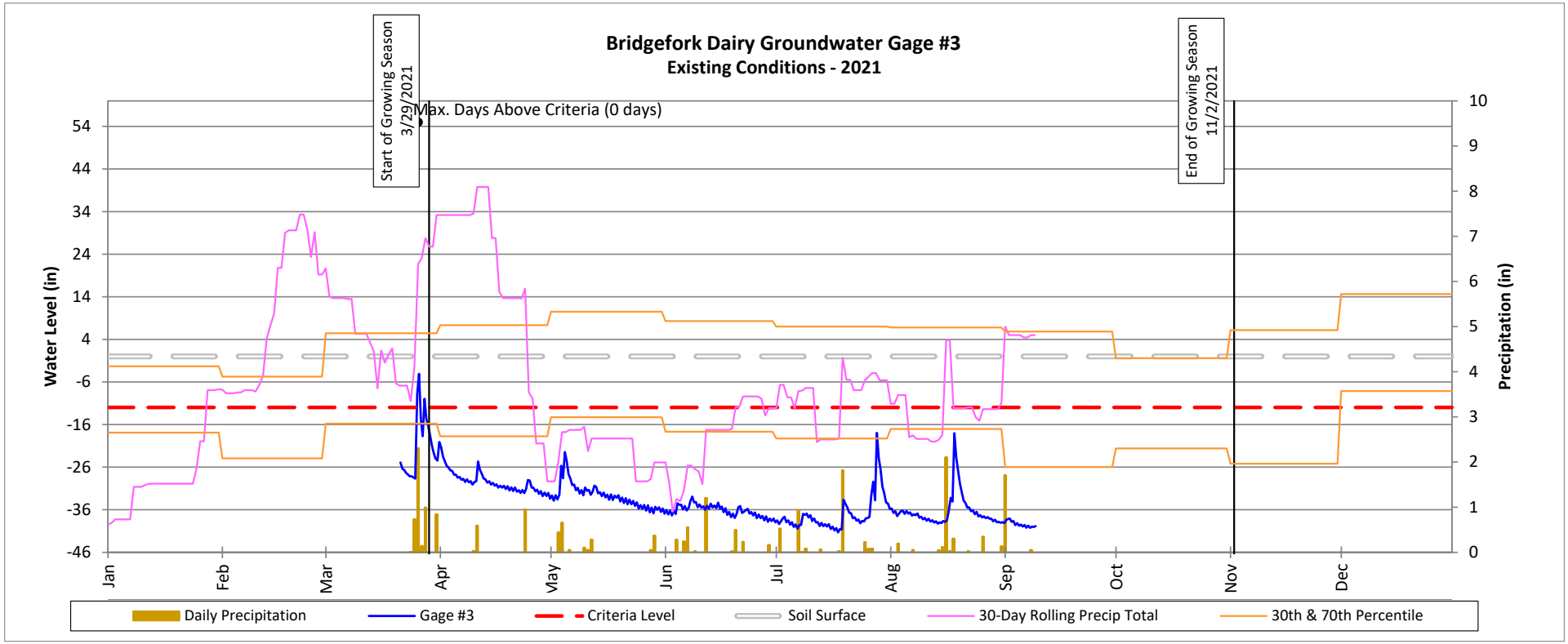
Groundwater Gage Plots

Bridgefork Dairy

DMS Project No. 100171

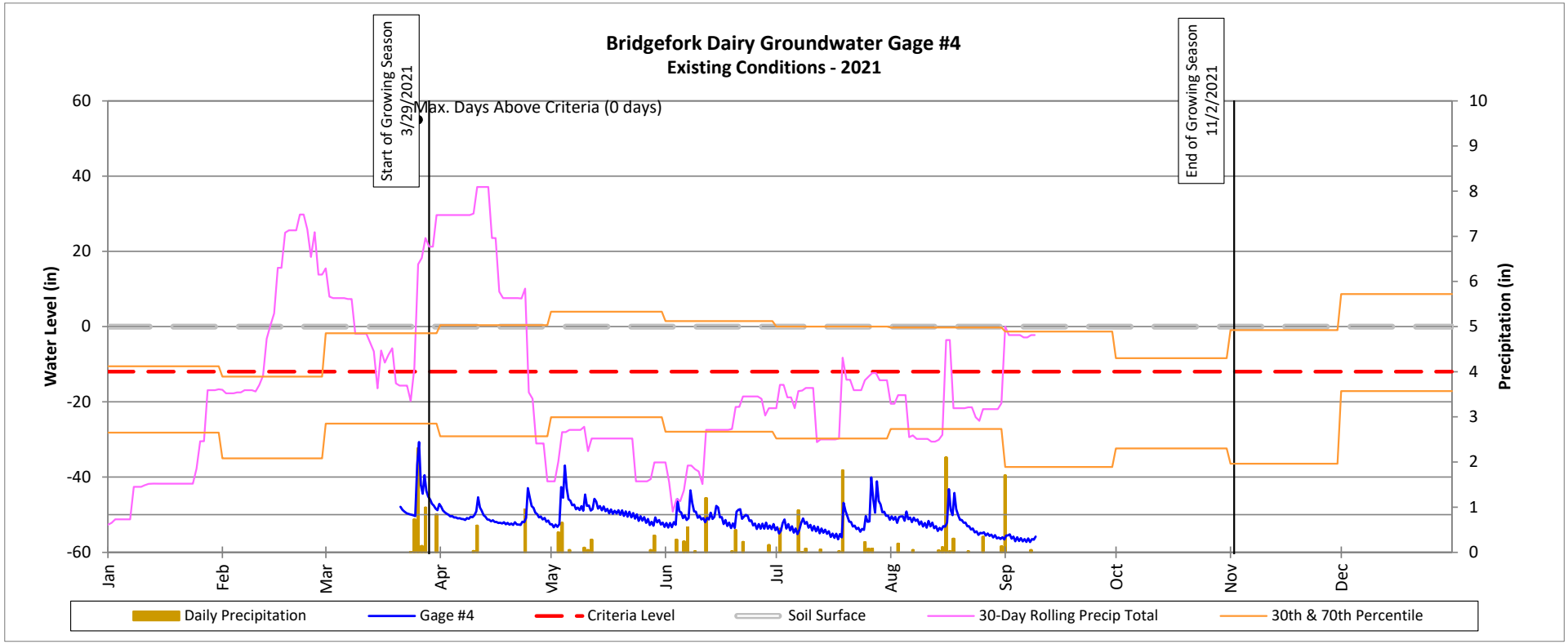
Existing Conditions - 2021

Wetland GWG3



Groundwater Gage Plots

Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021
Wetland GWG4



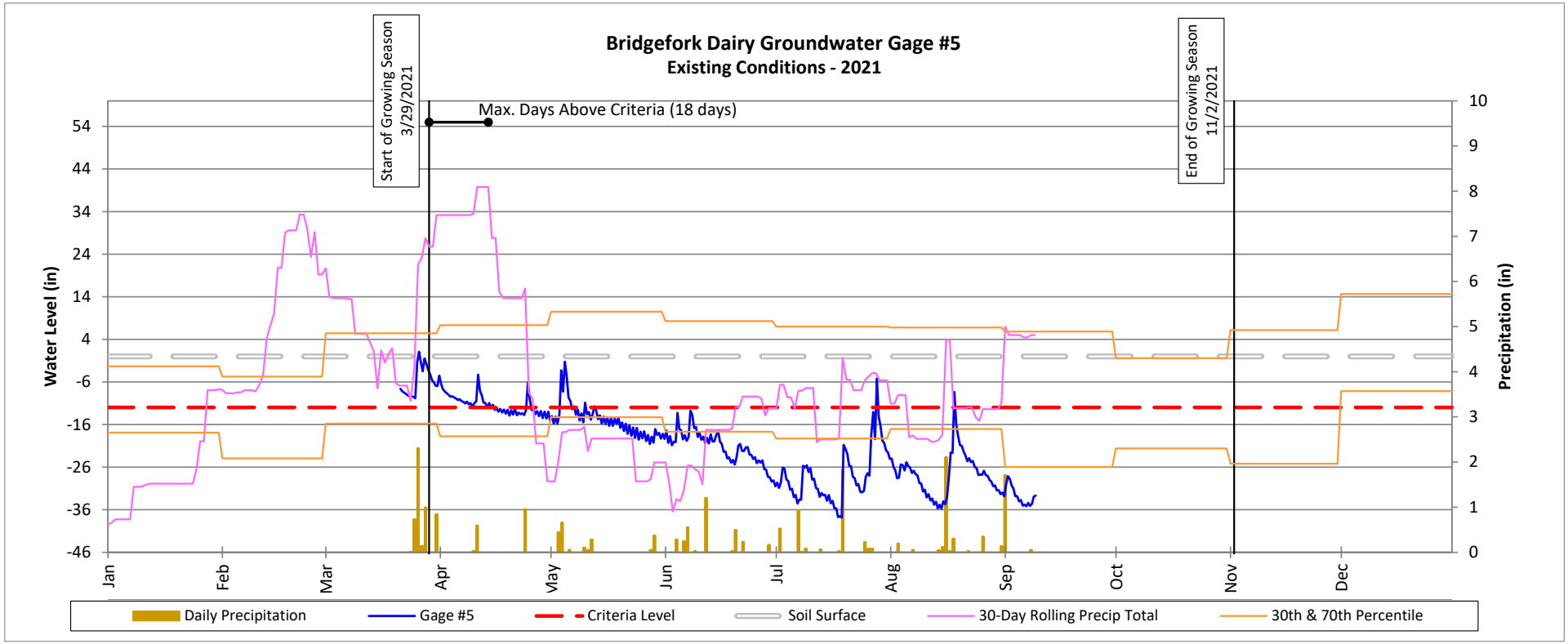
Groundwater Gage Plots

Bridgefork Dairy

DMS Project No. 100171

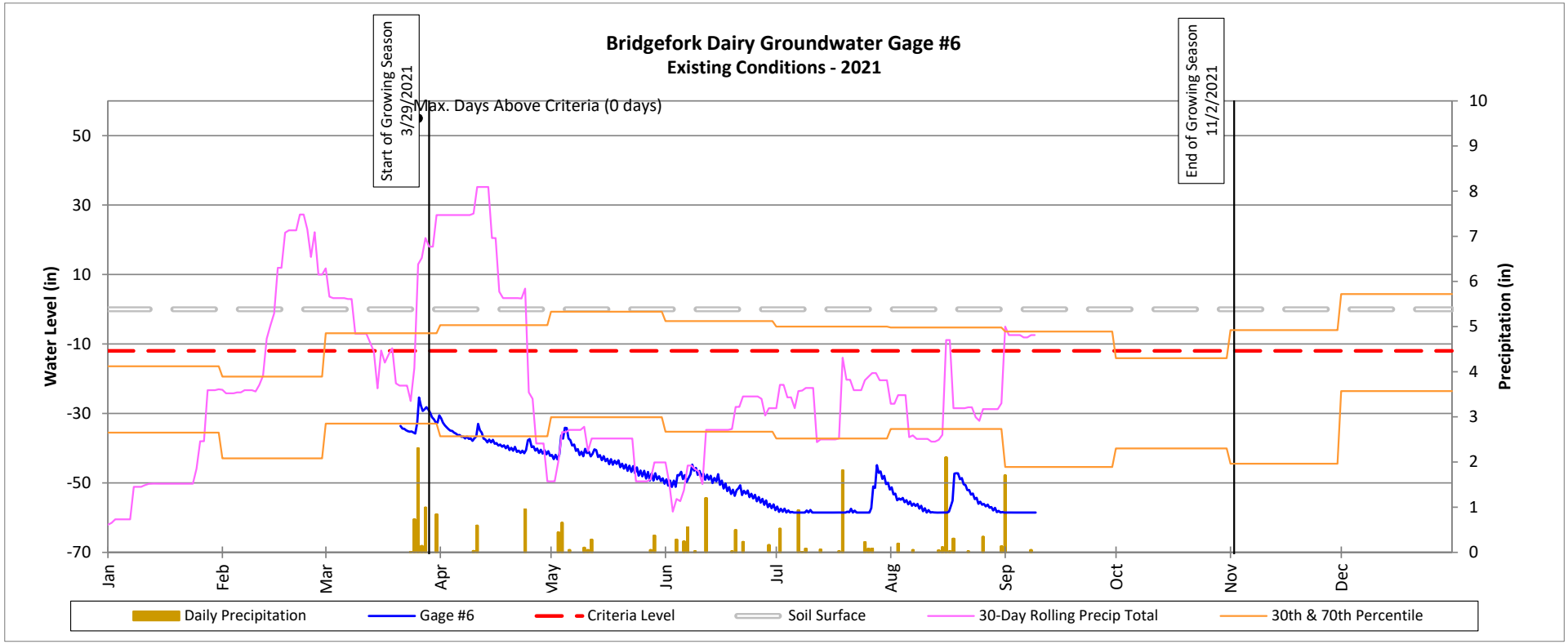
Existing Conditions - 2021

Wetland GWG5



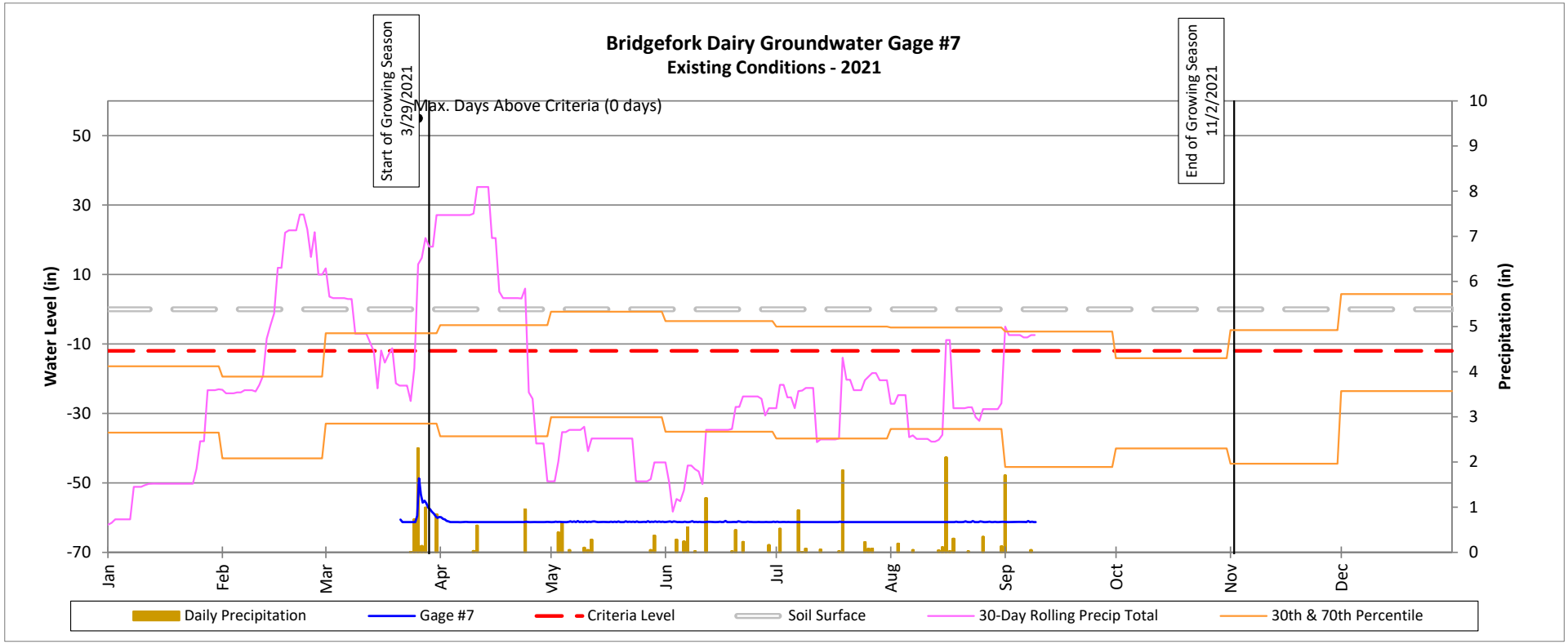
Groundwater Gage Plots

Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021
Wetland GWG6



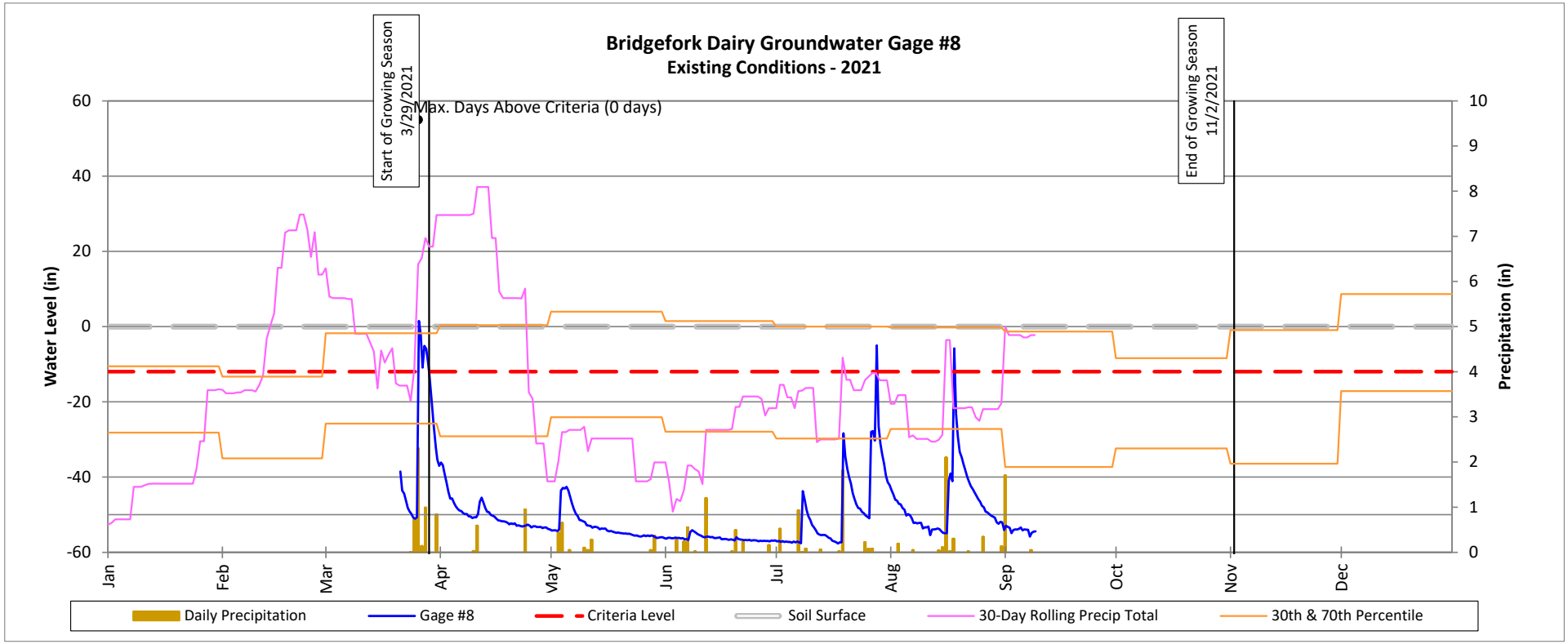
Groundwater Gage Plots

Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021
Wetland GWG7



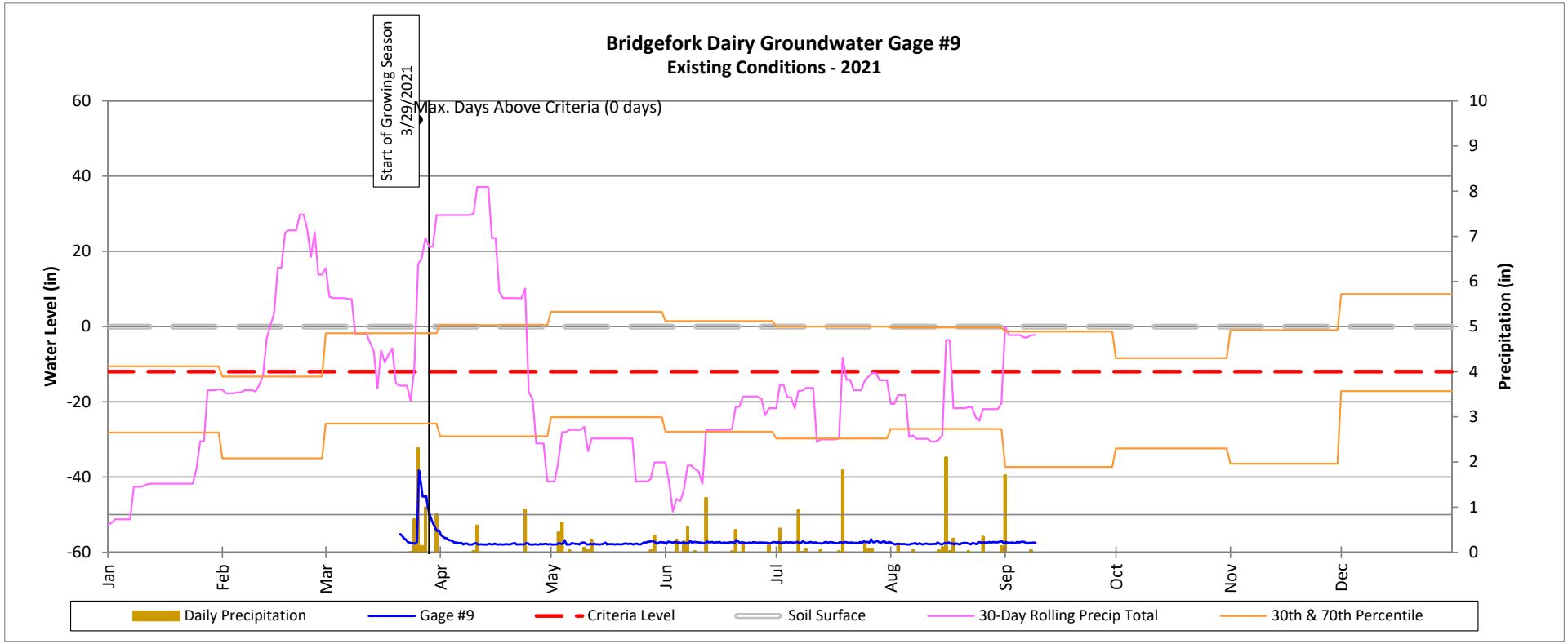
Groundwater Gage Plots

Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021
Wetland GWG8



Groundwater Gage Plots

Bridgefork Dairy
DMS Project No. 100171
Existing Conditions - 2021
Wetland GWG9



S&EC
Soil & Environmental Consultants, PA
11010 Raven Ridge Road • Raleigh, North Carolina 27614 • Phone: (919) 846-5900 • Fax: (919) 846-9467
www.SandEC.com

PRELIMINARY HYDRIC SOIL INVESTIGATION

Bridgefork Dairy Mitigation Site
Kings Mountain, NC
PIEDMONT
Broad River Basin
Cleveland County, North Carolina

Prepared for:
Mr. Eric Neuhaus
Wildlands
167-B Haywood Road
Asheville, NC 28806

March 20th, 2020

INTRODUCTION

Soil & Environmental Consultants, PA (S&EC, PA) was retained to perform a preliminary evaluation to assess the presence and extent of hydric soils onsite. Portions of the evaluated areas are currently planted in herbaceous grass, while the remainder is made up of mature mixed hardwoods. Areas that are considered to be hydric soils contained hydric soil indicator F3. (see attached Figure A - Preliminary Soils Investigation Map)

METHODOLOGY

On March 17th, 2020 S&EC, PA staff performed a hydric soil evaluation at the site. Hand auger borings were advanced on the property at locations as appropriate to approximately estimate the location and extent of hydric soils within the project area (see attached Figure A - Preliminary Soils Investigation Map). Each soil boring was evaluated to assess the presence or absence of hydric soil indicators. Hydric soil indicators were identified utilizing the NRCS Field Indicators of Hydric Soils in the United States - A Guide for Identifying and Delineating Hydric Soils (Version 8.2, 2018).

Most of the areas evaluated are mapped as the somewhat poorly drained Chewacla (Fluvaquentic Dystrudepts). All hydric soils observed onsite were most like the Wehadkee soil series (Typic Fluvaquents) and any variations in the soil profiles were within the range of characteristics detailed in the Official Series Description.

RESULTS

Approximately 41 soil borings were performed within the study area. Soil characteristics were evaluated, and all areas identified as containing hydric soils met the hydric soil criteria described below. Several of the borings met F3 indicator (a) while most met F3 indicator (b) (see below)

Soil boring locations are indicated on the attached Figure A- Preliminary Soils Investigation Map. All soil borings had a depleted matrix (F3 indicator) within 10" of current land surface. A few borings had an F19 indicator above the F3 (b) indicator as indicated in the table included in Figure A.

Indicator F3: Depleted Matrix

Technical Description: A layer that has a depleted matrix with 60 percent

or more chroma of 2 or less and that has a minimum thickness of either:

(a) 2 in. (5 cm) if the 2 in. (5 cm) is entirely within the upper 6 in. (15 cm)

of the soil, or

(b) 6 in. (15 cm) starting within 10 in. (25 cm) of the soil surface.

Boring	Depth to Hydric Indicator	Boring	Depth to Hydric Indicator
B1	0" - F3	B22	0" - F3
B2	3" - F3	B23	10" - F3
B3	2" F19 6" - F3	B24	0" - F3
B4	6" - F3	B25	Non-Hydric
B5	3" - F3	B26	4" - F3
B6	10" - F19 Boarderline	B27	Non-Hydric
B7	Non-Hydric	B28	Non-Hydric
B8	Non-Hydric	B29	3" - F3
B9	Non-Hydric	B30	Non-Hydric
B10	6" - F3	B31	Non-Hydric
B11	Non-Hydric	B32	Non-Hydric
B12	Non-Hydric	B33	9" - F3 Boarderline
B13	8" - F19 10" - F3	B34	Non-Hydric
B14	0" - F3	B35	Non-Hydric
B15	Non-Hydric	B36	Non-Hydric
B16	Non-Hydric	B37	Non-Hydric
B17	0" - F3	B38	0" - F3
B18	Non-Hydric	B39	Non-Hydric
B19	0" - F3	B40	Non-Hydric
B20	Non-Hydric	B41	Non-Hydric
B21	Non-Hydric		

Project Parcels

Proposed Conservation Easement

Soil Borings and Observations within 10" of the Soil Surface

Hydric

Non-hydric

Proposed Wetland Restoration Zones

Wetland Rehabilitation

Wetland Re-Establishment

Existing Streams

Existing Ditch

Topographic Contours (2')

UT5
B40
B39
B38
B41
B37
B36
B35
B34
B33
Bridgefork Creek
B32
B31
B30
B27
B29
B28
B26
UT4
UT4
UT4A
B1
B4
B3
B5
B6
B2
B9
B7
B14
B10
B8
B12
B13
B11
B25
B24
B22
B23
Location of Soil Profile 1 (B17)
Bridgefork Creek
B15
UT1
B16
B18
B20
B21
B19
B17
UT2

2019 Aerial Photography

WILDLANDS ENGINEERING

0 500 1,000 Feet

N

Figure A
Preliminary Soil Investigation
Bridgefork Dairy Mitigation Site
BroadRiver Basin 03050105
Cleveland County, NC

Soil Profile #1 / Boring Location B17
Hydric Soil Indicator: F3
Series and Taxonomic Class: Wehadkee – Fine-loamy, mixed, active, nonacid, thermic Fluvaquentic Endoaquepts

Horizon Depth (inches)	Horizon	Matrix Color (moist)	%	Redox Features				Texture	Notes
				Color (moist)	%	Type	Location		
0 to 10	A	2.5Y 5/1	80	7.5YR 4/6	20	C	M & PL	Sandy Clay Loam	Fe Masses and pore linings present
10 to 14	Bg1	2.5Y 3/1	95	10YR 4/4	5	C	M	Sandy clay loam	Fe Masses present

NOTE: In all areas considered to be hydric, the F3 indicator was found within 10" or less from the soil surface and was 6" or more in thickness (see table on attached Figure 1 - Preliminary Soils Investigation Map) as required to meet the F3 criteria. In such cases, the soil horizon above the horizon containing the F3 indicator would be an A horizon containing a chroma of 3 or more and without redox features unless that horizon was noted to meet the F19 hydric soil criteria.

APPENDIX 6 – Categorical Exclusion Checklist and Summary
Botanical Survey Agency Correspondance

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:	Bridgefork Dairy Mitigation Site
County Name:	Cleveland
DMS Number:	100171
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:	Matthew Reid

Project Description

The Bridgefork Mitigation Site is being developed to provide stream and wetland mitigation in the Broad River basin. The project will include restoration, enhancement, and preservation of nine unnamed tributaries as well as wetland re-establishment and rehabilitation. The land-use on the property includes an active cattle farm, hay pasture, horse boarding pastures and some wooded areas. The major goals of the stream and wetland mitigation project are to provide ecological and water quality enhancements to the Broad River Basin while creating a functional riparian corridor at the site level. This will be accomplished by excluding livestock, stabilizing stream channels, restoring and enhancing native floodplain and wetland vegetation, implementing BMPs, and permanently protecting the site through establishing a conservation easement.

For Official Use Only

Reviewed By:

April 23, 2021 — Matthew Reid

Date — **DMS Project Manager**

Conditional Approved By:

Date — **For Division Administrator FHWA**

☐ **Check this box if there are outstanding issues**

Final Approval By:

4-23-21 — 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

Bridgefork Dairy 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 Bridgefork Dairy 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 February 26, 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 EDR Radius Map Report identified two sites within 0.5 mile from the target property: one site having a leaking underground storage tank (LUST) and the other having a leaking aboveground underground storage tank (LAST).

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 consider 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 Bridgefork Dairy Mitigation Site on February 2, 2021. SHPO responded on March 10, 2021 and is unaware of any historical resources that would be affected by the project. Therefore, SHPO does not have any concerns with the project as proposed. All correspondence related to Section 106 is included in the Appendix.

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.

Bridgefork Dairy 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 Bridgefork Dairy Mitigation Site on February 2, 2021. On March 1, 2021, Ms. Toombs (Cherokee Nation THPO) requested a copy of the comments from the SHPO. NCDMS emailed SHPO comments on March 11, 2021 to the Cherokee Nation Tribal Historic Preservation Office, the Eastern Bank of Cherokee, or the United Keetoowah Band of Cherokee. No additional comments have been received at this time.

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 northern long-eared bat (NLEB) (*Myotis septentrionalis)* and the dwarf-flowered heartleaf (*Hexastylis naniflora)*. The USFWS does not currently list any Critical Habitat Designations for the Federally listed species within Cleveland County nor are there any current known occurrences of the above listed species within a 2-mile radius of the project site. The project site is located approximately 46 miles from the nearest known hibernaculum for the NLEB. (https://www.fws.gov/asheville/htmls/project_review/NLEB_in_WNC.html).

Results from pedestrian surveys conducted on March 9, 2020 indicated that the project area provides areas of suitable habitat for the dwarf-flowered heartleaf and the NLEB, however, no individual species were noted on site during the pedestrian survey. Wildlands conclusions and determinations are noted below and included in the Appendix.

Dwarf-flowered Heartleaf

Dwarf-flowered heartleaf grows in acidic soils along bluffs and adjacent slopes, in boggy areas next to streams and creek heads, and along the slopes of nearby hillsides and ravines. (https://www.fws.gov/southeast/pdf/fact-sheet/dwarf-flowered-heartleaf.pdf). Wildlands identified suitable habitat within the project area, however, no populations resembling the species were found during the pedestrian survey. Wildlands determined the project will have “no effect” on the dwarf-flowered heartleaf.

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 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 North Carolina Natural Heritage Program (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 17, 2021.

To meet regulatory requirements, a scoping letter requesting comment from the USFWS was sent on February 2, 2021. The USFWS responded on March 3, 2021, which required further clarification that the pedestrian survey was completed within the optimal survey window for the dwarf-flowered heartleaf. Wildlands responded via email on March 10, 2021, no further correspondence was required. The signing of the NLEB 4(d) Rule Streamlined Consultation Form by the FHWA 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. A FHWA signed 4(d) Consultation Form and the correspondence associated with the above determinations are included in the Appendix.

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.

The Bridgefork Dairy 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 Bridgefork Dairy Mitigation Site includes stream restoration, enhancement, and preservation. 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 5, 2021 and did not have any concerns. The USFWS responded on March 3, 2021 and provided recommendations for minimizing impacts on downstream aquatic 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 Bridgefork Dairy Mitigation Site from the USFWS regarding migratory birds on February 2, 2021. The USFWS responded on March 3, 2021 and provided recommendations for minimizing impacts on migratory birds. All correspondence with USFWS is included in the Appendix.

From: Youngman, Holland J
To: Kirsten Gimbert
Subject: Re: [EXTERNAL] Bridgefork Dairy- Botanical Survey update
Date: Thursday, October 13, 2022 12:07:19 PM

Okay, thanks Kirsten. Do you need anything more from me on this one?

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: Thursday, October 13, 2022 11:57 AM
To: Youngman, Holland J <holland_youngman@fws.gov>
Subject: RE: [EXTERNAL] Bridgefork Dairy- Botanical Survey update

Yes, sorry for the typo. Suitable habitat was present, but no species were identified for the DFHL. And yes, Service Log Number is 4-2-21-151.

Kirsten Gimbert | *Senior Environmental Scientist*
M: 704.941.9093

From: Youngman, Holland J <holland_youngman@fws.gov>
Sent: Thursday, October 13, 2022 11:25 AM
To: Kirsten Gimbert <kgimbert@wildlandseng.com>
Subject: Re: [EXTERNAL] Bridgefork Dairy- Botanical Survey update

Hi Kirsten - was the sentence on DFHL supposed to read "suitable habitat, but no individuals identified on May 24th, 2022 field assessment" ?
If no individuals were IDed then yes, we would concur with a NLAA determination from the USACE for dwarf-flowered heartleaf for this project. I think it was Service log # 21-151.

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: Thursday, October 13, 2022 11:13 AM
To: Youngman, Holland J <holland_youngman@fws.gov>

Subject: RE: [EXTERNAL] Bridgefork Dairy- Botanical Survey update

Hi Holland,

USACE is asking for concurrence from USFWS regarding the *Hexastylis naniflora* biological determination on the Bridgefork Dairy Mitigation Site located in Cleveland County, NC. USACE would concur with a "may affect, not likely to adversely affect" determination on this species based on Wildlands findings of suitable habitat, but individuals identified on May 24th, 2022 field assessment. Would USFWS also concur with this determination?

Thanks,
Kirsten Gimbert | *Senior Environmental Scientist*
M: 704.941.9093

From: Youngman, Holland J <holland_youngman@fws.gov>
Sent: Tuesday, May 31, 2022 10:21 AM
To: Kirsten Gimbert <kgimbert@wildlandseng.com>
Subject: Re: [EXTERNAL] Bridgefork Dairy- Botanical Survey update

Thank you Kirsten,

I appreciate the notification and have saved it to the project file.
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: Thursday, May 26, 2022 11:48 AM
To: Youngman, Holland J <holland_youngman@fws.gov>
Cc: Reid, Matthew <matthew.reid@ncdenr.gov>; Eric Neuhaus <eneuhaus@wildlandseng.com>
Subject: [EXTERNAL] Bridgefork Dairy- Botanical Survey update

Hi Holland,

Wildlands conducted a pedestrian survey at the Bridgefork Dairy Mitigation Site on May 24th, 2022 to update the botanical survey for the federally listed Dwarf-flowered heartleaf (*hexastylis naniflora).* Areas with suitable habitat were evaluated and no individual species were identified during this pedestrian survey.

Please let me know if you have any questions or need additional information.

Thanks,
Kirsten Gimbert | *Senior Environmental Scientist*
M: 704.941.9093

Wildlands Engineering, Inc.
1430 S. Mint St, Suite 104
Charlotte, NC 28203

APPENDIX 7 – IRT Communications

WILDLANDS ENGINEERING

MEETING MINUTES

MEETING:	Post Contract IRT Site Visit **BRIDGEFORK DAIRY Mitigation Site** Broad River Basin 03050105: Cleveland County, NC NCDEQ Contract No. 0301-01 Wildlands Project No. 005-02190
DATE:	*On-site Meeting:* Tuesday, January 12, 2021, 11:00 am *Meeting Notes Distributed:* Friday, January 22, 2021 *Meeting Notes Revised and Redistributed per IRT Comment:* February 6, 2021 (revision shown in blue)
LOCATION:	321 Patterson Road King's Mountain, NC 28086

Attendees

Todd Tugwell, USACE
Casey Haywood, USACE
Erin Davis, NC Department of Environmental Quality (NCDEQ)
Matthew Reid, Division of Mitigation Services (NCDMS) Project Manager
Paul Wiesner, NCDMS
Shawn Wilkerson, Wildlands Engineering
Eric Neuhaus, Wildlands Engineering Project Manager

Materials

- Wildlands Engineering Technical Proposal dated March 26, 2020 in response to NCDMS RFP #16-20190301

Meeting Notes

1. Wildlands gave a brief site overview before the walk which discussed overall site conditions, general stream and wetland approaches, site constraints, and watershed classifications. It was noted that the project is within catchment 12034601 which is identified as a Targeted Resource Area (TRA) for hydrology, habitat, and water quality by NCDEQ.
2. NCDEQ noted that current available planning documentation within the project watershed should be investigated and discussed within the mitigation plan to identify major potential stressors to the project.
3. Wildlands was asked about the discussion within the proposal regarding sand load within the existing streams and if streams (particularly UT6) would be designed as sand bed channels. Wildlands explained that streams will be designed as riffle/pool systems with designed rock riffle habitat, but that anticipated sand loads within this region of the Broad River Basin are higher than what is typically seen within Piedmont streams. Wildlands will consider the sediment regime as part of the design and monitoring and include discussion within the mitigation plan around anticipated gradation of project streams post construction and through the monitoring period.
4. Wildlands was asked about timber practices noted in the proposal between UT4 and UT4a. It was explained that the high terrace between the two streams was timbered in 2016, but that stream buffers were left intact as can be seen in the included aerial photos. Wildlands noted that there were no known definite plans to timber this area again in the future based on discussions with the property owners.

5. Table G.1 within the proposal was recognized as very helpful for communicating site stressors, goals, objectives, and corresponding uplift potential. It was also noted that fully populated NC DWQ stream ID forms and the detailed mapping are helpful with project evaluation at the proposal stage.
6. The walk began at the upstream extent of Bridgefork Creek Reach 1a (upstream extent of the project). Bridgefork Creek Reach 1a was proposed for an enhancement II approach at 2.5:1 credit ratio. The IRT noted that the credit ratio may need to be adjusted based on the existing condition of Reach 1a and the associated proposed work. Wildlands noted to ensure the 2.5:1 credit ratio is adequately justified within the mitigation plan or is adjusted to reflect minor work (cattle exclusion, planting) if proposed.
7. Along Bridgefork Creek Reach 1a, and generally across the project, it was noted that fescue treatment will need to be addressed as part of the mitigation plan and proposed planting.
8. Proposed Crossing 1 for an existing over utility line was observed in the field. Wildlands noted that the stream will be restored through the internal crossing, but no credit will be claimed. The IRT inquired about coordination with the utility on vegetation and general management and Wildlands noted that they will attempt to contact the utility to discuss management schedules, but that many times utilities are unresponsive and difficult to coordinate with.
9. Continuing downstream, the group walked Bridgefork Creek Reach 1b and observed the area proposed for wetland re-establishment in the Bridgefork Creek Reach 1b floodplain. Generally, the group agreed with the approach along the reach. It was noted that areas of the wetland re-establishment along the right floodplain of Bridgefork Creek 1b upstream of the UT1 confluence will likely jurisdictionally delineate based on field conditions. It was also noted that while these areas will likely delineate, cattle impacts, vegetation management, and current stream conditions have heavily reduced wetland function. It was generally agreed that a wetland rehabilitation approach with a corresponding credit ratio between 1:1 and 1.5:1 is appropriate for these areas based on the current lack of wetland function.
10. The walk continued up the UT1 tributary where the group observed the existing pond, the relic valley in the left floodplain of the existing channel, and the upstream series of stormwater outfalls, active headcuts, and previously ditched streams. NCDEQ noted that Wildlands needs to discuss the pond dewatering activities within the mitigation plan and ensure dewatering techniques are coordinated to reduce risk of sedimentation in downstream channels.
11. The group then continued downstream along Bridgefork Creek Reach 1a towards UT2. UT2 enters the project from an existing stormwater outfall and is actively eroding and headcutting upstream. A restoration approach was generally agreed on for this channel.
12. Continuing downstream, the wetland rehabilitation/re-establishment area in the left floodplain of Bridgefork Creek Reach 1b was investigated. While some of this area was shown as potential delineation in the proposal, it was noted that the delineated boundary would need to be verified and the current wetland condition and function may be more appropriate for an enhancement level approach with an increased ratio compared to the proposed rehabilitation at 1.5:1. Wildlands confirmed that they would evaluate wetland function using the NC Wetland Assessment method, and adjust the wetland approach and associated credit ratio within the mitigation plan based on the results of the detailed investigation.
13. The group observed UT3 and it was noted that the IRT would like to see a stream gage placed approximately halfway up the project reach to ensure adequate flow regime during monitoring.
14. The area in the right floodplain of Bridgefork Creek Reach 1a proposed for wetland rehabilitation/re-establishment was observed next. Generally, potential hydric soils within the area looked adequate to support wetland conditions and the lack of vegetation, along with agriculture and hydrology impacts confirmed this area as appropriate for wetland restoration.
15. It was noted that woody vegetation along Bridgefork Creek reaches proposed for restoration where streams are being significantly raised will need to be evaluated during design and construction to determine potential impacts from increased water table elevations across the Site.
16. The walk continued downstream to Bridgefork Creek Reach 2. The proposed crossing location and was observed before the group headed up the UT4 tributary.
17. The downstream extent of UT4 was more impacted than a typical enhancement II approach, however, after continuing upstream and understanding the general overall approach of treating large amounts of

invasive vegetation as well as addressing some minor erosion issues, it was generally agreed that an enhancement II approach was appropriate for UT4 based on the extent of overall proposed work. It was noted that if bank work/grading were done as part of the work along UT4, the IRT would require representative monitoring cross-sections be performed along the reach.

18. The walk continued up UT4a, the profile alteration corresponding to the proposed restoration was discussed based on the severe downcutting that currently exists at the Site. It was noted that Wildlands would likely bring the stream profile up approximately halfway depending on earthwork but would not likely be able to do a full priority 1 approach based on the current depth of the existing channel.
19. The proposed best management practice (BMP) at the upstream extent of UT4A was noted. Wildlands will confirm the jurisdictional stream call location to ensure the extent/length of the BMP and develop a design to promote treatment from adjacent terraced agricultural fields. Please note Wildlands discussed creating a BMP that held water (stormwater/wetland type approach); IRT requests Wildlands to provide a detailed summary of the BMP approach in the MP.
20. Given that UT4a is a headwater channel that originates on-site, the IRT would like to see a stream gage placed approximately halfway up the project reach to ensure adequate flow regime.
21. The group returned to Bridgefork Creek and continued downstream. The Reach 2/Reach 3 break, associated crossing 7 location, and existing bedrock grade control features were observed and generally it was agreed that this location was appropriate for the crossing and corresponding reach break. Wildlands proposed a ford crossing for horse farm. Todd stated that it may not be necessary because it is a recreational use (not ag) and also the streambed is bedrock here. Landowner just wants the ability to cross. Wildlands would discuss further with the landowner.
22. UT5 was observed in the left floodplain of Bridgefork Creek Reach 3. UT5 was proposed as preservation in the proposal at a 5:1 ratio. However, discussions in the field were that a portion of the reach would likely need to be restored based on an existing headcut and the associated restoration of Bridgefork Creek Reach 3. Additionally, it was noted that the credit ratio originally proposed (5:1) for UT5 would need to be increased where no work is being performed on the stream outside of invasive vegetation management based on the current stream condition. Wildlands agreed and noted that they would address these issues in the mitigation plan and update the approach and associated credit ratios based on the discussions in the field. It is anticipated that a very short downstream section of UT5 will end up as restoration at a 1:1 ratio and upstream of the existing headcut, the ratio will be evaluated and increased above 5:1 based on the corresponding level of work and discussion with the IRT. During the site visit IRT noted that this area (145 LF) was not appropriate for 5:1. Wildlands proposed to drop the credits for the preservation area but requested 10-30 LF of restoration where they would address a headcut and tie UT5 into Bridgefork Creek. IRT agreed with this approach but requests a gauge in this area to monitor flow. If Wildlands moves forward with this approach, IRT requests that this be discussed in the MP.
23. It was noted that the IRT would like to see a stream gage placed approximately halfway up the UT5 reach to ensure adequate flow regime during monitoring.
24. The walk continued downstream along Bridgefork Creek Reach 3 towards the confluence with UT6. Wildlands discussed the downstream tie in of the project and noted that downstream of the UT6 confluence, Bridgefork Creek will likely be built as a priority 2 approach based on the existing channel grades at the downstream extents.
25. Given the incision of Bridgefork Creek Reach 3, the water table upstream of the UT6 confluence could be raised significantly via the priority 1 restoration of the reach. While the preliminary soils investigation did now show current hydric soil indicators, Wildlands noted that wetland creation may be proposed within floodplain areas along this reach if field data indicates a potential for a dramatic increase in the water table. If wetland creation is pursued, Wildlands will install existing groundwater gages as well as address the potential design within the mitigation plan. Wildlands anticipates the wetland creation would be proposed at a 3:1 ratio if pursued.
26. The walk continued upstream along UT6. The existing Dillon Road crossing was observed and generally the approach of restoration along UT6 was agreed upon. The IRT noted the existing gravel road within

the right floodplain of UT6 and stated that Wildlands needs to ensure adequate stream buffer along the right floodplain of UT6 post restoration.

27. The group continued upstream to UT6A, where an existing and relic gully valley was observed. Wildlands outlined their general approach of returning UT6A to its previous valley and removing the elevated terrace between the two valleys to create one larger stream valley. It was also noted that a BMP will be installed at the upstream extent of UT6A. It was noted that the IRT would like to see a stream gage placed approximately halfway up the project reach to ensure adequate flow regime during monitoring.

Additional notes provided based upon IRT review:

• UT6/UT6A: DWR requests Wildlands to confirm if fencing will be in this area in the mitigation plan.

• EII Section below the second power-line crossing on Reach 2: Todd discussed the option to possibility bench the left bank (left side- looking upstream) for the length of this section through the power-line break. Right side steep but overall, the section was not in horrible condition. Mature veg in this area.

• Wetlands: Some areas of wetland could be expanded. Ultimately this will be driven by the JD, it will also determine what will be reestablishment and rehabilitation. IRT also discussed with Wildlands the potential to add wetland pockets after the project has been constructed but also stated it could hold up monitoring by a year. It was recommended that if Wildlands anticipated an area to be a wetland pocket and wanted to request credit, to determine the soil type and put in gauges to help monitor- this will help determine if wetland is possible and the mitigation type. If additional wetlands are requested an amendment to the mitigation plan would be required.

• Please note that IRT prefers gauges to be installed in the upper length of the reach, usually within the first 100 LF depending on the length of the reach and topography.

• Please note that credit ratios are not approved during the draft review of a site.

APPENDIX 8 – Invasive Species Treatment Plan

Appendix 8 – Invasive Species Plan

The presence of invasive species across the Site is extensive throughout the streambank zone of the project streams with the most prevalent species being Chinese privet (*Ligustrum sinense*). Multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), English ivy (*Hedera helix*), kudzu (*Pueraria montana*), marsh dewflower (*Murdannia keisak*), tree of heaven (*Ailanthus altissima*), Bradford pear (*Pyrus calleryana*), autumn olive (*Elaeagnus umbellata*), and periwinkle (*Vinca* sp.) are also scattered along the existing streambanks, but in much lower quantities. Tall fescue (*Festuca arundinacea*) is scattered within and adjacent to project areas and will require ongoing treatment.

A goal of this project is to treat and remove as many invasive plant populations as possible before and during construction. During construction and post-construction, 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. Generally, the treatment plan shall follow the below guidelines in Table 1 for common invasive species found in riparian areas; however, treatment may be changed based on the professional judgement of the project engineer and lead steward.

Table 1. Invasive Species Treatment – *Bridgefork Dairy Mitigation Site*

Invasive Species	Recommended Treatment Technique
Chinese Privet (*Ligustrum sinense*)	Use a foliar treatment on seedlings using 3% glyphosate solution (12 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant in the late fall or winter to seedlings. For stems too tall for foliar application and/or when safety to surrounding vegetation is desired, immediately treat cut stems and apply a 25-50% triclopyr or glyphosate solution to stumps. For large diameter stems, apply stem injections or hack-and-squirt techniques using 3% Arsenal AC solution (or when safety to surrounding vegetation is desired 25-50% triclopyr or glyphosate solution) year-round except early spring (March and April). An EZ-Ject tree injector can help reach the lower part of the main stem; otherwise, every branching trunk can be treated using the hack-and-squirt method.
Multiflora Rose *(Rosa multiflora)*	Use a foliar treatment on large populations using 3% glyphosate (12 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant or 3% triclopyr solution.

	For large diameter stems, cut and immediately treat stems and stump tops using either a 25-50% glyphosate or triclopyr solution.
Kudzu (*Pueraria montana*)	Larger infestations usually require a combination of cut stump and foliar treatments. Where vines have grown into the tree canopy, cut each stem as close to the ground as possible and treat freshly cut surfaces with a 25-50% solution of glyphosate or triclopyr. Groundcover will be treated using one or multiple treatments of the following herbicides: o 3% triclopyr solution (20 ounces per 3-gallon mix) o 3% glyphosate solution (20 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant o 1% Escort solution (4 ounces metsulfuron methyl per 3-gallon mix) plus 0.5% non-ionic surfactant o 0.5% Transline solution (2 ounces clopyralid per 3-gallon mix) plus 0.5% non-ionic surfactant
Bradford Pear (***Pyrus calleryana)***	Use a foliar treatment on seedlings using 3% glyphosate solution (12 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant or 3% triclopyr solution. For large diameter stems, apply stem injections, hack-and-squirt, or cut stump techniques using a 25-50% triclopyr solution. Immediately treat cut stems and stumps.
Autumn Olive (***Elaeagnus umbellata)***	Use a foliar treatment on seedlings using 3% glyphosate solution (12 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant or 3% triclopyr solution. For large diameter stems, apply stem injections, hack-and-squirt, or cut stump techniques using a 25-50% triclopyr solution. Immediately treat cut stems and stumps.
Tree of Heaven (*Ailanthus altissima*)	Use a foliar treatment on seedlings using 3% glyphosate solution (12 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant or 3% triclopyr solution. For large diameter stems, apply stem injections, hack-and-squirt, or cut stump techniques using a 25-50% triclopyr solution. Immediately treat cut stems and stumps. Treatments most effective July – October.

Japanese Honeysuckle (*Lonicera japonica*)	Larger infestations usually require a combination of cut stump and foliar treatments. Where vines have grown into the tree canopy, cut each stem as close to the ground as possible and treat freshly cut surfaces with a 25-50% solution of glyphosate or triclopyr. Groundcover will be treated with a foliar solution of 3% glyphosate solution (12 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant or 3% triclopyr solution.
Asian Spiderwort/ Marsh Dewflower (*Murdannia keisak*)	Use a foliar treatment on leaves using 3% aquatic glyphosate solution (12 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant. <u>Do not remove mechanically</u>. Spiderwort spreads readily in disturbed areas through fragmentation and seed dispersal.
English Ivy (*Hedera helix*)	Larger infestations usually require a combination of cut stump and foliar treatments. Where vines have grown into the tree canopy, cut each stem as close to the ground as possible and treat freshly cut surfaces with a 25-50% solution of glyphosate or triclopyr. Groundcover will be treated with a foliar solution of 3% glyphosate (12 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant.
Periwinkle (*Vinca* sp.)	Use a foliar treatment on leaves using 3% glyphosate solution (12 ounces per 3-gallon mix) plus 0.5% non-ionic surfactant.
Tall Fescue (*Festuca arundinacea*)	Undesirable fescue grasses will be mechanically removed during construction on portions of the site. Following construction, these grasses will be treated where they are impacting planted stems using a variety of methods including herbicide ring sprays, herbicide treatment and reseeding, and mechanical tree release. Foliar applications will use a 3% glyphosate plus 0.5% non-ionic surfactant solution.

APPENDIX 9 – Site Protection Instrument

Appendix 9 Site Protection Instrument

The land required for construction, management, and stewardship of this mitigation project includes portions of the parcels listed in Table 1. This property is 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, enhanced, and preserved along with their corresponding buffers.

Table 1: Site Protection Instrument –*Bridgefork Dairy Mitigation Site*

Property Owner	Parcel ID Number	County	Under Option to Purchase by Wildlands?	Memorandum of Option Deed Book (DB) and Page Number (PG)	Acreage to be Protected
Barbara B. Dellinger (Life Estate)	2585-49-9873	Cleveland	Yes	DB: 1175 PG: 1350	2.45
Barbara B. Dellinger (Life Estate) David Dellinger (Remainder)	2585-59-5279	Cleveland	Yes	DB: 1183 PG: 2205	3.61
Barbara B. Dellinger (Life Estate)	2585-49- 5005	Cleveland	Yes	DB: 1175 PG: 1350	1.60
Luke E. Judd	2585-48-7530	Cleveland	Yes	DB: 1774 PG: 2043	5.97
Luke E. Judd	2585-58-7323	Cleveland	Yes	DB: 1774 PG: 2043	2.43
Luke E. Judd	2585-67-0580	Cleveland	Yes	DB: 1774 PG: 2043	0.62
Barbara K. Dellinger Mary E. Dellinger	2585-67-5976	Cleveland	Yes	DB: 1604 PG: 977	7.77
William L. Hamrick	2586-81-2597 2585-78-2547	Cleveland	Yes	DB: 1769 PG: 2108	3.97
Jerry E. Patterson Dennis C. Patterson & Wife, Susan H. Patterson	2585-77-7748	Cleveland	Yes	DB: 1612 PG: 613 DB: 1718 PG: 1059 PB: 6 PG: 67	10.81
Dennis C. Patterson & Wife, Susan H. Patterson	2585-87-8557	Cleveland	Yes	DB: 1310 PG: 257 & DB: 1314 PG: 1782 PB: 6 PG: 67	3.03
Hayward D. Bullock & Wife, Nancy L. Bullock	2585-88-5323	Cleveland	Yes	DB: 11-R PG: 476	0.65

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.

APPENDIX 10 – Maintenance Plan

Appendix 10 – Maintenance Plan

The site shall be monitored on a regular basis 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 (2) years following site construction and may include the following:

Table 1: Maintenance Plan

Component/Feature	Maintenance through project close-out
Stream/ Wetlands	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. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank erosion. Beaver dams that inundate the stream channels shall be removed and the beaver shall be trapped if deemed necessary.
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 shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance 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.

Additional maintenance activities are discussed in the Vegetation and Land Management section of the mitigation plan.

APPENDIX 11 – Financial Assurance

Appendix 111 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 12 – Credit Calculations and Release Schedule

Appendix 12 - Credit Release Schedule

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. 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 release of project credits will be subject to the criteria described as follows:

Table A: Credit Release Schedule – Stream Credits – *Bridgefork Dairy Mitigation Site*

Credit Release Milestone	Monitoring Year	Credit Release Activity	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 – see requirements below	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%
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 and interim performance standards have been met	10%	90% (100%**)

*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 B: Credit Release Schedule – Wetland Credits – *Bridgefork Dairy Mitigation Site*

Credit Release Milestone	Monitoring Year	Credit Release Activity	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 – see requirements below	30%	30%
3	1	Year 1 monitoring report demonstrates that interim performance standards have been met	10%	40%

Credit Release Milestone	Monitoring Year	Credit Release Activity	Interim Release	Total Released
4	2	Year 2 monitoring report demonstrates that interim performance standards have been met	10%	50%
5	3	Year 3 monitoring report demonstrates that interim performance standards have been met	15%	65%
6	4*	Year 4 monitoring report demonstrates that interim performance standards have been met	5%	70%
7	5	Year 5 monitoring report demonstrates that interim performance standards have been met	15%	85%
8	6*	Year 6 monitoring report demonstrates that interim performance standards have been met	5%	90%
9	7	Year 7 monitoring report demonstrates that interim performance standards have been met	10%	100%

*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.

1.1 Initial Allocation of Released Credits

For this NCDMS project, no initial release of credits is provided. To account for this, the 15% credit release typically associated with the site establishment is held until completion of all initial physical and biological improvements made pursuant to the Mitigation Plan. In order for NCDMS to receive the 30% release (shown in Tables A and B as Milestone 2), they must comply with the credit release requirements stated in Section IV(I)(3) of the approved NCDMS instrument.

1.2 Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved.

The following conditions apply to credit release schedules:

a. A reserve of 10% of site's total stream credits will be release 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 Section IV (General Monitoring Requirements) of this 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.

As projects approach milestones associated with credit release, the DMS will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

APPENDIX 13 – Preliminary Plans

October 27, 2023

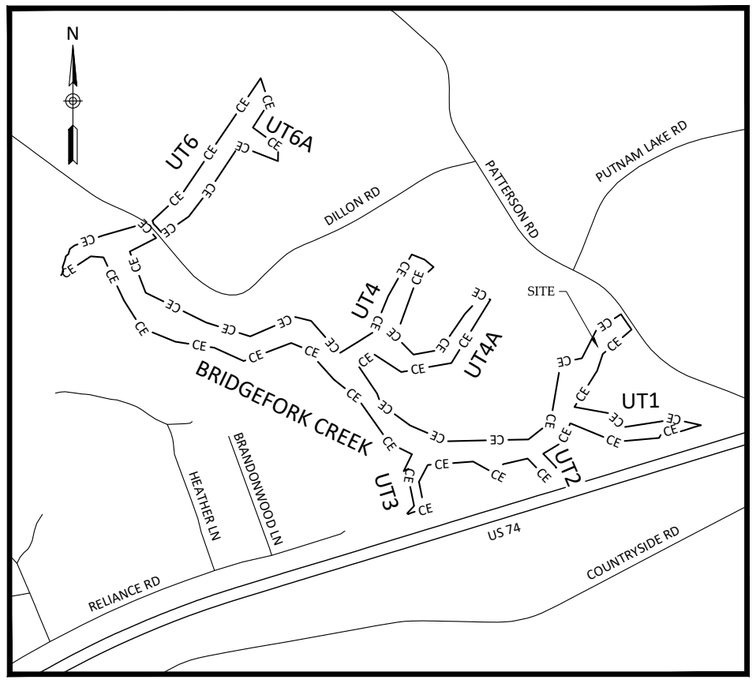
Bridgefork Dairy Mitigation Site

Cleveland County, North Carolina

Prepared For

NCDEQ

Division of Mitigation Services



Vicinity Map
Not to Scale

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PROVIDED WITH
FINAL MITIGATION PLAN
NOVEMBER 2, 2022

Sheet Index

Project Directory

Engineering:
Wildlands Engineering, Inc
License No. F-0831
167-B Haywood Rd
Asheville, NC 28806

Surveying:
Kee Mapping and Surveying, PA
88 Central Avenue
Asheville, NC 28801
Phillip B. Kee, PLS
828-575-9021

Owner:
DEQ NCDMS
1652 Mail Service Center
Raleigh, North Carolina 27699-1652
Attention: Matthew Reid
828-231-7912

Broad River Basin
HUC 03050105
NCDEQ Contract No. 0301-01
DMS ID No. 100120
USACE Action ID No. 2020-09162
RFP#: 16-20190301

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DRAFT

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Title Sheet

Revisions:

Date: 10.27.2022
Job Number: 005-02190
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Sheet 0.1

X:\Shared\Projects\WI2190_Bridgefork_Dairy\Cad\Plans\02190 Title.dwg

October 28, 2022

MICHAEL R. GRAYSON, JR.
PIN: 2586-61-9203
DB: 1690 PG: 2266

BARBARA B. DELLINGER
(LIFE ESTATE)
BRYAN K. DELLINGER & WIFE,
MARY B. DELLINGER (REMAINDER)
PIN: 2585-49-5005
DB: 1175 PG: 1350

ELBERT W. DELLINGER & WIFE,
FAYE M. DELLINGER
(LIFE ESTATE)
MAGGIE D. MAYES
MELISSA D. PUTNAM
(REMAINDER)
PIN: 2586-70-4443
(NOT UPDATED)
DB: 1790 PG: 1883
(PORTION OF TRACT 2)

JIMMIE M. BLANTON
PIN: 2585-69-9037
PORTION OF DB: 1122 PG: 1299
REF. DB: 1604 PG: 977
(EXCEPTION TRACT)

THOMAS D. DIXON & WIFE,
KATHY H. DIXON
MELANIE DIXON
AMY D. MALCOM
PIN: 2586-30-6202
DB: 1783 PG: 1609

BARBARA B. DELLINGER
(LIFE ESTATE)
DAVID L. DELLINGER
(REMAINDER)
PIN: 2585-59-5279
DB: 1183 PG: 2205

BRYAN K. DELLINGER & WIFE,
MARY E. DELLINGER
PIN: 2585-68-4939
PORTION OF DB: 1612 PG: 2361

JIMMIE M. BLANTON
PIN: 2585-79-2273
DB: 14-M PG: 842

BARBARA B. DELLINGER
PIN: 2585-58-8903
DB: 15-C PG: 349

BRYAN K. DELLINGER & WIFE,
MARY E. DELLINGER
PIN: 2585-67-5964
DB: 1604 PG: 977

LUKE E. JUDD
PIN: 2585-48-7530
DB: 1774 PG: 2043
(PORTION OF TRACT ONE)
PB: 41 PG: 8 (TRACT 3)

WILLIAM L. HAMRICK
PIN: 2586-81-2597
DB: 1769 PG: 2108

FRANKIE H. WEBSTER
PIN: 2585-88-3554
DB: 1818 PG: 1726

HAYWARD D. BULLOCK & WIFE,
NANCY L. BULLOCK
PIN: 2585-88-5323
DB: 11-R PG: 476

LUKE E. JUDD
PIN: 2585-58-4130
DB: 1774 PG: 2043
(PORTION OF TRACT ONE)
PB: 41 PG: 8 (TRACT 2)

JERRY E. PATTERSON
DENNIS C. PATTERSON & WIFE,
SUSAN H. PATTERSON
PIN: 2585-77-7748
PORTION OF DB: 1642 PG: 643 &
DB: 1718 PG: 1059
PB: 6 PG: 67
(PORTIONS OF TRACTS 11-15)

DENNIS C. PATTERSON & WIFE,
SUSAN H. PATTERSON
PIN: 2585-87-7920
DB:16-G PG: 356 &
DB: 16-N PG: 392

DENNIS C. PATTERSON & WIFE,
SUSAN H. PATTERSON
PIN: 2585-87-8557
DB: 1310 PG: 257 &
DB: 1314 PG: 1782
PB: 6 PG: 67
(PORTIONS OF TRACTS 10 & 11)

JORDAN T. DEMERS
PIN: 2585-48-2172
DB: 1734 PG: 1513

ROGER D. COSTNER
PIN: 2585-48-3164
DB: 1374 PG: 384 &
DB: 1290 PG: 868

BRADLEY S. YARBRO & WIFE,
SHERRY D. YARBRO
PIN: 2585-48-5231
DB: 1174 PG: 1432

JIMMY J. HILL
PIN: 2585-47-9885
DB: 1263 PG: 1250

KENNETH D. CORN & WIFE,
BEVERLY L. CORN
PIN: 2585-57-2786
DB: 1350 PG: 486

JEFFREY V. CANNOVA
PIN: 2585-57-4629
DB: 1543 PG: 1806

KENNETH R. MABE & WIFE,
BARBARA J. MABE
PIN: 2585-57-6612
DB: 1119 PG: 1094

LUKE E. JUDD
PIN: 2585-67-0580
DB: 1774 PG: 2043
(PORTION OF TRACT ONE)
PB: 41 PG: 8 (TRACT 1)

PATRICK R. MCPHERSON & WIFE,
LAURA L. MCPHERSON
PIN: 2585-66-7897
DB: 1467 PG: 77
PB: 28 PG: 174
PB: 30 PG 184

DILLON ROAD

PATTERSON ROAD

US HIGHWAY 74

BRIDGEFORK CREEK

UT1 UT2 UT3 UT4 UT4A UT5 UT6 UT6A

DOCK

1.1.1 1.1.2 1.1.3 1.1.4 1.1.5 1.1.6 1.1.7 1.1.8
1.2.1 1.2.2 1.2.3 1.2.4 1.2.5 1.2.6
1.3.1 1.3.2
1.4.1 1.4.2 1.4.3 1.4.4
1.5.1 1.5.2 1.5.3
1.6.1 1.6.2 1.6.3
1.7.1
1.8.1 1.8.2 1.8.3 1.8.4 1.8.5
1.9.2
2.1 2.2

R/W
CE
OHE
OUE

N

0' 200' 400' 600'
(HORIZONTAL)

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Tel: 828.774.5547
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DRAFT

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Project Overview

Revisions:

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 0.2

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October 28, 2022

General Notes

(To be included with final plans.)

Construction Sequence

(To be included with final plans.)

Existing Features

- EXISTING TOP OF BANK
- EXISTING THALWEG
- EXISTING FENCE
- EXISTING STORM PIPE
- EXISTING MAJOR CONTOUR (100)
- EXISTING MINOR CONTOUR
- EXISTING RIGHT-OF-WAY
- EXISTING PROPERTY LINE
- OVERHEAD ELECTRIC
- OVERHEAD UTILITY EASEMENT
- EXISTING BEDROCK
- EXISTING FARM PATH
- EXISTING WETLAND
- EXISTING POND
- EXISTING BUILDING
- EXISTING SPRING
- EXISTING UTILITY POLE
- EXISTING GUY WIRE
- EXISTING DECIDUOUS TREE

Proposed Features

- PROPOSED THALWEG (100+00)
- PROPOSED BANKFULL
- PROPOSED MAJOR CONTOUR (100)
- PROPOSED MINOR CONTOUR
- PROPOSED CONSERVATION EASEMENT
- PROPOSED CONSERVATION EASEMENT INTERNAL CROSSING
- PROPOSED LOG SILL
- LOG VANE
- PROPOSED CURVED BOULDER SILL
- PROPOSED LOG J-HOOK
- PROPOSED ROCK J-HOOK
- PROPOSED CASCADE
- PROPOSED CULVERT
- PROPOSED CHECK DAM
- PROPOSED WETLAND REHABILITATION
- PROPOSED WETLAND REESTABLISHMENT
- PROPOSED WETLAND ENHANCEMENT
- PROPOSED ANGLED LOG RIFFLE (CR-ALR)
- PROPOSED CHUNKY RIFFLE (CR-CH)
- PROPOSED JAZZ RIFFLE (CR-JZ)
- PROPOSED LOG-ROCK CASCADE RIFFLE (CR-LRC)
- PROPOSED NATIVE MATERIAL RIFFLE (CR-NM)
- PROPOSED WOODY RIFFLE (CR-WD)
- PROPOSED BRUSH TOE
- PROPOSED TRANSPLANTED SOD MAT
- PROPOSED VEGETATED SOIL LIFT
- PROPOSED BOULDER TOE
- PROPOSED COVER LOG
- PROPOSED SHALLOW VERNAL POOL
- DEBRIS TO BE REMOVED
- ENHANCEMENT BANK GRADING
- INTENSE INVASIVE TREATMENT

Erosion Control Features

- LOD / SAF / [X] — LIMITS OF DISTURBANCE
- SAFETY FENCE
- SILT FENCE
- SILT FENCE OUTLET
- PUMP
- TEMPORARY CROSSING
- STAGING/STOCKPILE AREA
- PROPOSED CONSTRUCTION ACCESS
- PROPOSED HAUL ROAD

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

General Notes and Symbols

Revisions:

Date:	10.27.2022
Job Number:	005-02150
Project Engineer:	EJN
Drawn By:	CAW
Checked By:	CDB

Sheet 0.3

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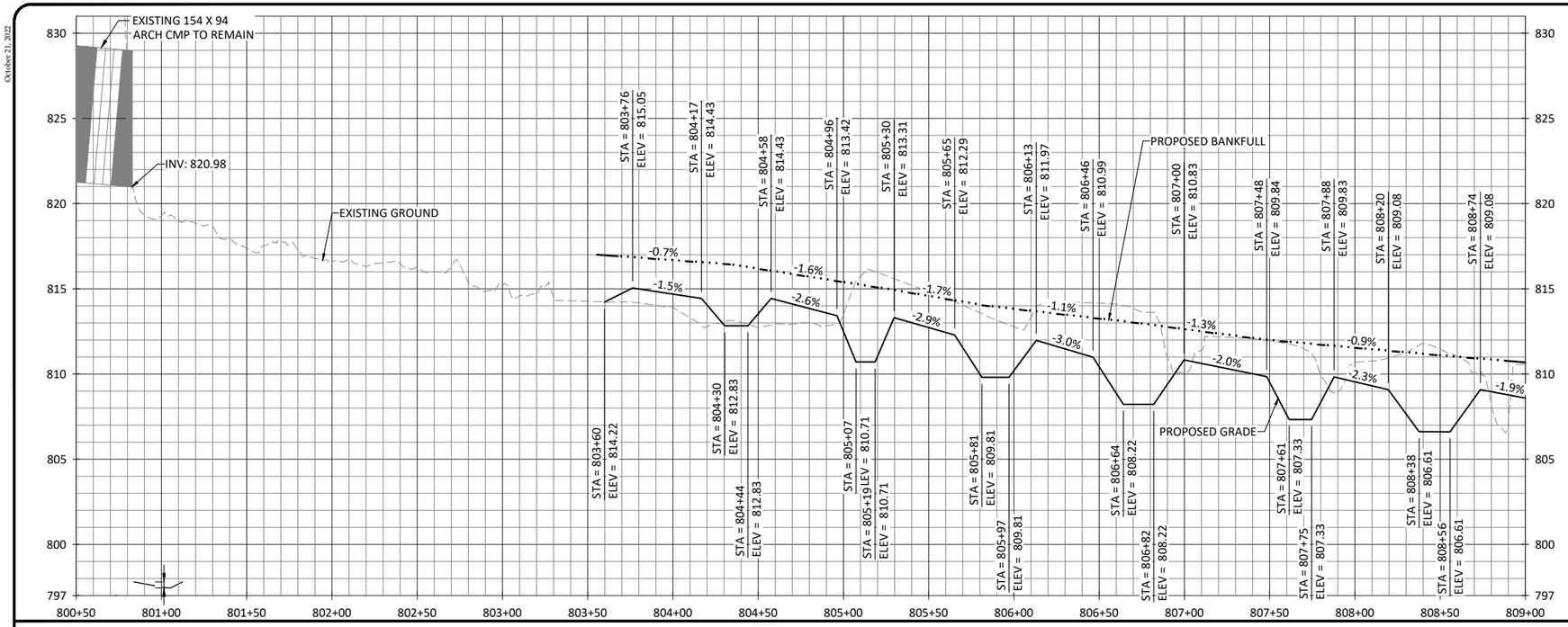
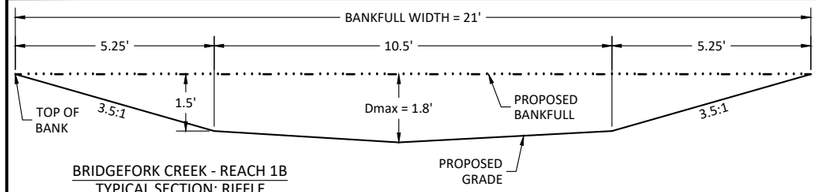
October 21, 2021





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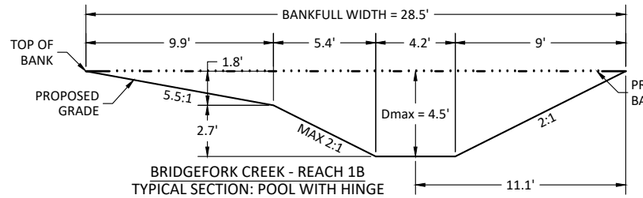

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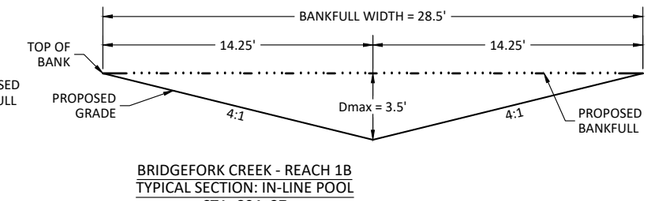
STA: 803+43 TO 827+75



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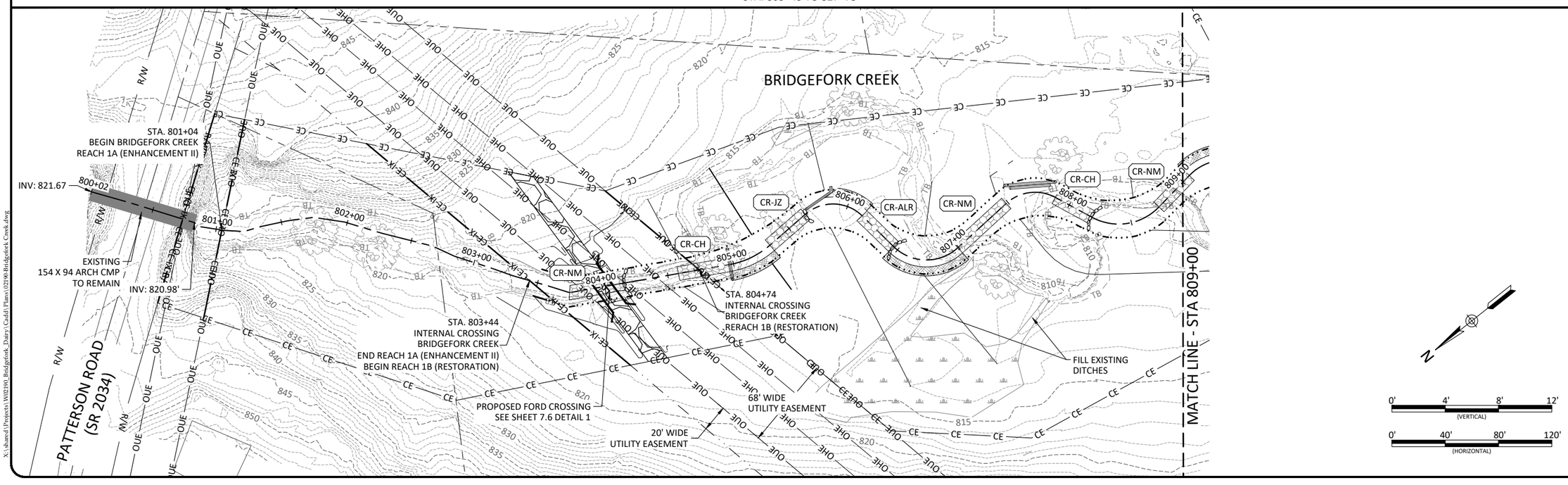
STA: 804+37



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DRAFT

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

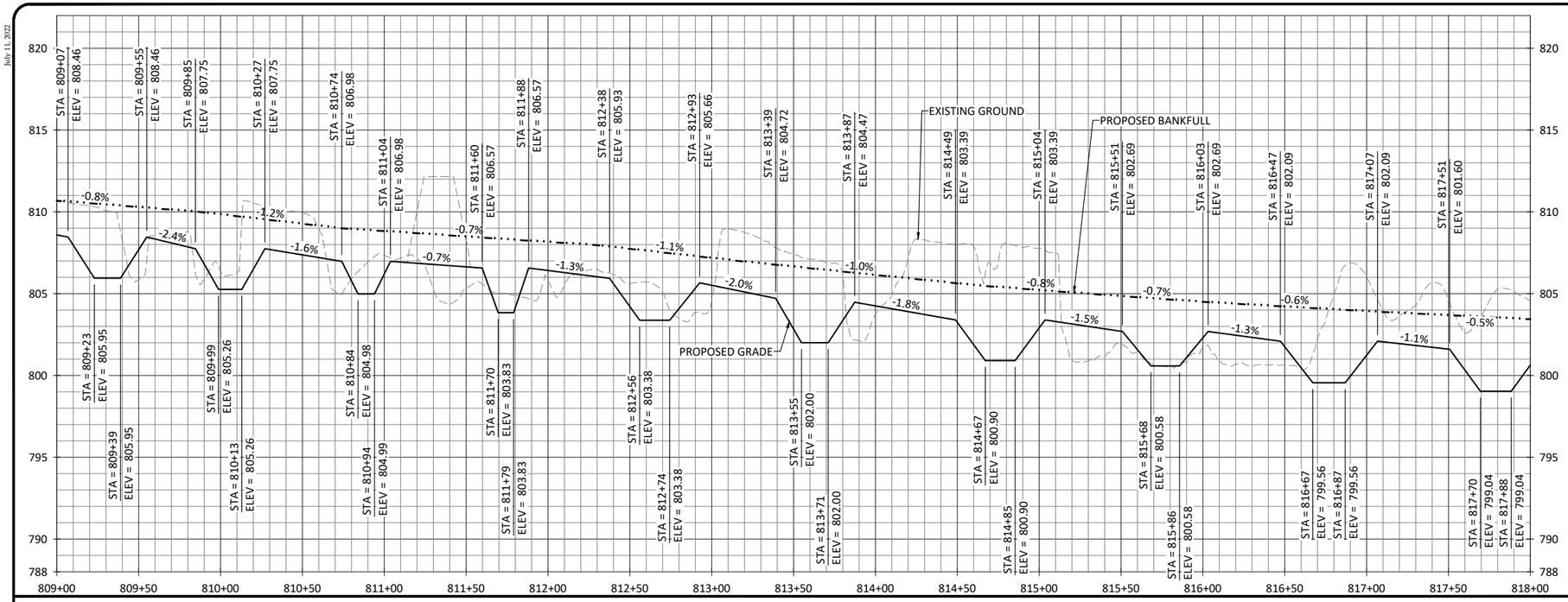
Bridgefork Creek
Stream Plan and Profile

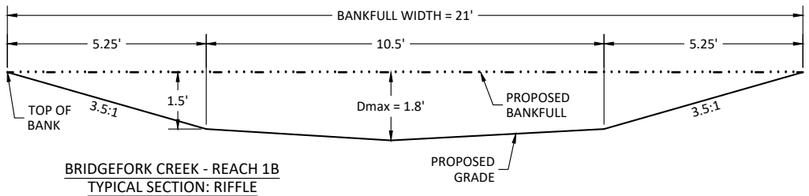
Revisions:

Date: 9.28.2022
Job Number: 005-02150
Project Engineer: EHN
Drawn By: CAW
Checked By: CDB

Sheet 1.1.1

July 11, 2023





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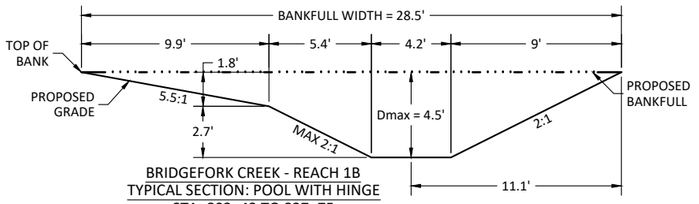
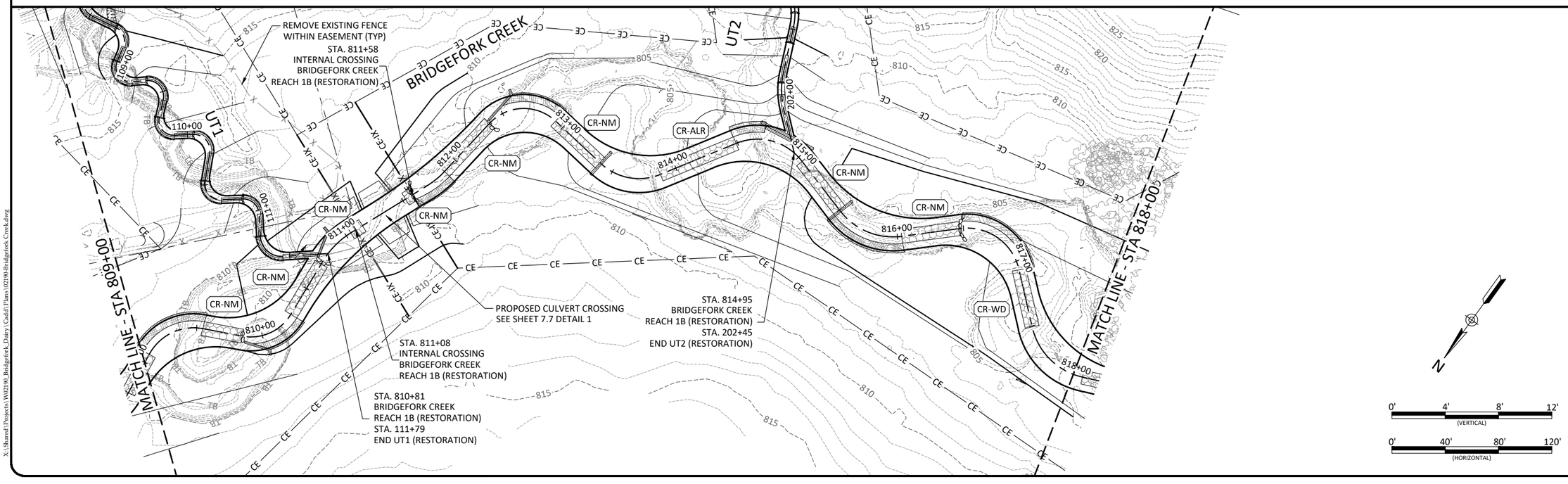
TYPICAL SECTION: RIFFLE
STA: 803+43 TO 827+75



BRIDGEFORK CREEK - REACH 1B
TYPICAL SECTION: POOL WITH HINGE
STA: 803+43 TO 827+75



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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek
Stream Plan and Profile

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

Sheet 1.1.2

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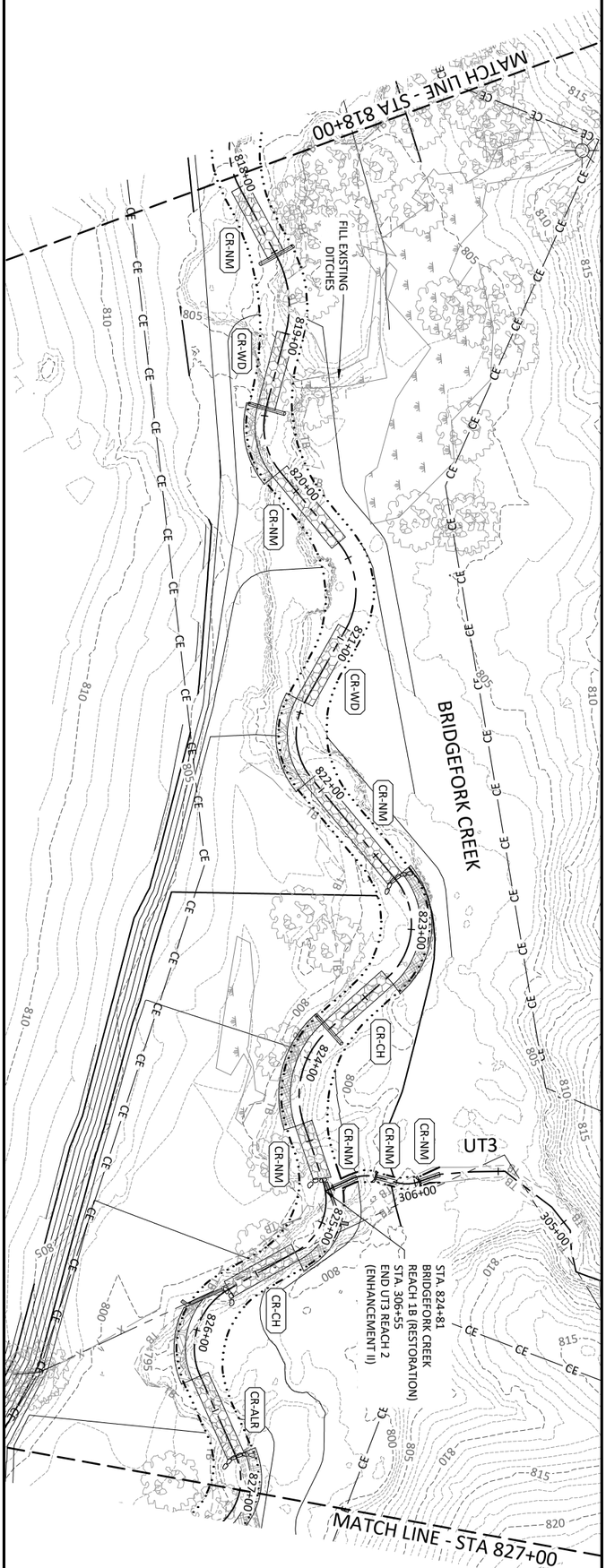

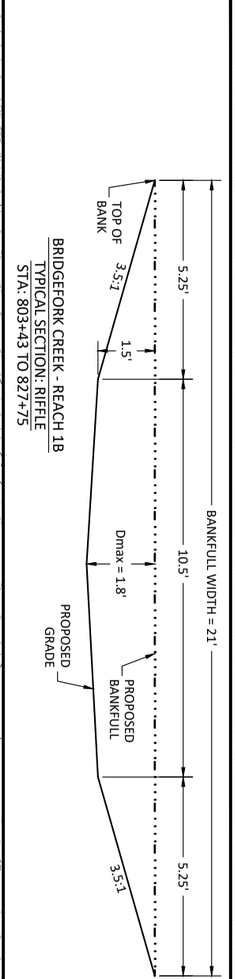

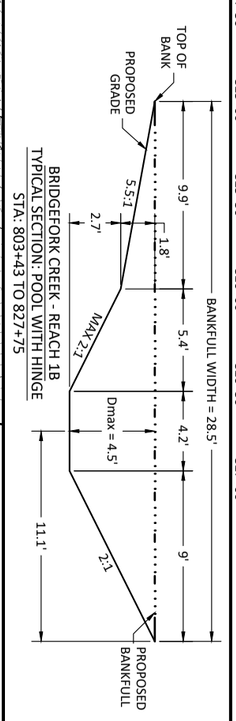

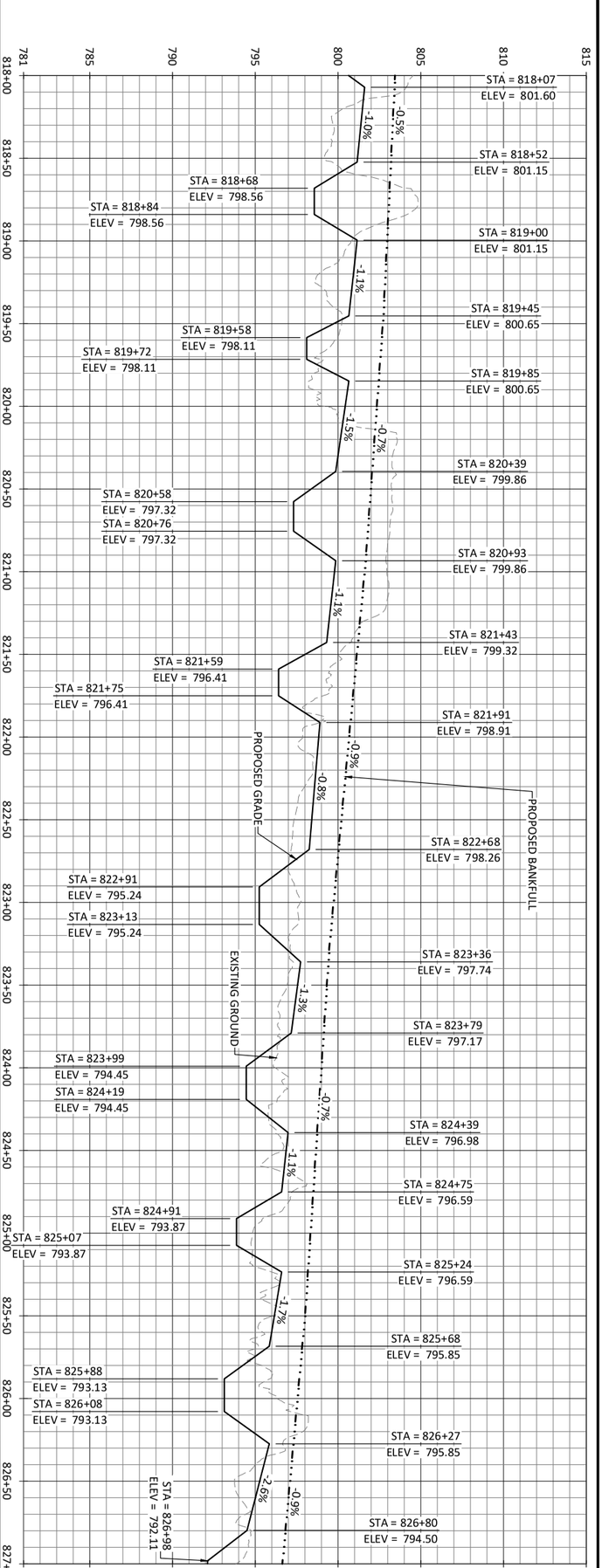

Date:	9.28.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

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Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek
Stream Plan and Profile

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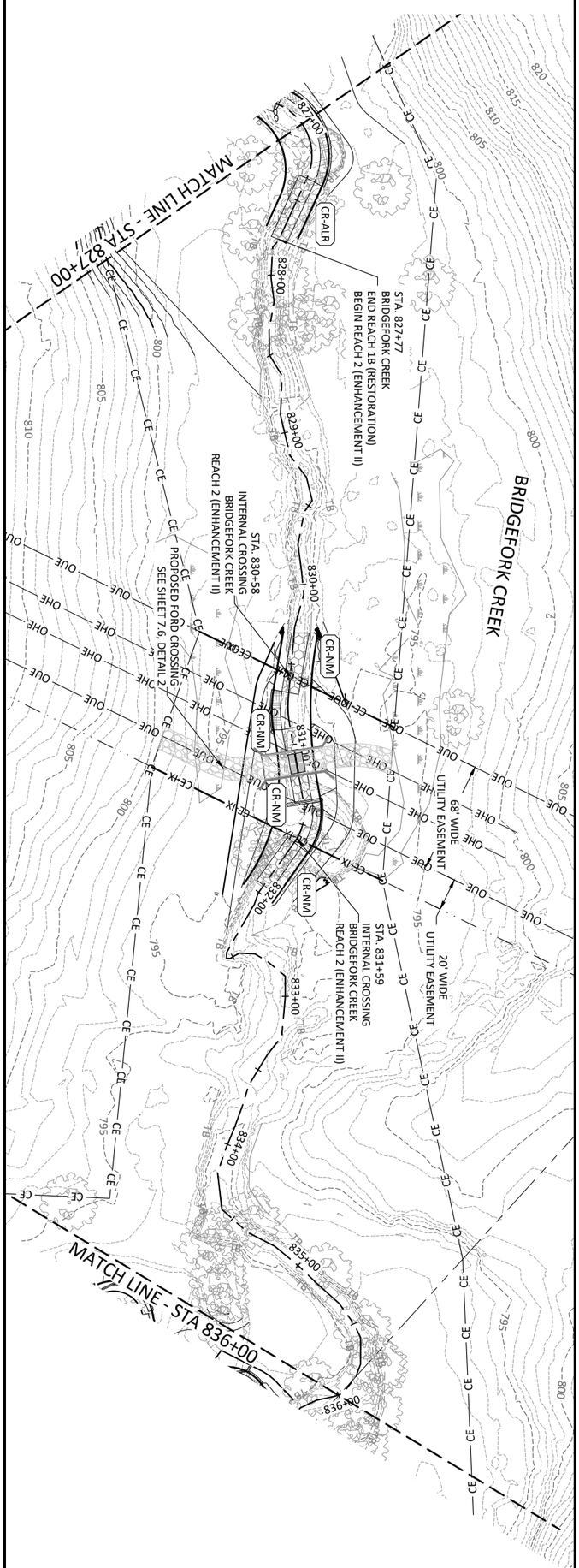

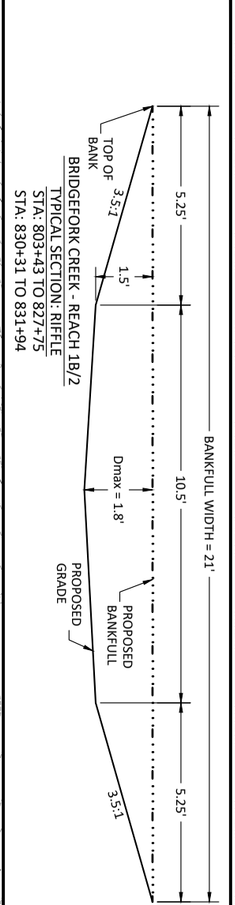

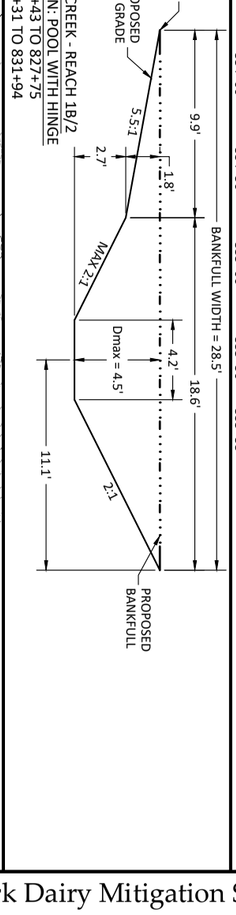

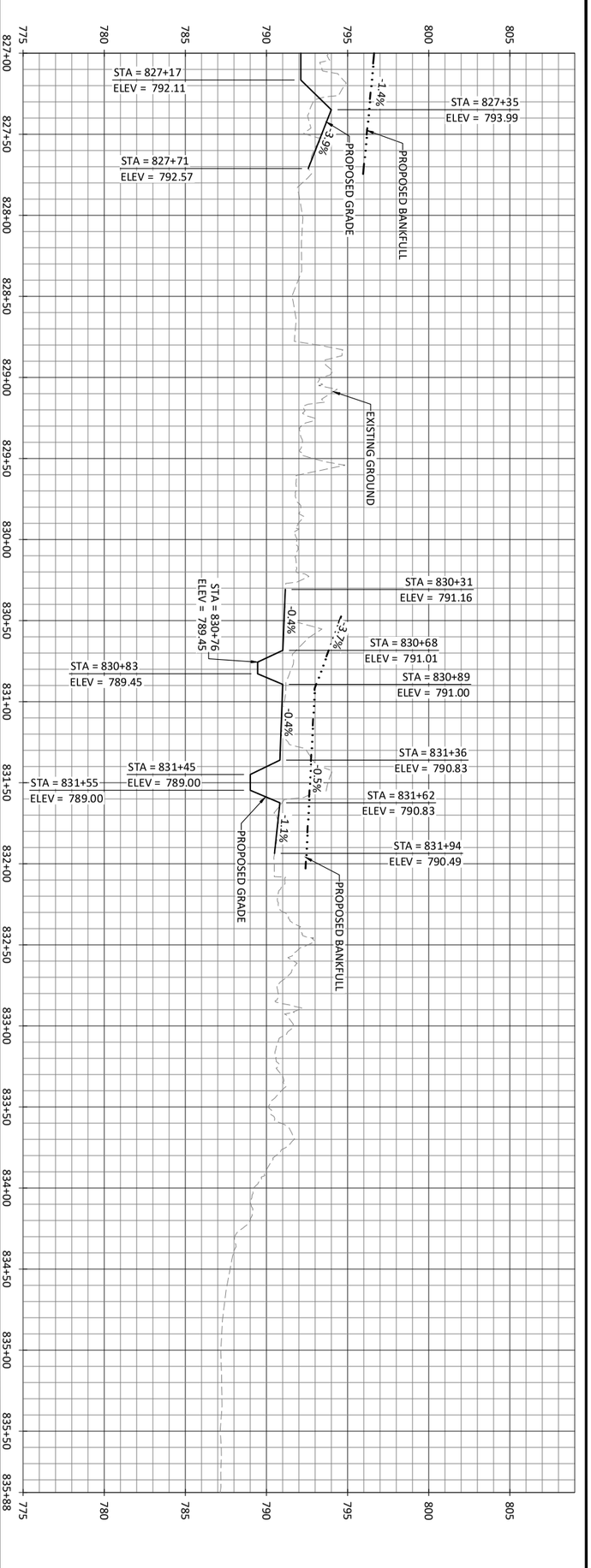

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

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1.1.4
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek
Stream Plan and Profile

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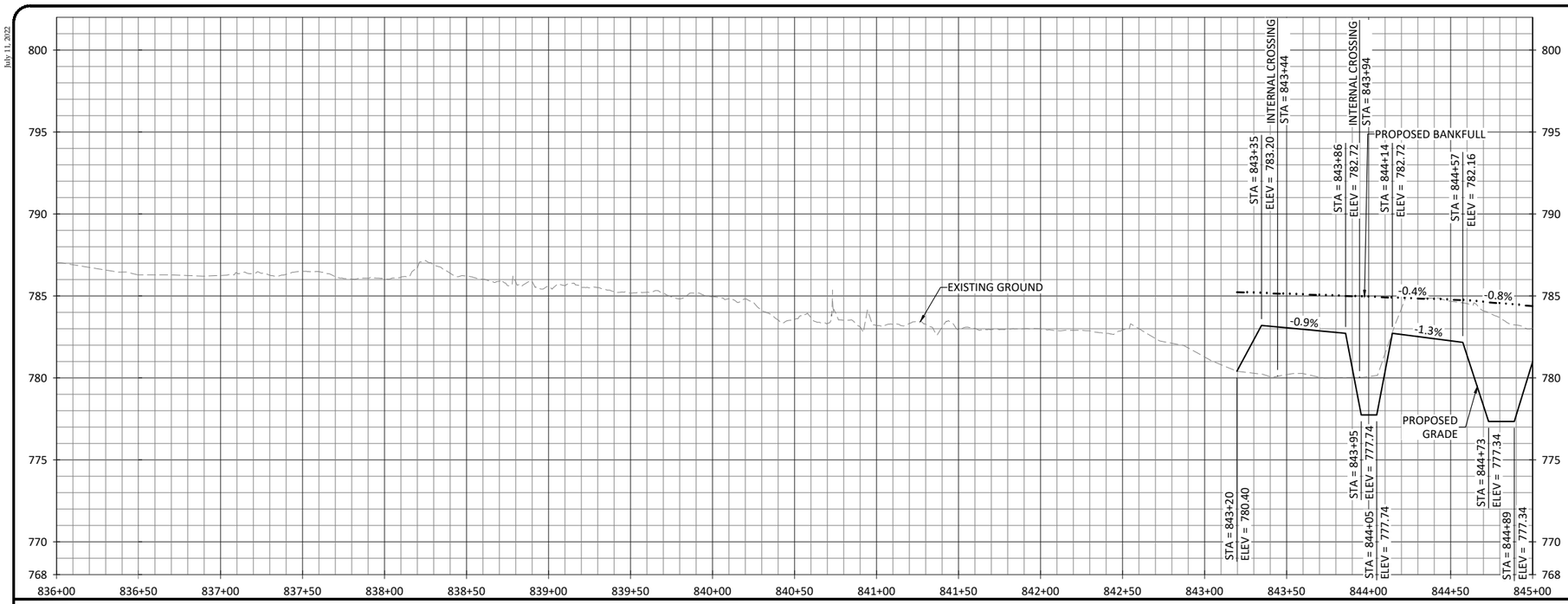
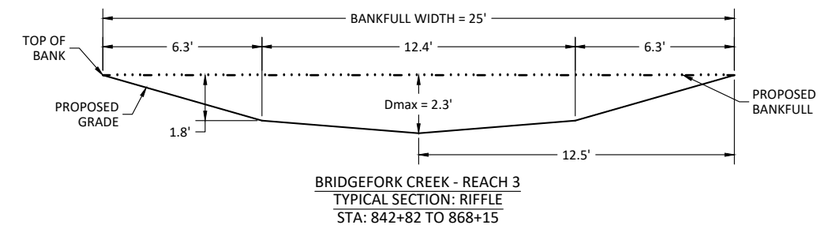
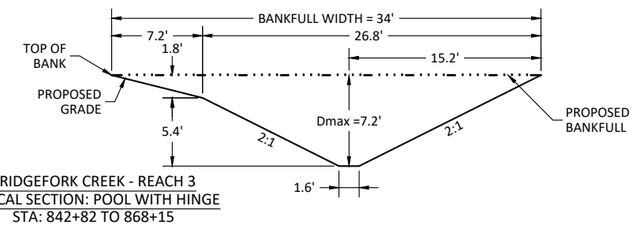
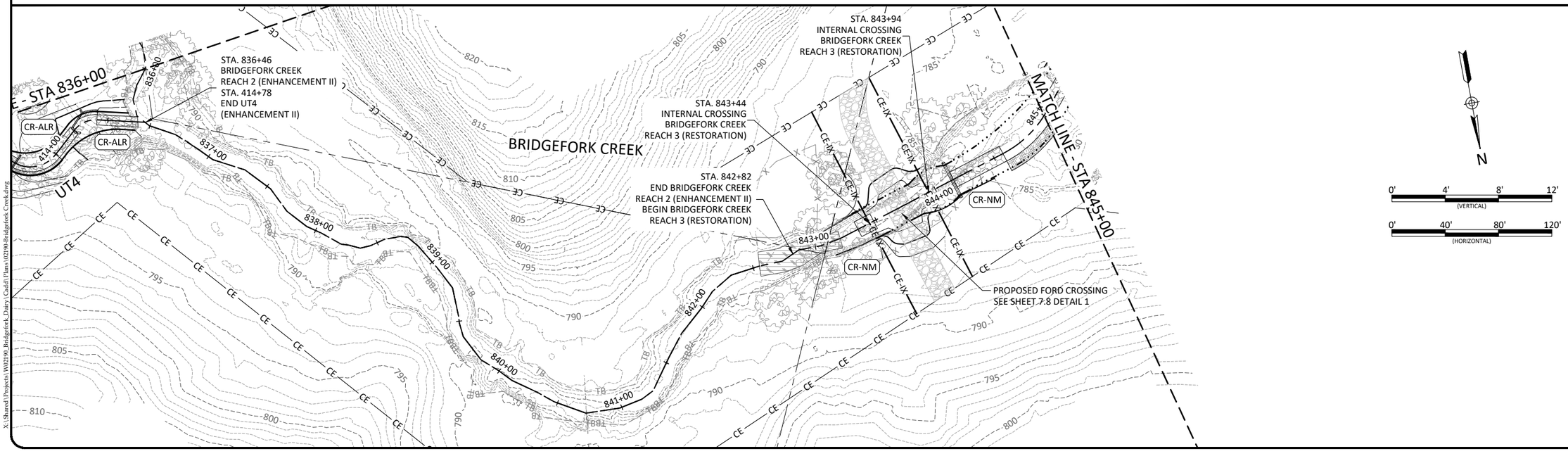




BRIDGEFORK CREEK - REACH 3
TYPICAL SECTION: RIFFLE
STA: 842+82 TO 868+15



BRIDGEFORK CREEK - REACH 3
TYPICAL SECTION: POOL WITH HINGE
STA: 842+82 TO 868+15



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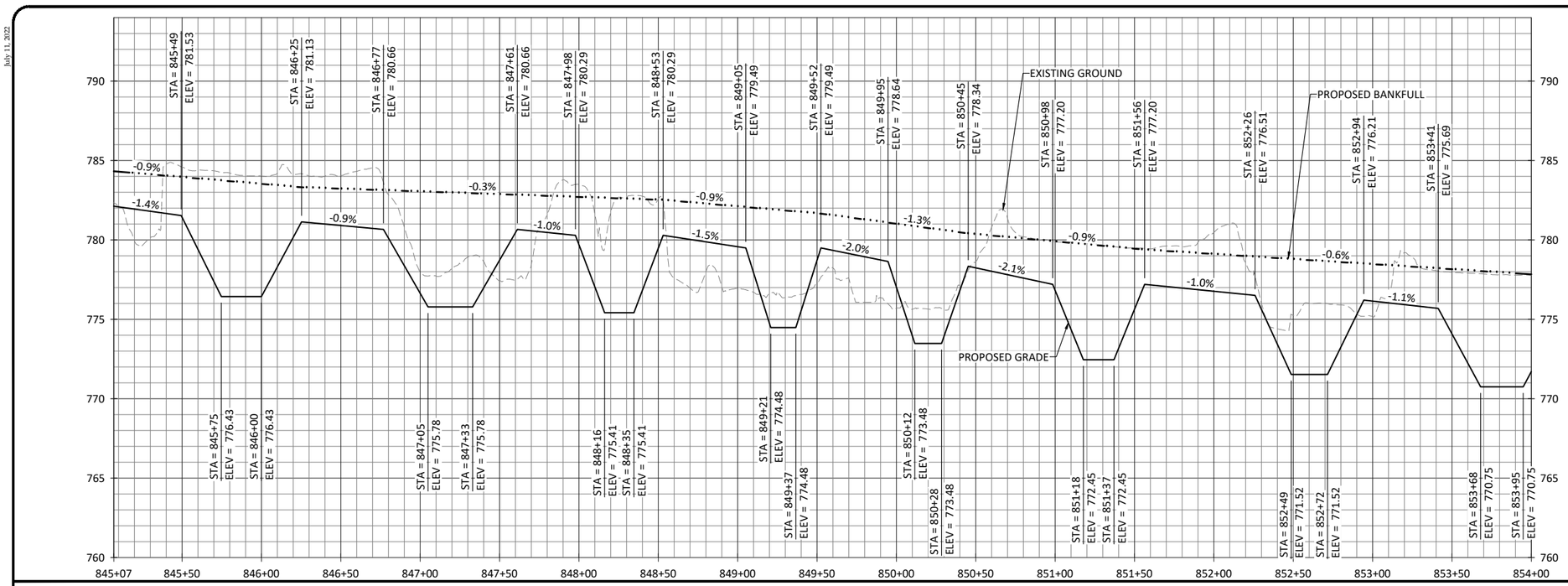
Bridgefork Creek
Stream Plan and Profile

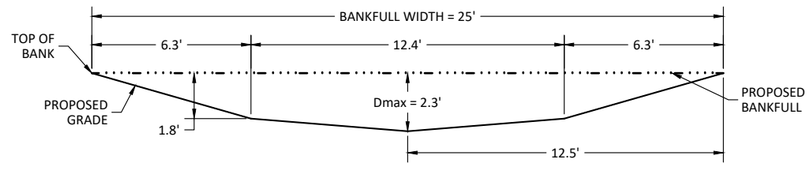
Revisions:

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

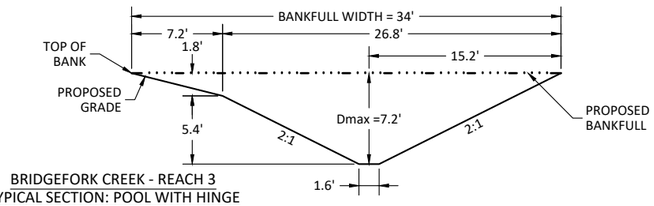
Sheet 1.1.5

July 11, 2023

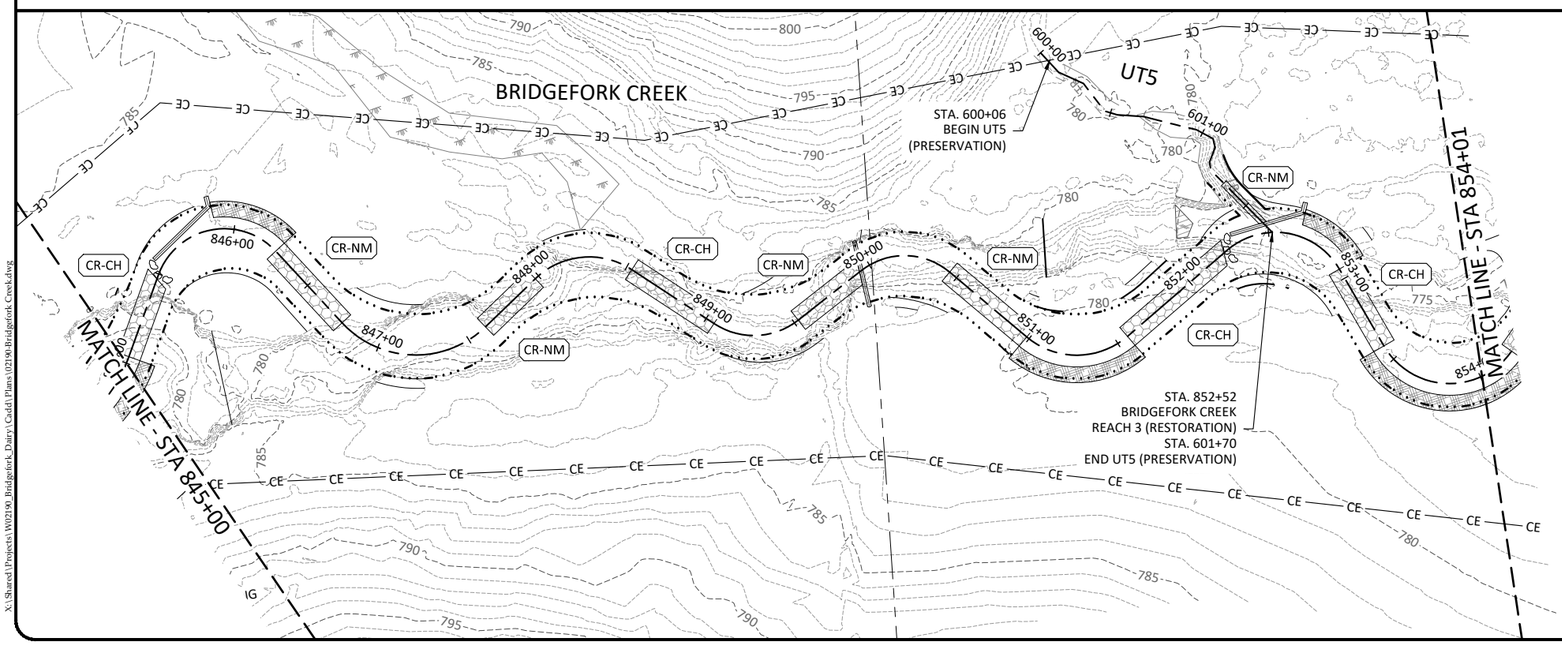


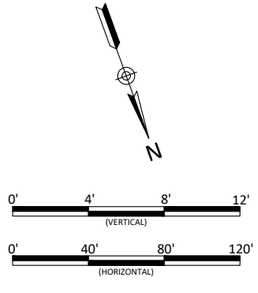


BRIDGEFORK CREEK - REACH 3
TYPICAL SECTION: RIFFLE
STA: 842+82 TO 868+15



BRIDGEFORK CREEK - REACH 3
TYPICAL SECTION: POOL WITH HINGE
STA: 842+82 TO 868+15





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Bridgefork Creek
Stream Plan and Profile

Revisions:

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
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Sheet 1.1.6

July 11, 2023

BRIDGEFORK CREEK - REACH 3
TYPICAL SECTION: RIFFLE
STA: 842+82 TO 868+15

BRIDGEFORK CREEK - REACH 3
TYPICAL SECTION: POOL WITH HINGE
STA: 842+82 TO 868+15

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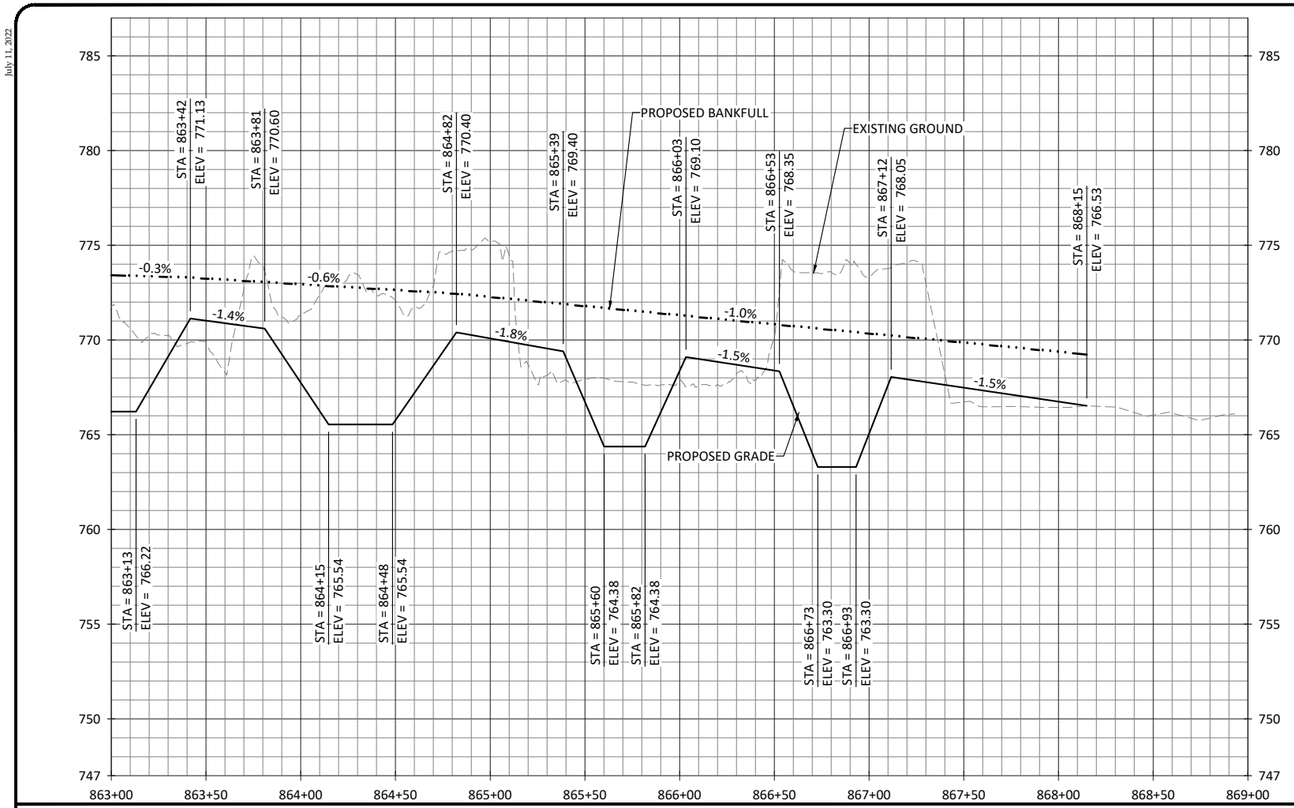
Bridgefork Creek
Stream Plan and Profile

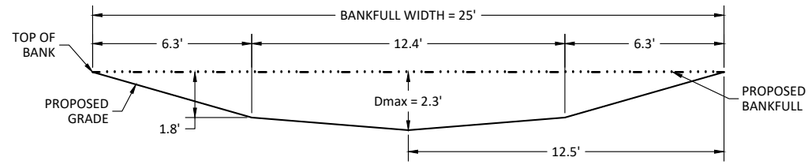
Revisions:

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

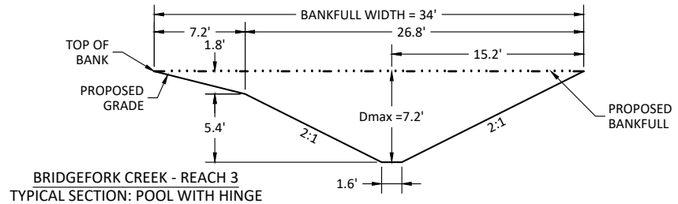
Sheet 1.1.7

July 11, 2023

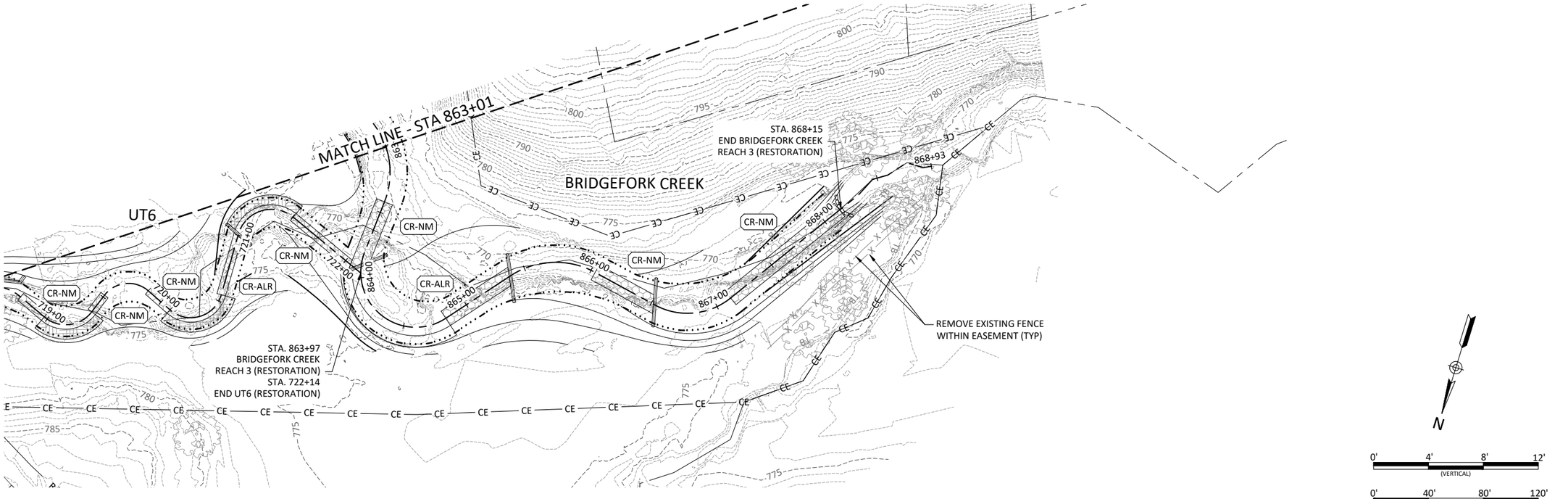




BRIDGEFORK CREEK - REACH 3
TYPICAL SECTION: RIFFLE
STA: 842+82 TO 868+15



BRIDGEFORK CREEK - REACH 3
TYPICAL SECTION: POOL WITH HINGE
STA: 842+82 TO 868+15



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Bridgefork Dairy Mitigation Site
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Bridgefork Creek
Stream Plan and Profile

Revisions:

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 1.1.8

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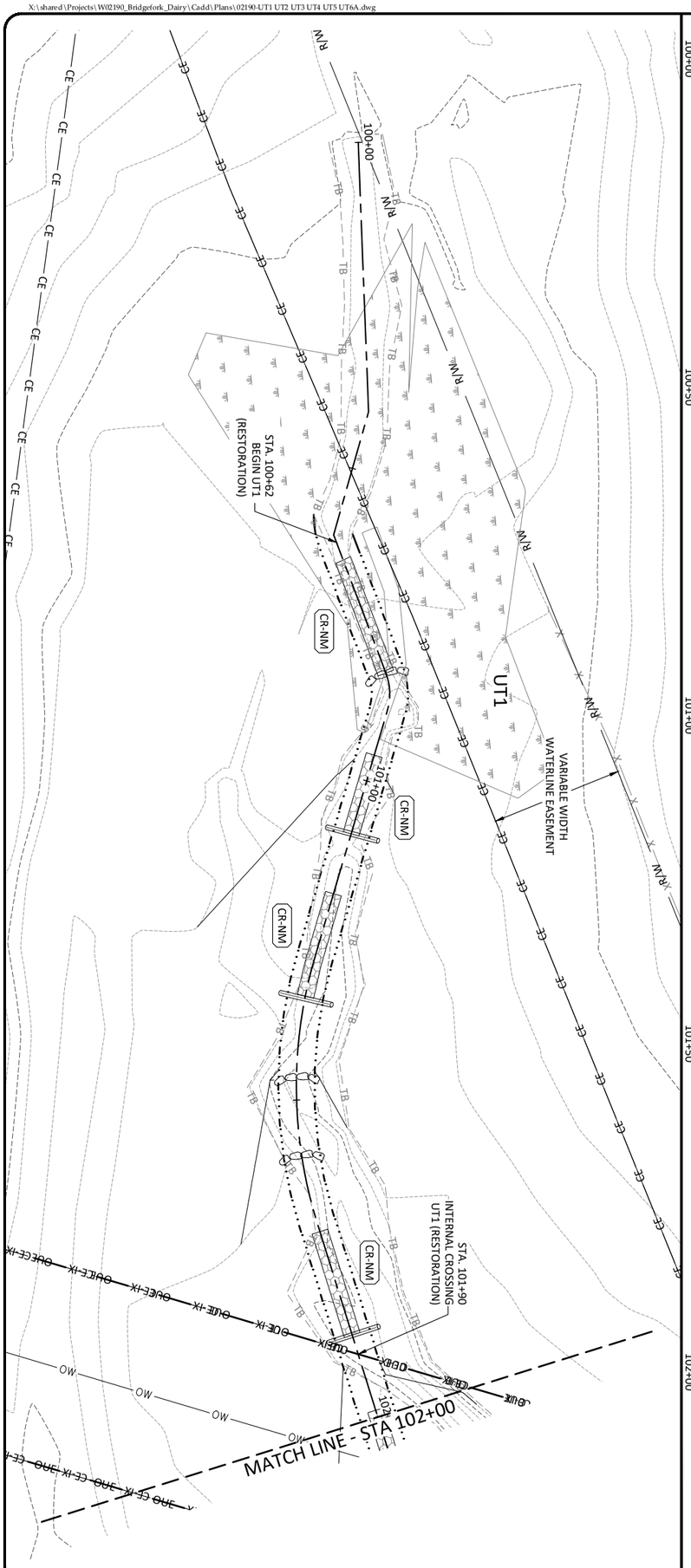

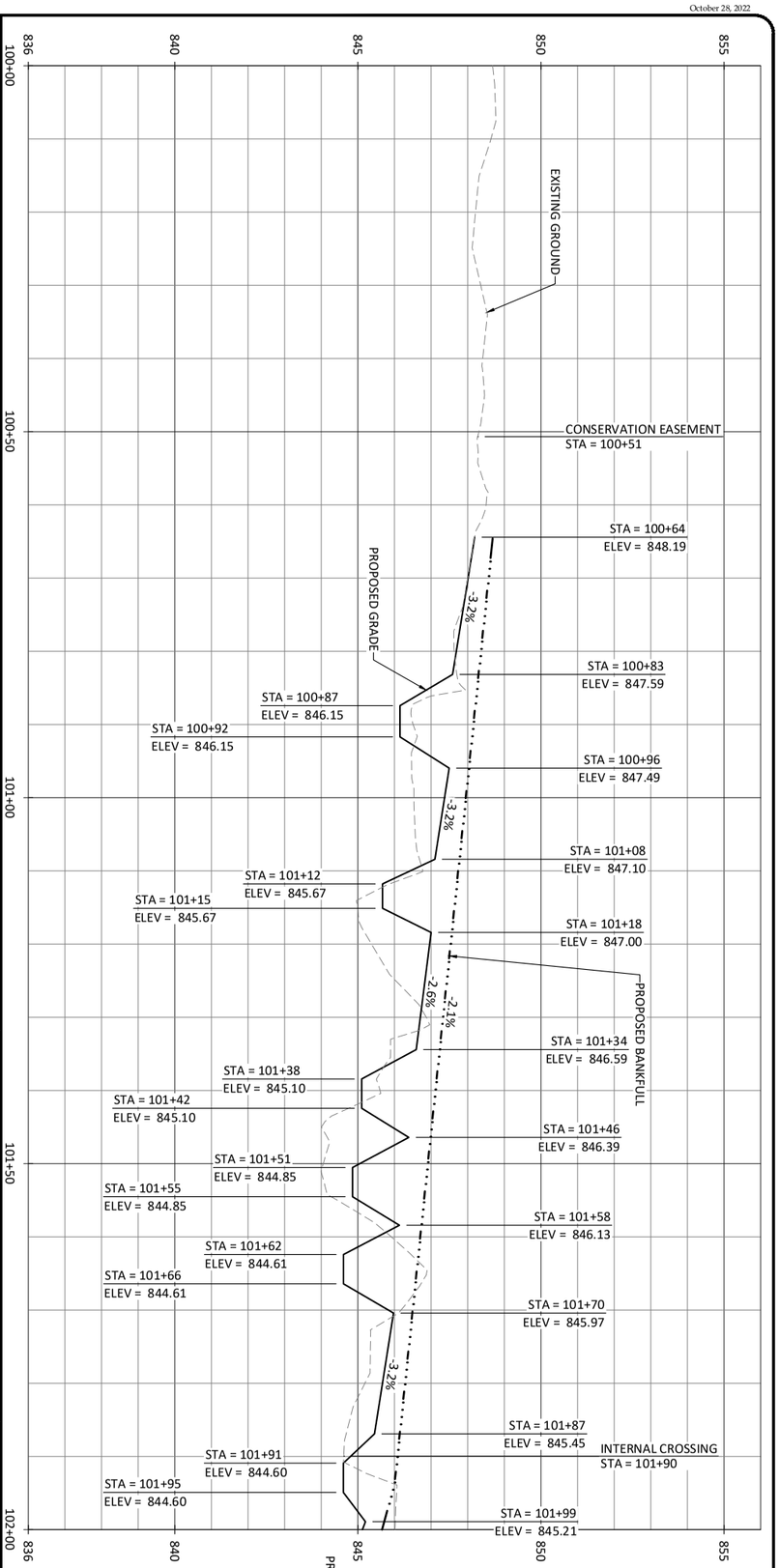

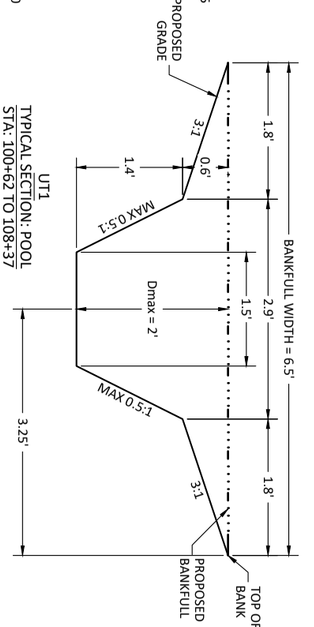

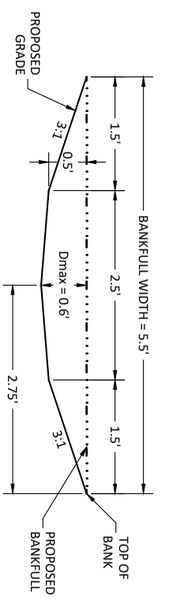

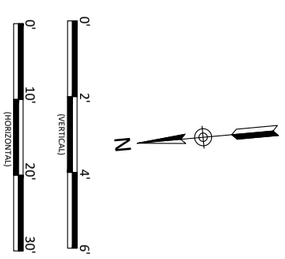

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

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Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT1
Stream Plan and Profile

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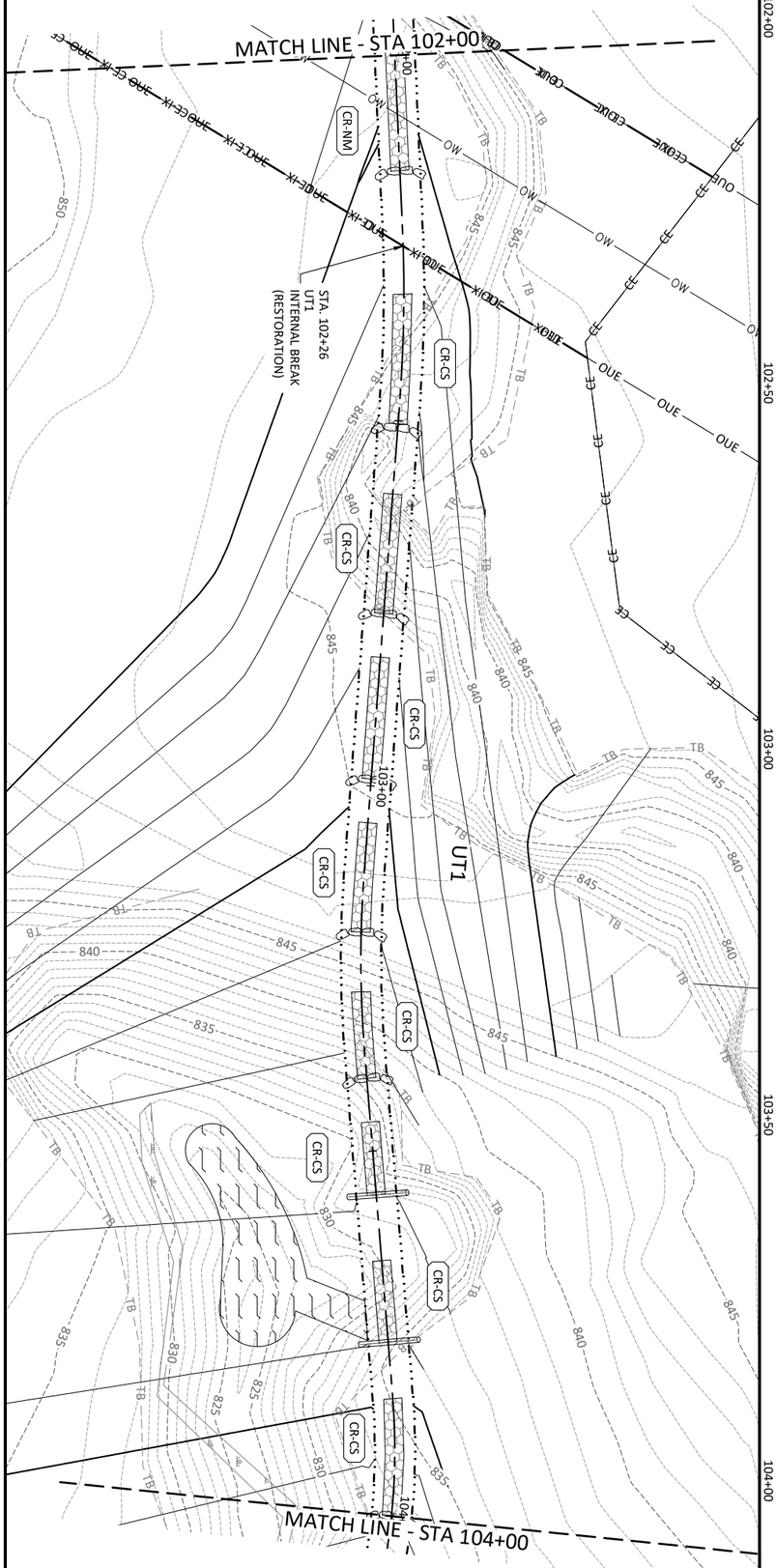

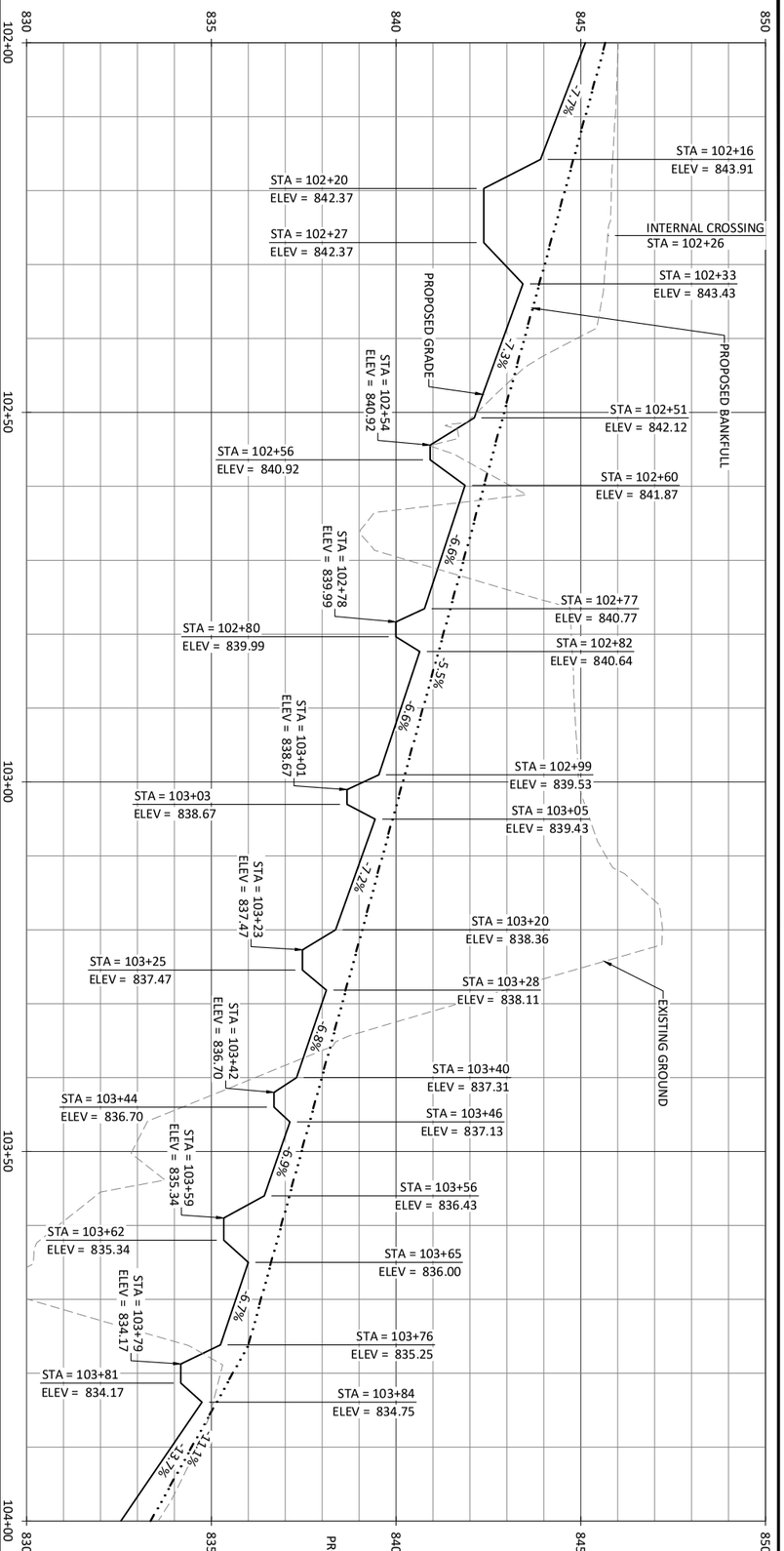

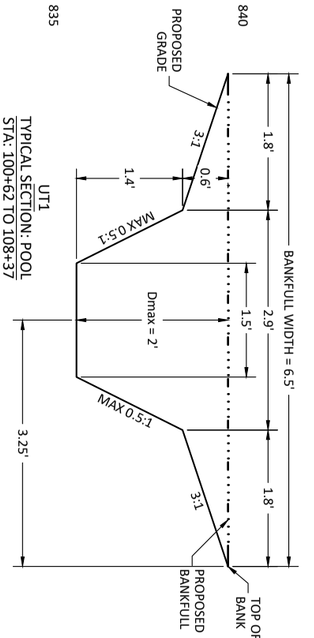

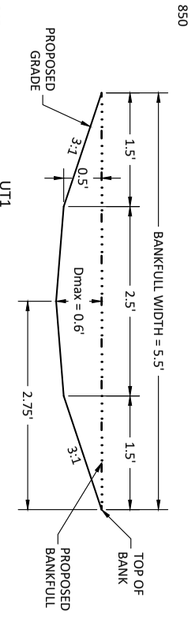

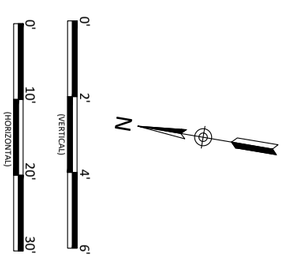

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT1
Stream Plan and Profile

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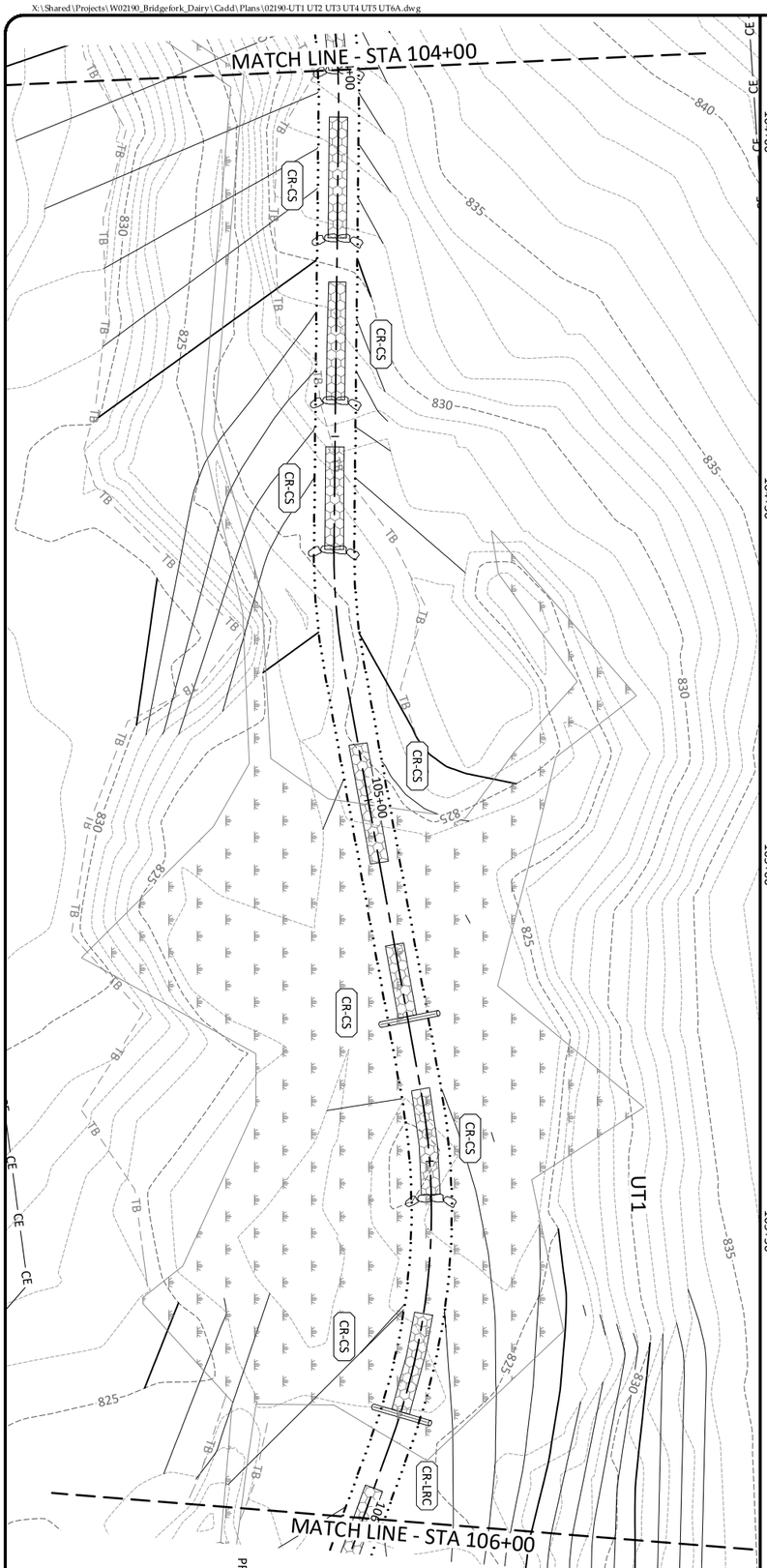

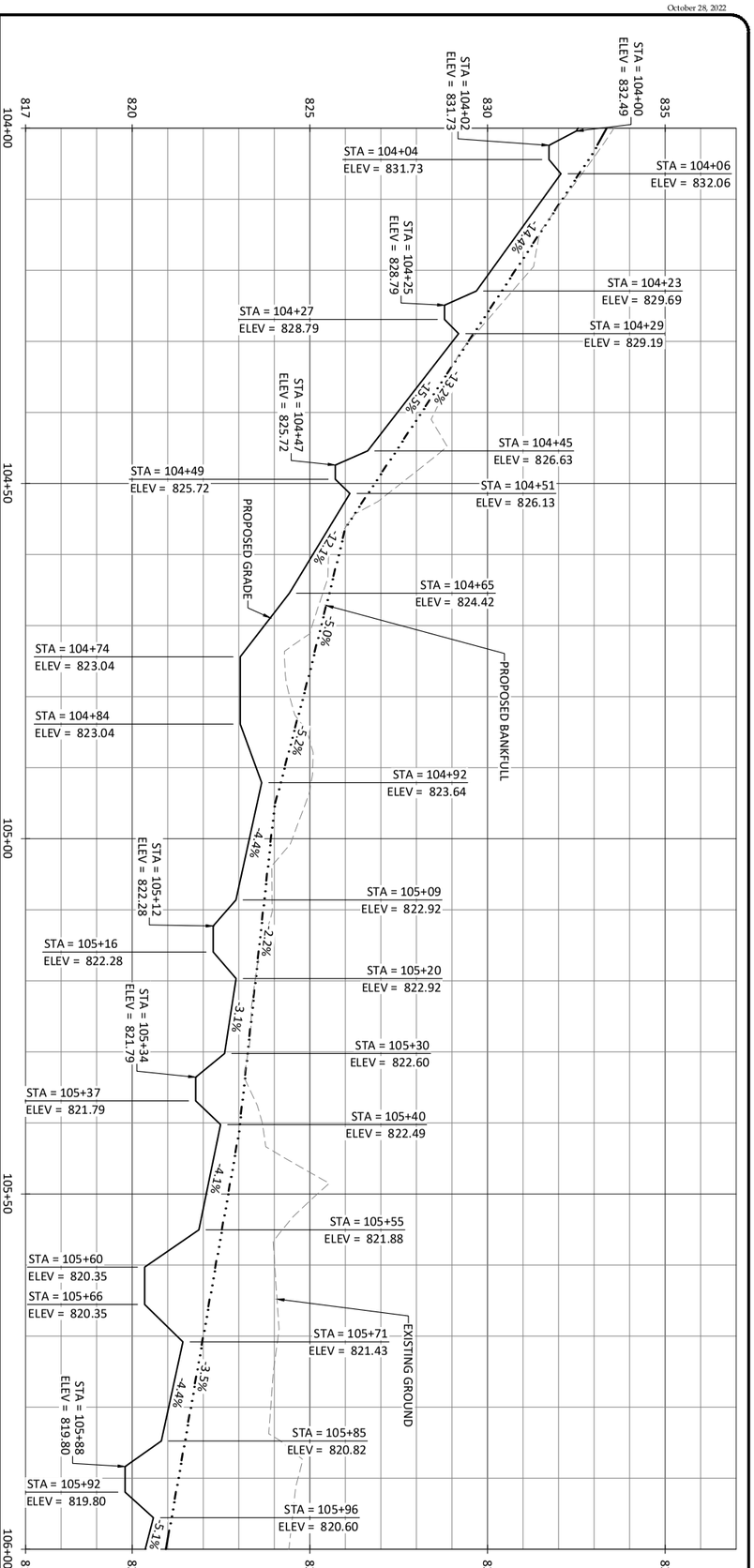

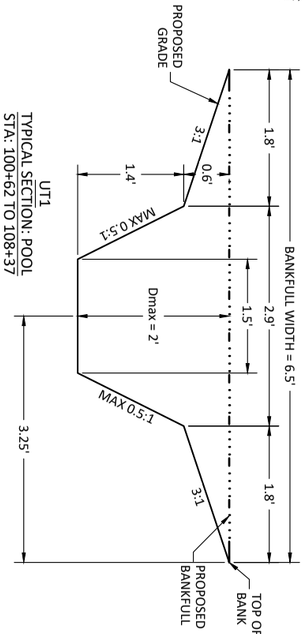

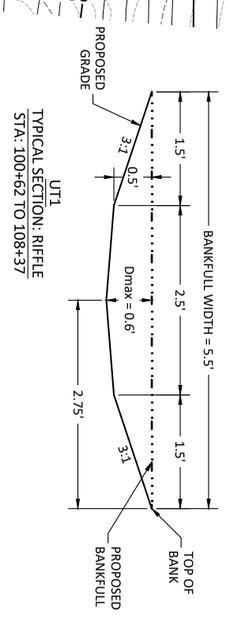

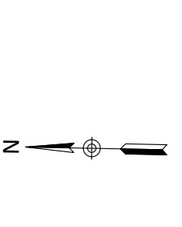

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
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Bridgefork Dairy Mitigation Site
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UT1
Stream Plan and Profile

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October 28, 2022

UT1
TYPICAL SECTION: RIFFLE
STA: 100+62 TO 108+37

UT1
TYPICAL SECTION: POOL
STA: 100+62 TO 108+37

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Bridgefork Dairy Mitigation Site
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UT1
Stream Plan and Profile

Revisions:

Date:	10.27.2022
Job Number:	005-02150
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 1.2.4

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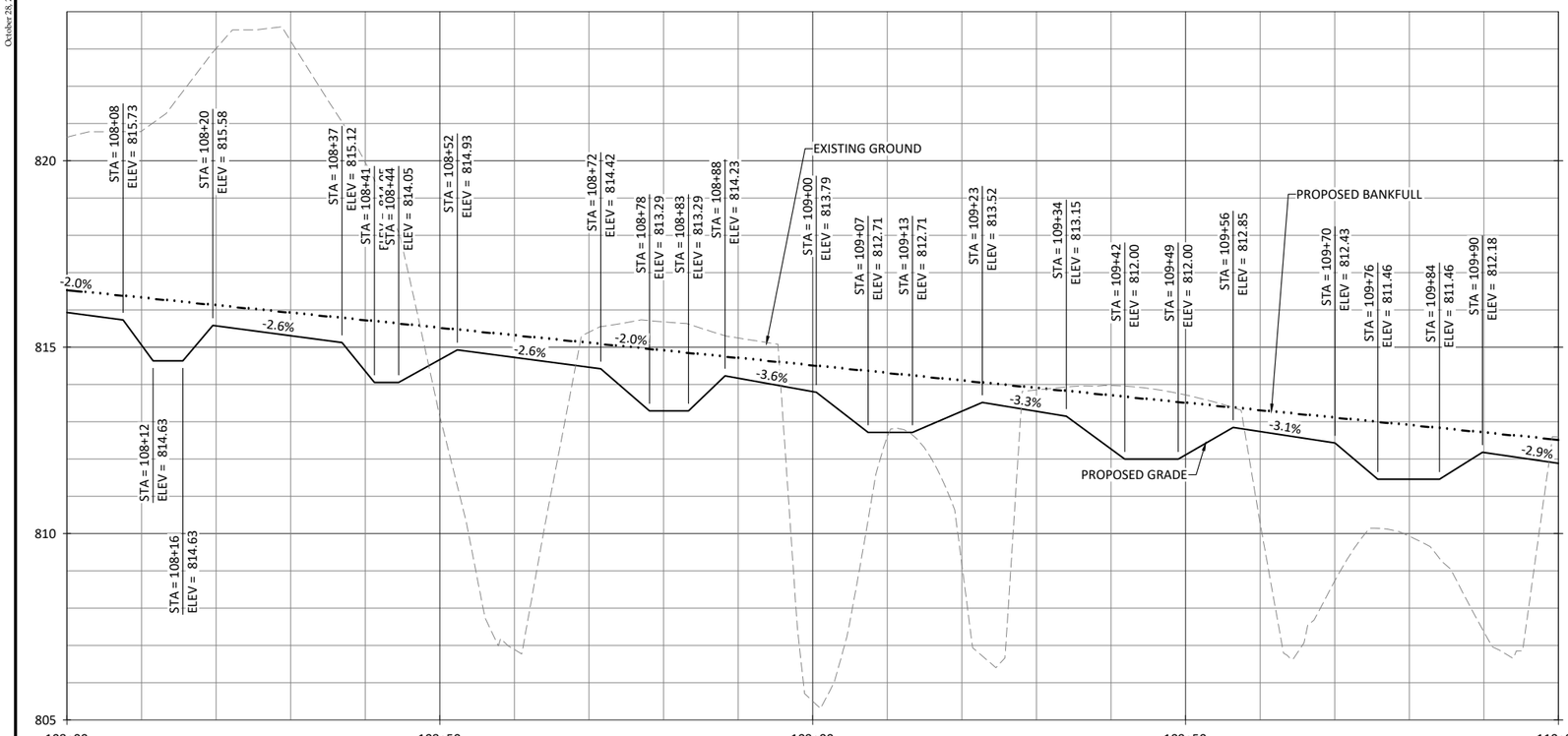
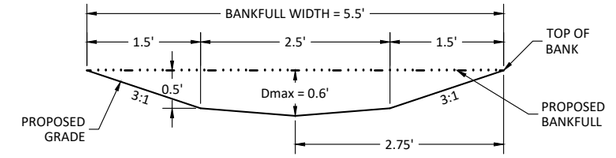
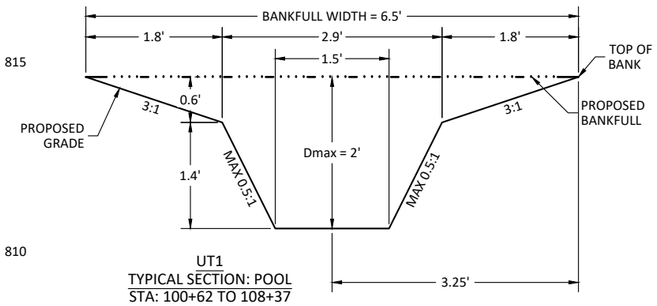
October 28, 2022

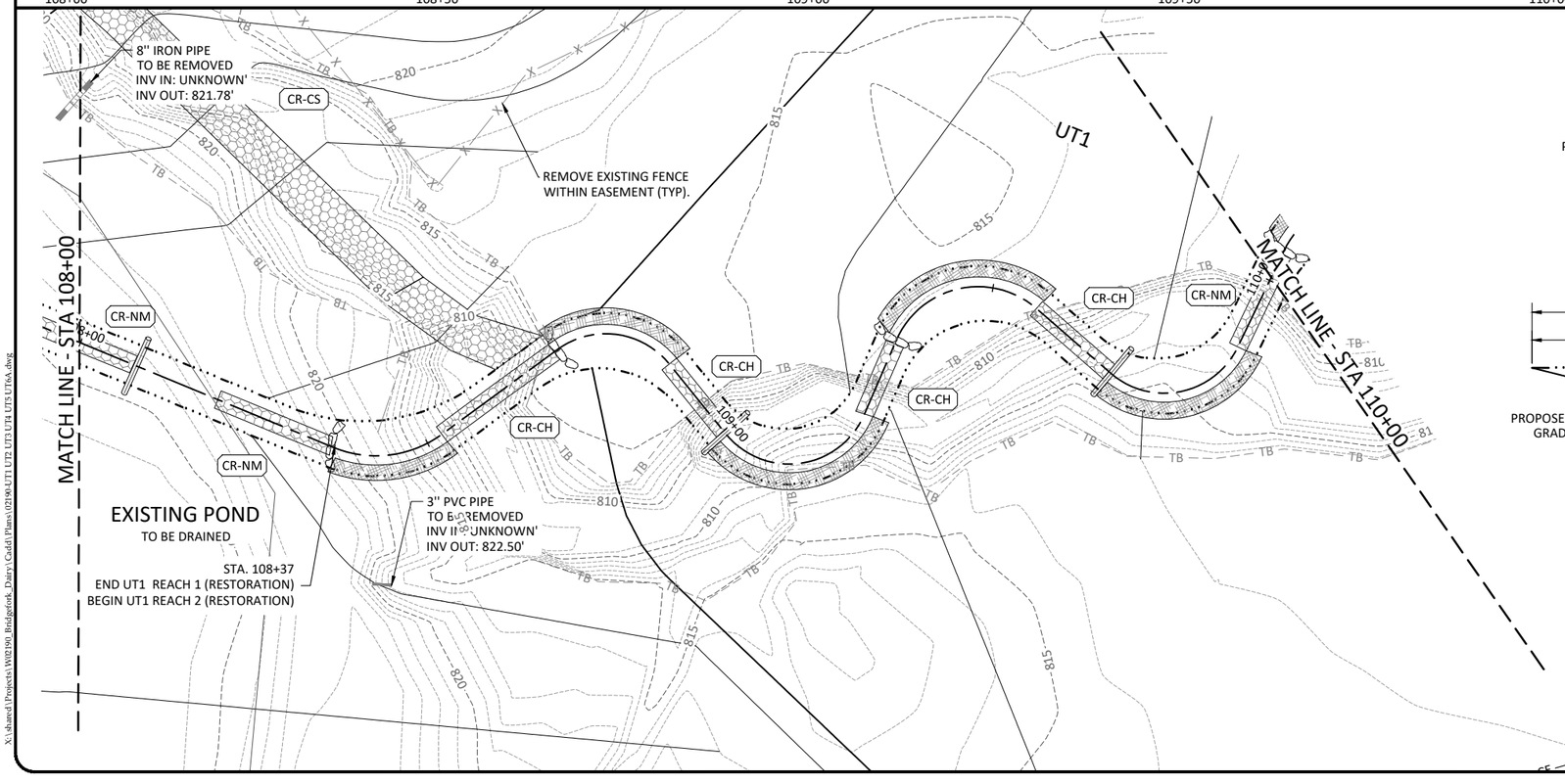


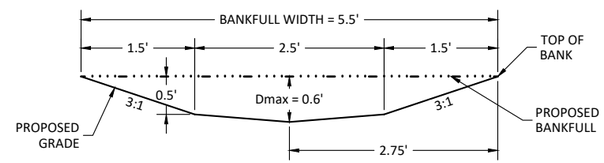


UT1
TYPICAL SECTION: RIFFLE
STA: 100+62 TO 108+37

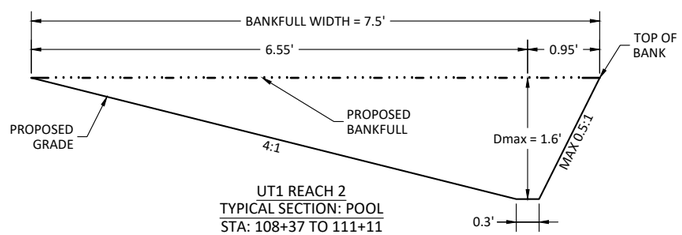


UT1
TYPICAL SECTION: POOL
STA: 100+62 TO 108+37





UT1 REACH 2
TYPICAL SECTION: RIFFLE
STA: 108+37 TO 111+11



UT1 REACH 2
TYPICAL SECTION: POOL
STA: 108+37 TO 111+11

0' 2' 4' 6' (VERTICAL)

0' 10' 20' 30' (HORIZONTAL)

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT1
Stream Plan and Profile

Revisions:

Date: 10.27.2022
Job Number: 005-02150
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Sheet 1.2.5

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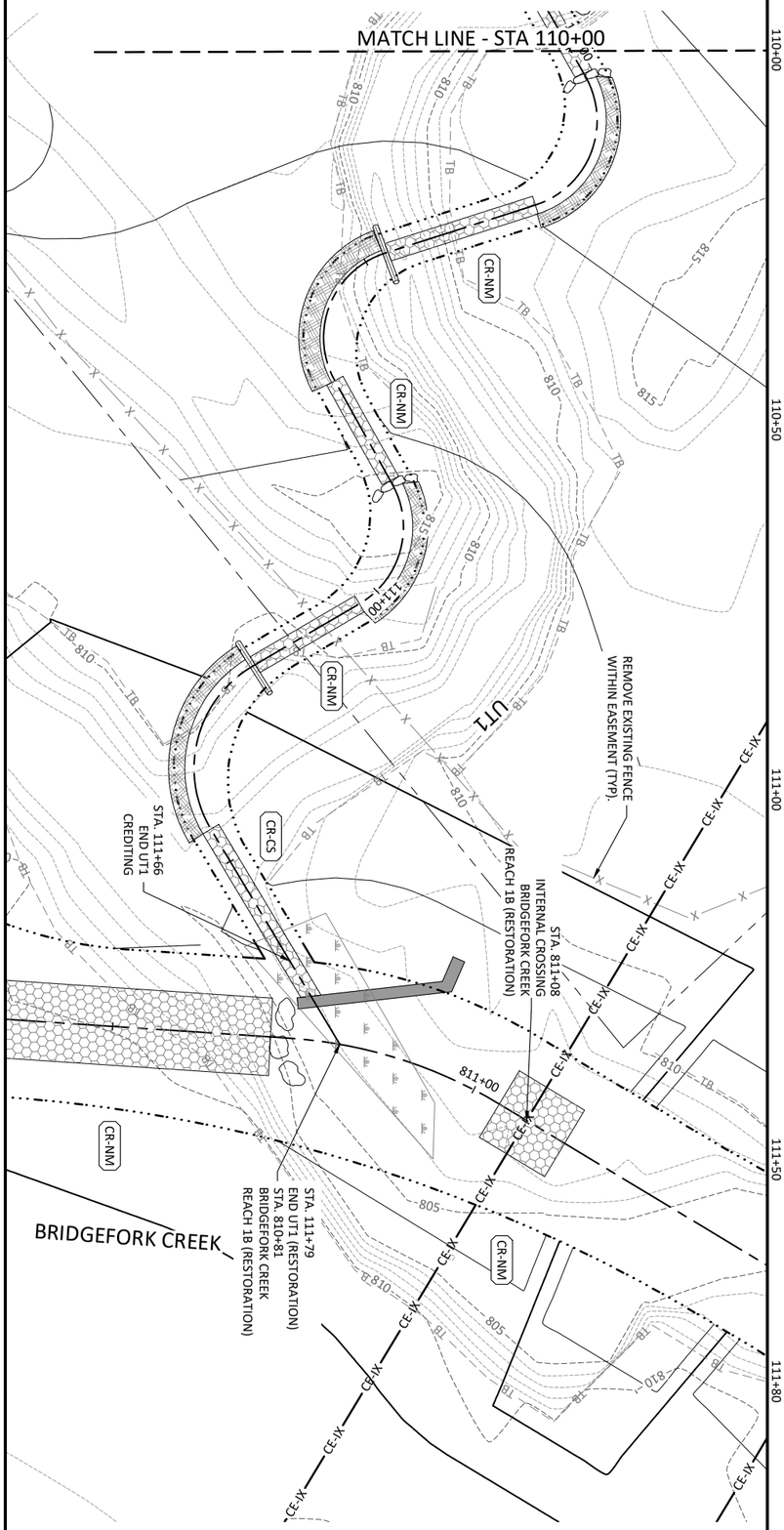

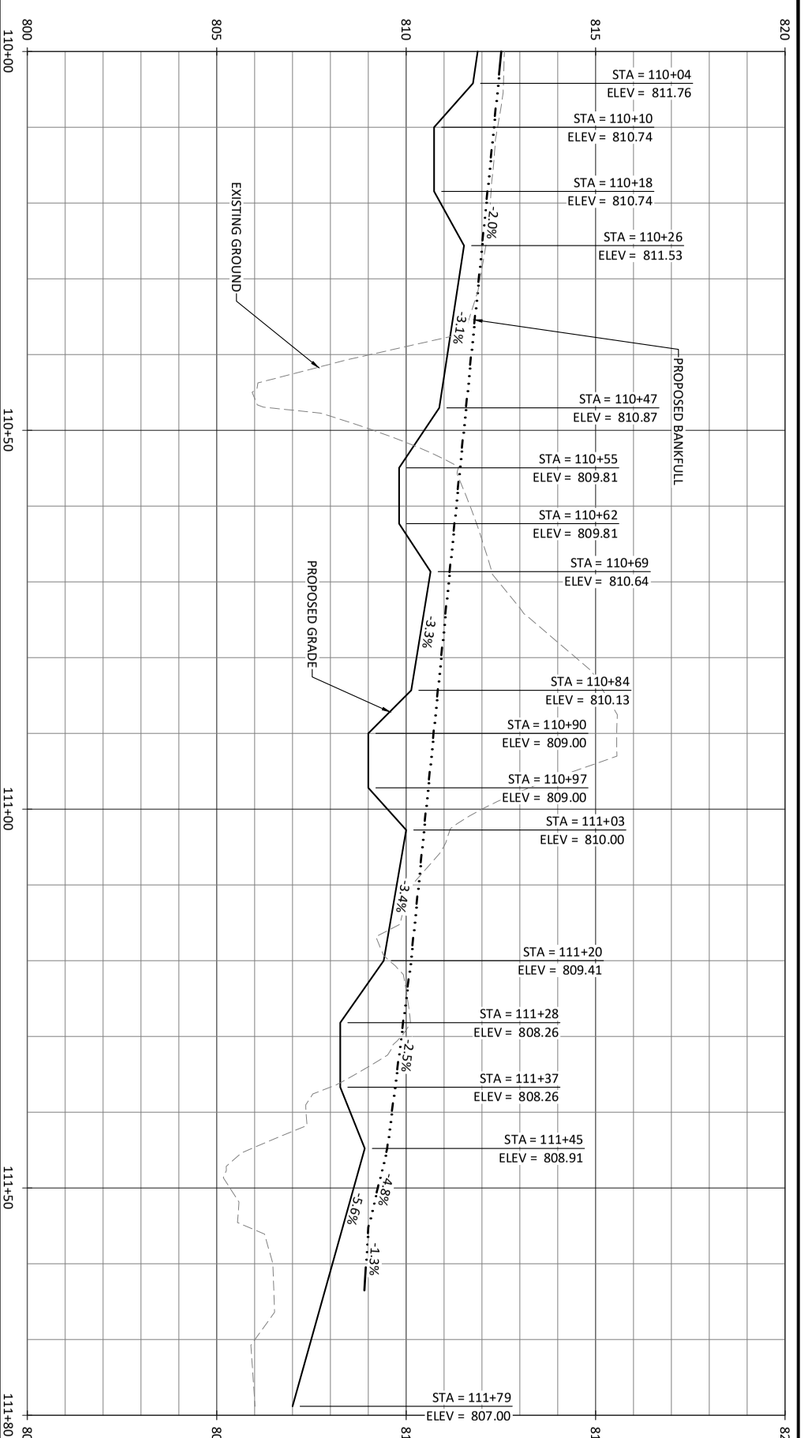

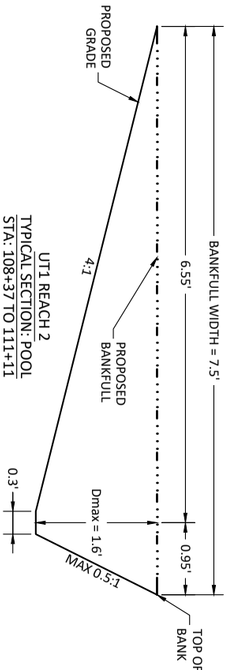

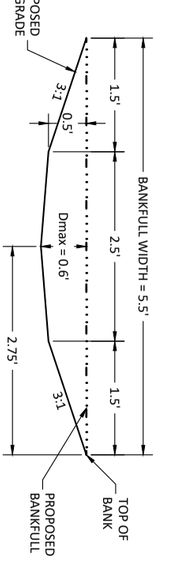

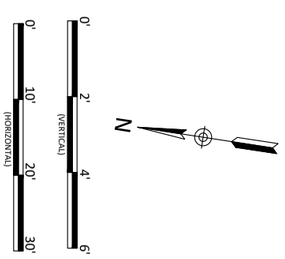

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

1.2.6
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT1
Stream Plan and Profile

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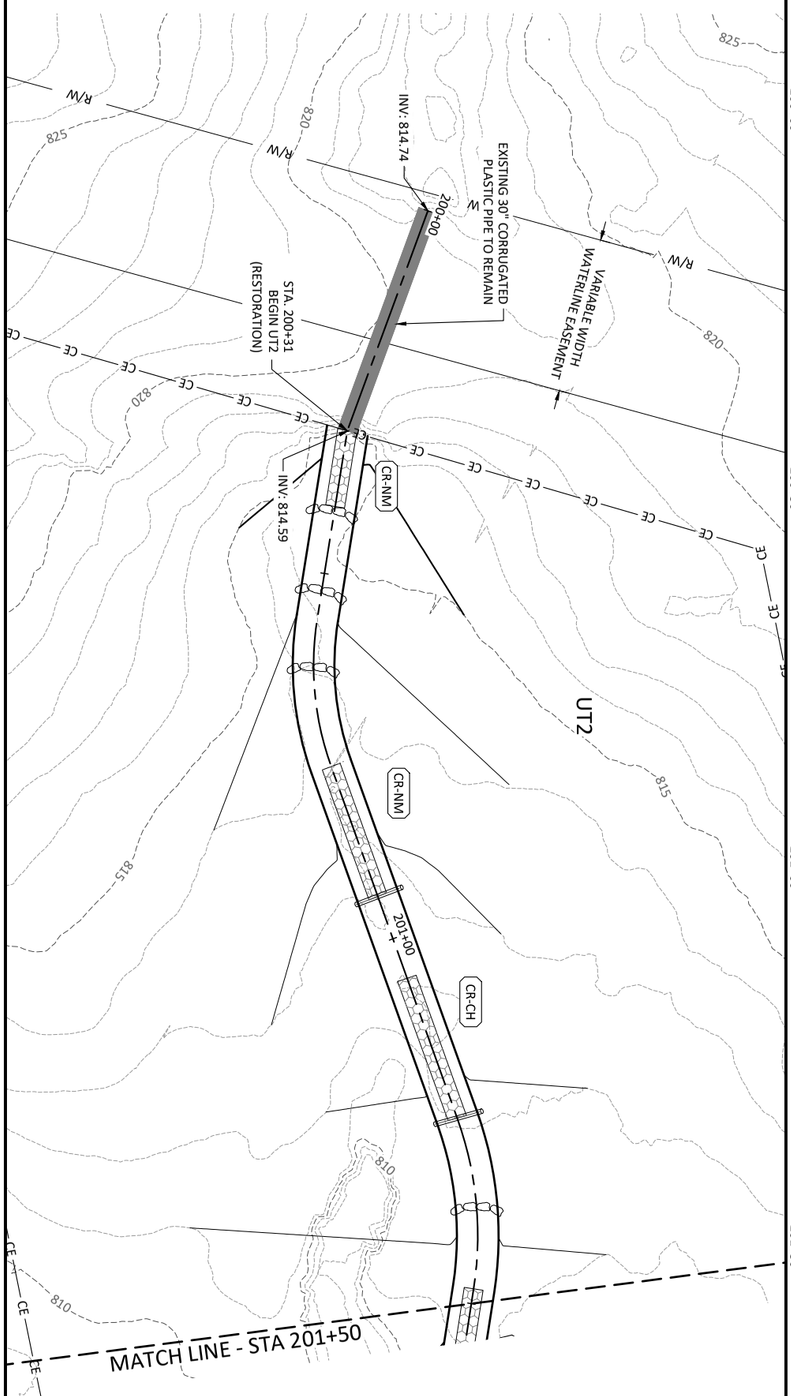

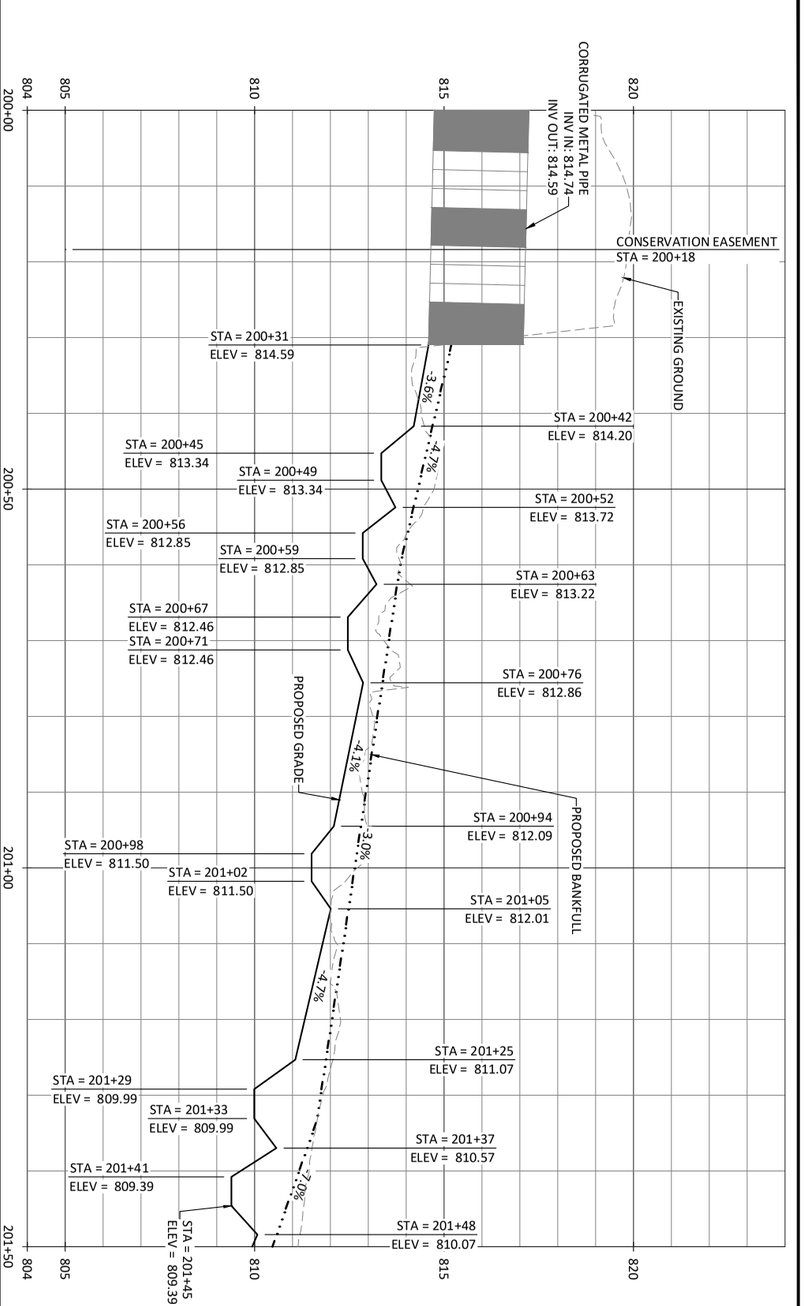

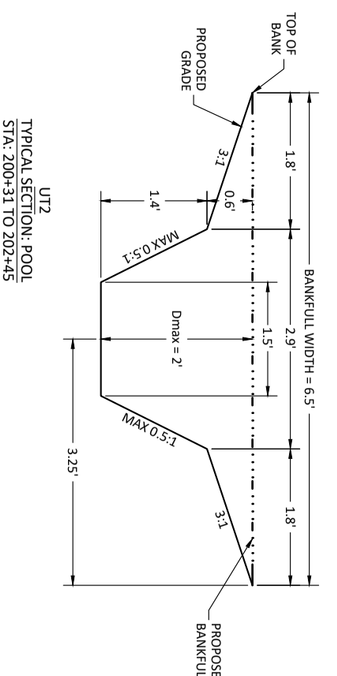

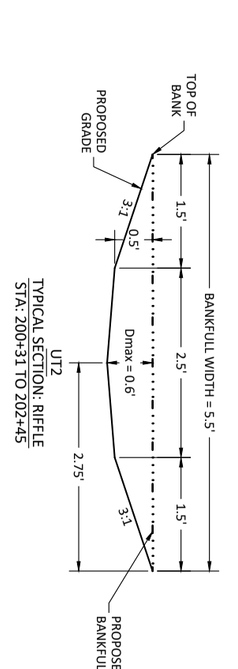

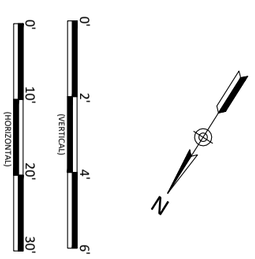

Date: 07.11.22
Job Number: 005-02190
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Revisions:

1.3.1
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT2
Stream Plan and Profile

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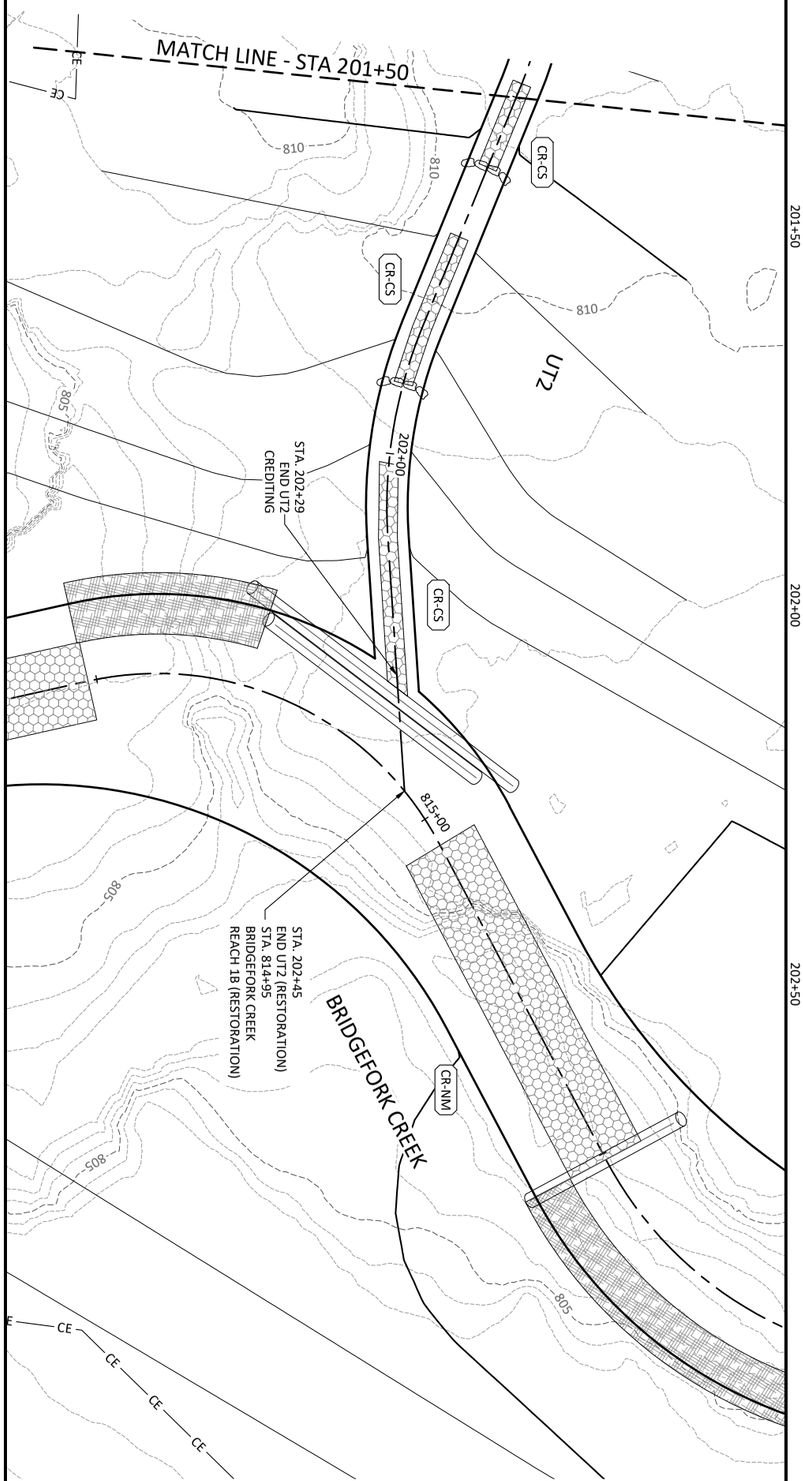

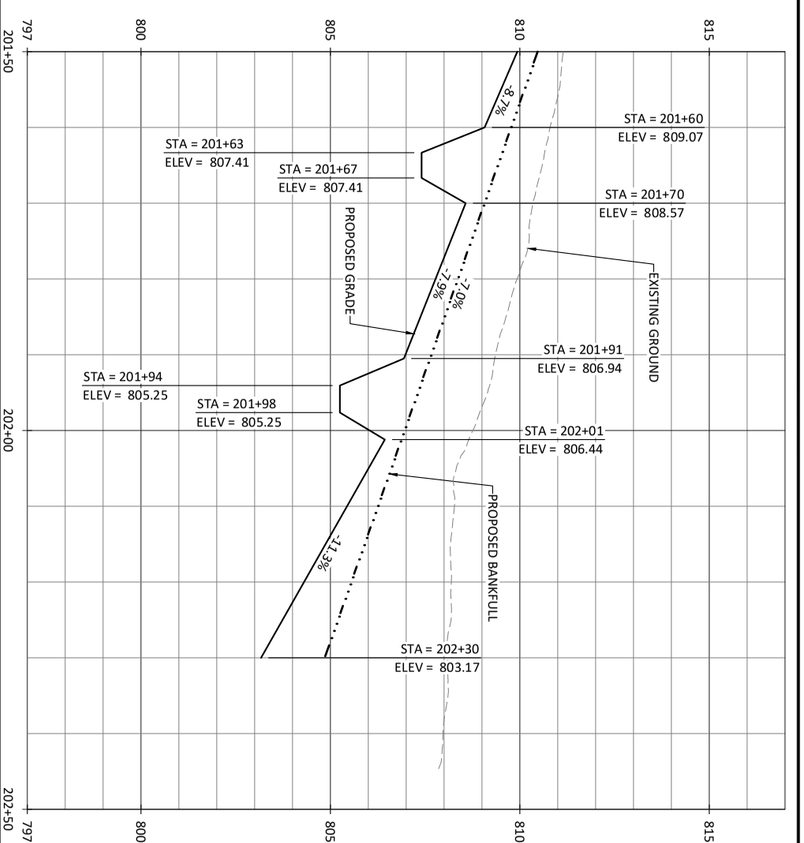

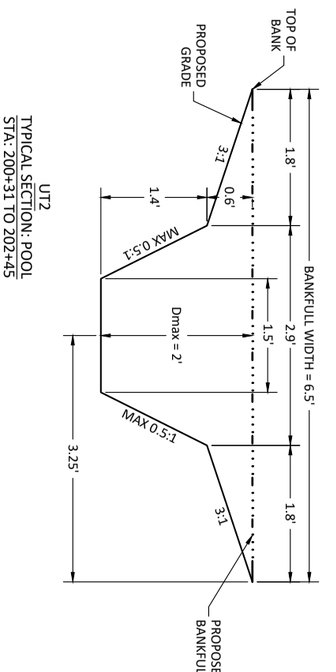

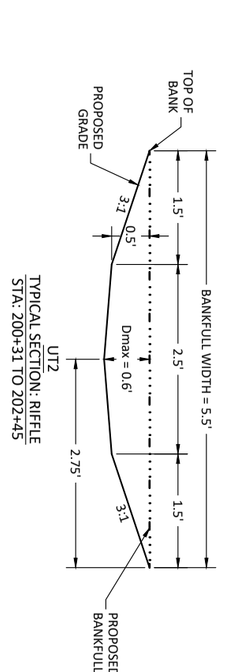

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

1.3.2
Sheet

Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT2
Stream Plan and Profile

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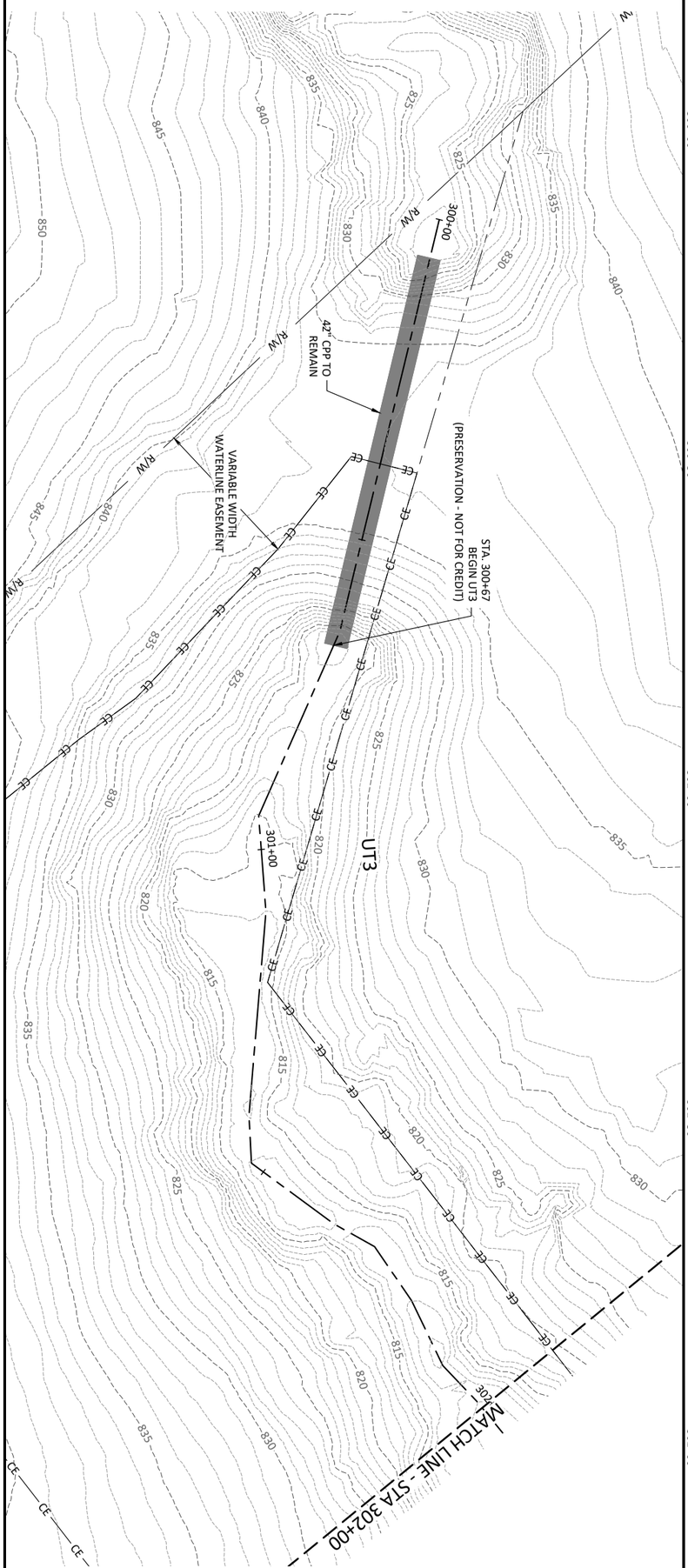

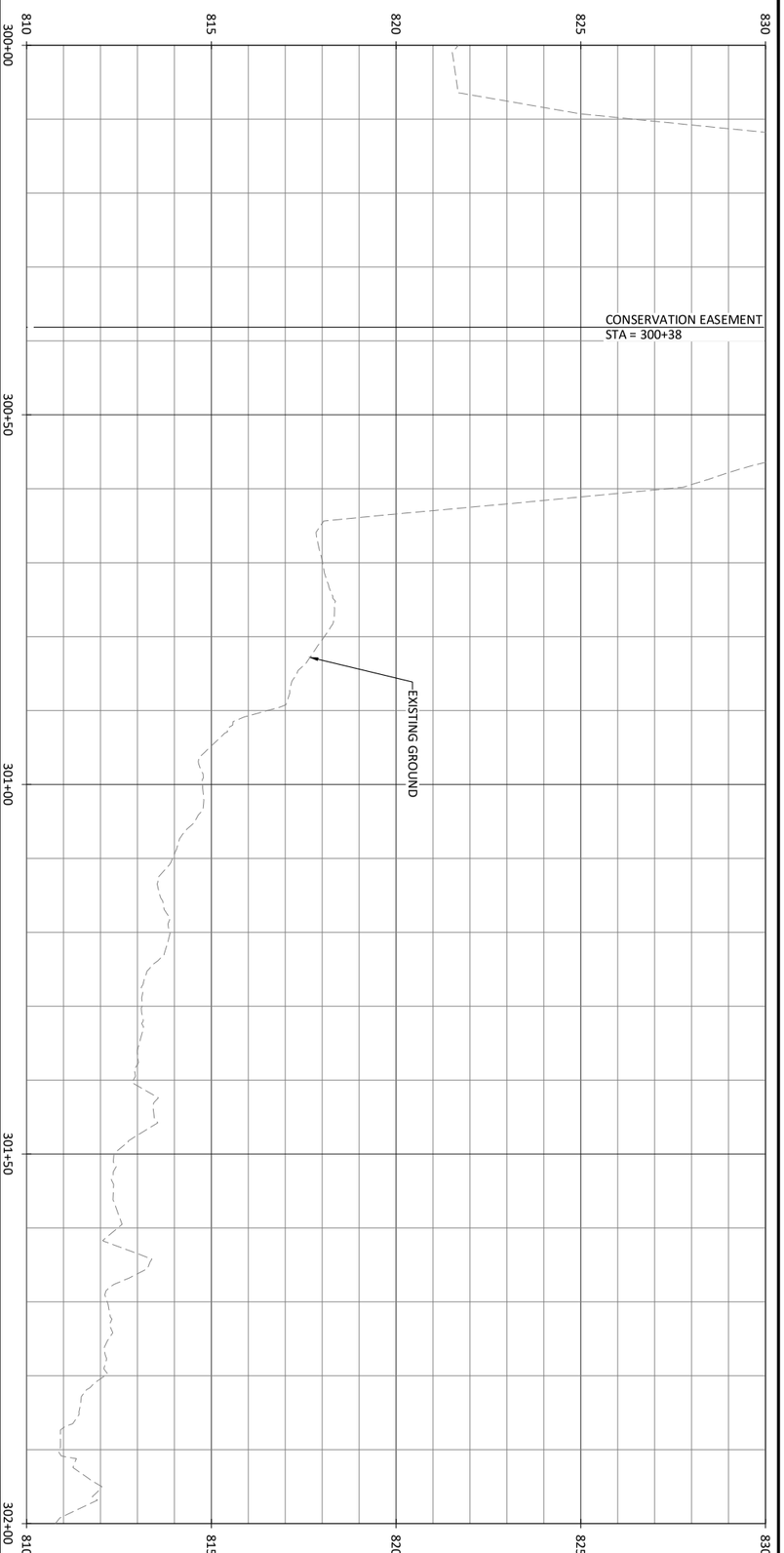

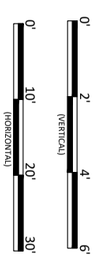

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

1.4.1
Sheet

Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT3
Stream Plan and Profile

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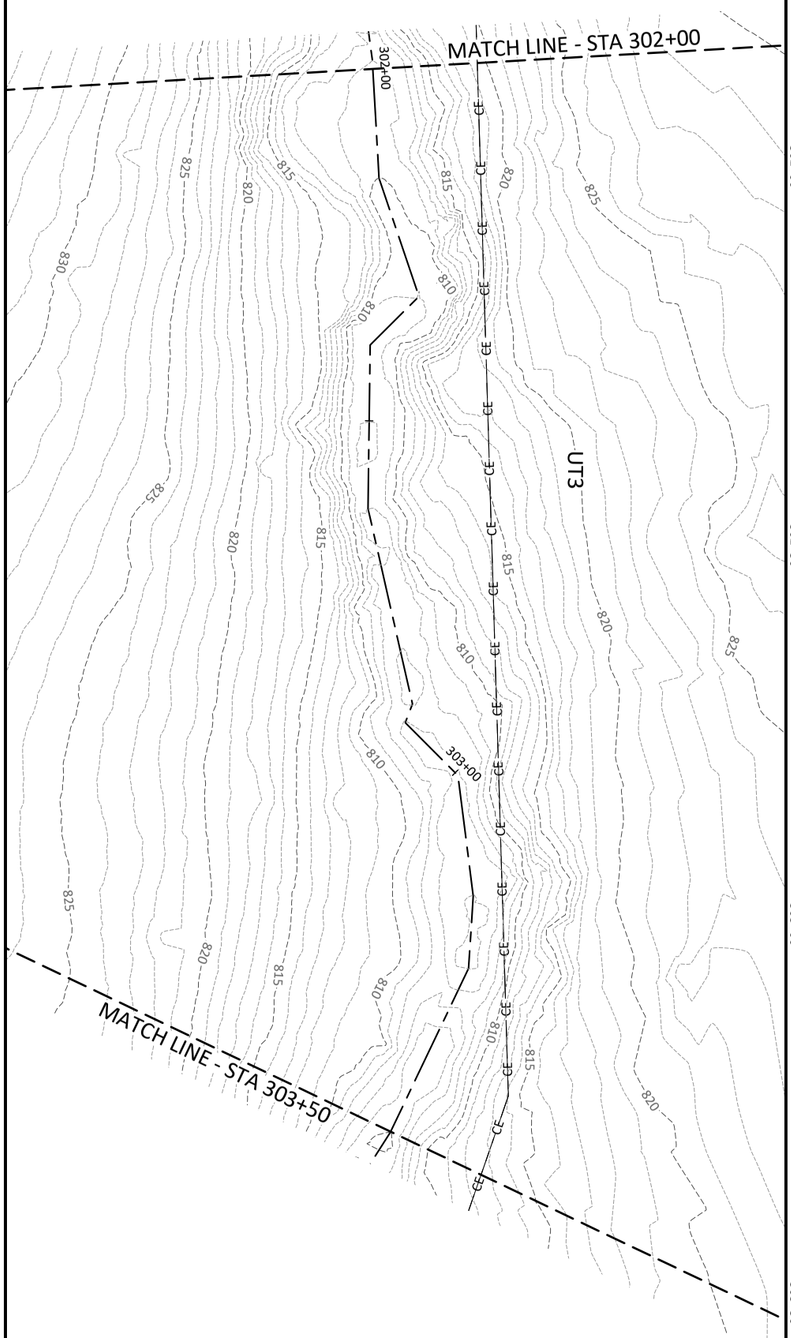

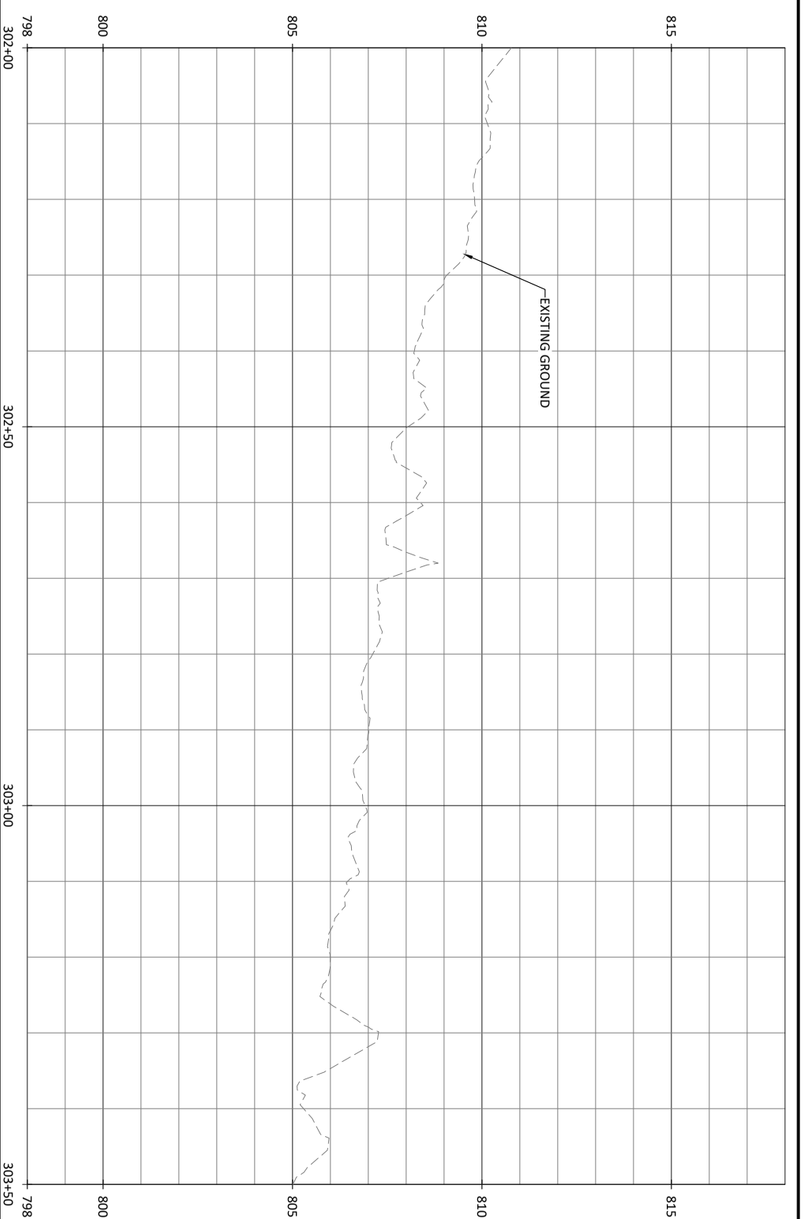

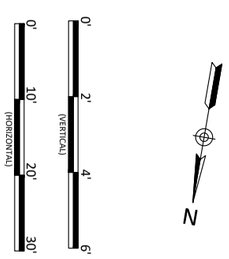

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

1.4.2
Sheet

Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT3
Stream Plan and Profile

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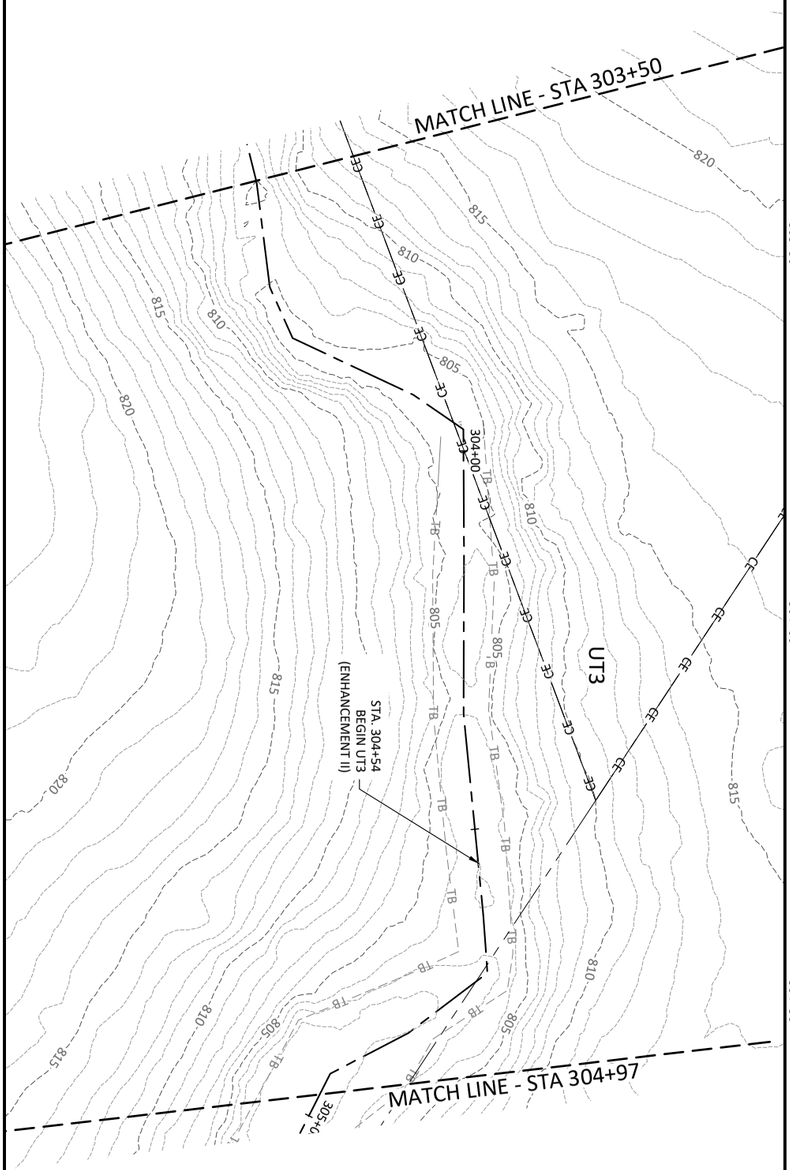

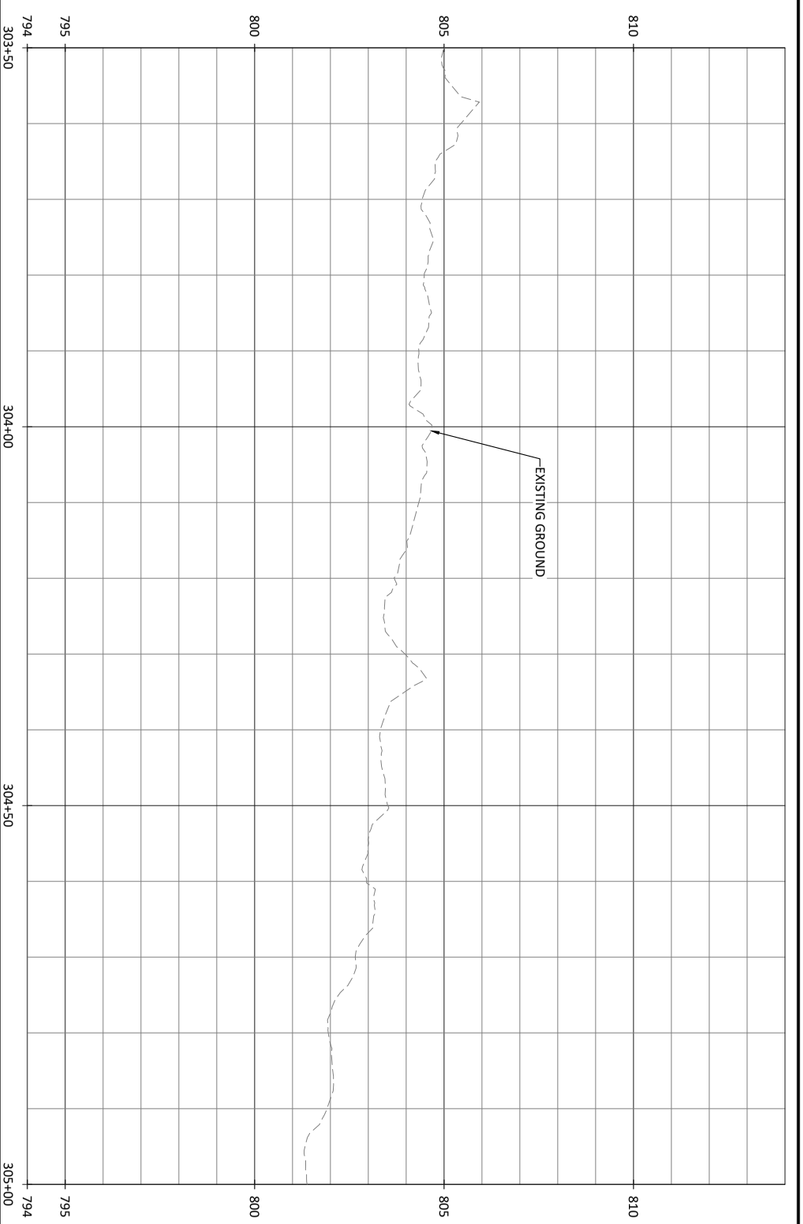

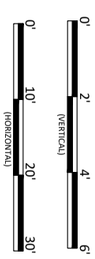

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

1.4.3
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT3
Stream Plan and Profile

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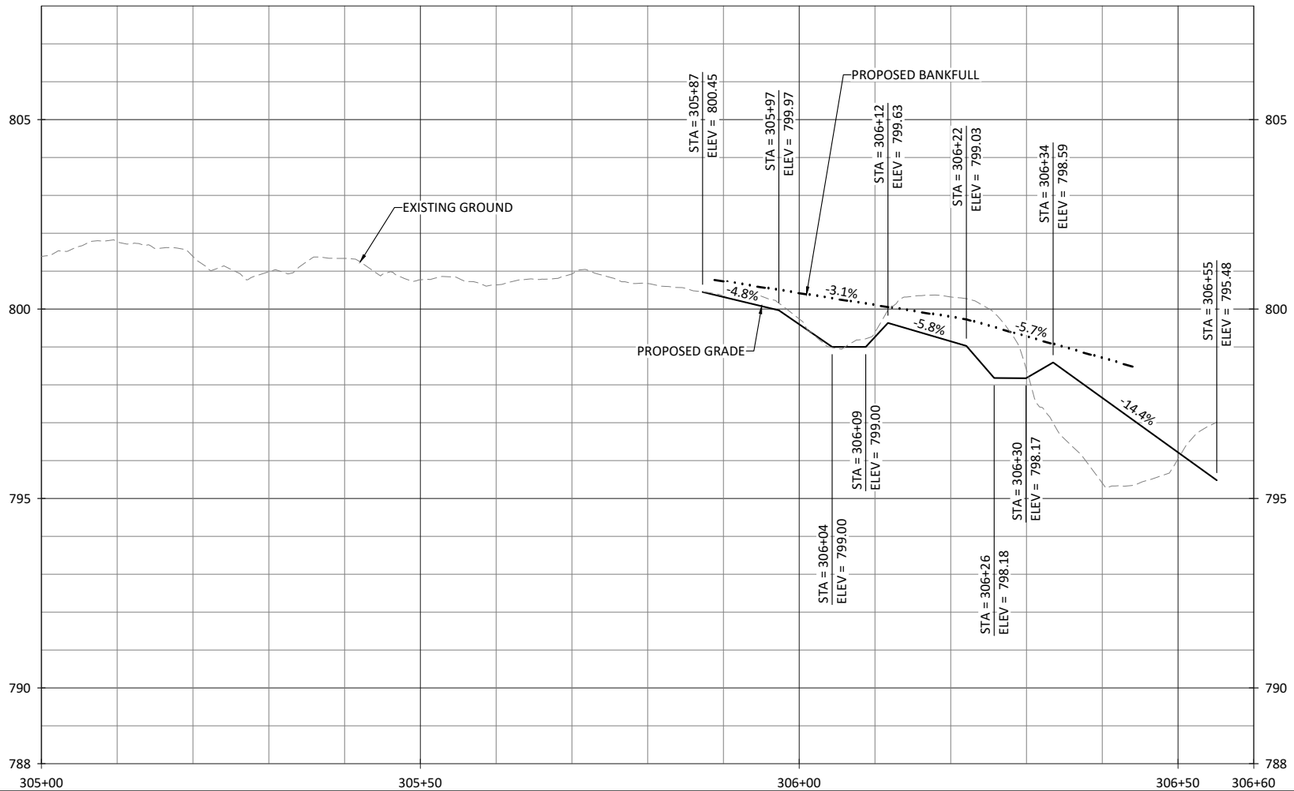
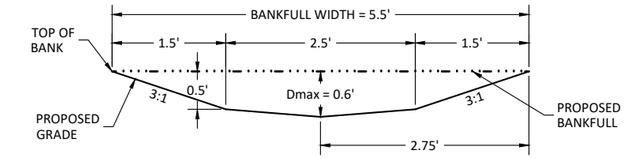
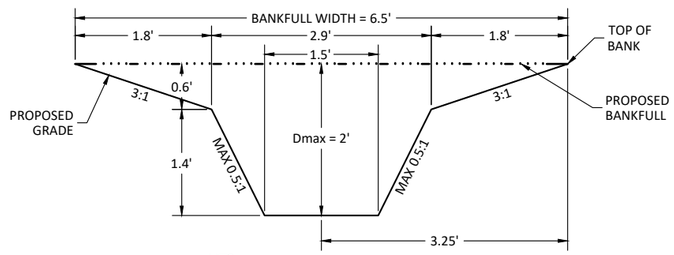
July 11, 2023

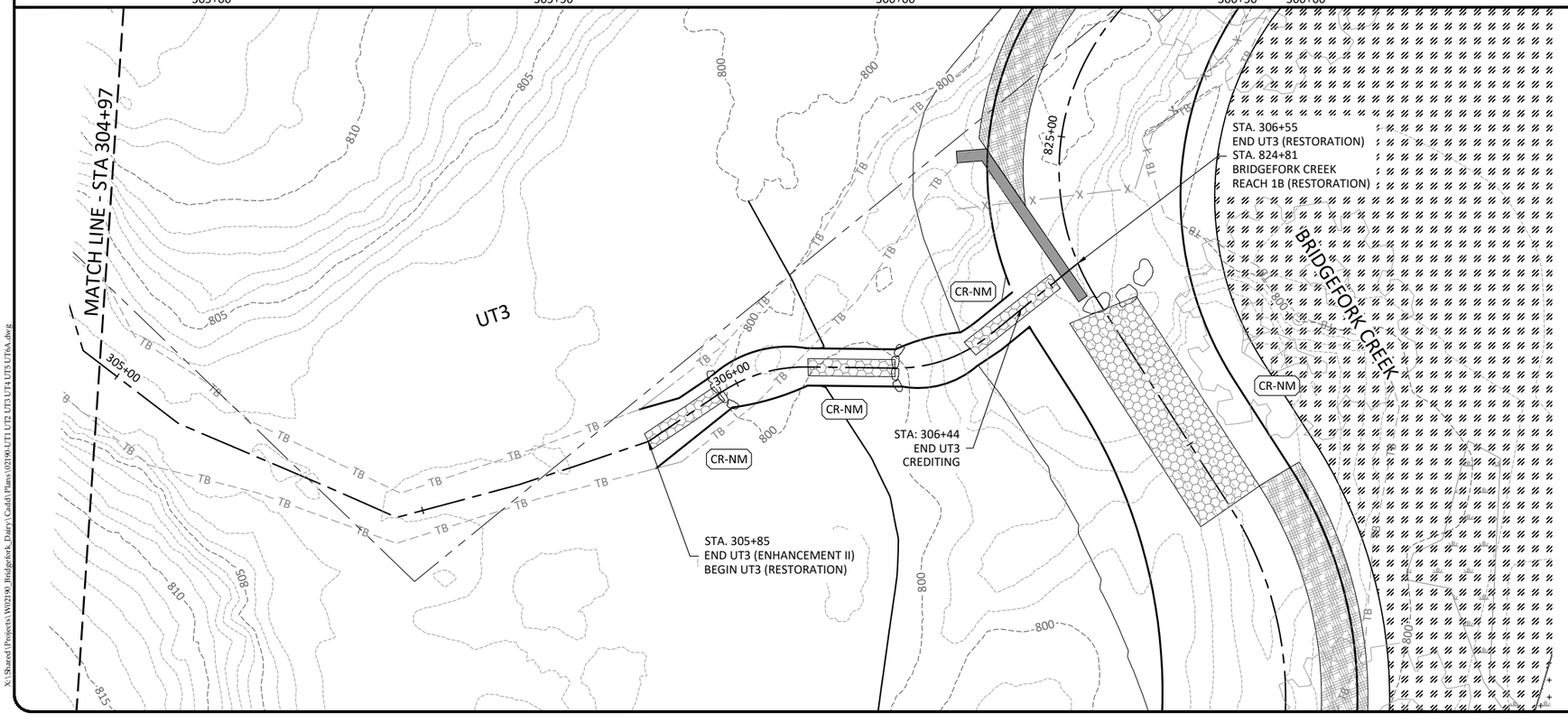


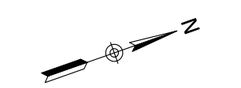


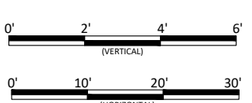
UT3
TYPICAL SECTION: RIFFLE
STA: 305+87 TO 306+55



UT3
TYPICAL SECTION: POOL
STA: 305+87 TO 306+55







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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT3
Stream Plan and Profile

Revisions:

Date:	07.11.22
Job Number:	005-02150
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 1.4.4

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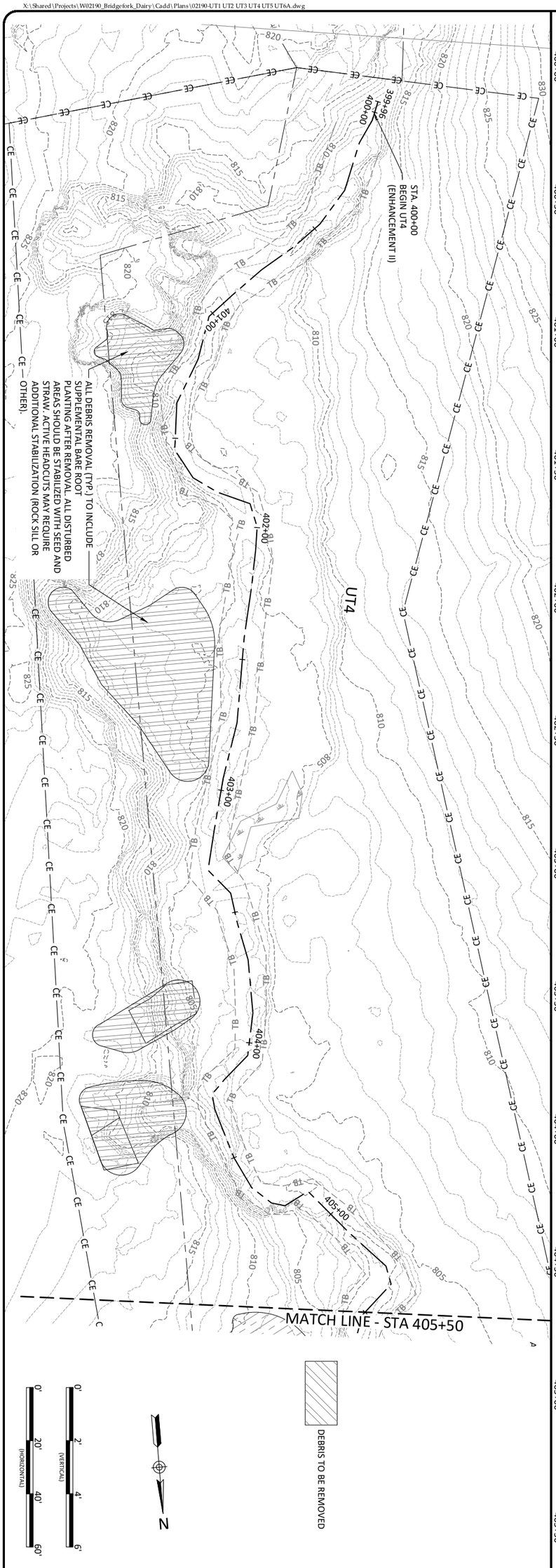

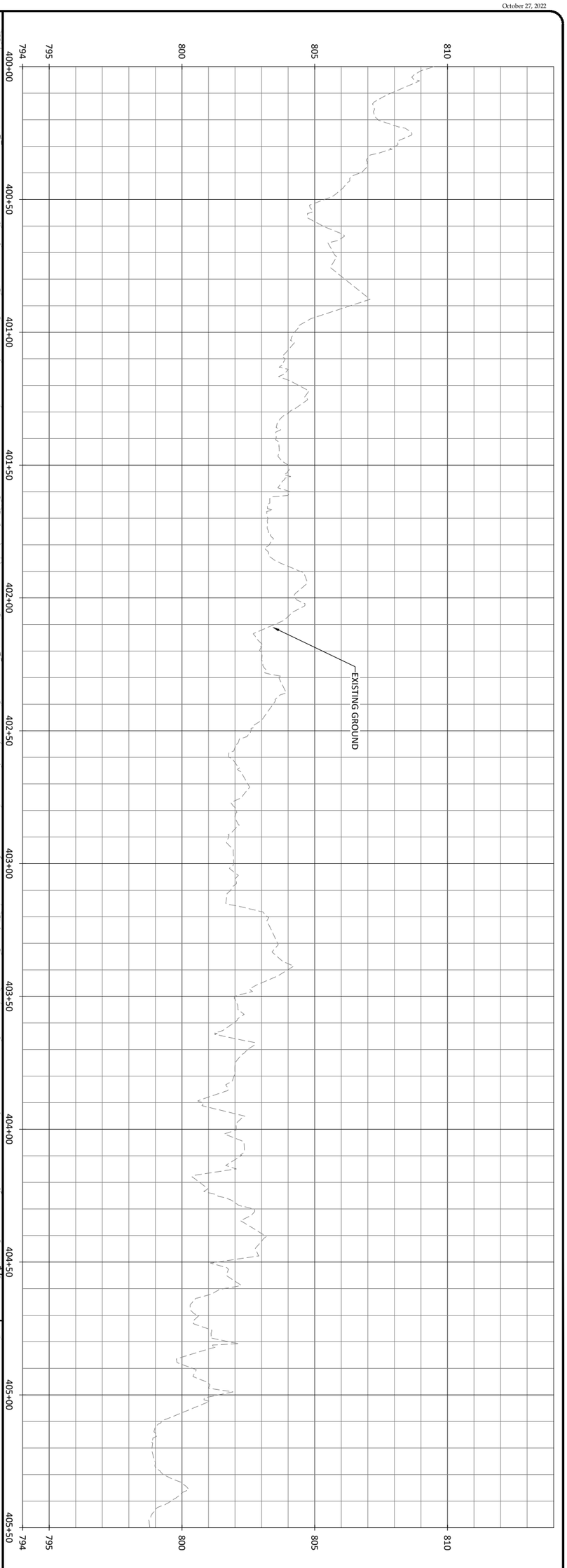

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

1.5.1
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT4
Stream Plan and Profile

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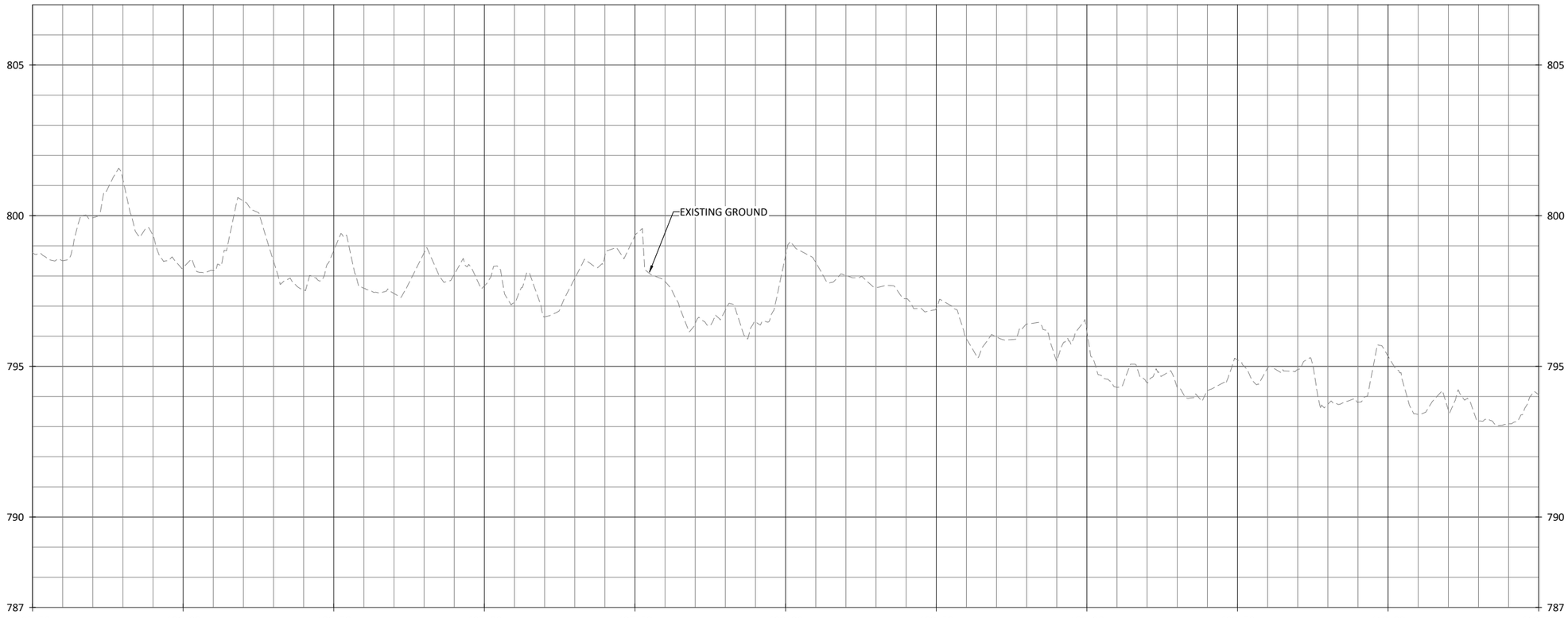
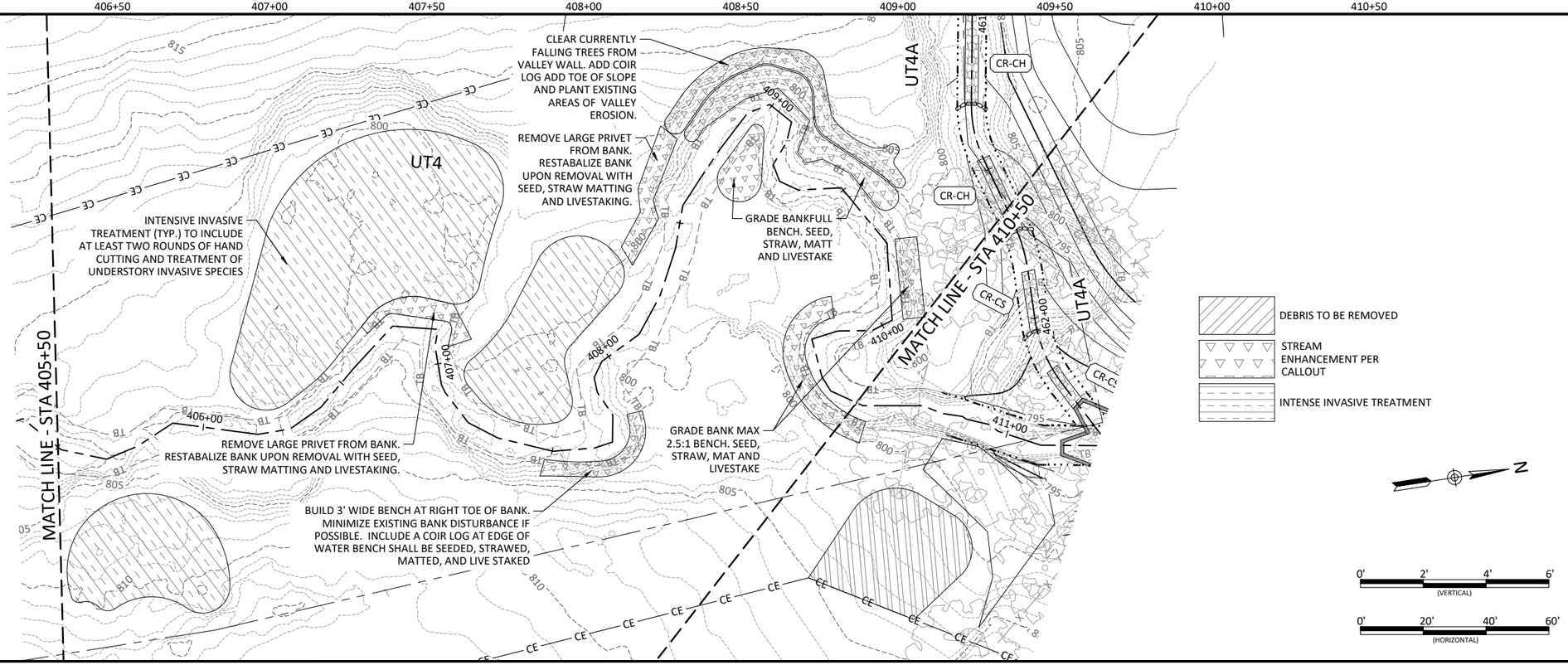
October 27, 2023





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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

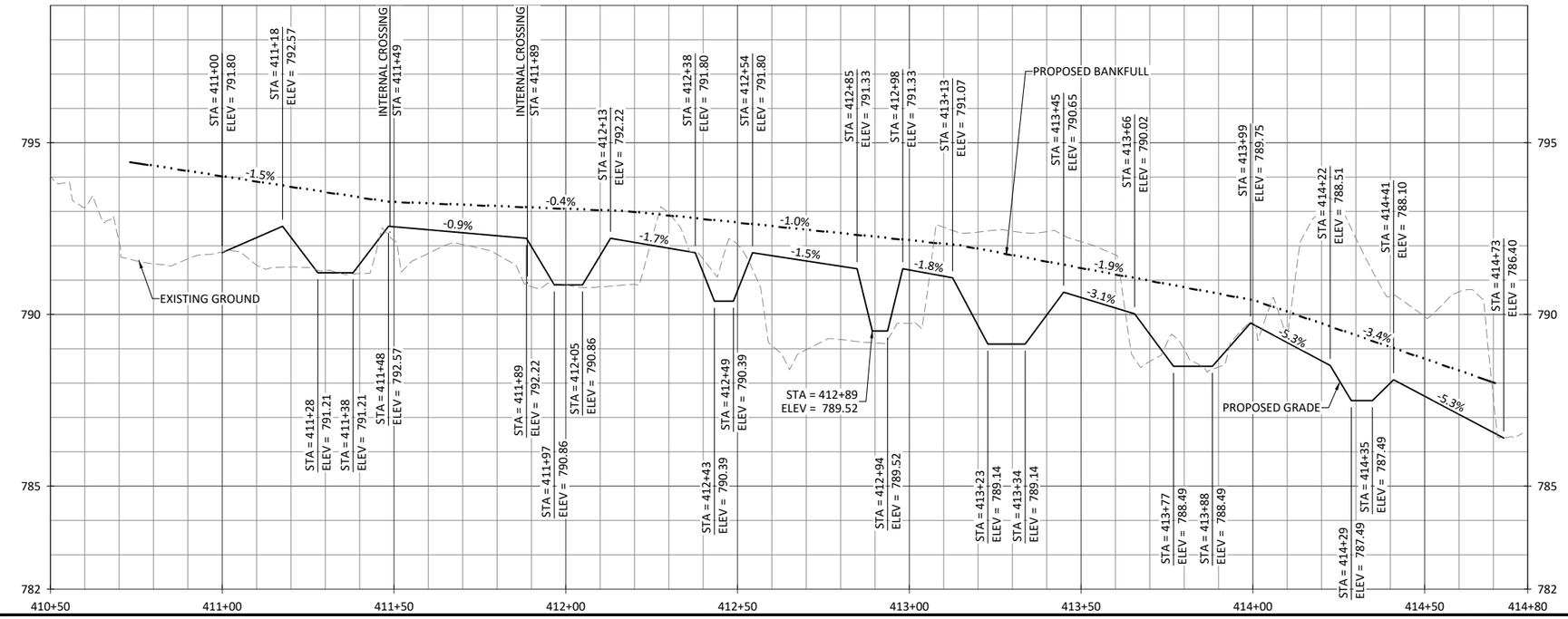
UT4
Stream Plan and Profile

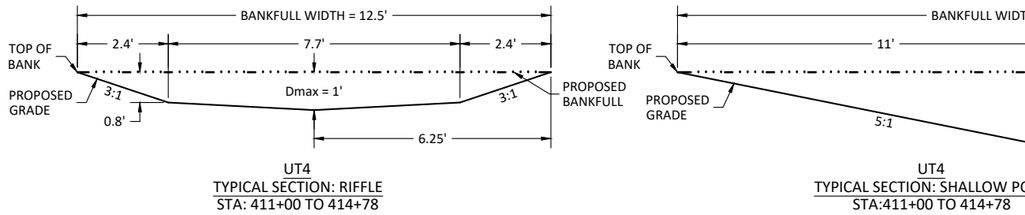
Revisions:

Date: 10.27.2022
Job Number: 005-02150
Project Engineer: EFN
Drawn By: CAW
Checked By: CDB

Sheet 1.5.2

October 27, 2022





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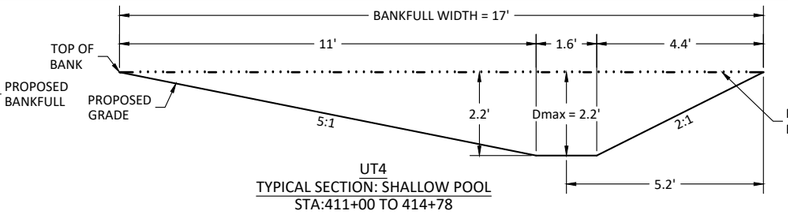
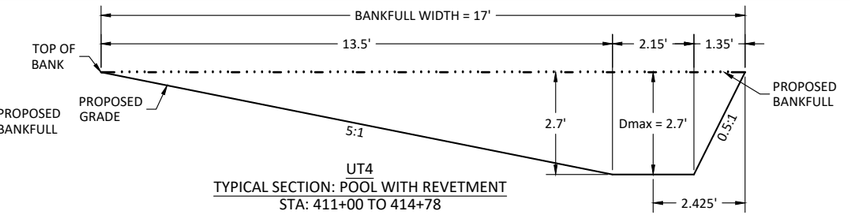
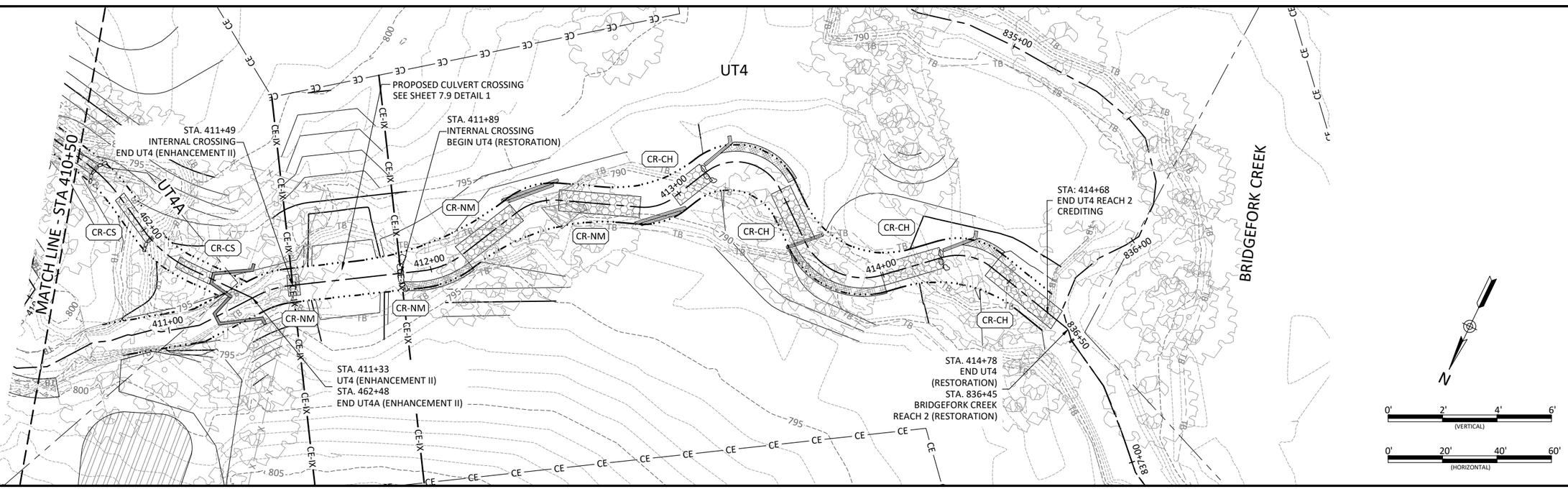
TYPICAL SECTION: RIFFLE
STA: 411+00 TO 414+78



UT4
TYPICAL SECTION: SHALLOW POOL
STA:411+00 TO 414+78



UT4
TYPICAL SECTION: POOL WITH REVETMENT
STA: 411+00 TO 414+78



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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

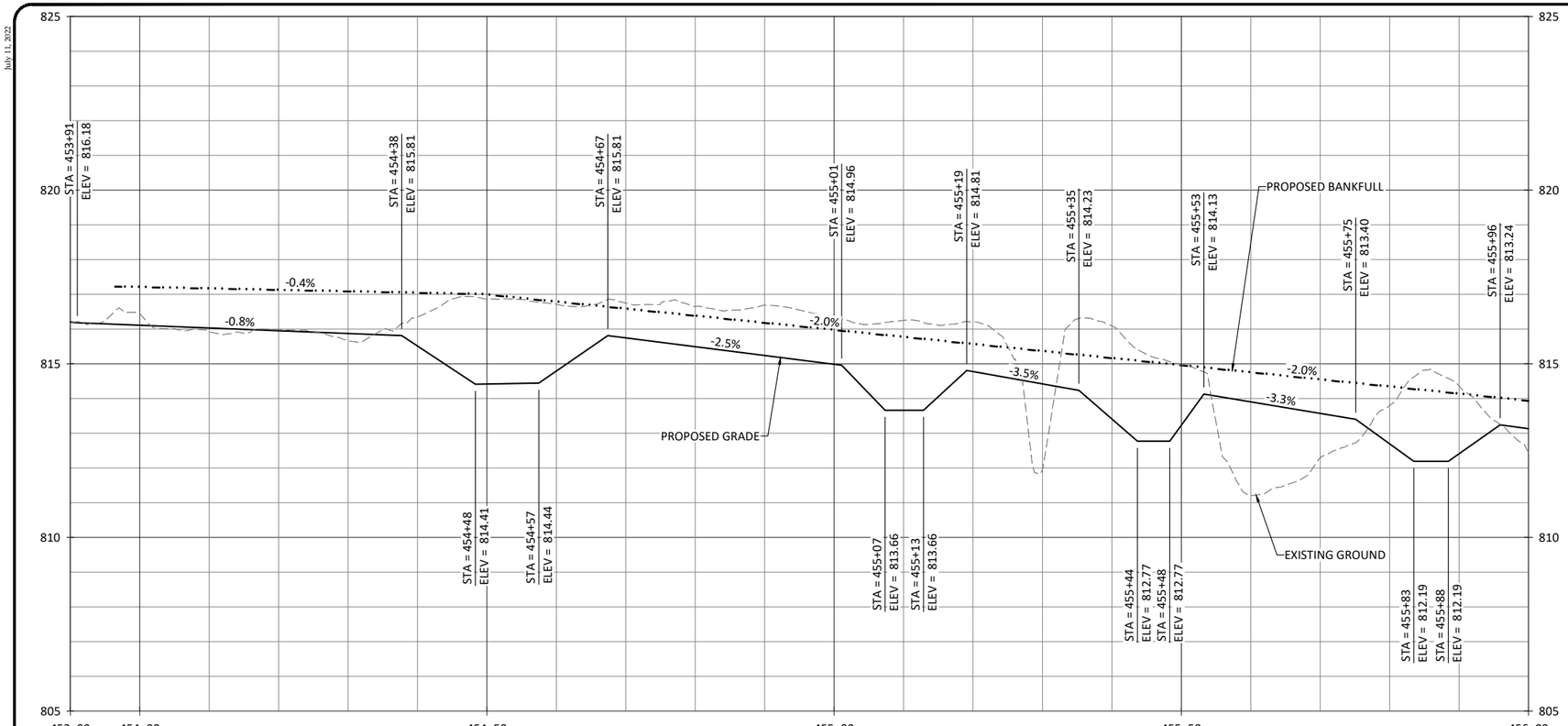
UT4
Stream Plan and Profile

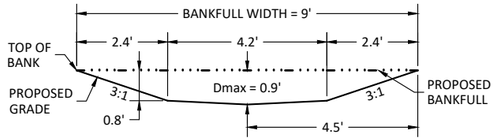
Revisions:

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

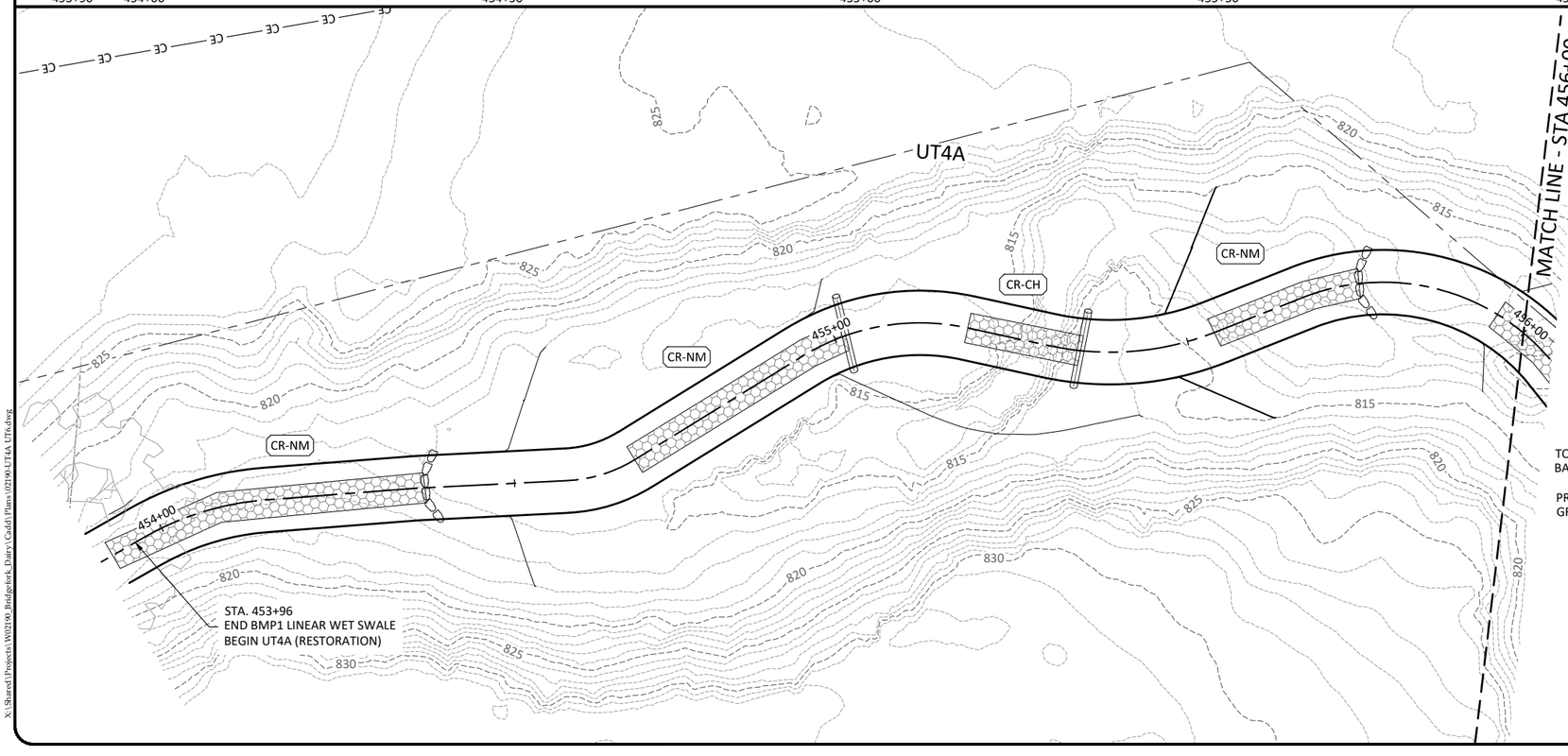
Sheet 1.5.3

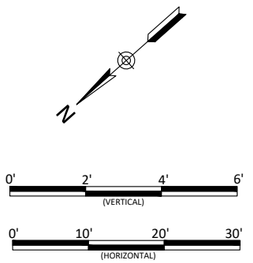
July 11, 2023

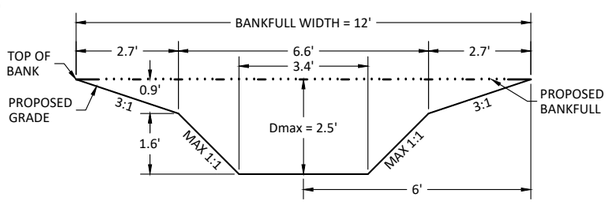




UT4A
TYPICAL SECTION: RIFFLE
STA: 453+96 TO 462+48







UT4A
TYPICAL SECTION: POOL
STA: 453+96 TO 462+48

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT4A
Stream Plan and Profile

Revisions:

Date: 07.11.22
Job Number: 005-02150
Project Engineer: EFN
Drawn By: CAW
Checked By: CDB

Sheet 1.6.1

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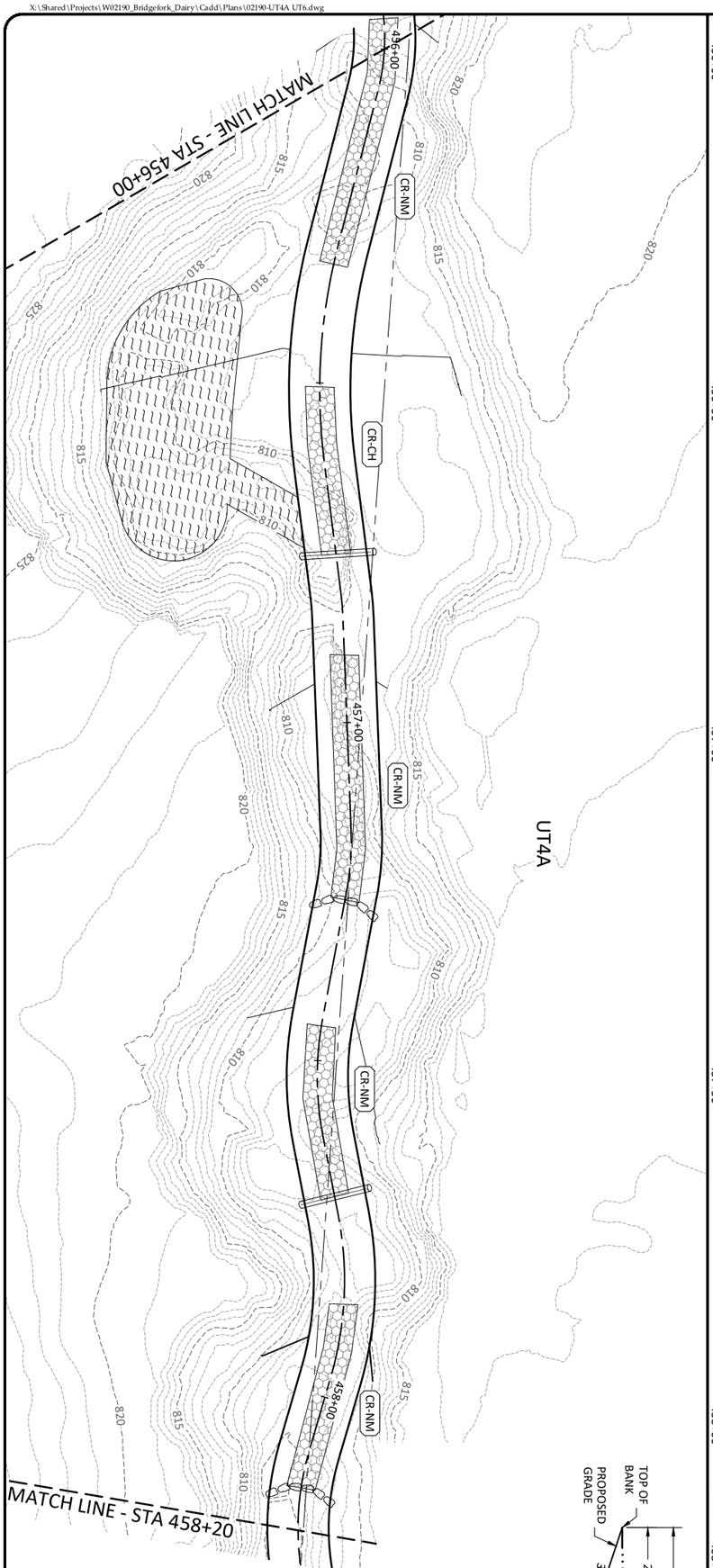
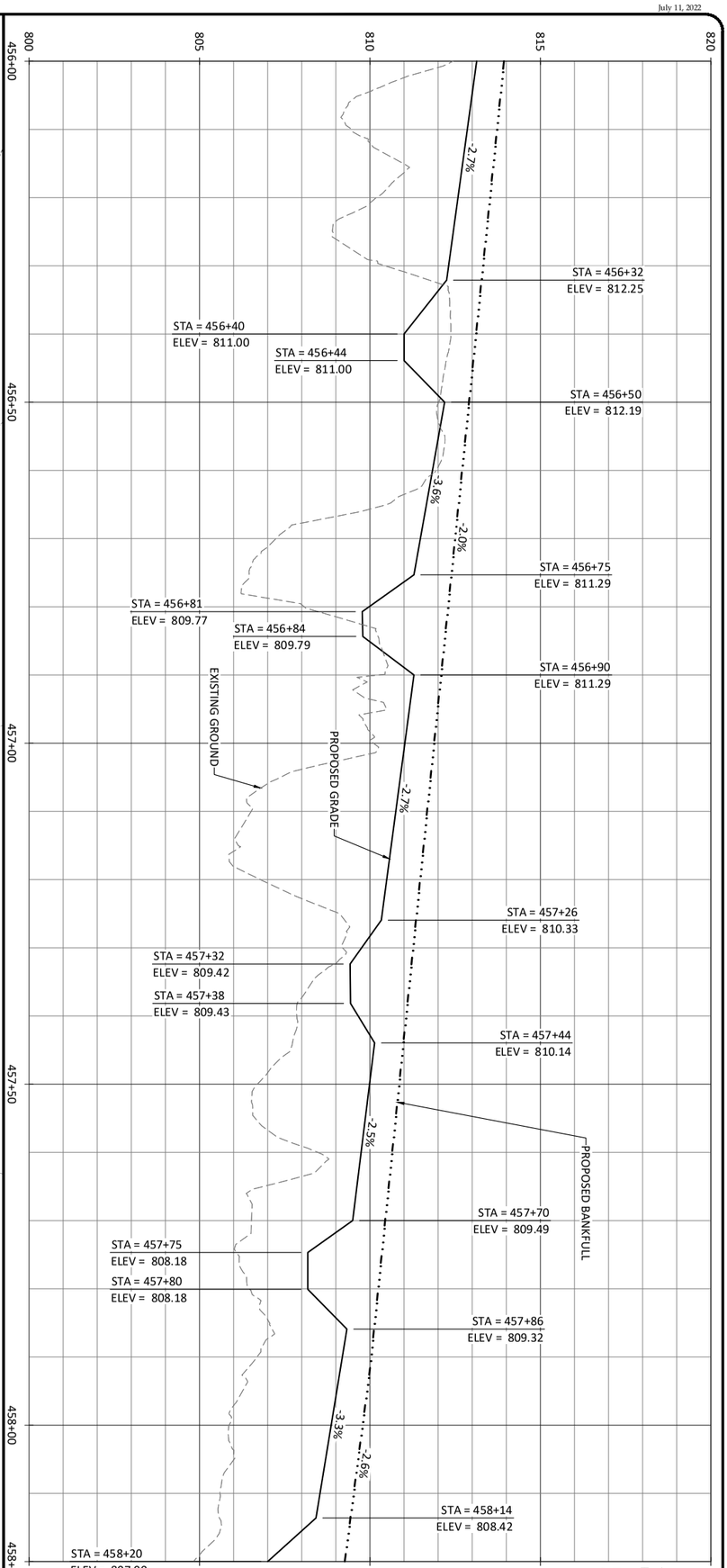
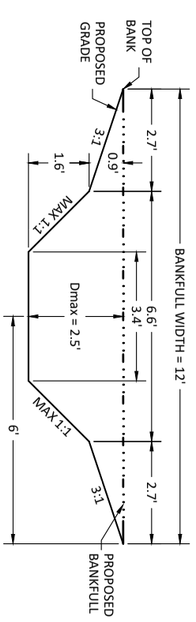
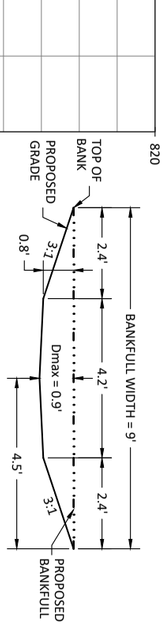


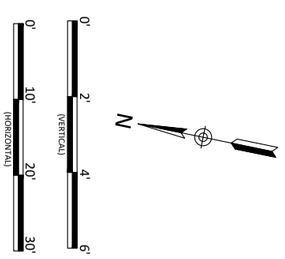




UT4A
TYPICAL SECTION: POOL
STA: 453+96 TO 462+48



UT4A
TYPICAL SECTION: RIFFLE
STA: 453+96 TO 462+48



Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT4A
Stream Plan and Profile

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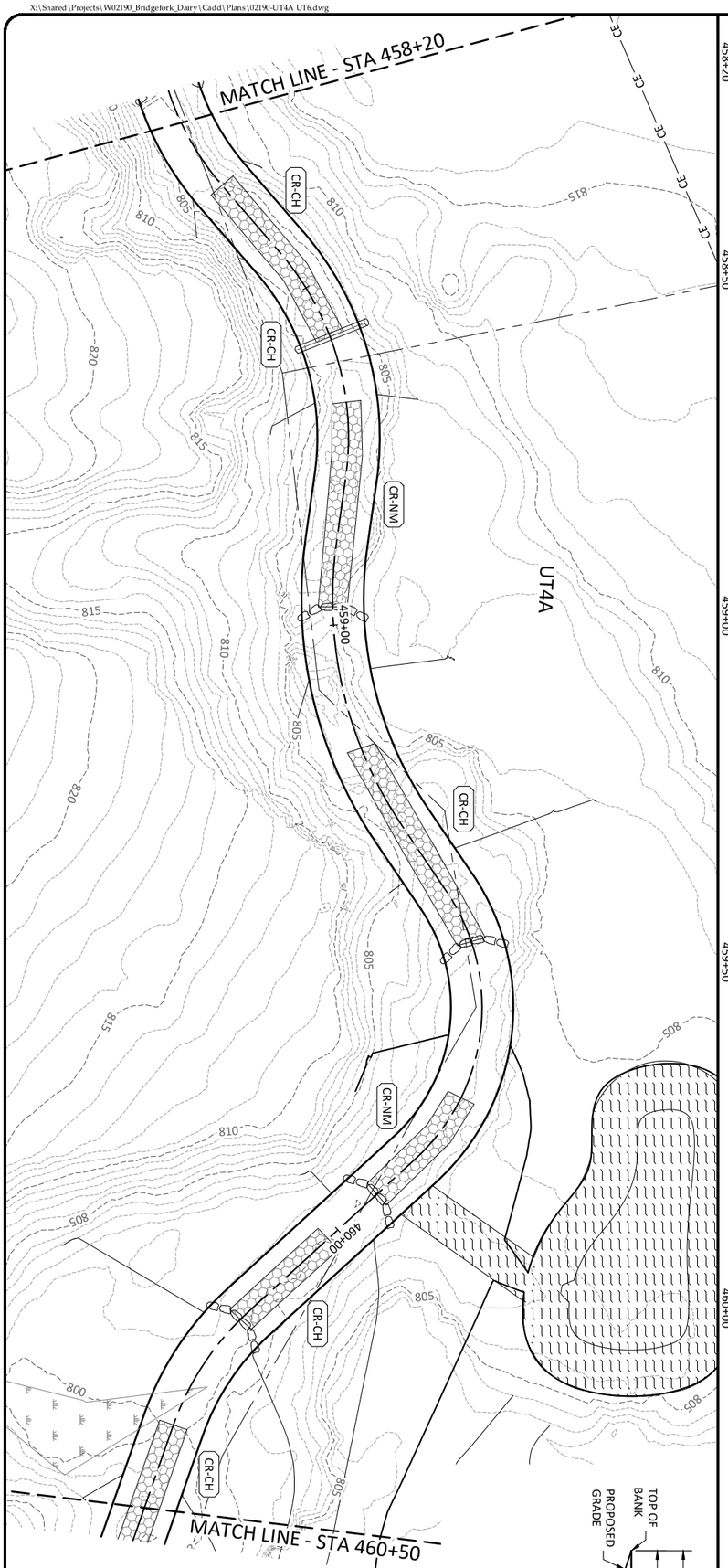

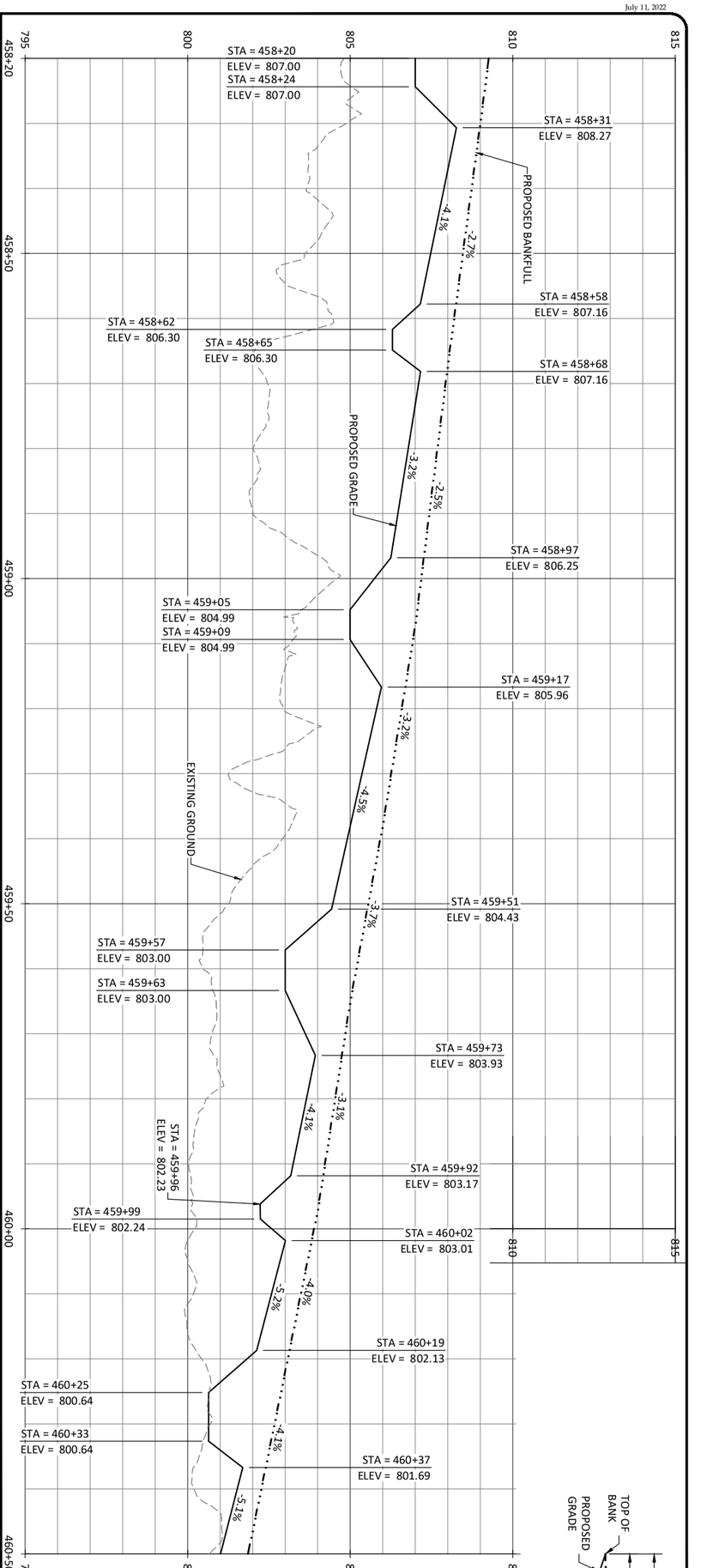

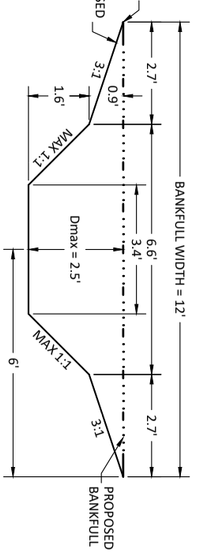

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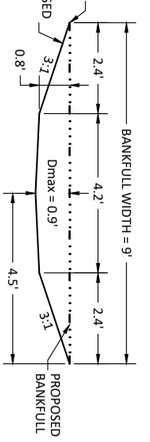
TYPICAL SECTION: POOL
STA: 453+96 TO 462+48



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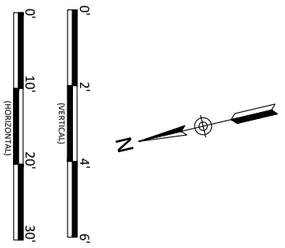
TYPICAL SECTION: RIFFLE
STA: 453+96 TO 462+48



Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

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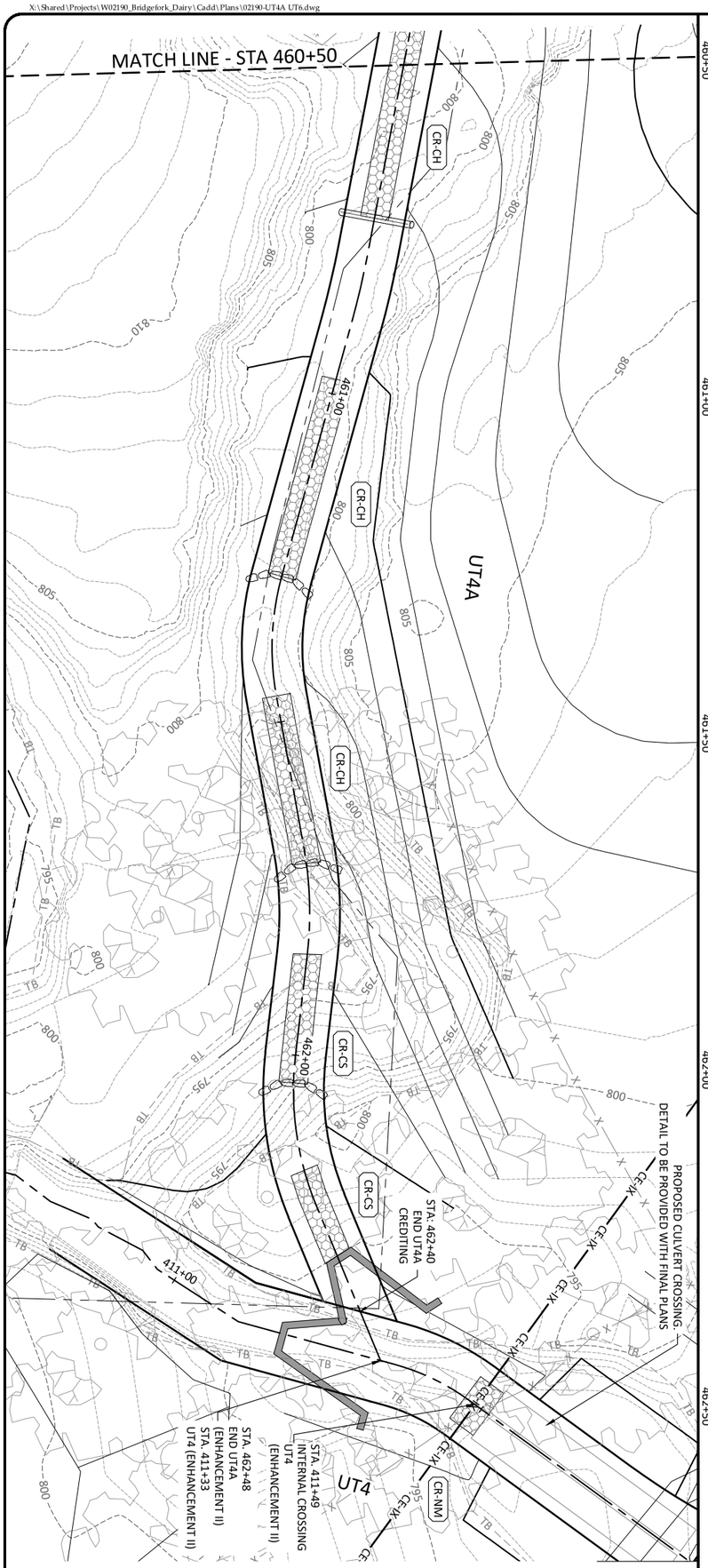

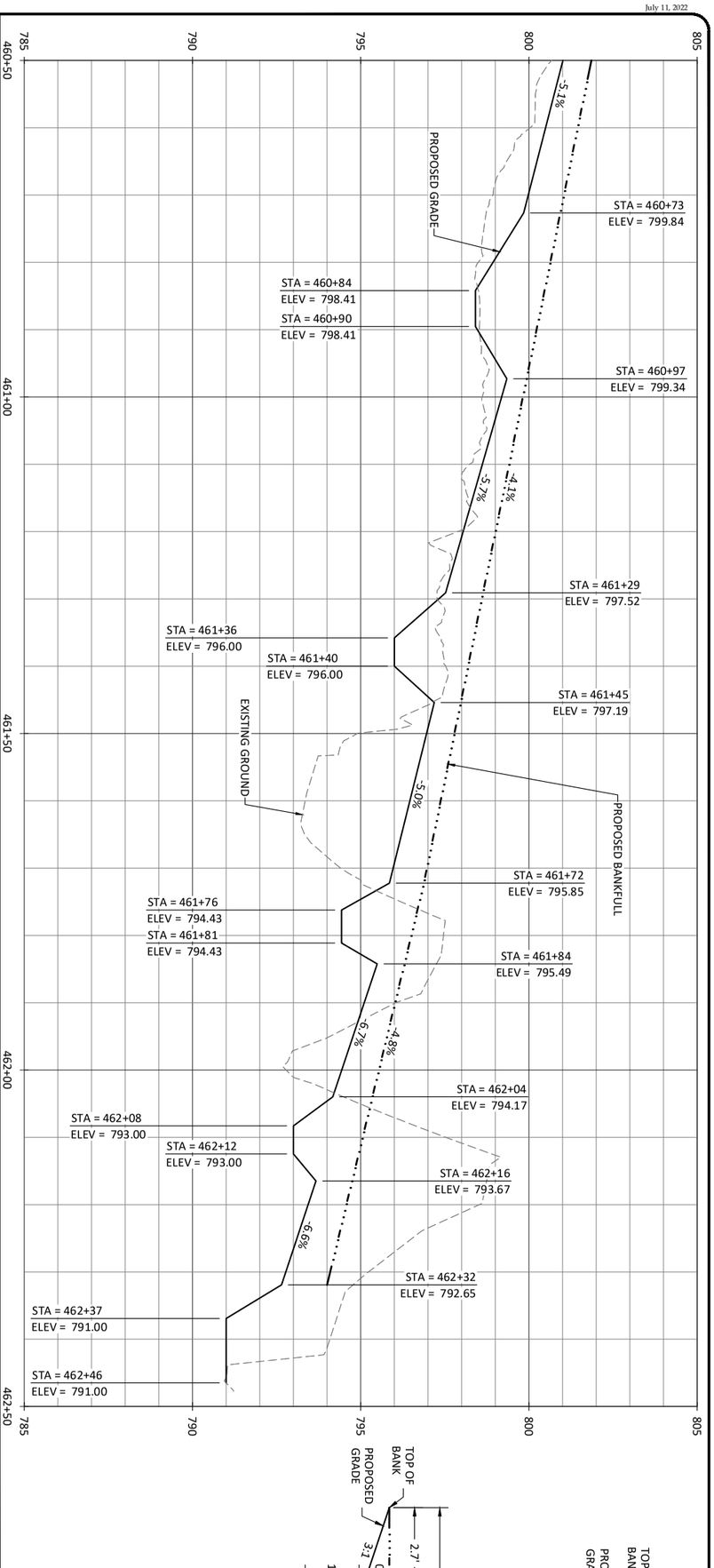

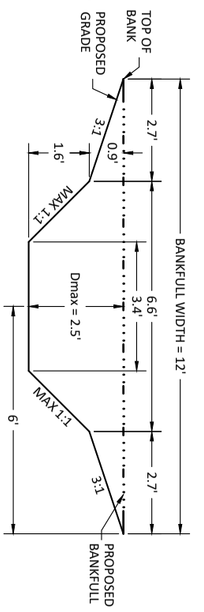

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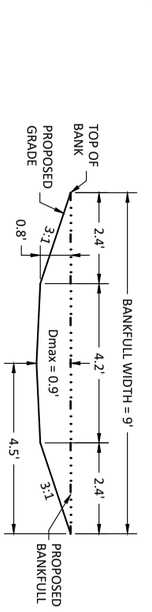
STA: 453+96 TO 462+48



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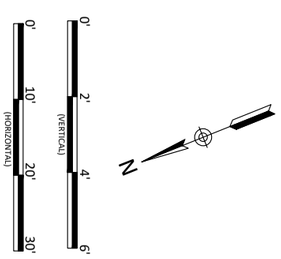
TYPICAL SECTION: RIFFLE
STA: 453+96 TO 462+48



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Bridgefork Dairy Mitigation Site
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UT4A
Stream Plan and Profile

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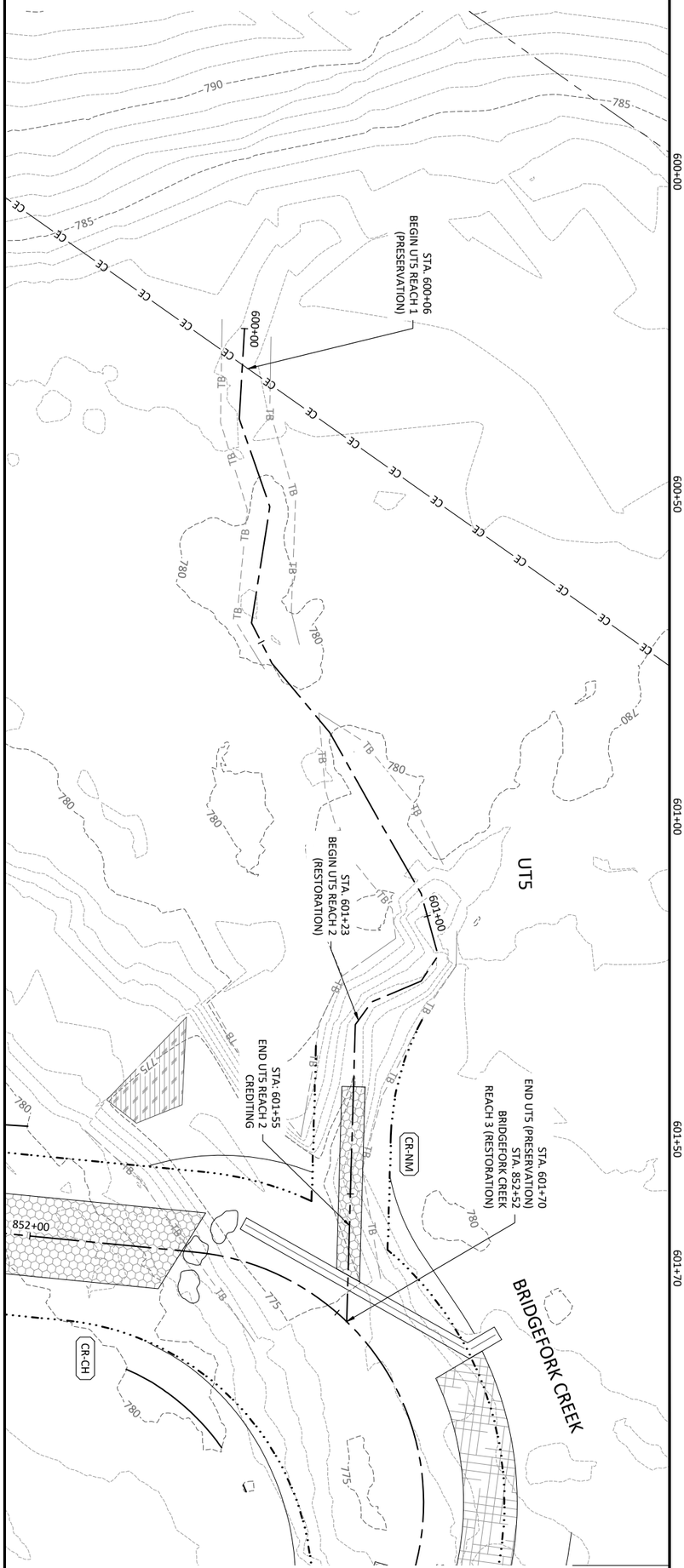

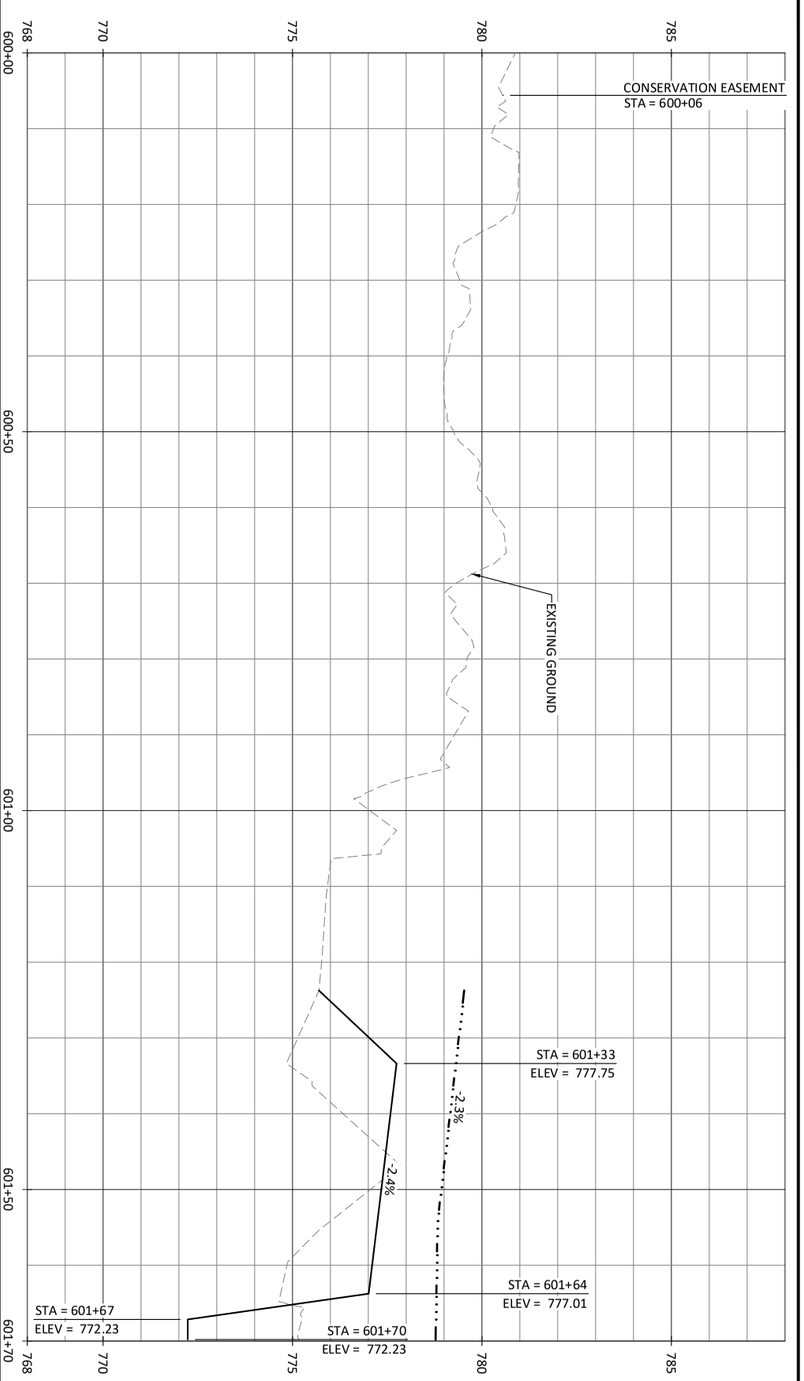

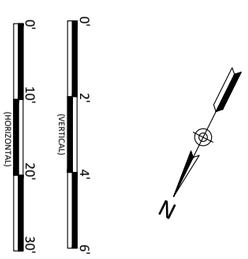

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Bridgefork Dairy Mitigation Site
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UT5
Stream Plan and Profile

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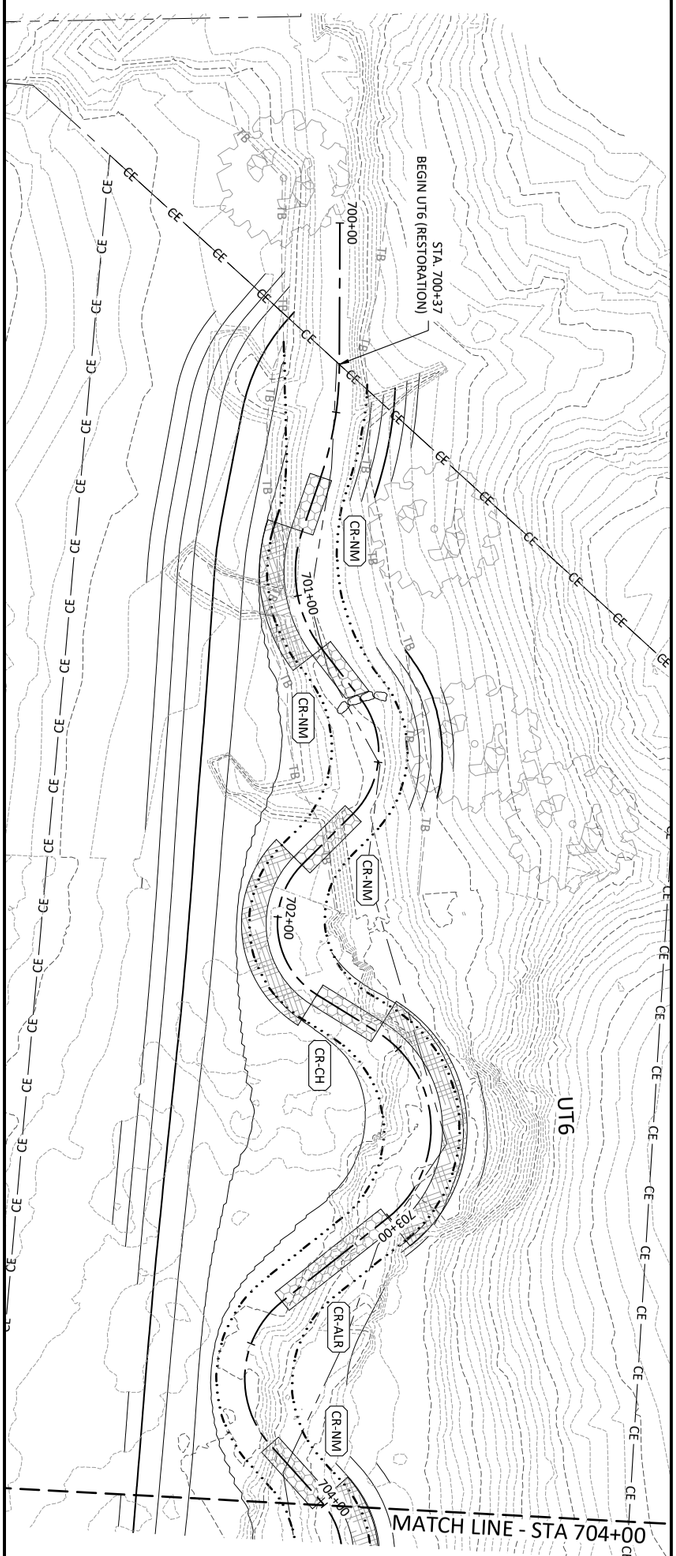

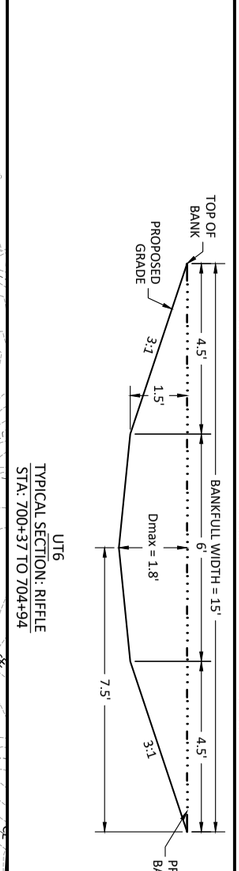

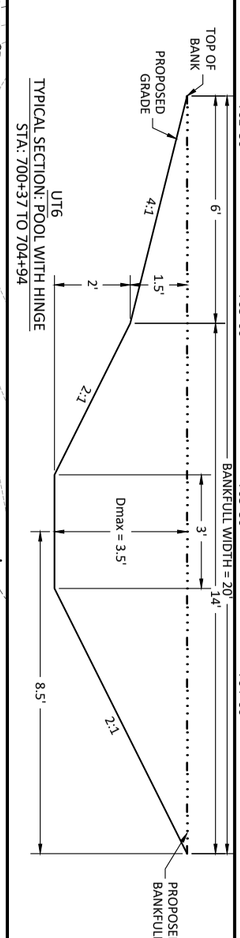

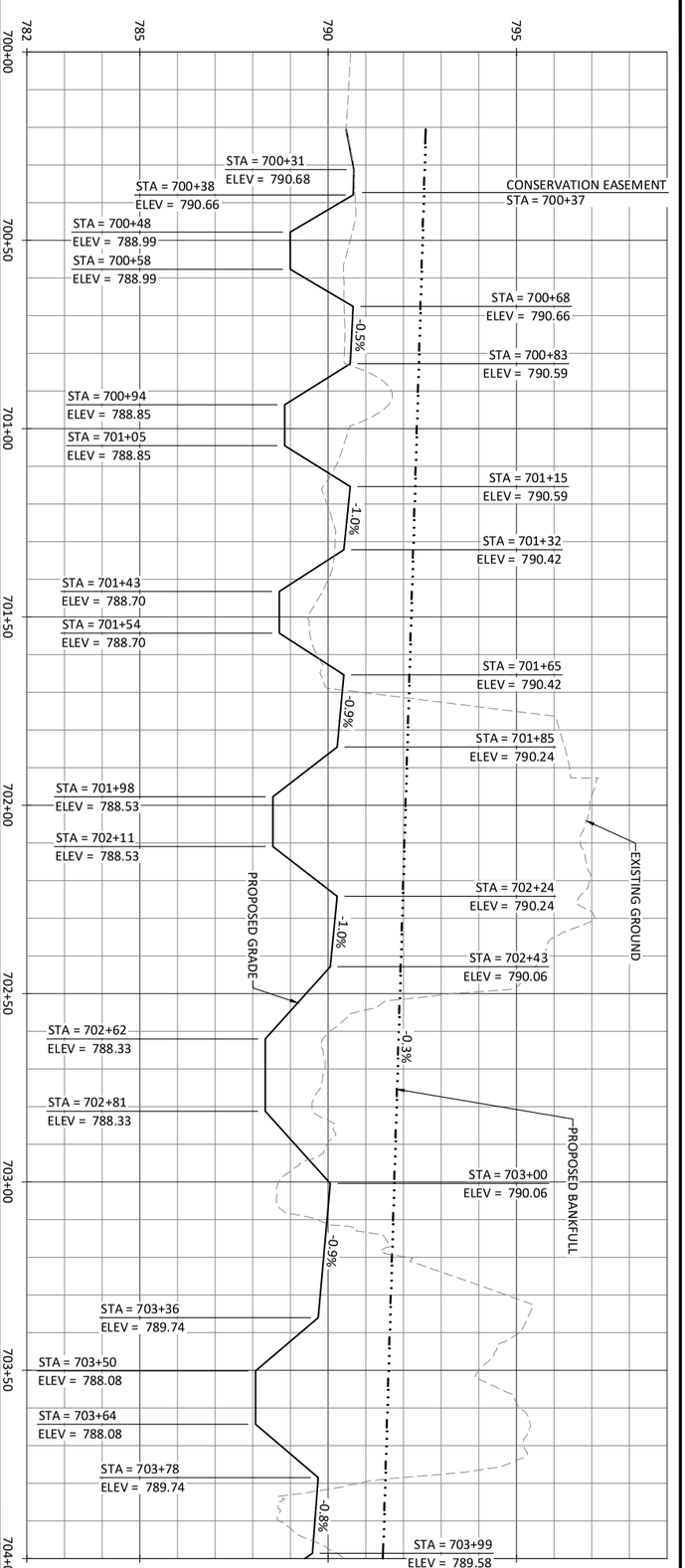

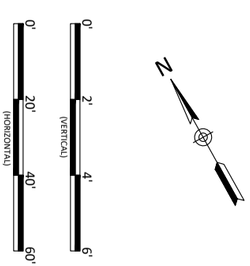

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Bridgefork Dairy Mitigation Site
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UT6
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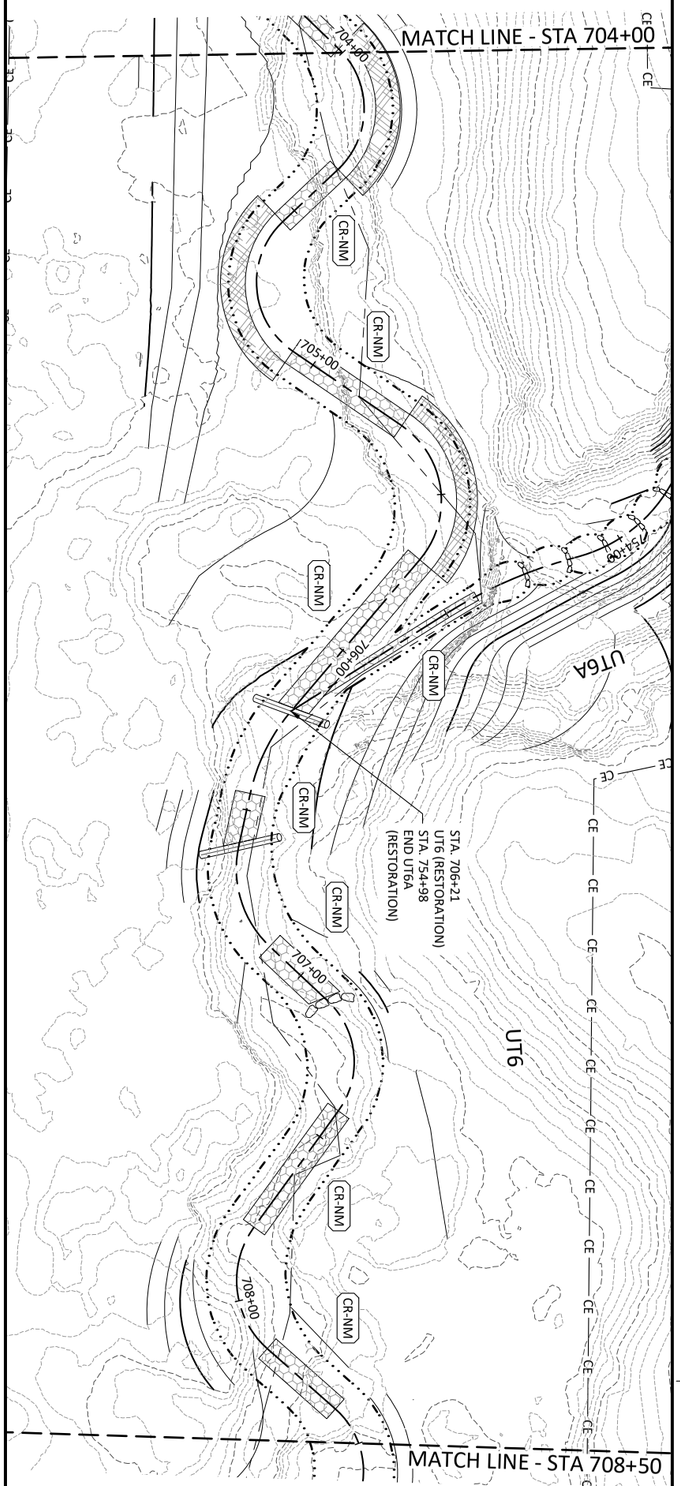

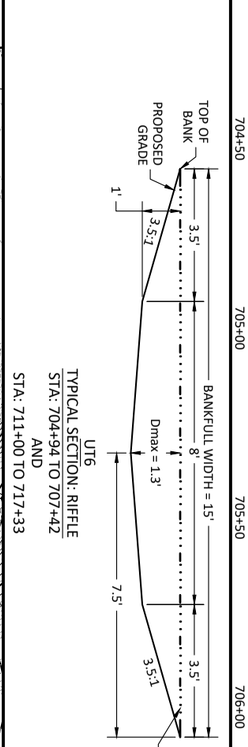

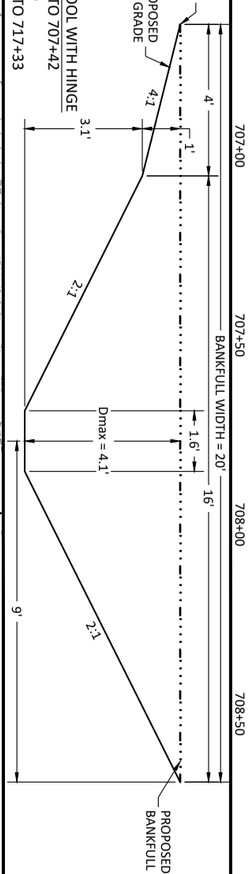

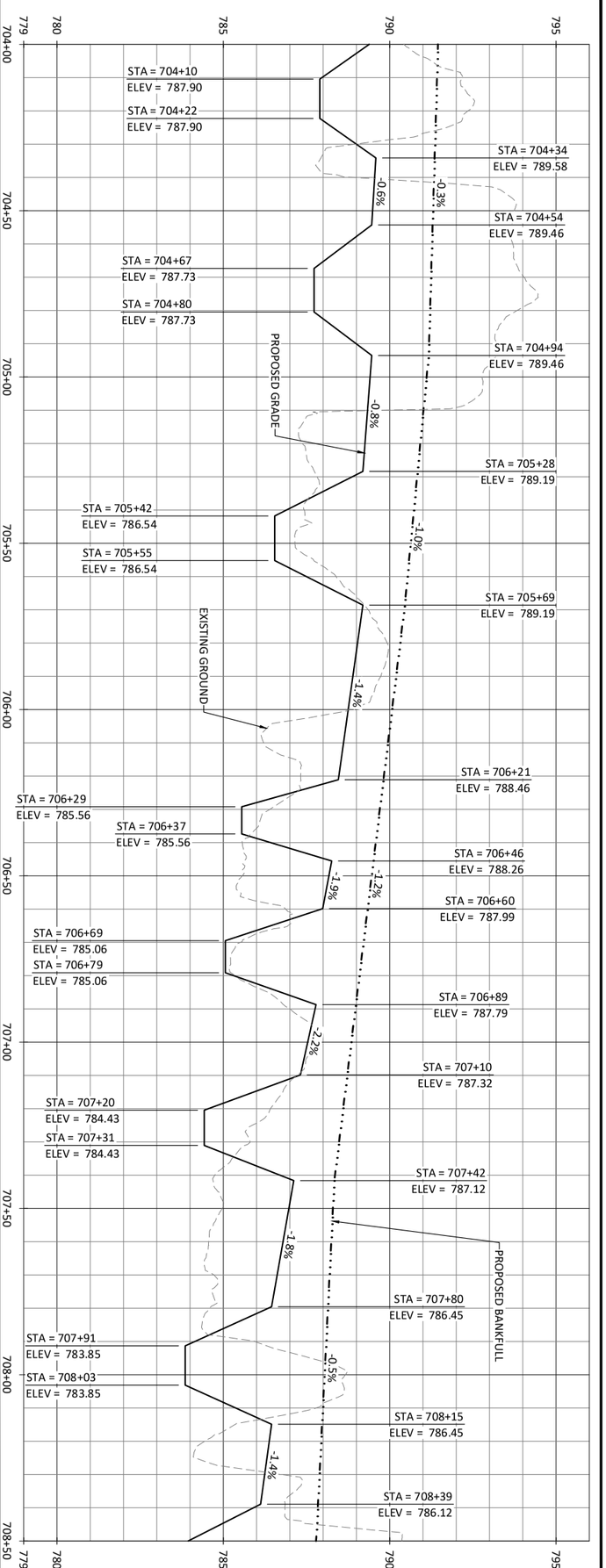

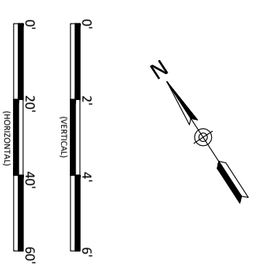

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Job Number:	005-02190
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Bridgefork Dairy Mitigation Site
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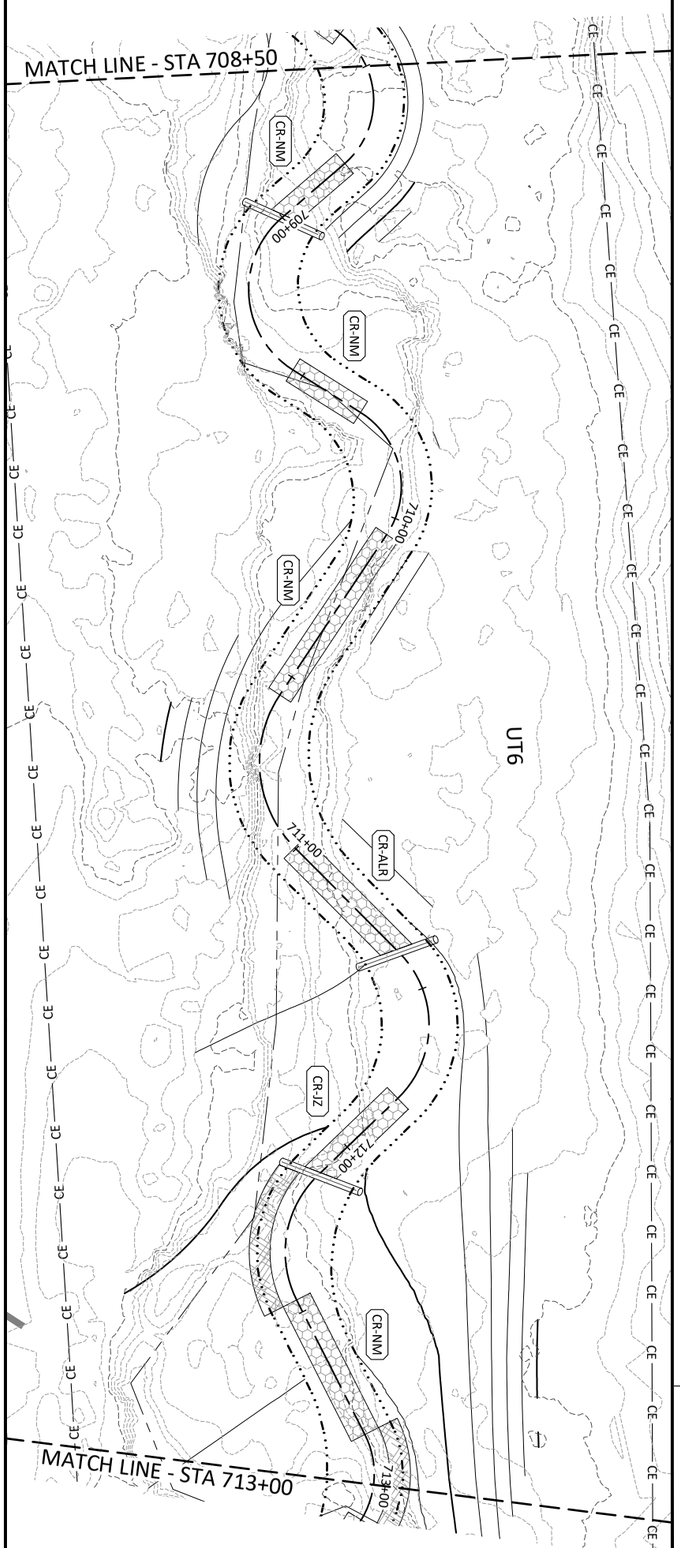

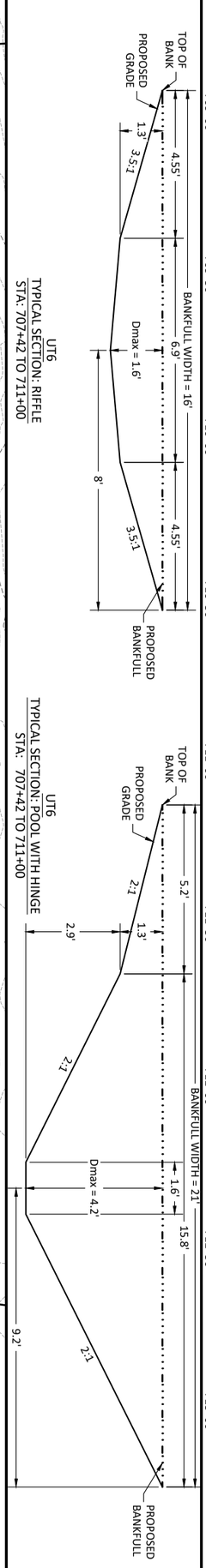

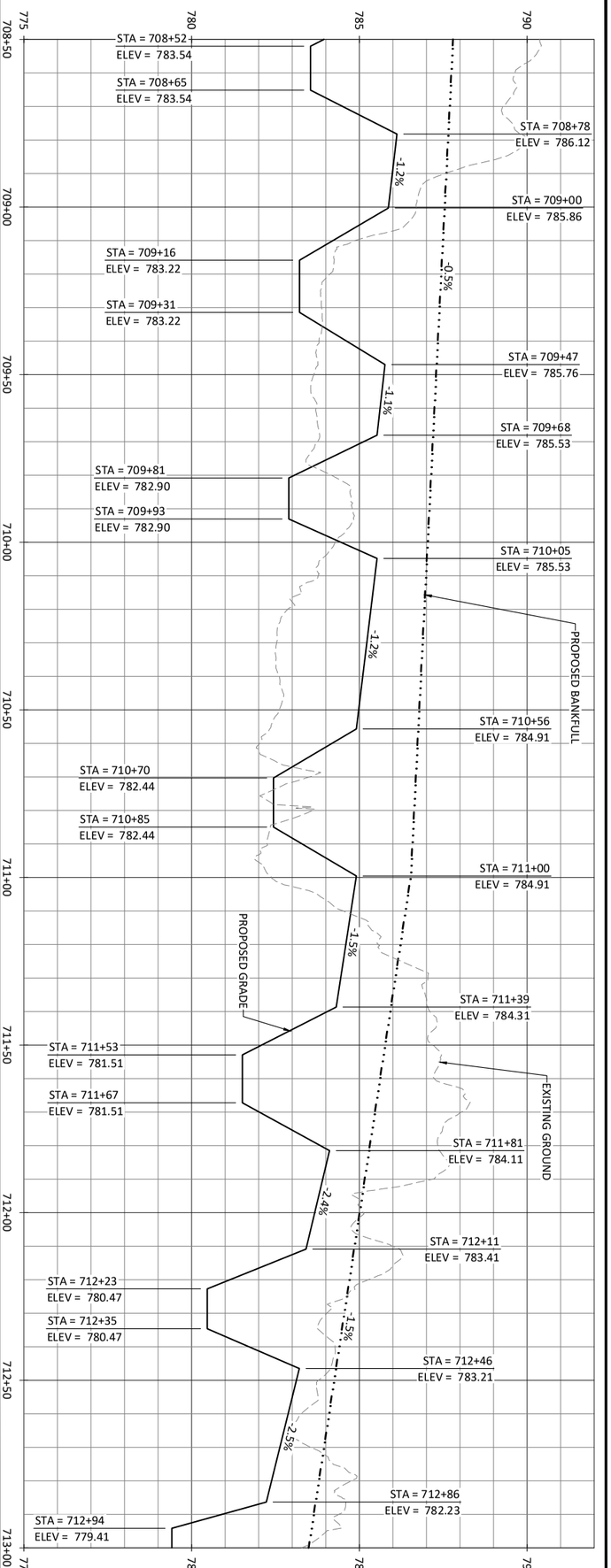

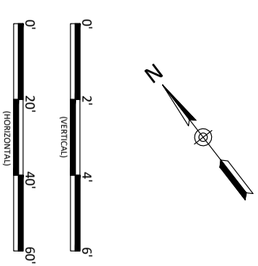

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

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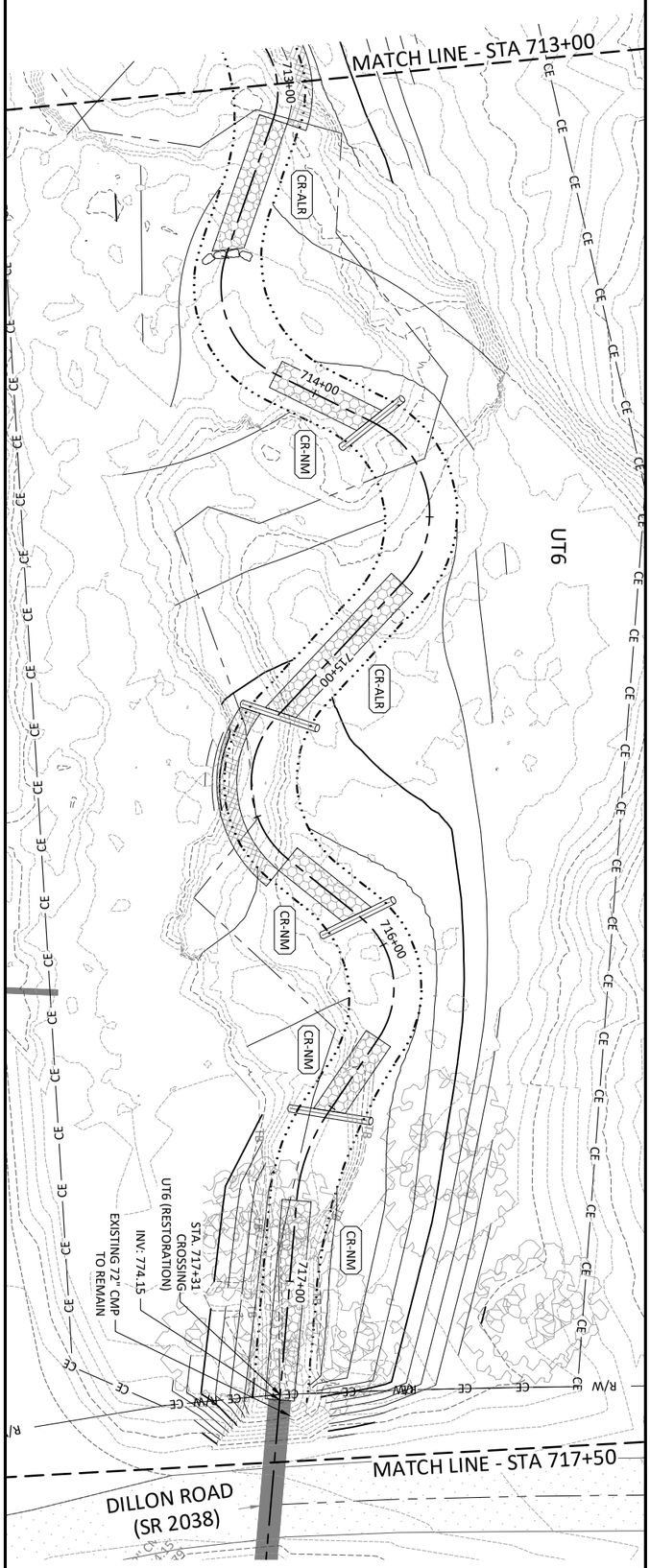

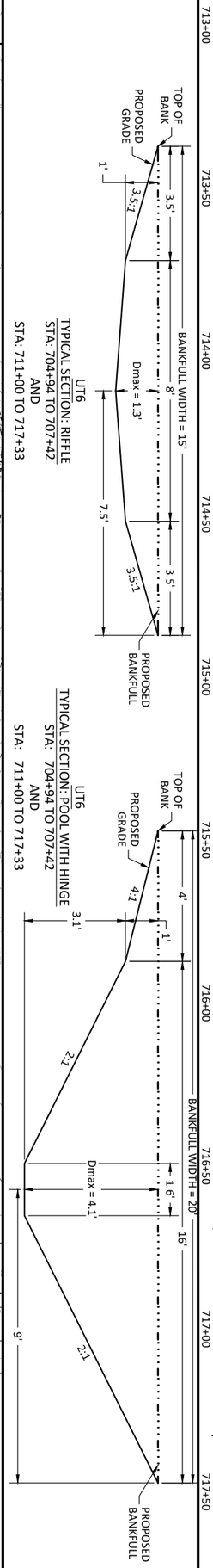

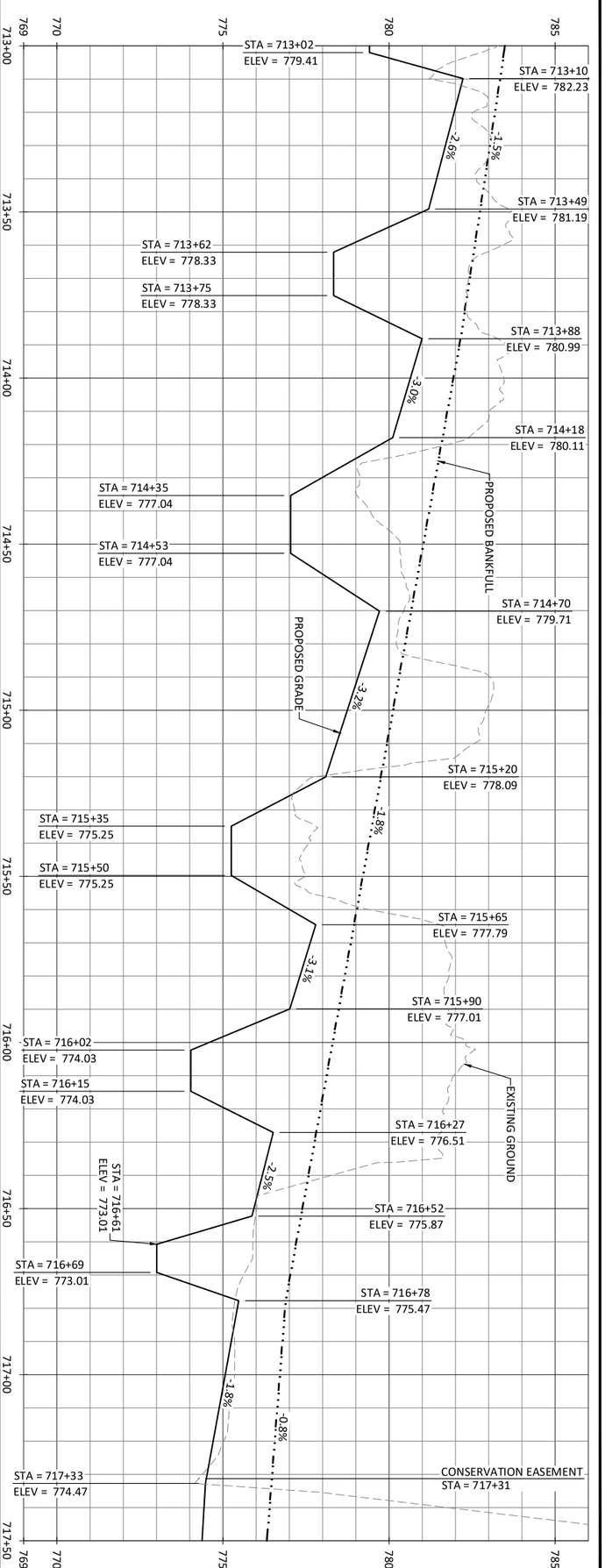

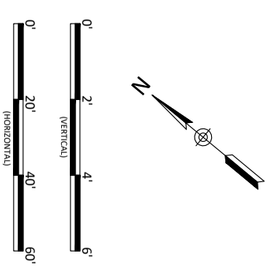

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

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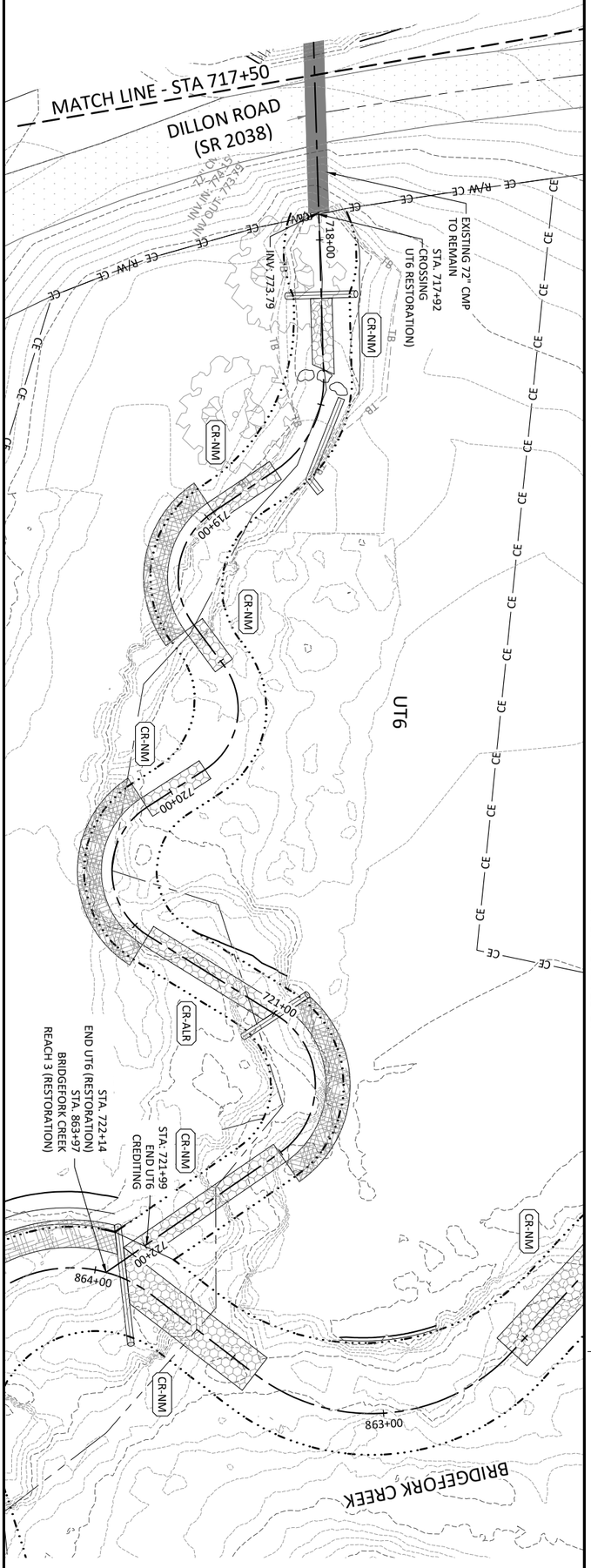

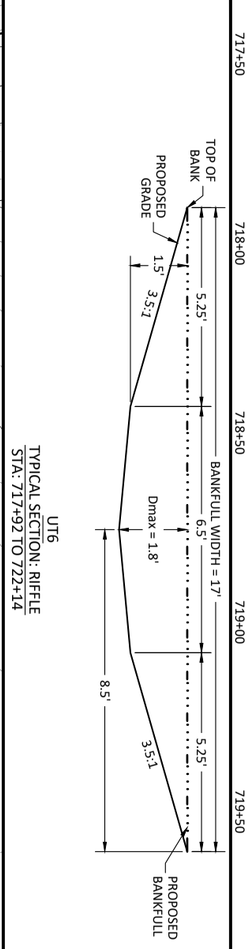

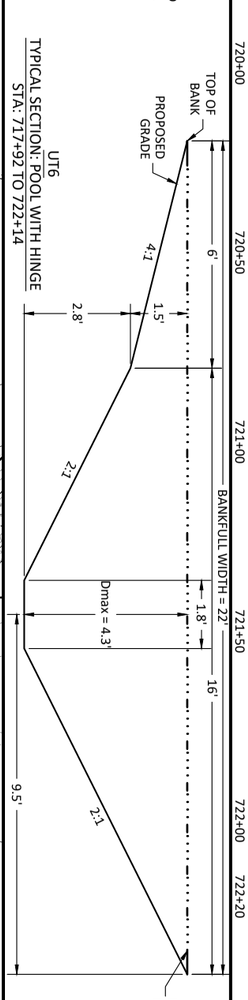

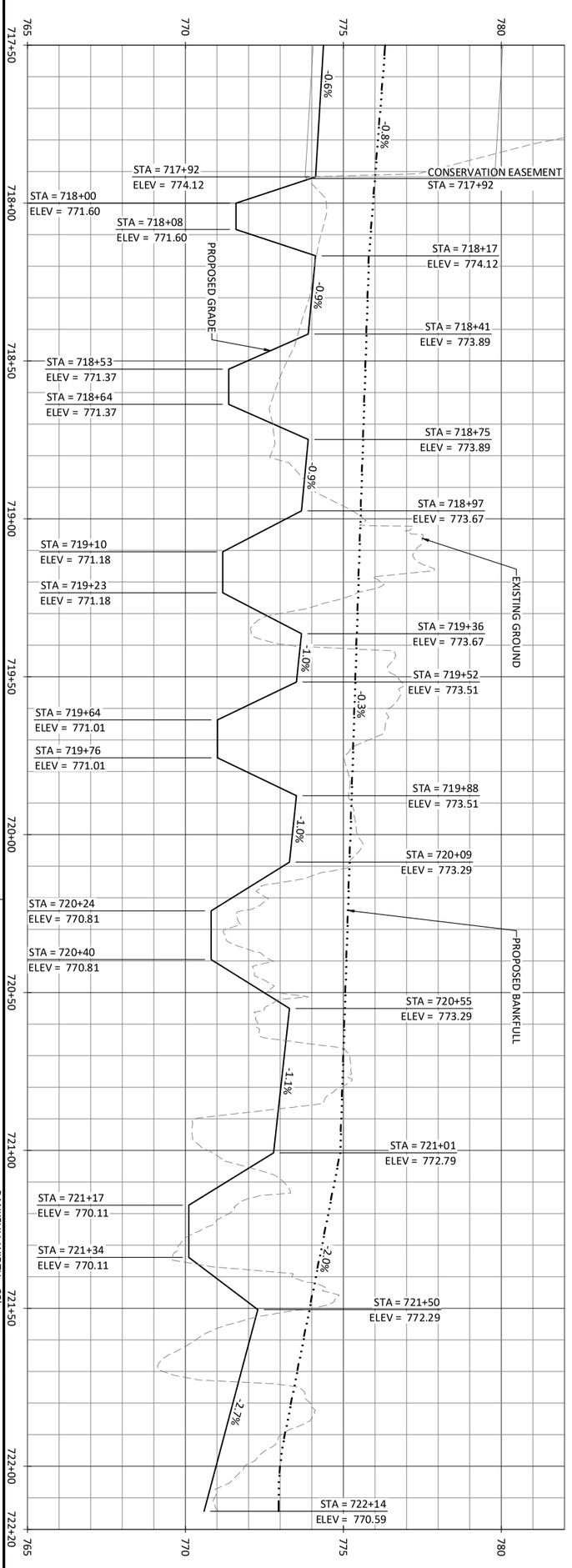

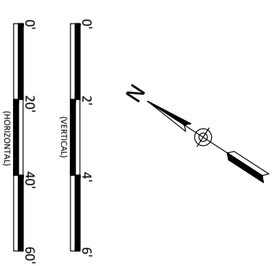

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT6
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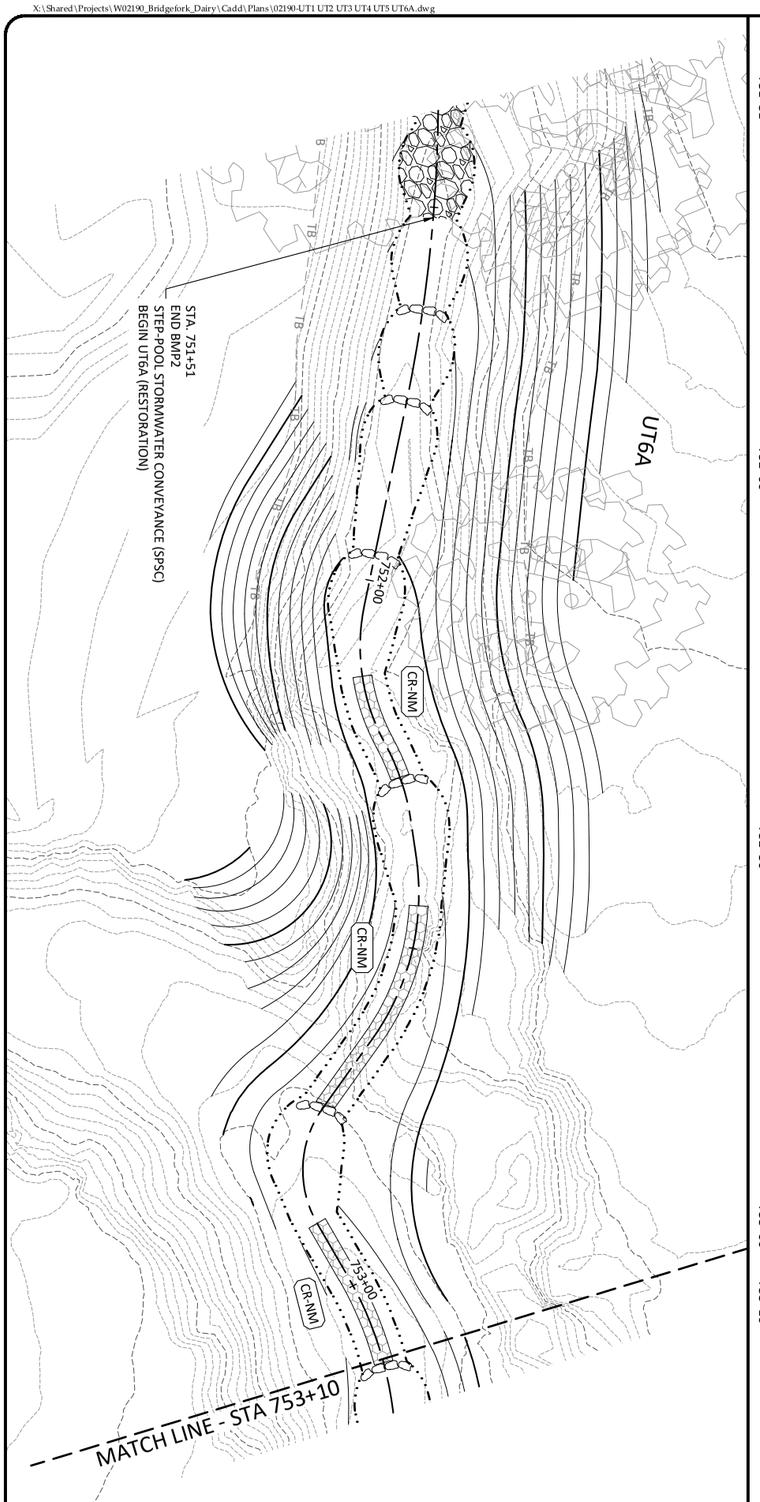

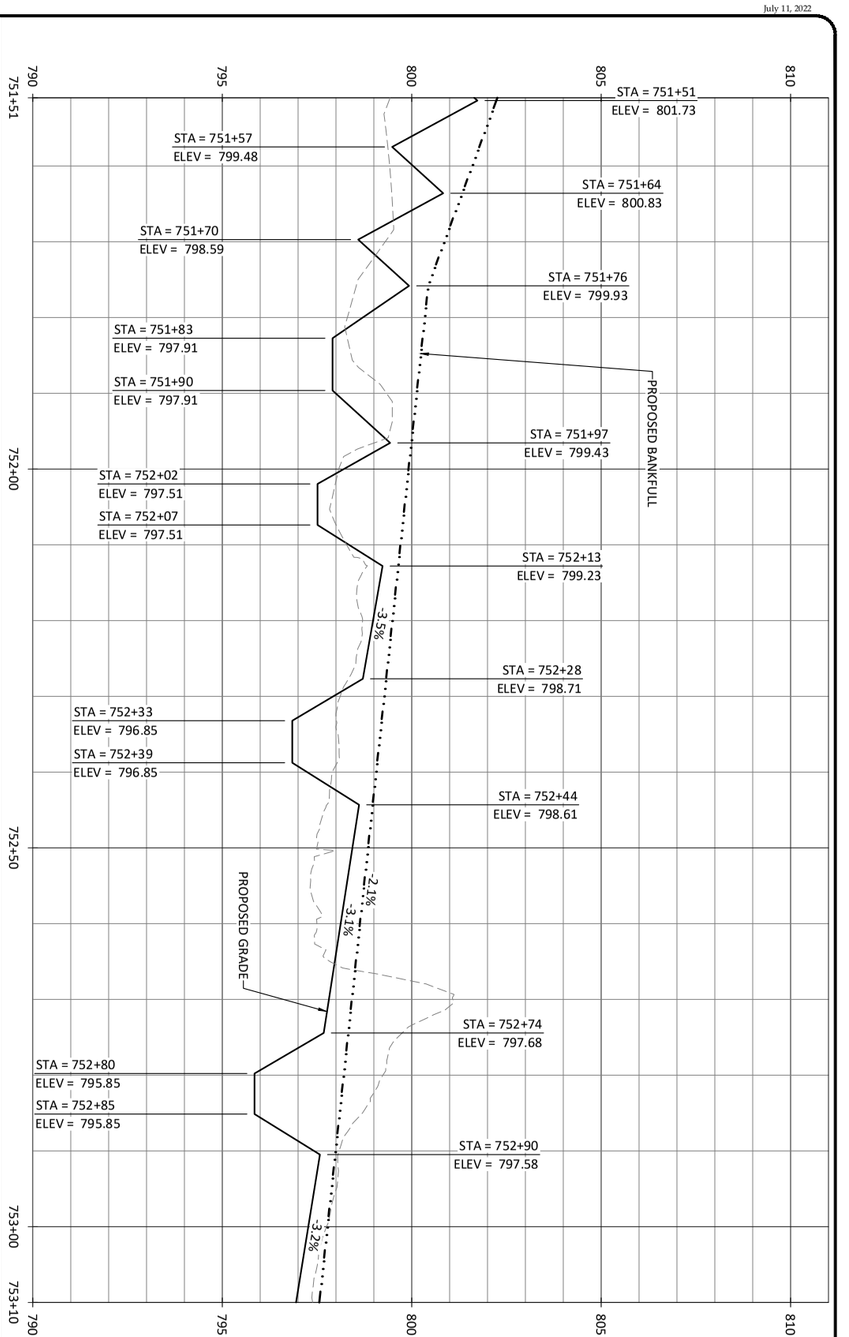

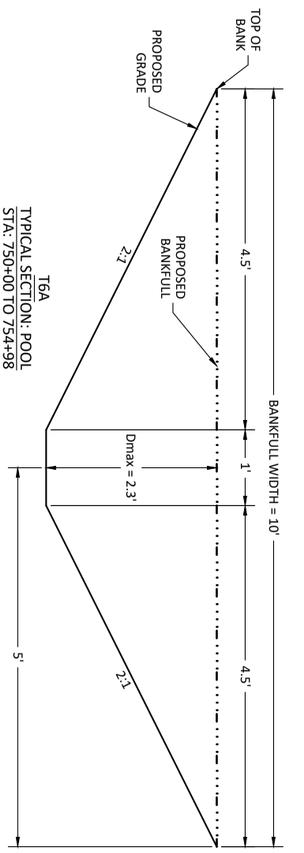

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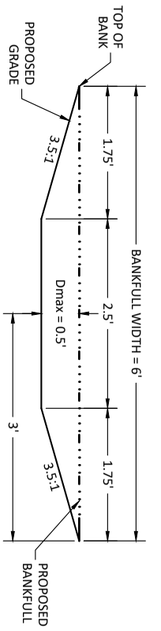
TYPICAL SECTION: POOL
STA: 750+00 TO 754+98



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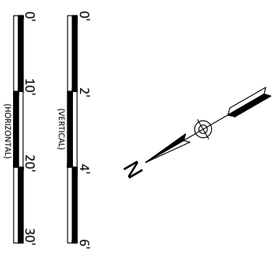
TYPICAL SECTION: RIFFLE
STA: 750+00 TO 754+98



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Bridgefork Dairy Mitigation Site
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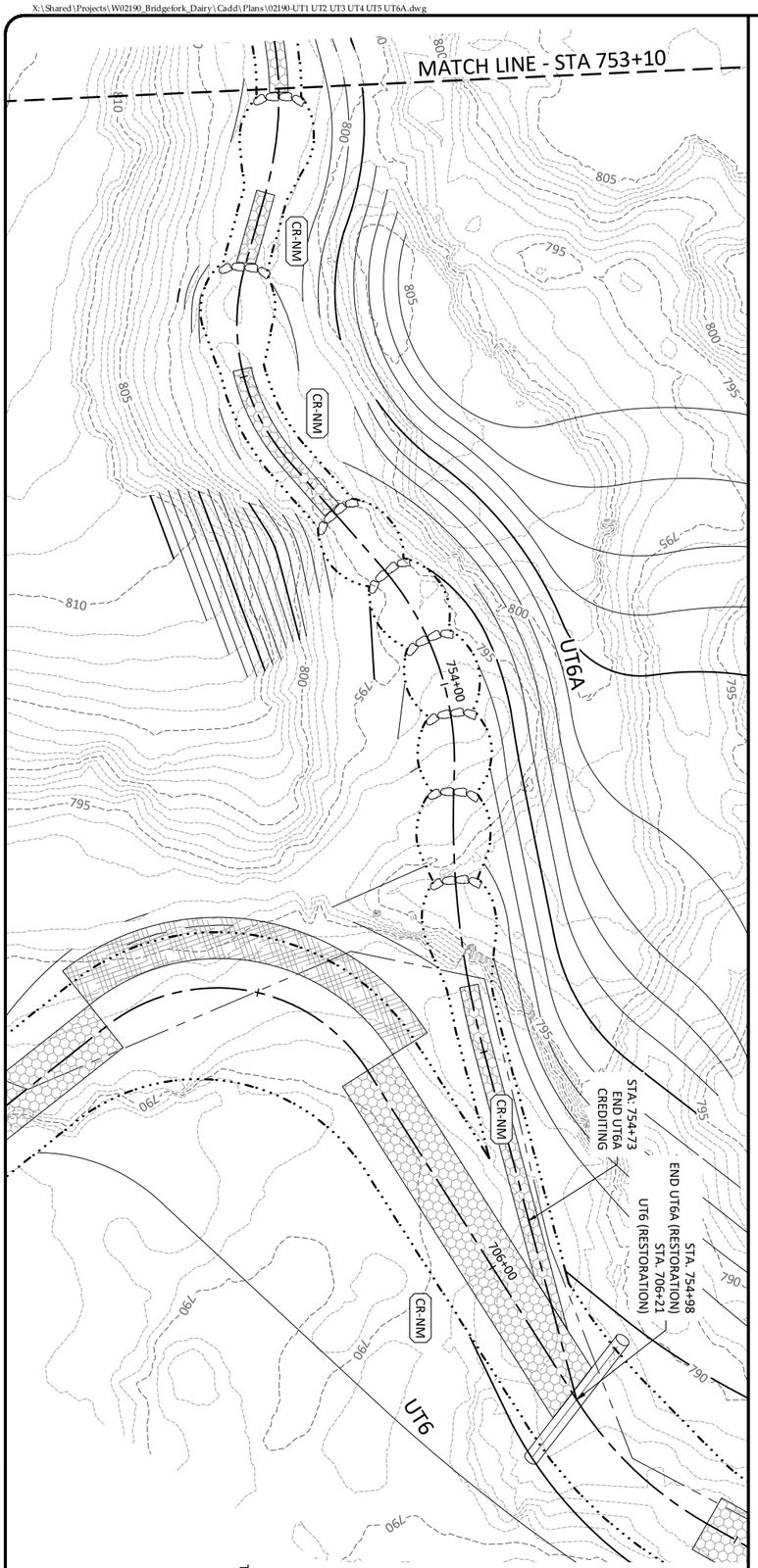

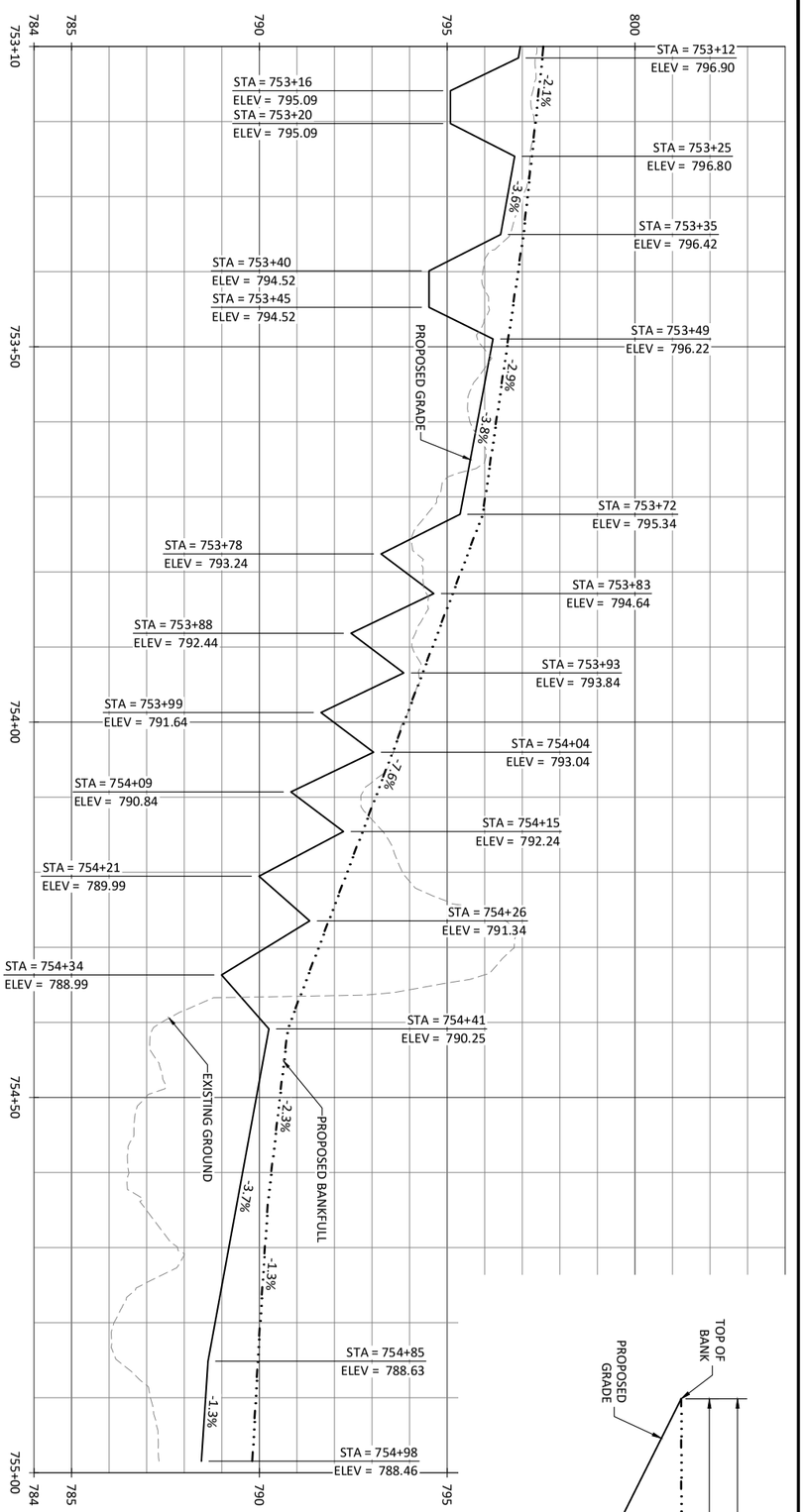

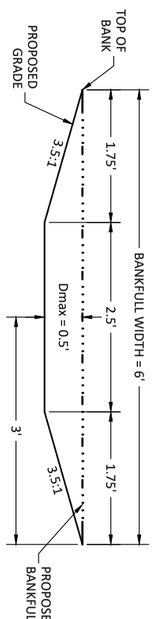

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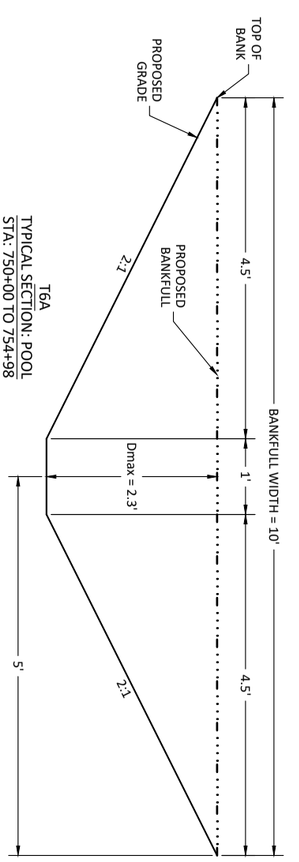
STA: 750+00 TO 754+98



T6A
TYPICAL SECTION: POOL
STA: 750+00 TO 754+98

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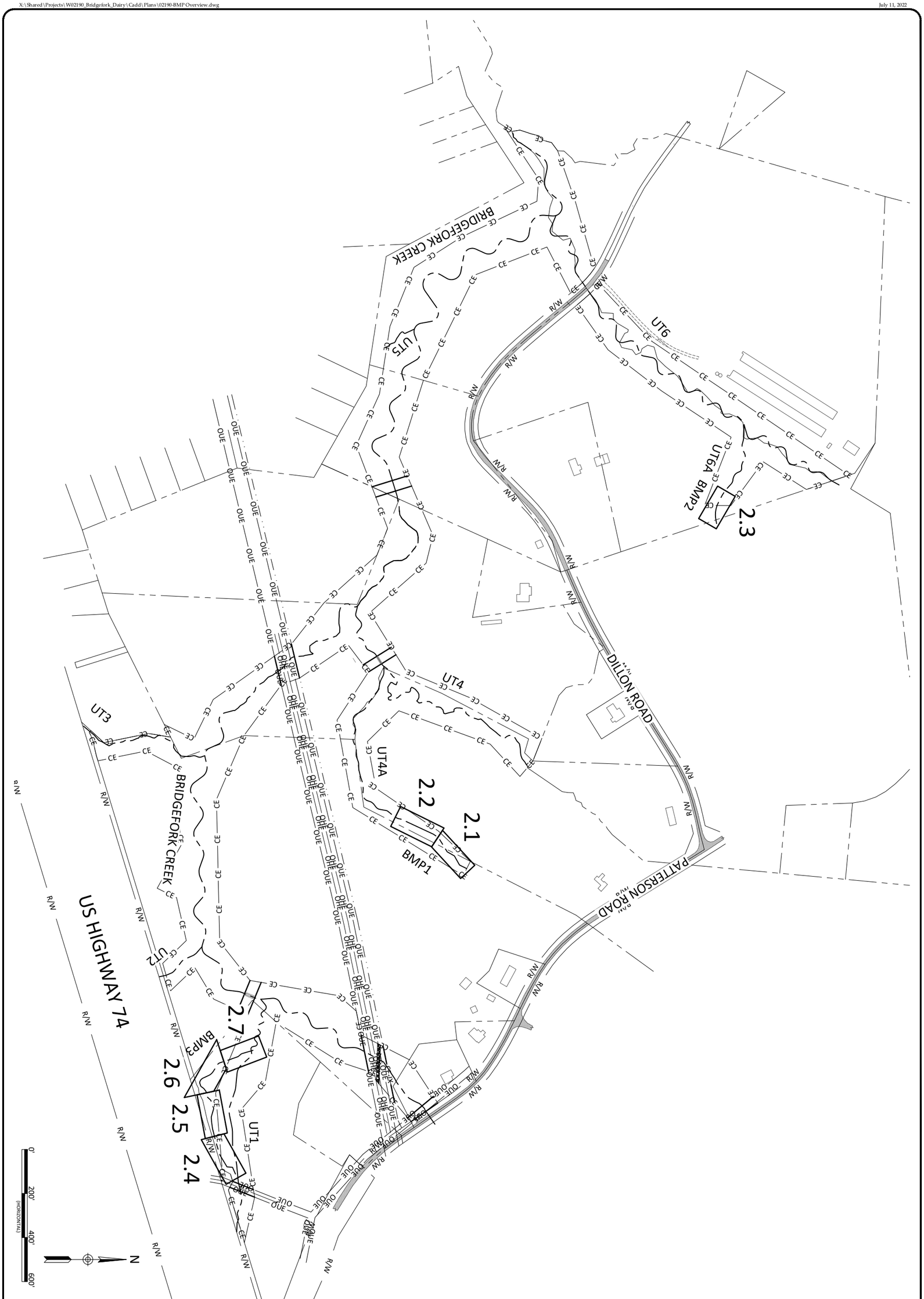

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Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

2.0

Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

BMP Overview

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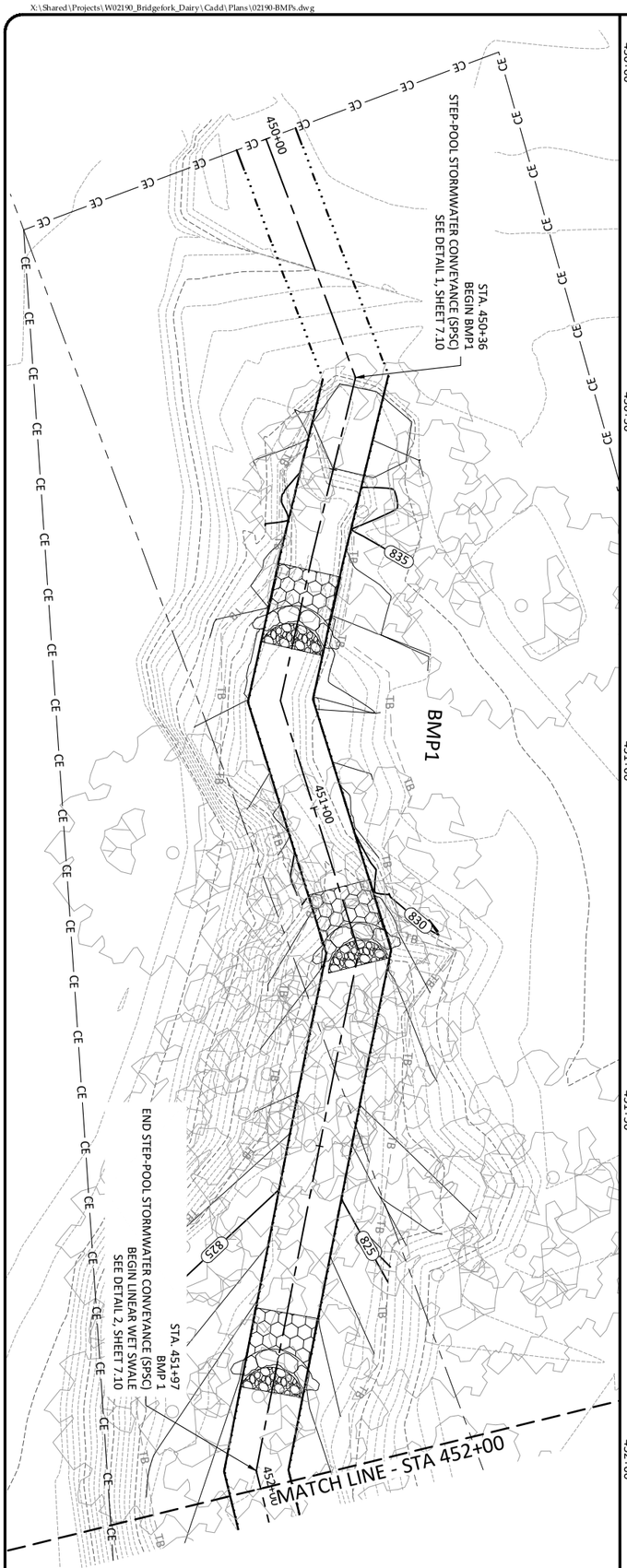
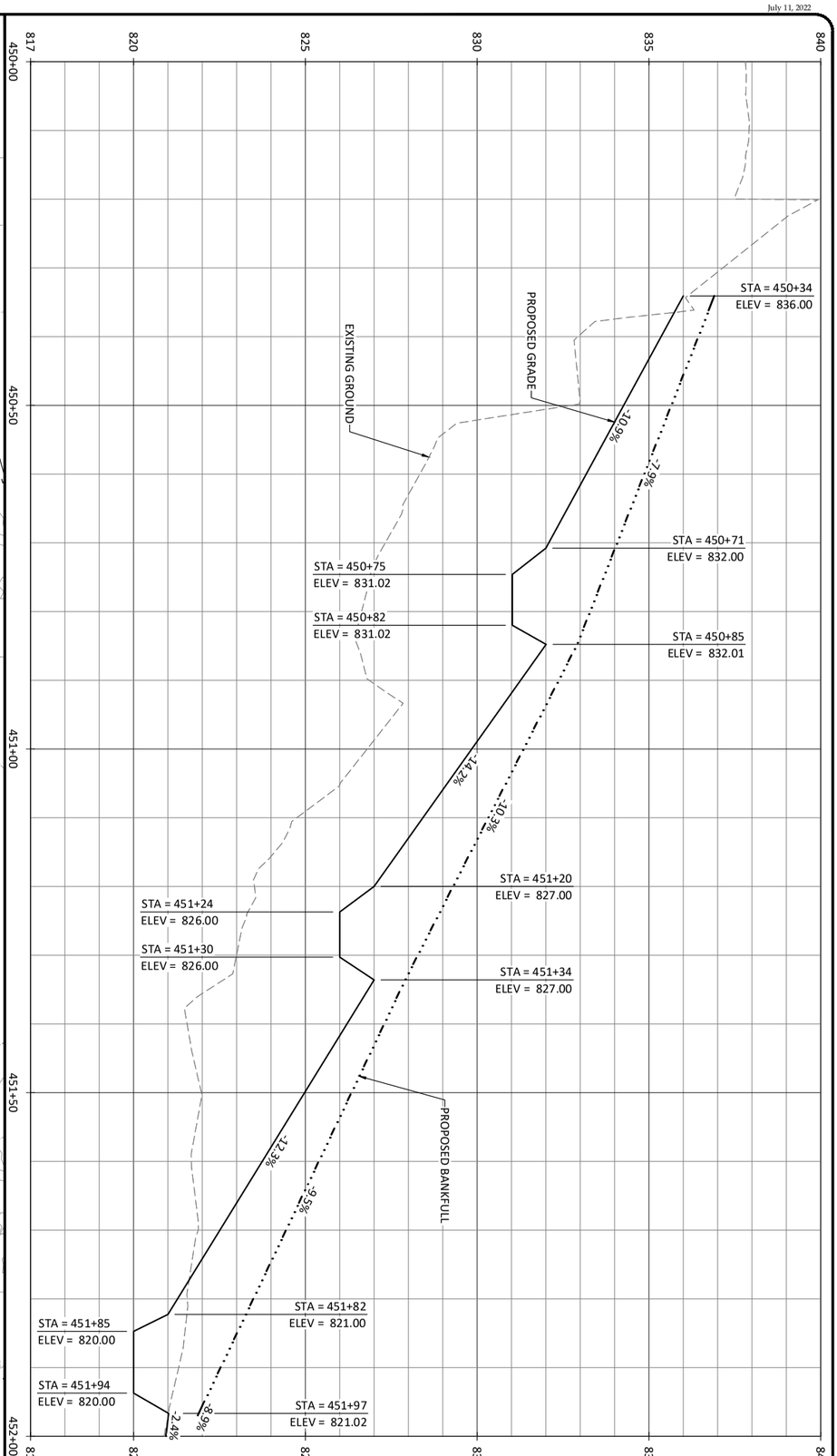
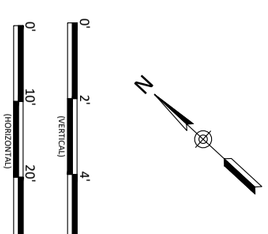




NOTES:

1. STEP-POOL STORMWATER COVEYANCE DETAIL ON SHEET 7.10.
2. LINEAR WET SWALE DETAIL ON SHEET 7.10.
3. TYPICAL SECTIONS TO BE PROVIDED IN FINAL PLANS.



Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

2.1
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Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

BMP1 - UT4A - Step-Pool Stormwater Conveyance & Linear Wet Swale BMPs

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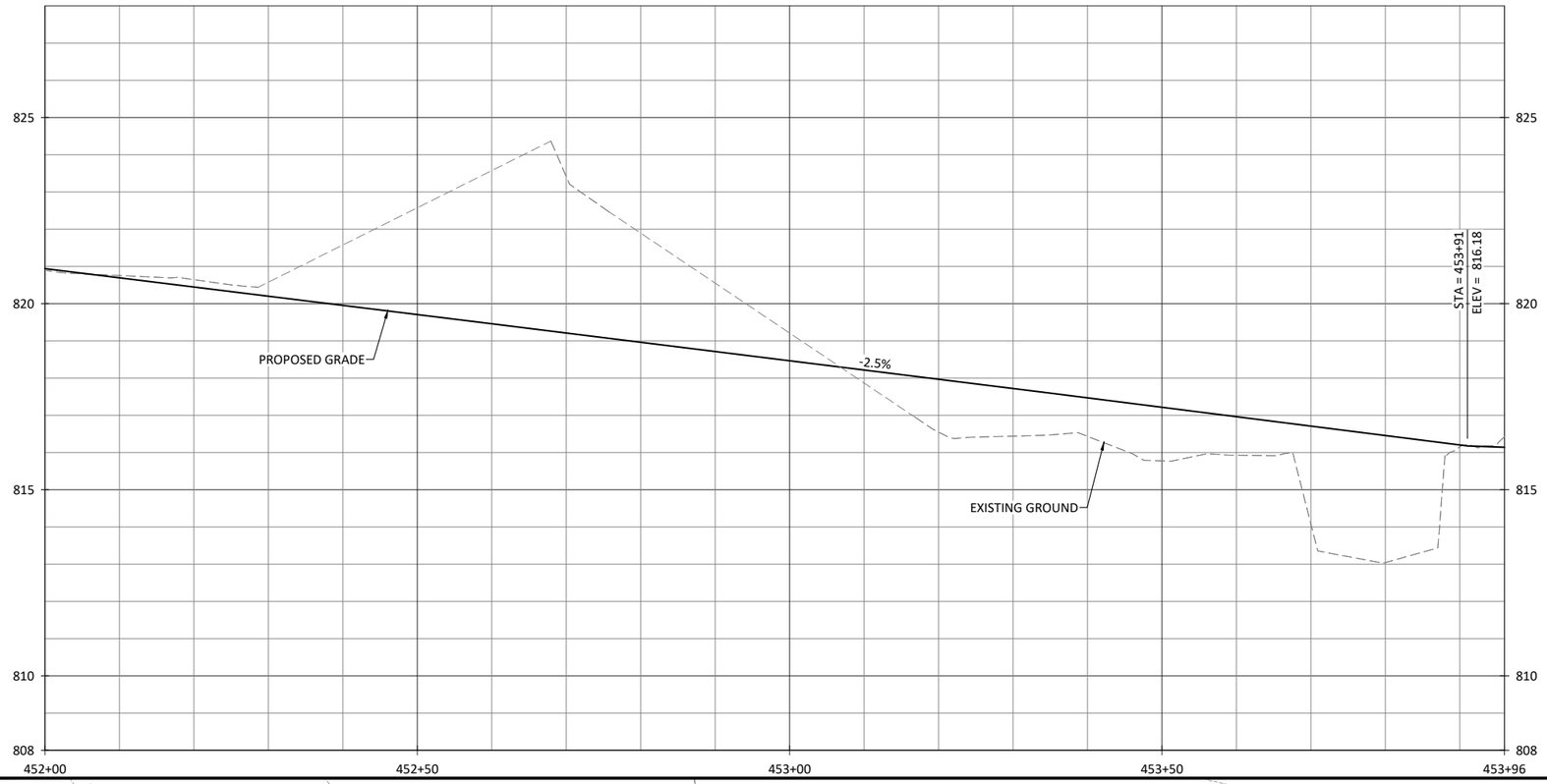

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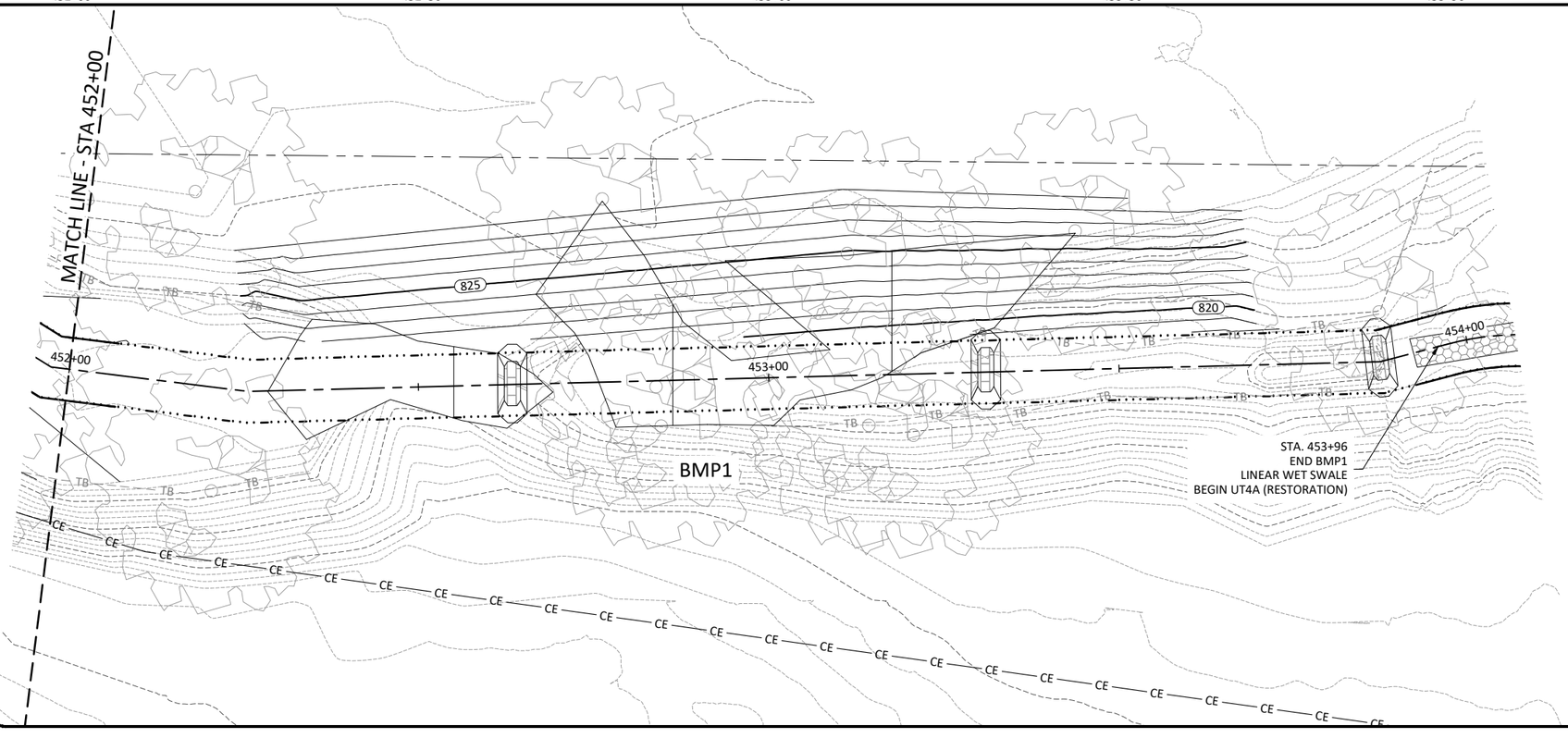

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

BMP1 - UT4A - Step-Pool Stormwater Conveyance & Linear Wet Swale
BMPs

Revisions:

Date:	07.11.22
Job Number:	005-02150
Project Engineer:	EFN
Drawn By:	CAW
Checked By:	CDB

Sheet 2.2

July 11, 2023

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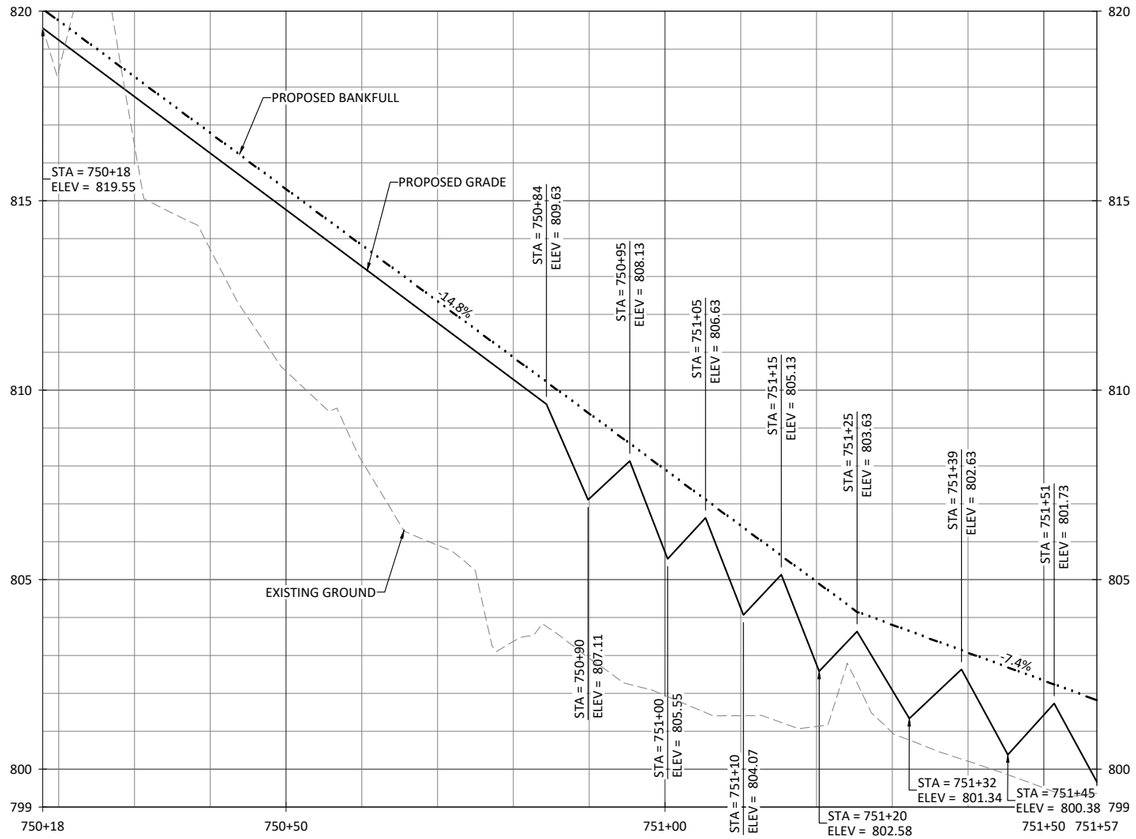

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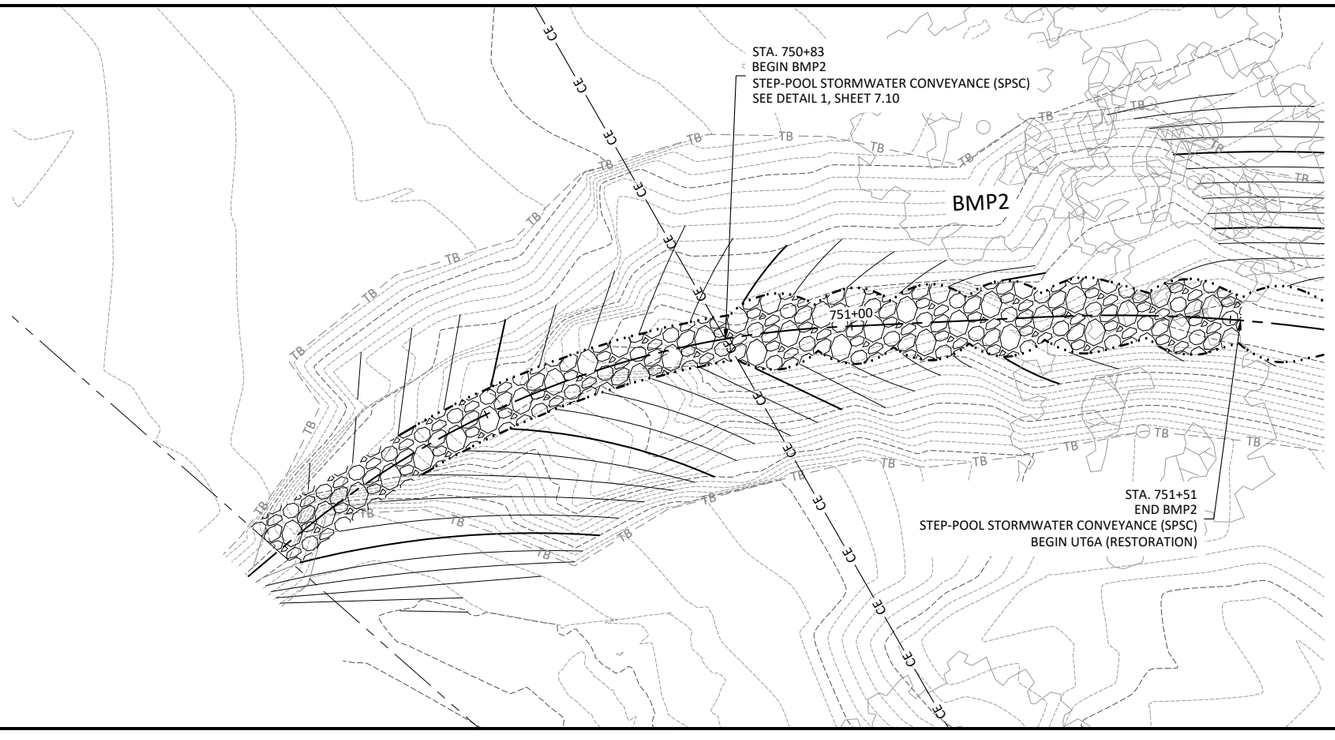
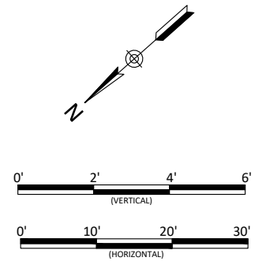
2. TYPICAL SECTIONS TO BE PROVIDED IN FINAL PLANS.





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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

BMP2 - UT6A - Step-Pool Stormwater Conveyance
BMPs

Revisions:

Date:	07.11.22
Job Number:	005-02156
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 2.3

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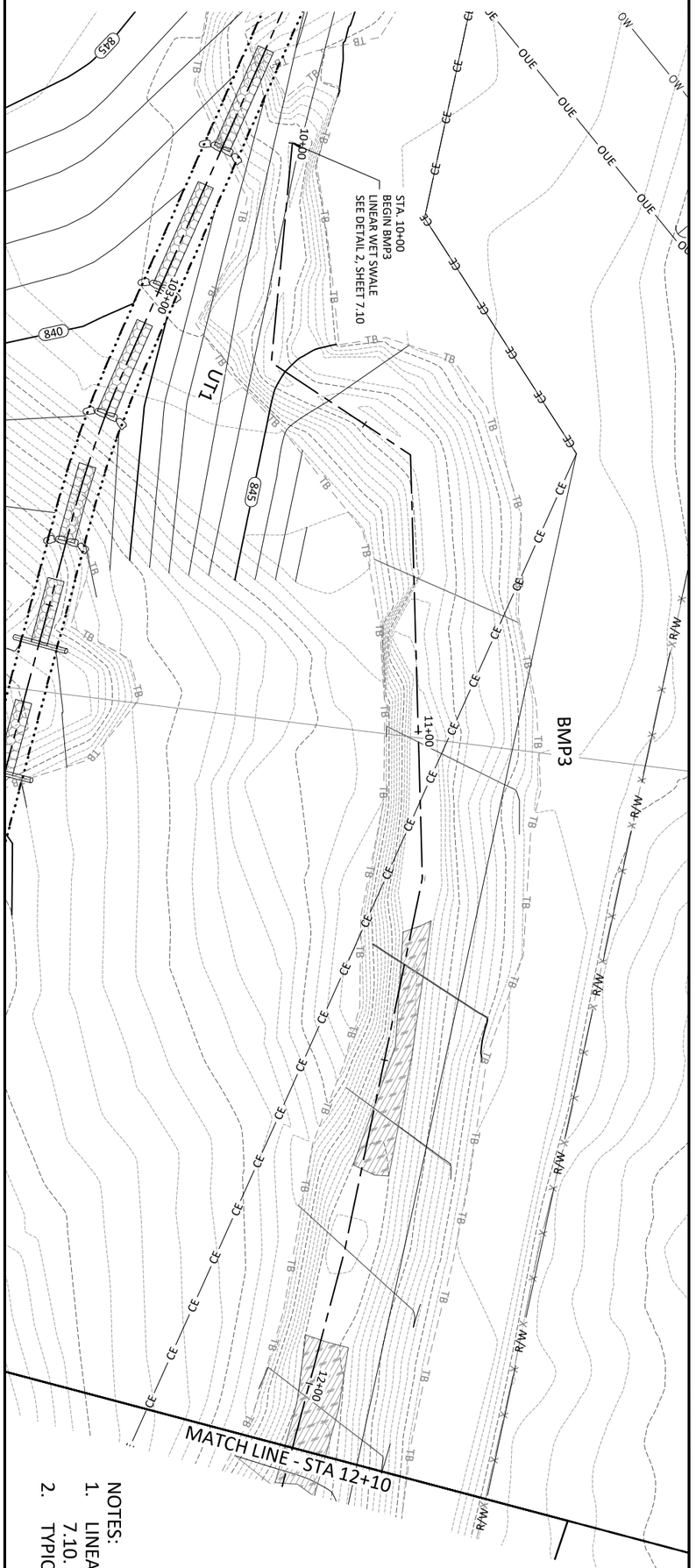

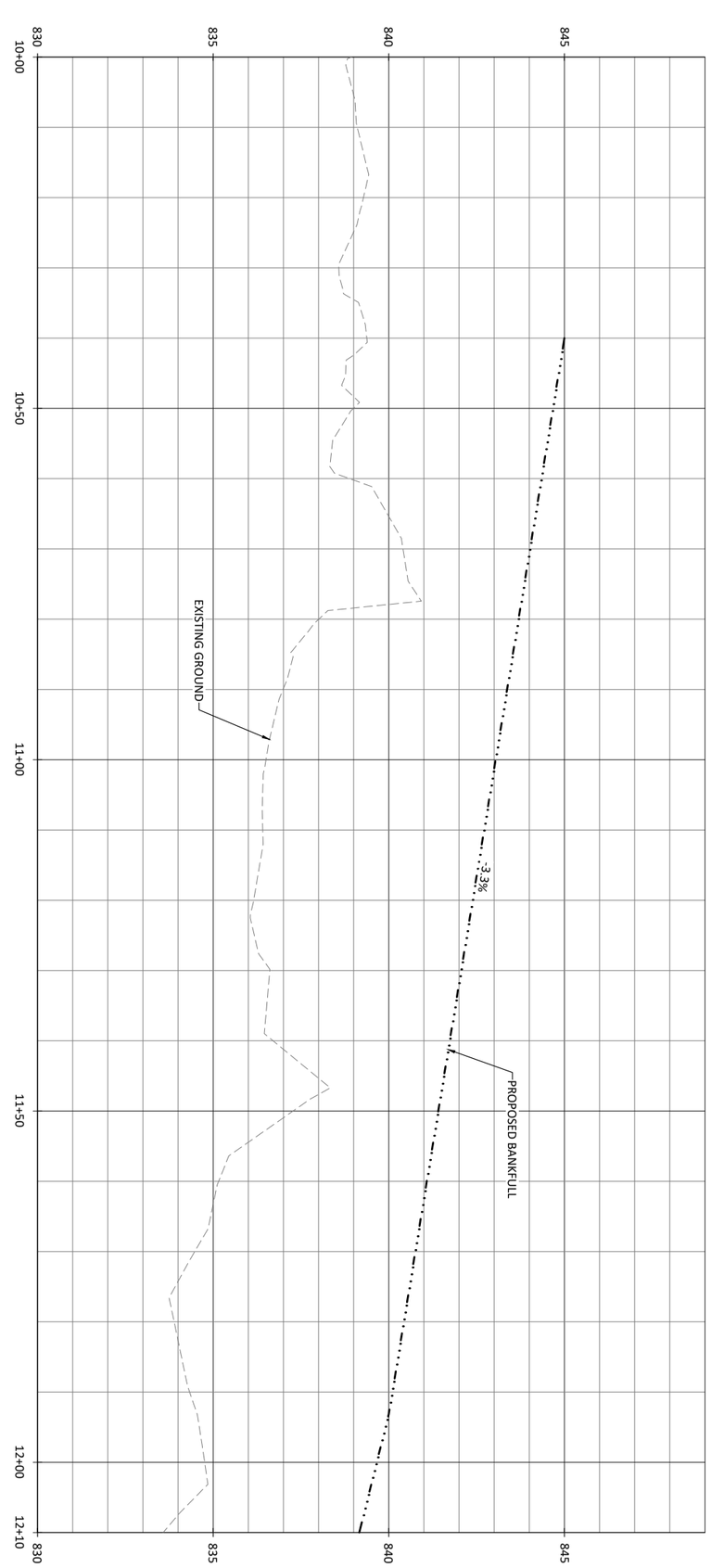

NOTES:
1. LINEAR WET SWALE DETAIL ON SHEET 7.10.
2. TYPICAL SECTIONS TO BE PROVIDED IN

Date:	9.28.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

2.4
Sheet

Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

BMP3 - UT1 - Linear Wet Swale
BMPs

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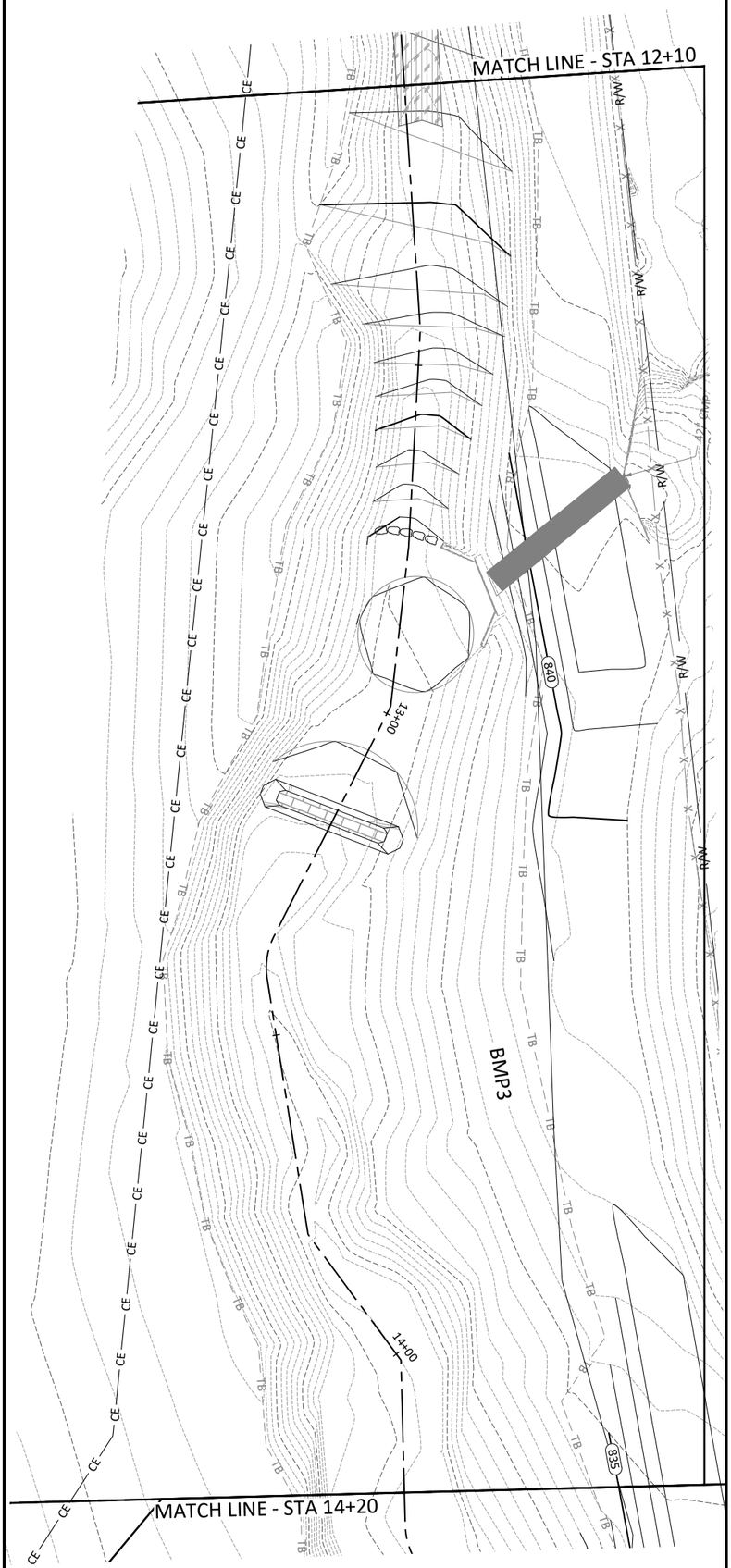

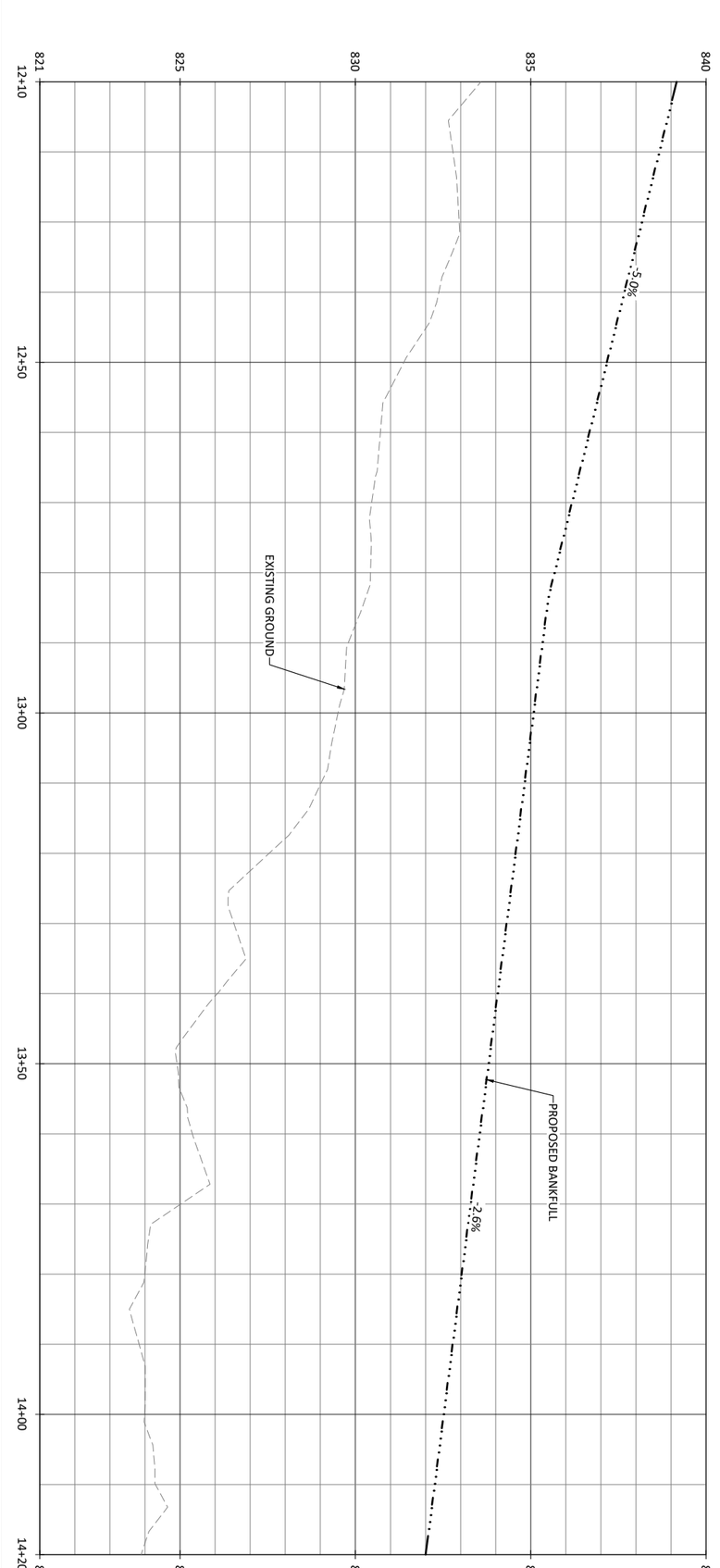

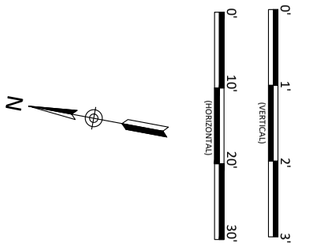

NOTES:
1. LINEAR WET SWALE DETAIL ON SHEET 7.10.
2. TYPICAL SECTIONS TO BE PROVIDED IN FINAL PLANS.

Date:	9.28.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
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2.5
Sheet

Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

BMP3 - UT1 - Linear Wet Swale
BMPs

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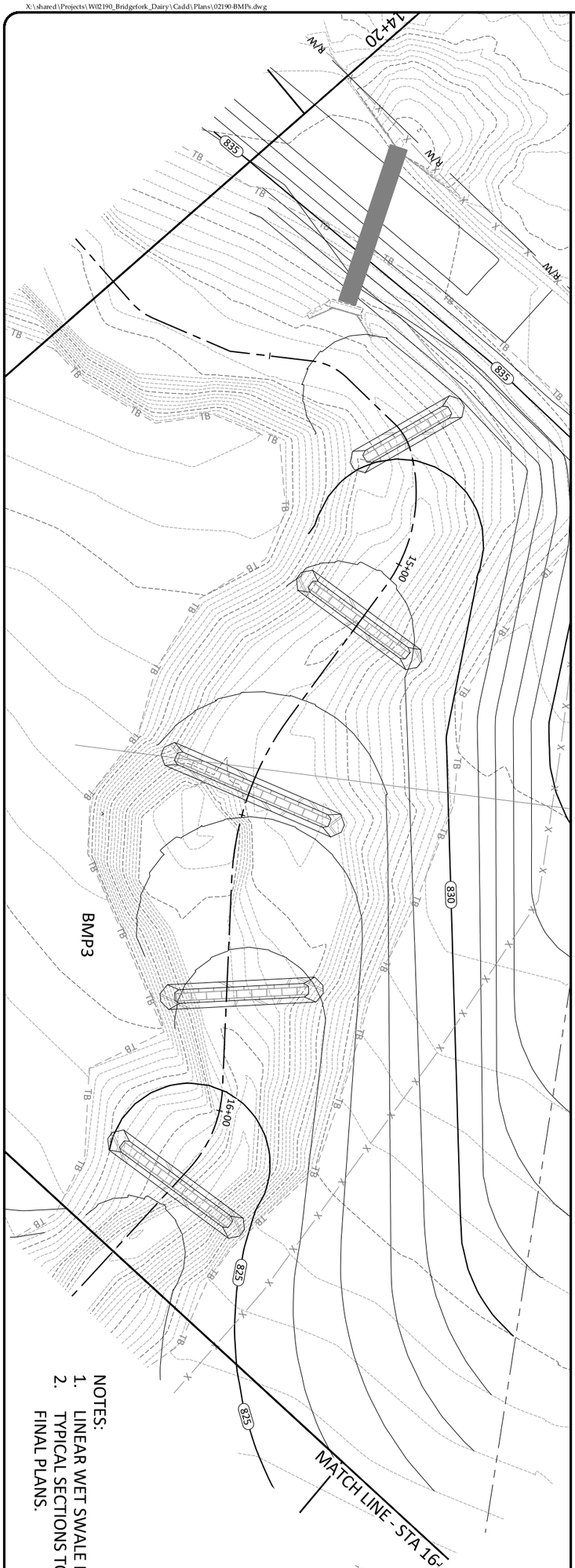

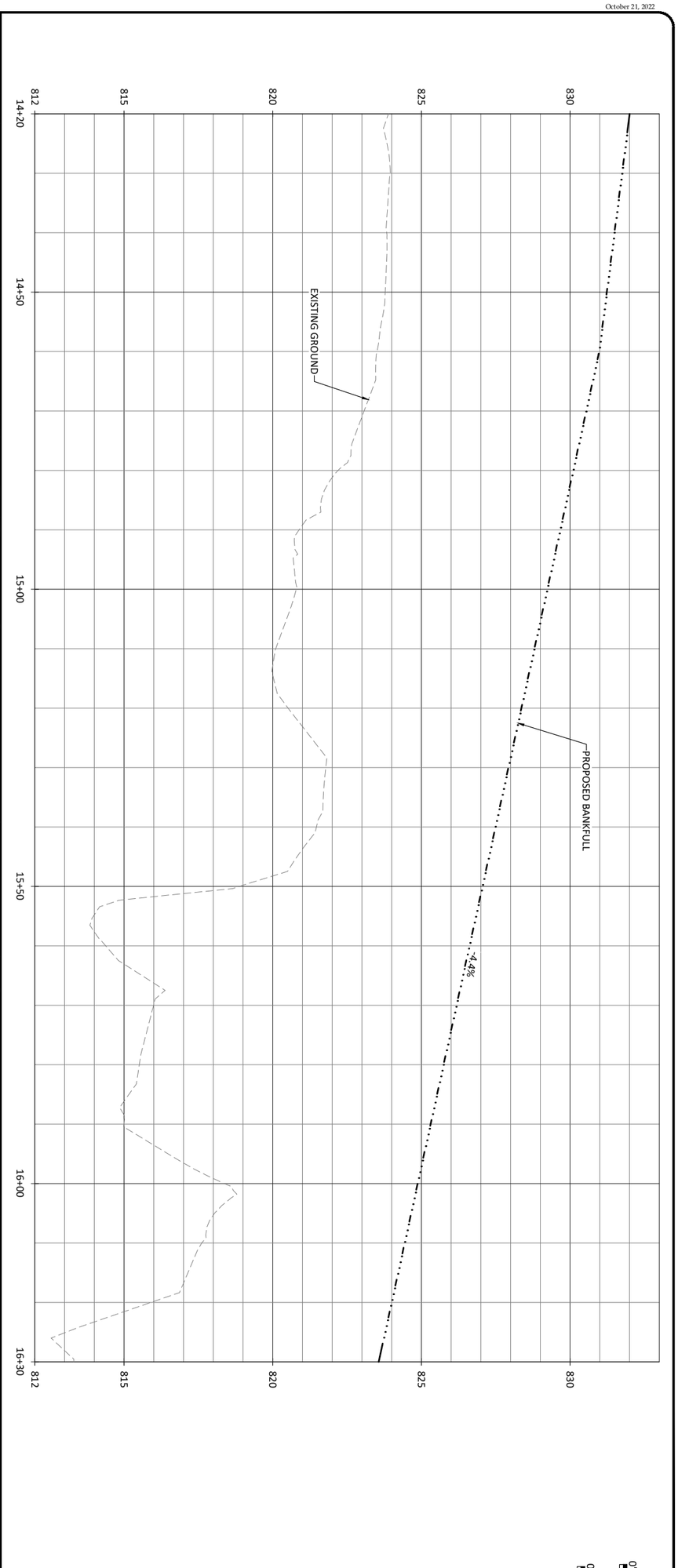

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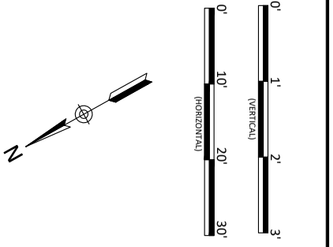

Date:	9.28.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

BMP3 - UT1 - Linear Wet Swale
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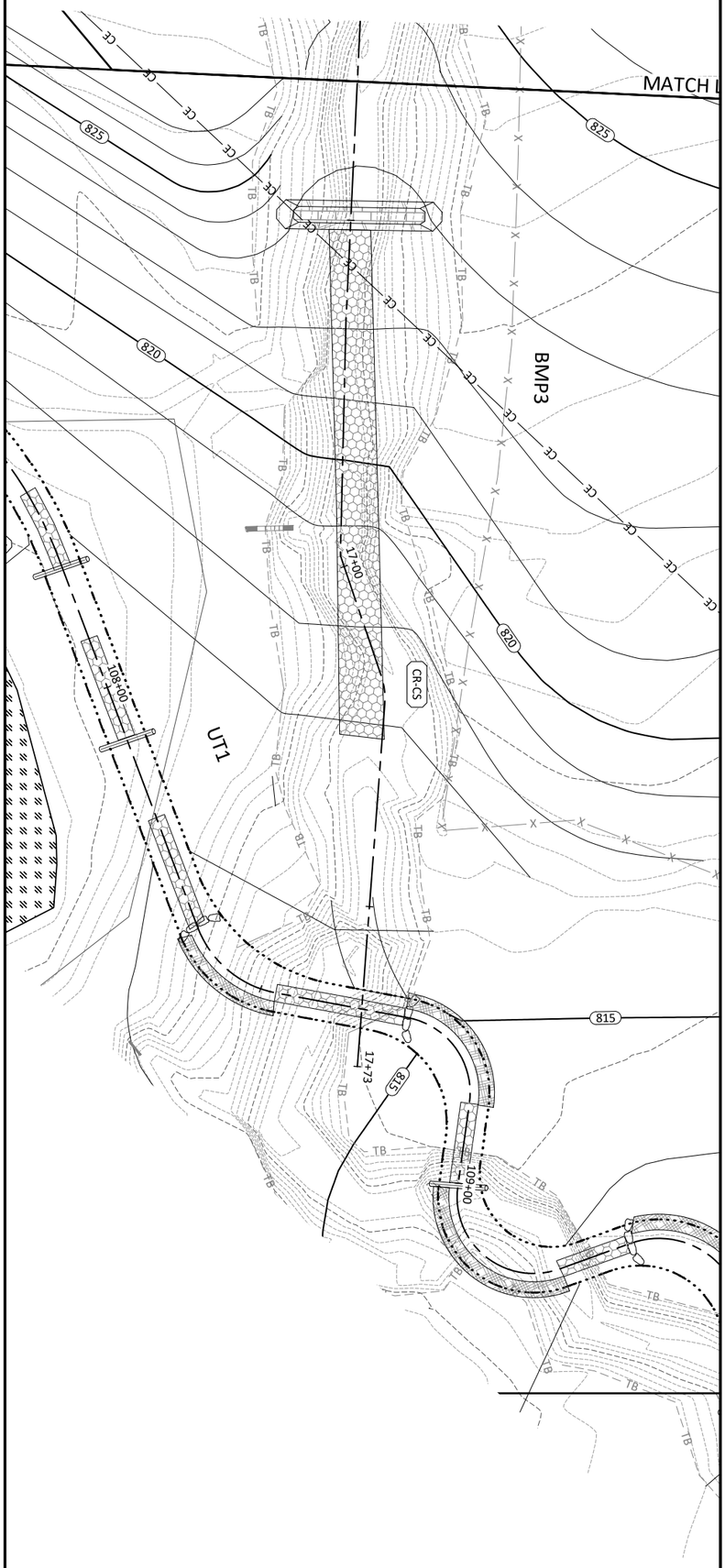

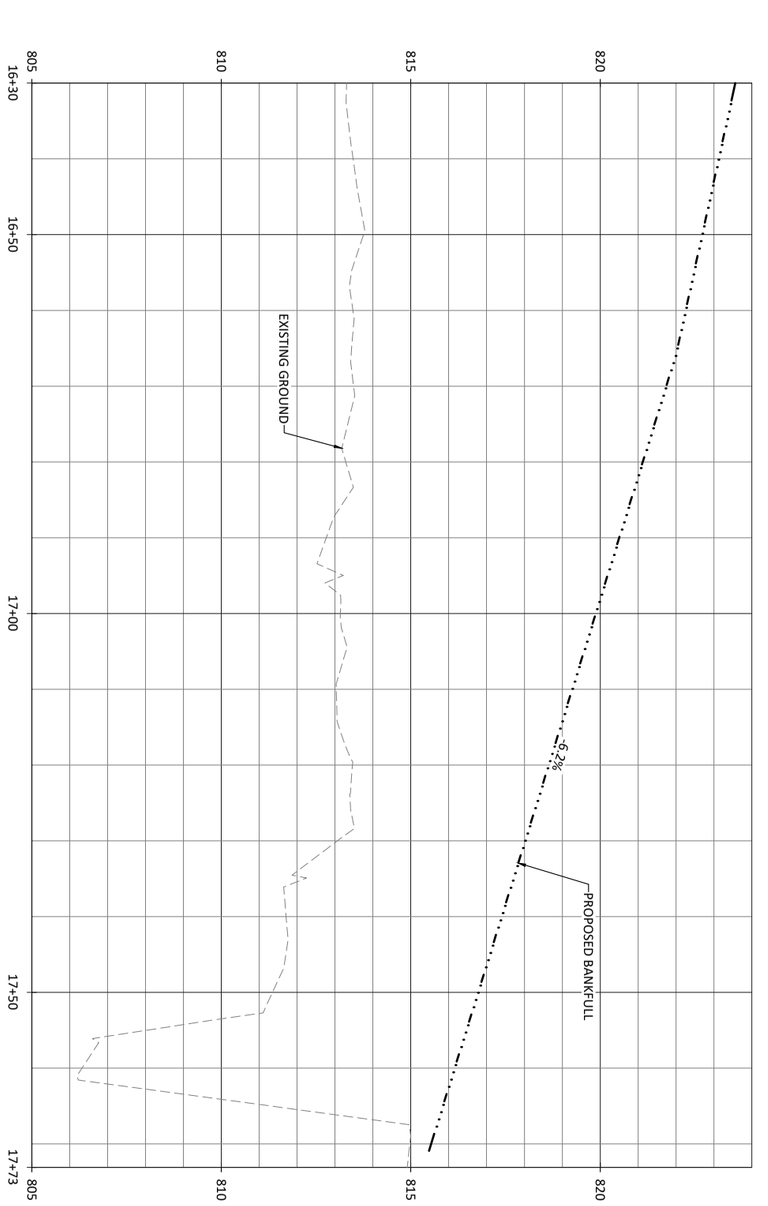

NOTES:
1. LINEAR WET SWALE DETAIL ON SHEET 7.10.
2. TYPICAL SECTIONS TO BE PROVIDED IN FINAL PLANS.

Date:	9.28.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
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2.7
Sheet

Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

BMP3 - UT1 - Linear Wet Swale
BMPs

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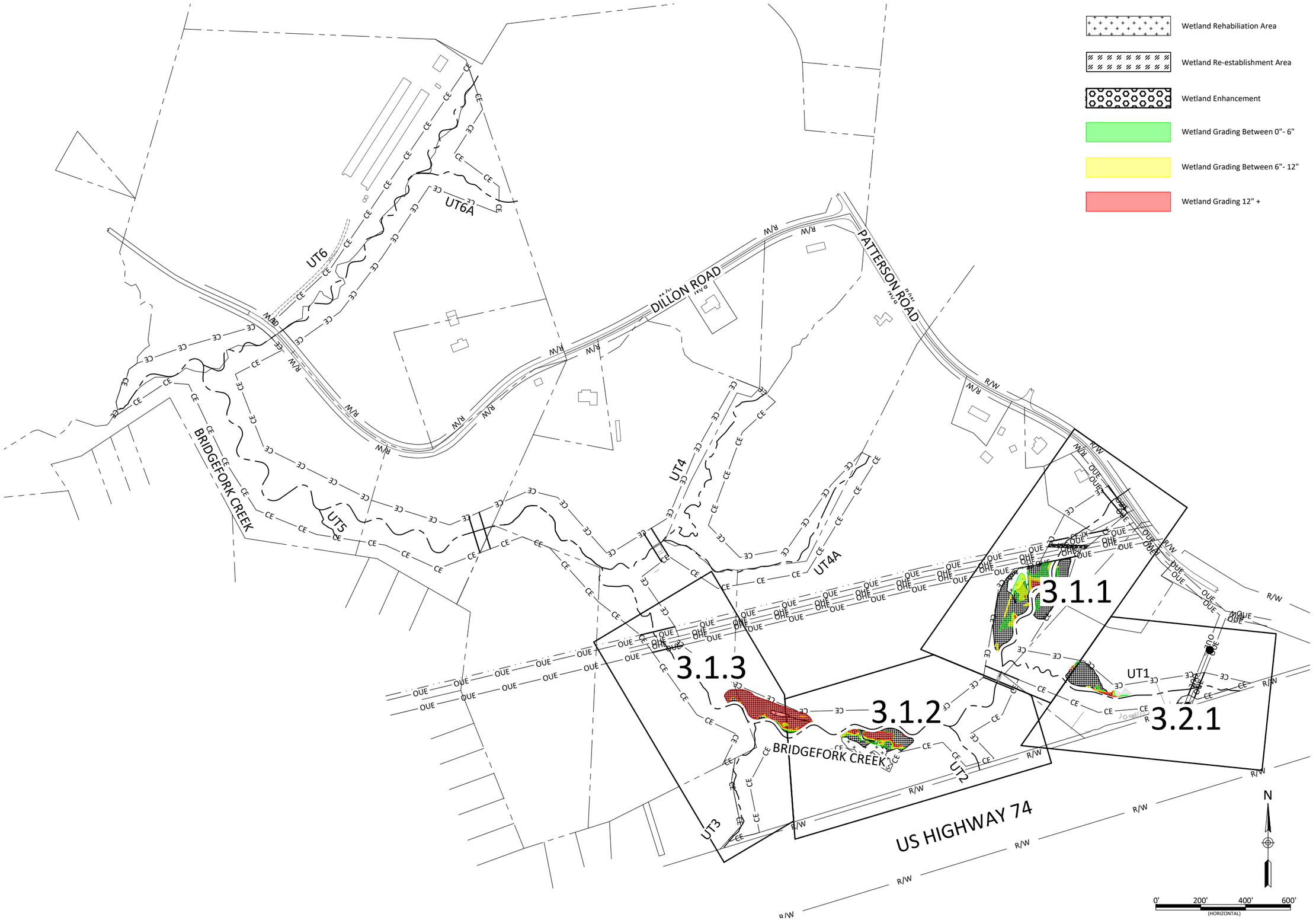
October 28, 2022



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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Wetland Grading Plan Overview

Revisions:

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 3.0.0

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Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

3.1.1
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek
Wetland Grading Plan

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October 28, 2022

US HIGHWAY 74

R/W

VARIABLE WIDTH
WATERLINE EASEMENT

BRIDGEFORK CREEK

UT1

UT2

MATCH LINE - STA 811+50

MATCH LINE - STA 823+00

200+00 201+00 202+00 202+50 810+00 811+00 811+79 812+00 813+00 814+00 815 816+00 817+00 818+00 819+00 820+00 821+00 822+00 805 810

CE CE-IX

Wetland Rehabiliation Area

Wetland Re-establishment Area

Wetland Enhancement

Wetland Grading Between 0"- 6"

Wetland Grading Between 6"- 12"

Wetland Grading 12" +

N

0' 40' 80' 120'
(HORIZONTAL)

X:\Shared\Projects\WI2190_Bridgefork_Dairy\Cadd\Plans\02190-Wetland Grading Plans.dwg

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek & UT2
Wetland Grading Plan

Revisions:

Date: 10.27.2022
Job Number: 005-02194
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Sheet 3.1.2

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

3.1.3
Sheet

Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek & UT3
Wetland Grading Plan

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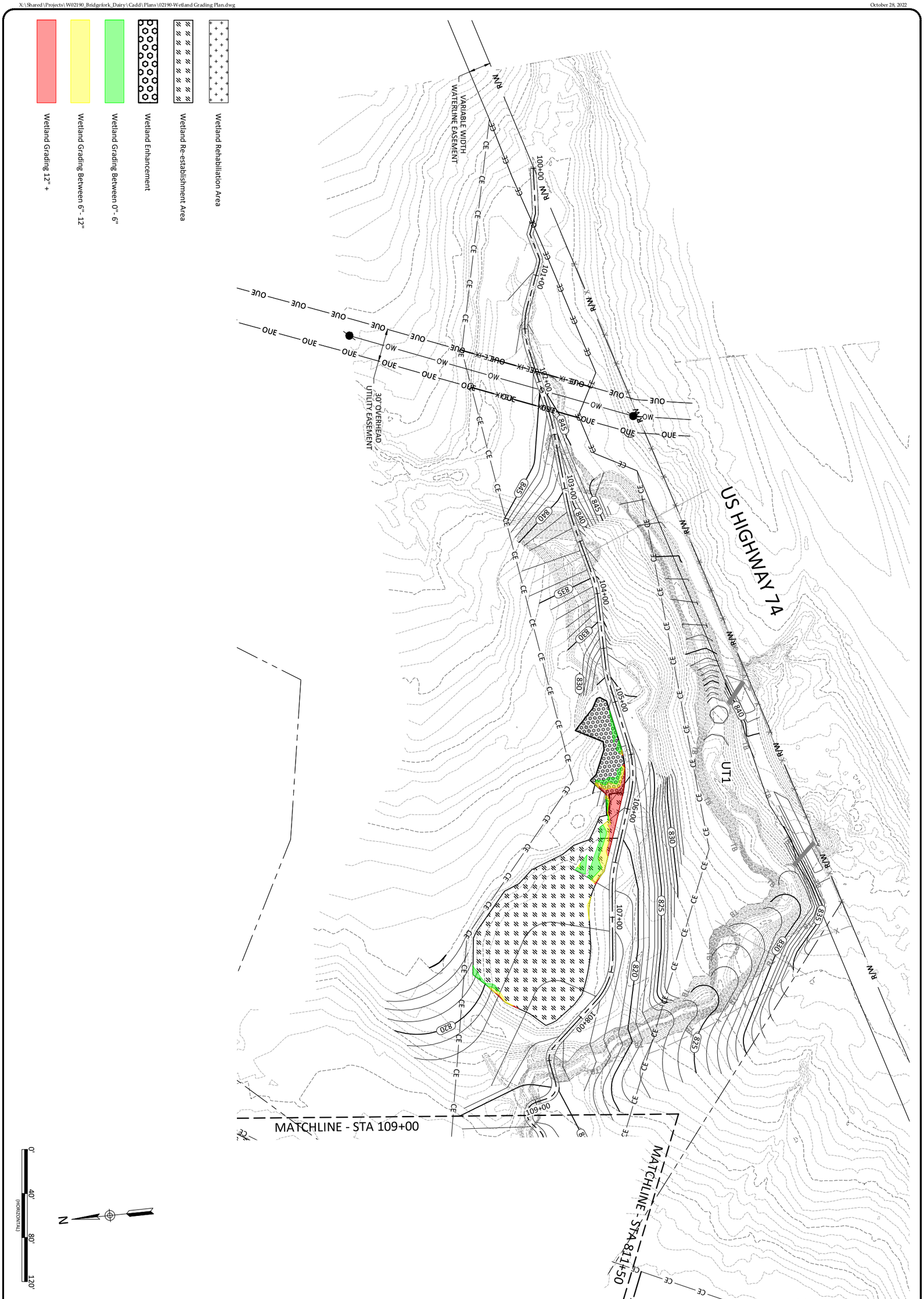

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

3.2.1
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT1
Wetland Grading Plan

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October 27, 2022

Streambank Planting Zone 1
Bridgefork Creek R1, R2, R3, UT4, UT4A, UT6

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Live Stakes						
Salix nigra	Black Willow	3-6 ft.	0.5" - 1.5" cal.	Canopy	OBL	45%
Salix sericea	Silky Willow	3-6 ft.	0.5" - 1.5" cal.	Subcanopy	OBL	20%
Cornus amomum	Silky Dogwood	3-6 ft.	0.5" - 1.5" cal.	Subcanopy	FACW	20%
Sambucus canadensis	Elderberry	3-6 ft.	0.5" - 1.5" cal.	Shrub	FAC	5%
Cephalanthus occidentalis	Buttonbush	3-6 ft.	0.5" - 1.5" cal.	Shrub	OBL	10%
						100%
Herbaceous Plugs						
Juncus effusus	Common Rush	4 ft.	1.0" - 2.0" plug	Herb	FACW	40%
Carex vulpinoidea	Fox Sedge	4 ft.	1.0" - 2.0" plug	Herb	OBL	15%
Carex crinita	Fringed Sedge	4 ft.	1.0" - 2.0" plug	Herb	OBL	15%
Scirpus cyperinus	Woolgrass	4 ft.	1.0" - 2.0" plug	Herb	FACW	20%
Lobelia cardinalis	Cardinal Flower	4 ft.	1.0" - 2.0" plug	Herb	FACW	10%
						100%

Streambank Planting Zone 2 - UT1, UT2, UT3, UT6A

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Live Stakes						
Salix sericea	Silky Willow	3-6 ft.	0.5" - 1.5" cal.	Subcanopy	OBL	45%
Cornus amomum	Silky Dogwood	3-6 ft.	0.5" - 1.5" cal.	Subcanopy	FACW	35%
Sambucus canadensis	Elderberry	3-6 ft.	0.5" - 1.5" cal.	Shrub	FAC	10%
Cephalanthus occidentalis	Buttonbush	3-6 ft.	0.5" - 1.5" cal.	Shrub	OBL	10%
						100%
Herbaceous Plugs						
Juncus effusus	Common Rush	4 ft.	1.0" - 2.0" plug	Herb	FACW	40%
Carex vulpinoidea	Fox Sedge	4 ft.	1.0" - 2.0" plug	Herb	OBL	15%
Carex crinita	Fringed Sedge	4 ft.	1.0" - 2.0" plug	Herb	OBL	15%
Scirpus cyperinus	Woolgrass	4 ft.	1.0" - 2.0" plug	Herb	FACW	20%
Lobelia cardinalis	Cardinal Flower	4 ft.	1.0" - 2.0" plug	Herb	FACW	10%
						100%

Wetland Planting Zone (3.8 acres)

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Bare Root						
*Alnus serrulata**	Tag Alder	6-12 ft.	0.25" - 1.0"	Subcanopy	OBL	5%
Quercus phellos	Willow Oak	6-12 ft.	0.25" - 1.0"	Canopy	FAC	10%
*Rosa palustris**	Swamp Rose	6-12 ft.	0.25" - 1.0"	Shrub	OBL	5%
*Lindera benzoin**	Spicebush	6-12 ft.	0.25" - 1.0"	Shrub	FAC	5%
*Euonymus americana**	Strawberry Bush	6-12 ft.	0.25" - 1.0"	Shrub	FAC	5%
Platanus occidentalis	Sycamore	6-12 ft.	0.25" - 1.0"	Canopy	FACW	15%
Betula nigra	River Birch	6-12 ft.	0.25" - 1.0"	Canopy	FACW	15%
Quercus michauxii	Swamp Chestnut Oak	6-12 ft.	0.25" - 1.0"	Canopy	FACW	10%
Acer negundo	Boxelder	6-12 ft.	0.25" - 1.0"	Canopy	FAC	5%
*Sambucus canadensis**	Elderberry	6-12 ft.	0.25" - 1.0"	Shrub	FAC	5%
Live Stake						
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	5%
						100%

* Not included in average height calculation

** Preferred alternates: Carpinus caroliniana, Populus deltoides, Quercus nigra, Cornus amomum, Asimina triloba

BMP Planting Zone

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Herbaceous Plugs						
Juncus effusus	Common Rush	4 ft.	1.0" - 2.0" plug	Herb	FACW	20%
Carex vulpinoidea	Fox Sedge	4 ft.	1.0" - 2.0" plug	Herb	OBL	20%
Juncus coriaceus	Leathery Rush	4 ft.	1.0" - 2.0" plug	Herb	FACW	20%
Carex crinita	Fringed Sedge	4 ft.	1.0" - 2.0" plug	Herb	OBL	20%
Scirpus cyperinus	Woolgrass	4 ft.	1.0" - 2.0" plug	Herb	FACW	20%
						100%

Note: to be planted in area of lowest elevation where water may collect. Flood tolerant emergent aquatics.

Buffer Planting Zone (18.2 acres)

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Bare Root						
*Asimina triloba**	Pawpaw	6-12 ft.	0.25" - 1.0"	Subcanopy	FAC	5%
*Oxydendrum arboreum**	Sourwood	6-12 ft.	0.25" - 1.0"	Subcanopy	UPL	5%
Betula nigra	River Birch	6-12 ft.	0.25" - 1.0"	Canopy	FACW	10%
*Lindera benzoin**	Spicebush	6-12 ft.	0.25" - 1.0"	Shrub	FAC	5%
*Euonymus americana**	Strawberry Bush	6-12 ft.	0.25" - 1.0"	Shrub	FAC	5%
Platanus occidentalis	Sycamore	6-12 ft.	0.25" - 1.0"	Canopy	FACW	15%
Quercus alba	White Oak	6-12 ft.	0.25" - 1.0"	Canopy	FACU	10%
Quercus phellos	Willow Oak	6-12 ft.	0.25" - 1.0"	Canopy	FAC	10%
Quercus rubra	Northern Red Oak	6-12 ft.	0.25" - 1.0"	Canopy	FACU	5%
Diospyros virginiana	Persimmon	6-12 ft.	0.25" - 1.0"	Canopy	FAC	10%
Ulmus rubra	Slippery Elm	6-12 ft.	0.25" - 1.0"	Canopy	FAC	10%
Fagus grandifolia	American Beech	6-12 ft.	0.25" - 1.0"	Canopy	FACU	5%
Nyssa sylvatica	Blackgum	6-12 ft.	0.25" - 1.0"	Canopy	FAC	5%
						100%

Buffer Planting Zone - Partially Forested (2 acres)

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Bare Root						
*Asimina triloba**	Pawpaw	12 ft.	0.25" - 1.0"	Subcanopy	FAC	5%
*Ilex opaca**	American Holly	12 ft	0.25" - 1.0"	Subcanopy	FACU	5%
*Cornus florida**	Flowering Dogwood	12 ft.	0.25" - 1.0"	Subcanopy	FACU	5%
*Lindera benzoin**	Spicebush	12 ft.	0.25" - 1.0"	Shrub	FAC	5%
*Euonymus americana**	Strawberry Bush	12 ft.	0.25" - 1.0"	Shrub	FAC	5%
Quercus michauxii	Swamp Chestnut Oak	12 ft.	0.25" - 1.0"	Canopy	FACW	5%
Quercus alba	White Oak	12 ft.	0.25" - 1.0"	Canopy	FACU	10%
Quercus phellos	Willow Oak	12 ft.	0.25" - 1.0"	Canopy	FAC	5%
Quercus rubra	Northern Red Oak	12 ft.	0.25" - 1.0"	Canopy	FACU	10%
Diospyros virginiana	Persimmon	12 ft.	0.25" - 1.0"	Canopy	FAC	10%
Ulmus rubra	Slippery Elm	12 ft.	0.25" - 1.0"	Canopy	FAC	15%
Fagus grandifolia	American Beech	12 ft.	0.25" - 1.0"	Canopy	FACU	10%
Nyssa sylvatica	Blackgum	12 ft.	0.25" - 1.0"	Canopy	FAC	10%
* Not included in average height calculation						**100%**

** Preferred alternates: Carpinus caroliniana, Ulmus alata, Cercis canadensis, Juniperus virginiana

NOTE: NON-HATCHED AREAS WITHIN EASEMENT ARE CURRENTLY VEGETATED AND WILL BE PLANTED AS NEEDED TO ACHIEVE TARGET DENSITY. BUFFER PLANTING WILL OCCUR WITHIN THE LIMITS OF DISTURBANCE.

Permanent Riparian Seeding (18.2 acres)

Approved Dates	Species Name	Common Name	Stratum	Wetland Indicator Status	lbs/acre
Pure Live Seed (20 lbs/acre)					
All Year	*Elymus virginicus*	Virginia Wildrye	Herb	FACW	4.0
All Year	*Panicum virgatum*	Switchgrass	Herb	FAC	1.5
All Year	*Schizachyrium scoparium*	Little Bluestem	Herb	FACU	3.0
All Year	*Dichanthelium clandestinum*	Deertongue	Herb	FAC	2.5
All Year	*Chasmanthium latifolium*	River Oats	Herb	FACU	0.5
All Year	*Sorghastrum nutans*	Indiangrass	Herb	FACU	1.5
All Year	*Rudbeckia hirta*	Blackeyed Susan	Herb	FACU	1.0
All Year	*Bidens aristosa*	Bur Marigold	Herb	FACW	1.0
All Year	*Coreopsis lanceolata*	Lanceleaf Coreopsis	Herb	FACU	1.0
All Year	*Tridens flavus*	Redtop	Herb	FACW	1.0
All Year	*Chamaecrista fasciculata*	Partridge Pea	Herb	FACU	1.0
All Year	*Heliopsis helianthoides*	Oxeye Sunflower	Herb	FACU	1.0
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	OBL	1.0
					20.0

Permanent Wetland Seeding (3.8 acres)

Approved Dates	Species Name	Common Name	Stratum	Wetland Indicator Status	Density (lbs/acre)
Pure Live Seed (20 lbs/acre)					
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	OBL	3.0
All Year	*Elymus virginicus*	Virginia Wildrye	Herb	FACW	3.0
All Year	*Dichanthelium clandestinum*	Deertongue	Herb	FAC	2.0
All Year	*Carex lurida*	Lurid Sedge	Herb	OBL	2.0
All Year	*Juncus effusus*	Common Rush	Herb	FACW	2.0
All Year	*Helianthus angustifolia*	Swamp Sunflower	Herb	FACW	1.0
All Year	*Bidens aristosa*	Bur Marigold	Herb	FACW	2.0
All Year	*Panicum anceps*	Beaked Panicgrass	Herb	FAC	2.0
All Year	*Asclepias incarnata*	Swamp Milkweed	Herb	OBL	0.5
All Year	*Tripsacum dactyloides*	Eastern Gamagrass	Herb	FACW	2.5
					20.0

Permanent Seeding Outside Easement (0.2 acres)

Approved Dates	Species Name	Common Name	Stratum	Density (lbs/acre)	Percentage
All Year	*Festuca arundinacea*	Fescue	Herb	15	43%
All Year	*Dactylis glomerata*	Orchardgrass	Herb	15	43%
All Year	*Trifolium repens*	Ladino Clover	Herb	5	14%
					100%

Temporary Seeding (22.3 acres)

Approved Dates	Species Name	Common Name	Stratum	Density (lbs/acre)
Pure Live Seed				
Aug 15 - May 1	*Secale cereale*	Rye Grain	Herb	110
Aug 15 - May 1	*Avena sativa*	Winter Oats	Herb	30
May 1 - Aug 15	*Setaria italica*	German Millet	Herb	50
All Year	*Trifolium incarnatum*	Crimson Clover	Herb	5
All Year	*Trifolium repens*	Ladino Clover	Herb	5

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Planting Tables

Revisions:

Date:	10.27.2022
Job Number:	005-02150
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 4.0.0

X:\Shared\Projects\WI02150_Bridgefork_Dairy\Cad\Plans\02150 Planting Tables.dwg

October 27, 2022

MICHAEL R. GRAYSON, JR.
PIN: 2586-61-9203
DB: 1690 PG: 2266

BARBARA B. DELLINGER
(LIFE ESTATE)
BRYAN K. DELLINGER & WIFE,
MARY B. DELLINGER (REMAINDER)
PIN: 2585-49-5005
DB: 1175 PG: 1350

ELBERT W. DELLINGER & WIFE,
FAYE M. DELLINGER
(LIFE ESTATE)
MAGGIE D. MAYES
MELISSA D. PUTNAM
(REMAINDER)
PIN: 2586-70-4443
(NOT UPDATED)
DB: 1790 PG: 1883
(PORTION OF TRACT 2)

JIMMIE M. BLANTON
PIN: 2585-69-9037
PORTION OF DB: 1122 PG: 1299
REF. DB: 1604 PG: 977
(EXCEPTION TRACT)

THOMAS D. DIXON & WIFE,
KATHY H. DIXON
MELANIE DIXON
AMY D. MALCOM
PIN: 2586-30-6202
DB: 1783 PG: 1609

BARBARA B. DELLINGER
(LIFE ESTATE)
DAVID L. DELLINGER
(REMAINDER)
PIN: 2585-59-5279
DB: 1183 PG: 2205

BRYAN K. DELLINGER & WIFE,
MARY E. DELLINGER
PIN: 2585-68-4939
PORTION OF DB: 1612 PG: 2361

JIMMIE M. BLANTON
PIN: 2585-79-2273
DB: 14-M PG: 842

BARBARA B. DELLINGER
PIN: 2585-58-8903
DB: 15-C PG: 349

BRYAN K. DELLINGER & WIFE,
MARY E. DELLINGER
PIN: 2585-67-5964
DB: 1604 PG: 977

WILLIAM L. HAMRICK
PIN: 2586-81-2597
DB: 1769 PG: 2108

FRANKIE H. WEBSTER
PIN: 2585-88-3554
DB: 1818 PG: 1726

HAYWARD D. BULLOCK & WIFE,
NANCY L. BULLOCK
PIN: 2585-88-5323
DB: 11-R PG: 476

LUKE E. JUDD
PIN: 2585-48-7530
DB: 1774 PG: 2043
(PORTION OF TRACT ONE)
PB: 41 PG: 8 (TRACT 3)

LUKE E. JUDD
PIN: 2585-58-4130
DB: 1774 PG: 2043
(PORTION OF TRACT ONE)
PB: 41 PG: 8 (TRACT 2)

JERRY E. PATTERSON
DENNIS C. PATTERSON & WIFE,
SUSAN H. PATTERSON
PIN: 2585-77-7748
PORTION OF DB: 1642 PG: 643 &
DB: 1718 PG: 1059
PB: 6 PG: 67
(PORTIONS OF TRACTS 11-15)

DENNIS C. PATTERSON & WIFE,
SUSAN H. PATTERSON
PIN: 2585-87-7920
DB:16-G PG: 356 &
DB: 16-N PG: 392

DENNIS C. PATTERSON & WIFE,
SUSAN H. PATTERSON
PIN: 2585-87-8557
DB: 1310 PG: 257 &
DB: 1314 PG: 1782
PB: 6 PG: 67
(PORTIONS OF TRACTS 10 & 11)

JORDAN T. DEMERS
PIN: 2585-48-2172
DB: 1734 PG: 1513

ROGER D. COSTNER
PIN: 2585-48-3164
DB: 1374 PG: 384 &
DB: 1290 PG: 868

BRADLEY S. YARBRO & WIFE,
SHERRY D. YARBRO
PIN: 2585-48-5231
DB: 1174 PG: 1432

JIMMY J. HILL
PIN: 2585-47-9885
DB: 1263 PG: 1250

KENNETH D. CORN & WIFE,
BEVERLY L. CORN
PIN: 2585-57-2786
DB: 1350 PG: 486

JEFFREY V. CANNOVA
PIN: 2585-57-4629
DB: 1543 PG: 1806

KENNETH R. MABE & WIFE,
BARBARA J. MABE
PIN: 2585-57-6612
DB: 1119 PG: 1094

LUKE E. JUDD
PIN: 2585-67-0580
DB: 1774 PG: 2043
(PORTION OF TRACT ONE)
PB: 41 PG: 8 (TRACT 1)

PATRICK R. MCPHERSON & WIFE,
LAURA L. MCPHERSON
PIN: 2585-66-7897
DB: 1467 PG: 77
PB: 28 PG: 174
PB: 30 PG 184

4.5.1
4.5.2
4.1.6
4.1.5
4.3.1
4.4.1
4.1.3
4.1.2
4.1.1
4.2.1

UT6A
UT6
UT5
UT4
UT4A
UT3
UT2
UT1

BRIDGEFORK CREEK
BRIDGEFORK CREEK

DILLON ROAD
PATTERSON ROAD
US HIGHWAY 74

0' 200' 400' 600'
(HORIZONTAL)

N

K:\shared\Projects\W02690_Bridgefork_Dairy\Cadd\Plans\02690 Planting Overview.dwg

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

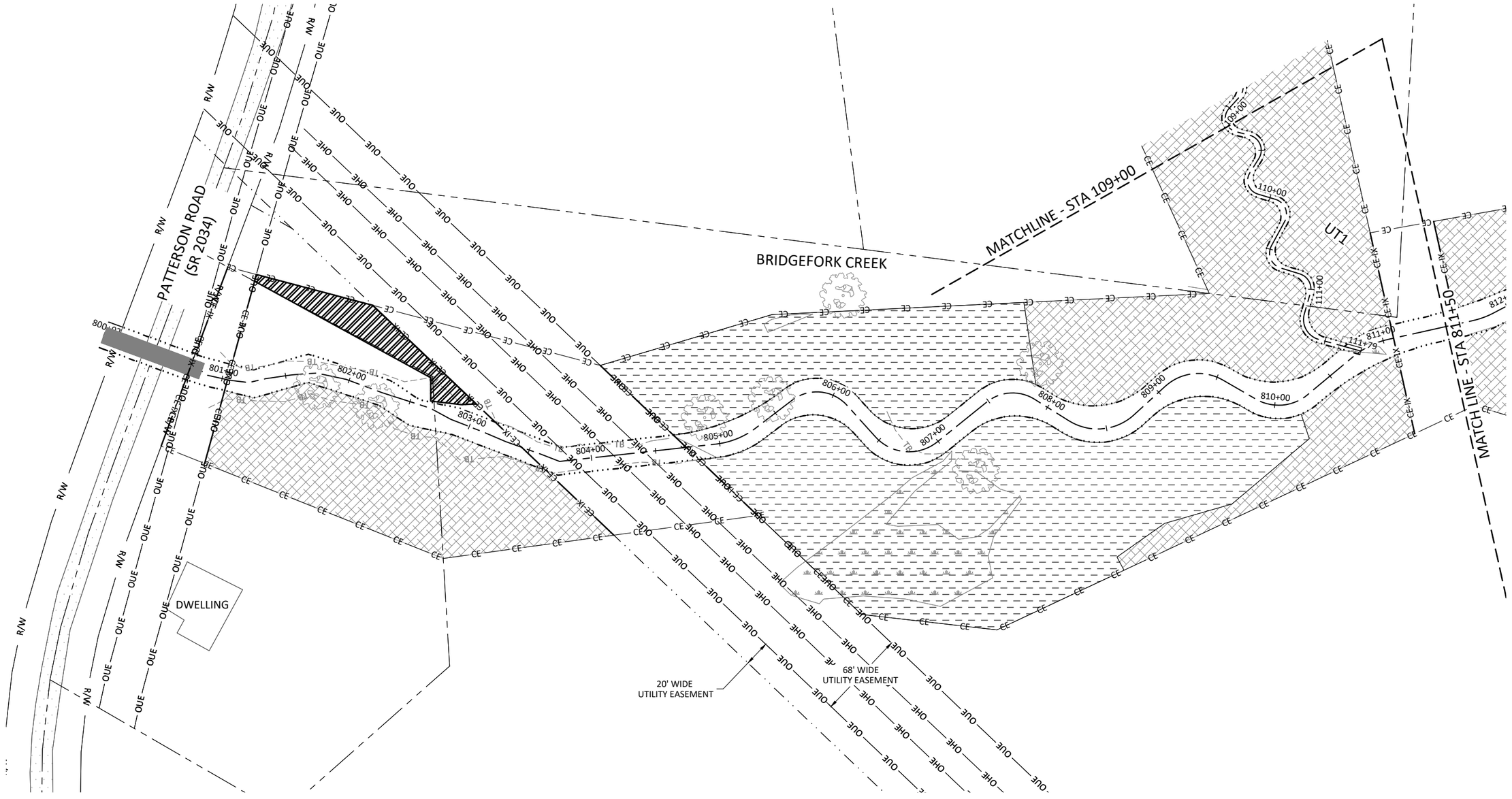
Planting Plan Overview

Revisions:

Date: 10.27.2022
Job Number: 005-02150
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Sheet 4.0.1

October 27, 2023



Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Zone 4 - Permanent Seeding Outside Easement

Zone 5 - Supplemental Planting Zone

Note: Non-hatched areas within easement are currently vegetated. Buffer planting will occur within the Limits of Disturbance

N

0' 40' 80' 120'
(HORIZONTAL)

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Bridgefork Dairy Mitigation Site
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Bridgefork Creek
Planting Plan

Revisions:

Date:	10.27.2022
Job Number:	005-02156
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 4.1.1

October 27, 2022

US HIGHWAY 74

R/W

200+00

VARIABLE WIDTH
WATERLINE EASEMENT

CE

201+00

UT2

BRIDGEFORK CREEK

202+00

202+65

813+00

814+00

816+00

817+00

818+00

819+00

820+00

821+00

822+00

812+00

UT1

MATCH LINE - STA 811+50

111+00

111+79

811+00

810+00

MATCH LINE - STA 823+00

N

0' 40' 80' 120'
(HORIZONTAL)

Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Zone 4 - Permanent Seeding Outside Easement

Zone 5 - Supplemental Planting Zone

Note: Non-hatched areas within easement are currently vegetated. Buffer planting will occur within the Limits of Disturbance

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

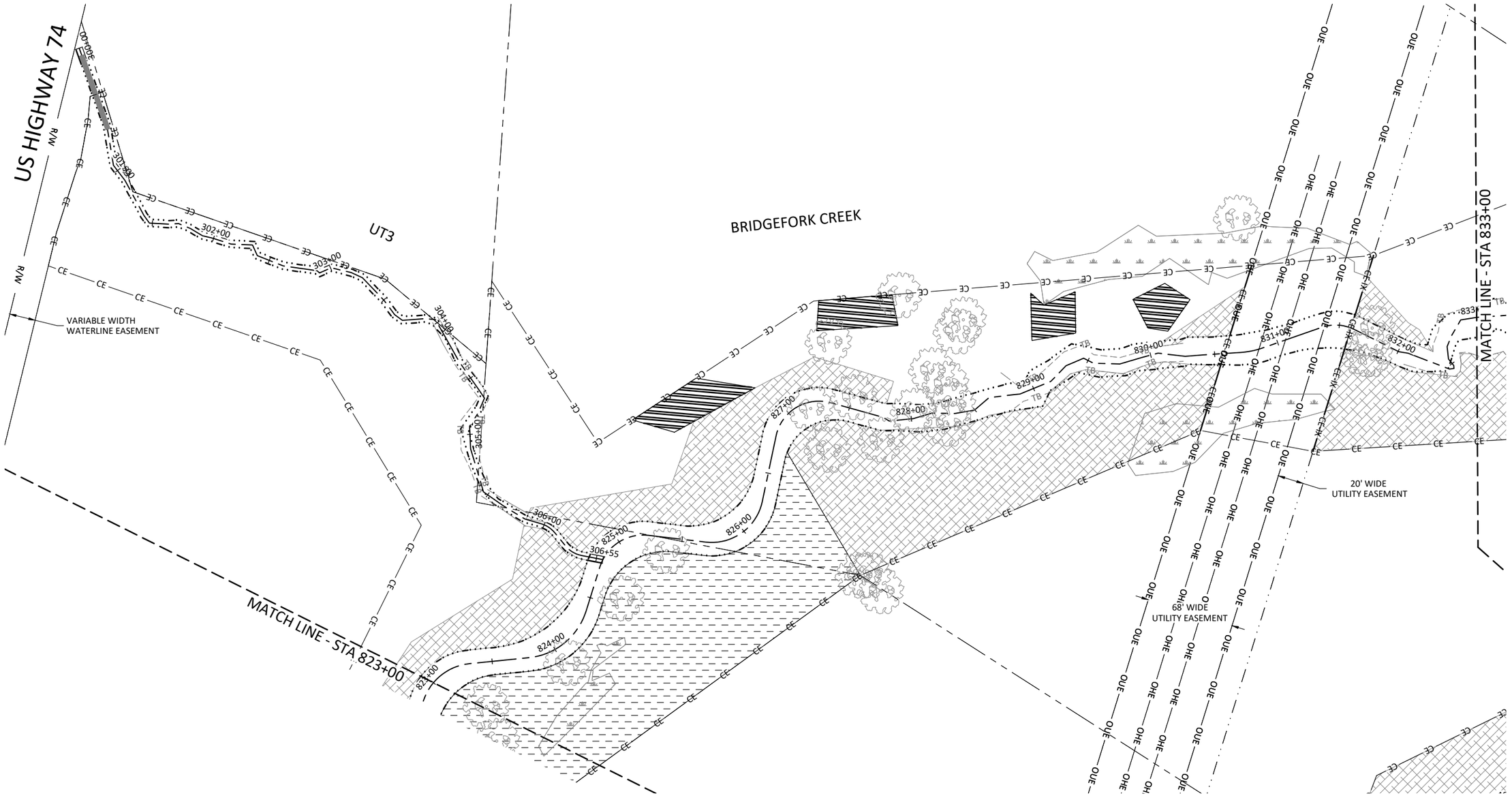
Bridgefork Creek & UT2
Planting Plan

Revisions:

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 4.1.2

October 27, 2022



Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Zone 4 - Permanent Seeding Outside Easement

Zone 5 - Supplemental Planting Zone

Note: Non-hatched areas within easement are currently vegetated. Buffer planting will occur within the Limits of Disturbance

N

0' 40' 80' 120'
(HORIZONTAL)

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

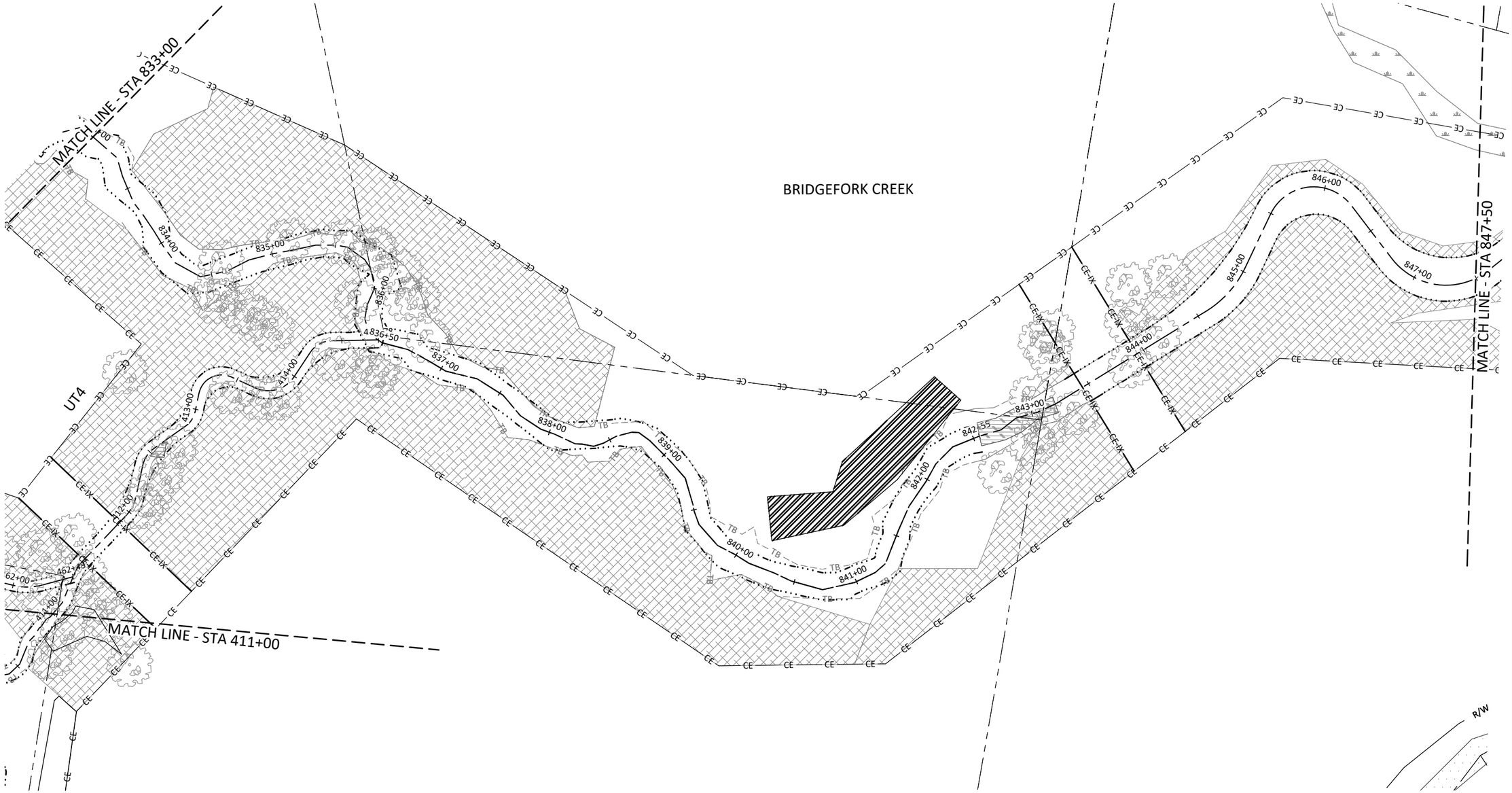
Bridgefork Creek & UT3
Planting Plan

Revisions:

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EHN
Drawn By:	CAW
Checked By:	CDB

Sheet 4.1.3

October 27, 2021



Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Zone 4 - Permanent Seeding Outside Easement

Zone 5 - Supplemental Planting Zone

Note: Non-hatched areas within easement are currently vegetated. Buffer planting will occur within the Limits of Disturbance

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

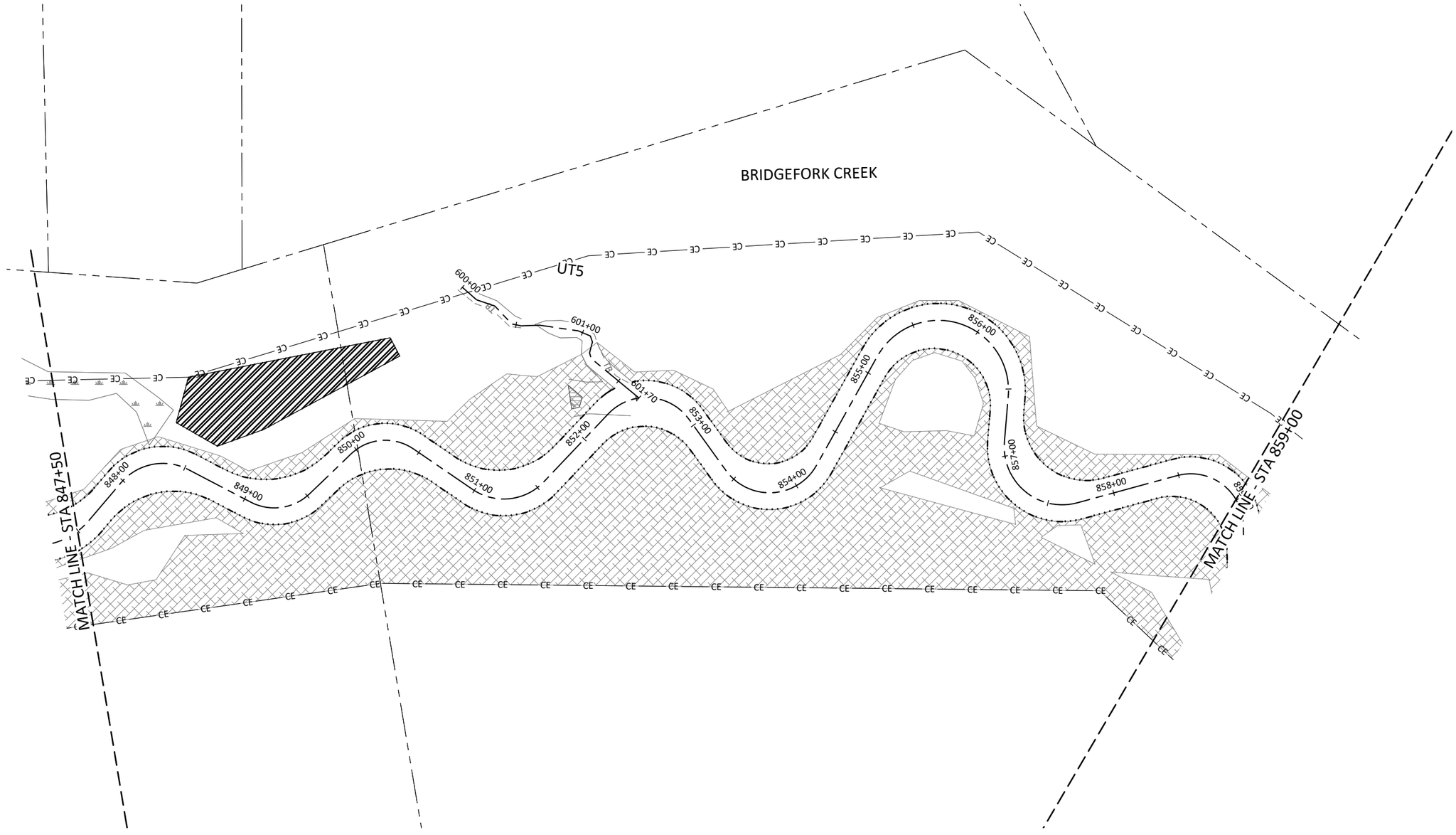
Bridgefork Creek
Planting Plan

Revisions:

Date: 10.27.2022
Job Number: 005-02190
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Sheet 4.1.4

October 27, 2021



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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek & UT5
Planting Plan

Revisions:

Date:	10.27.2022
Job Number:	005-02150
Project Engineer:	EHN
Drawn By:	CAW
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Sheet 4.1.5

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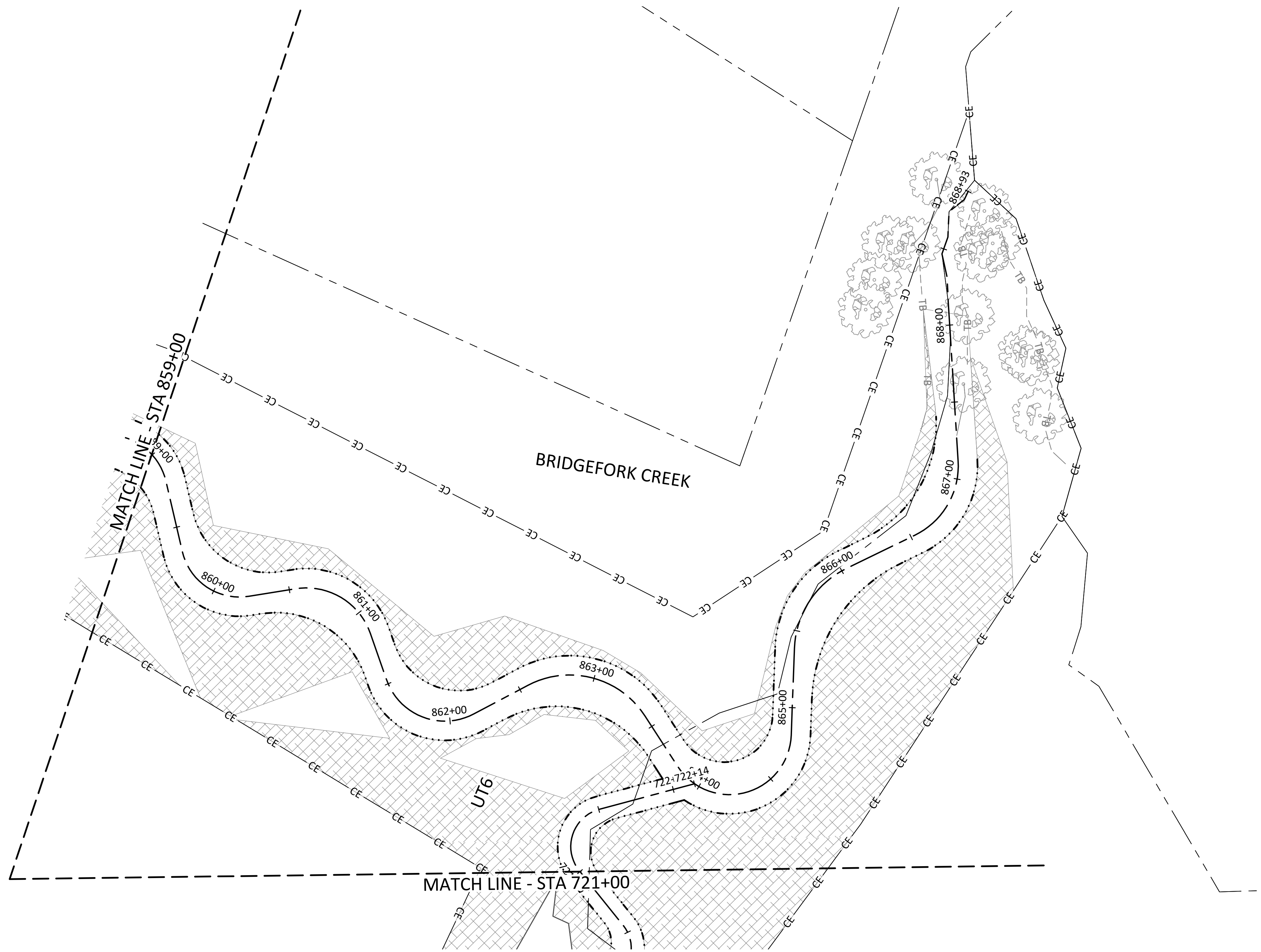

Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Zone 4 - Permanent Seeding Outside Easement

Zone 5 - Supplemental Planting Zone

Note: Non-hatched areas within easement are currently vegetated. Buffer planting will occur within the Limits of Disturbance

0' 40' 80' 120' (HORIZONTAL)

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

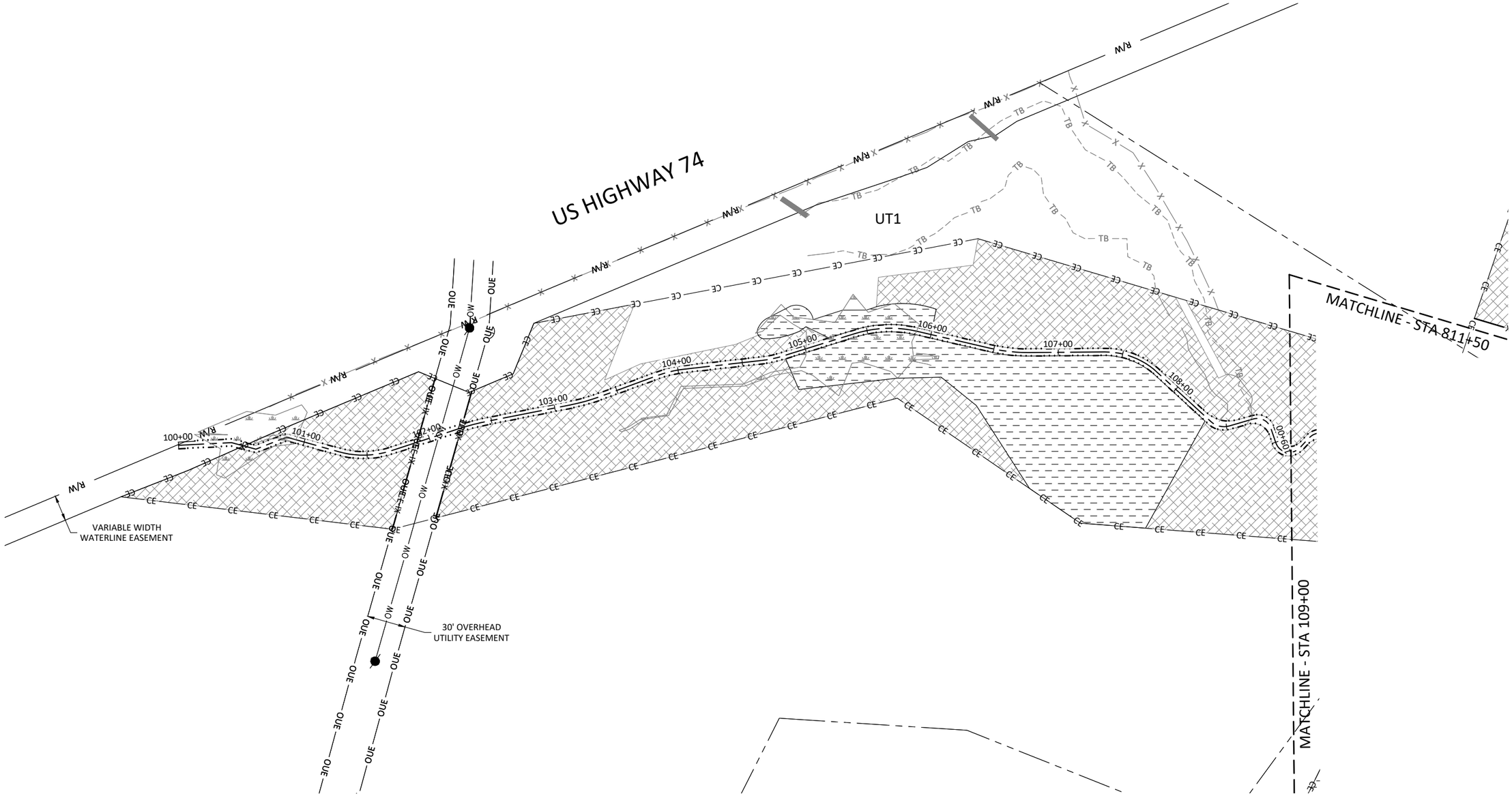
Bridgefork Creek
Planting Plan

Revisions:

Date: 10.27.2022
Job Number: 005-02190
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Sheet 4.1.6

October 27, 2023



Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Zone 4 - Permanent Seeding Outside Easement

Zone 5 - Supplemental Planting Zone

Note: Non-hatched areas within easement are currently vegetated. Buffer planting will occur within the Limits of Disturbance

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT1
Planting Plan

Revisions:

Date: 10.27.2022
Job Number: 005-02190
Project Engineer: EPN
Drawn By: CAW
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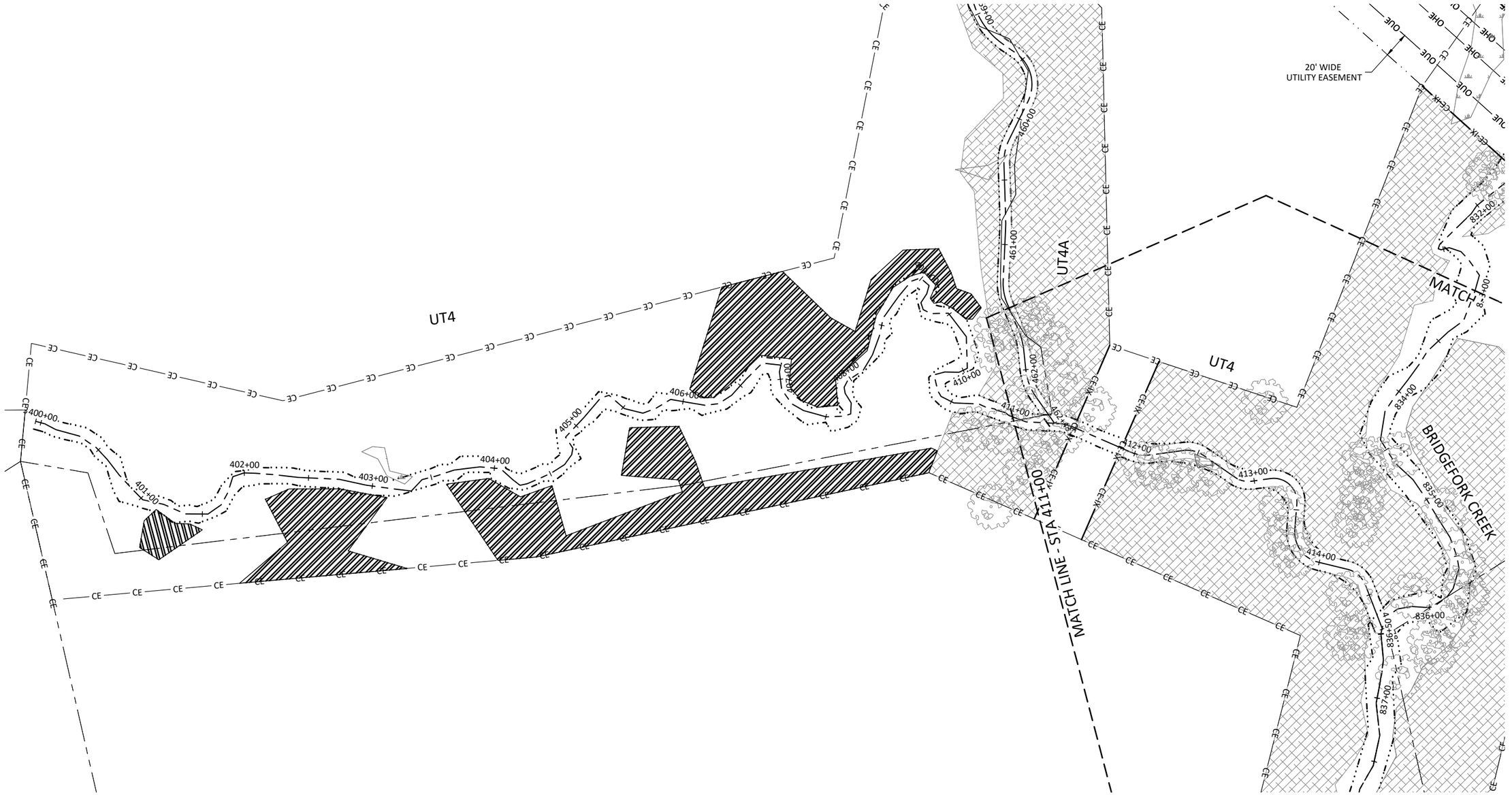
Sheet 4.2.1

October 27, 2022



Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Zone 4 - Permanent Seeding Outside Easement

Zone 5 - Supplemental Planting Zone

Note: Non-hatched areas within easement are currently vegetated. Buffer planting will occur within the Limits of Disturbance

0' 40' 80' 120'
(HORIZONTAL)

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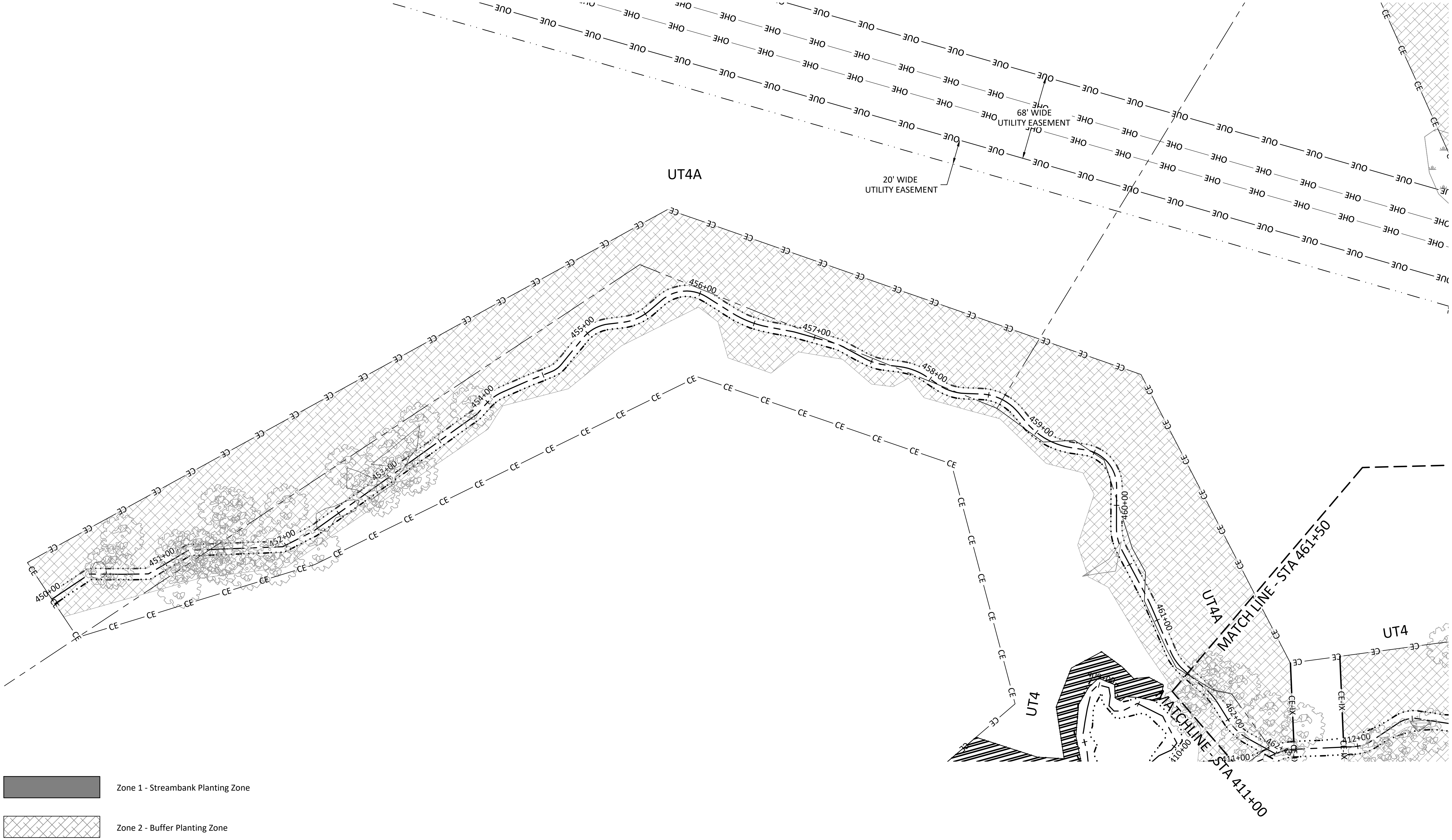
Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT4
Planting Plan

Revisions:

Date: 10.27.2022
Job Number: 005-02190
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Sheet 4.3.1



Zone 1 - Streambank Planting Zone

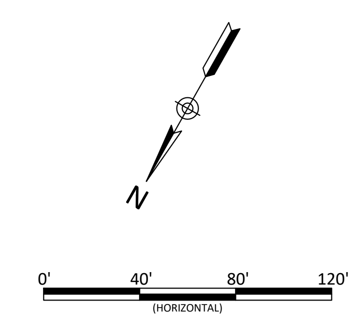
Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Zone 4 - Permanent Seeding Outside Easement

Zone 5 - Supplemental Planting Zone

Note: Non-hatched areas within easement are currently vegetated. Buffer planting will occur within the Limits of Disturbance



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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT4A
Planting Plan

Revisions:

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
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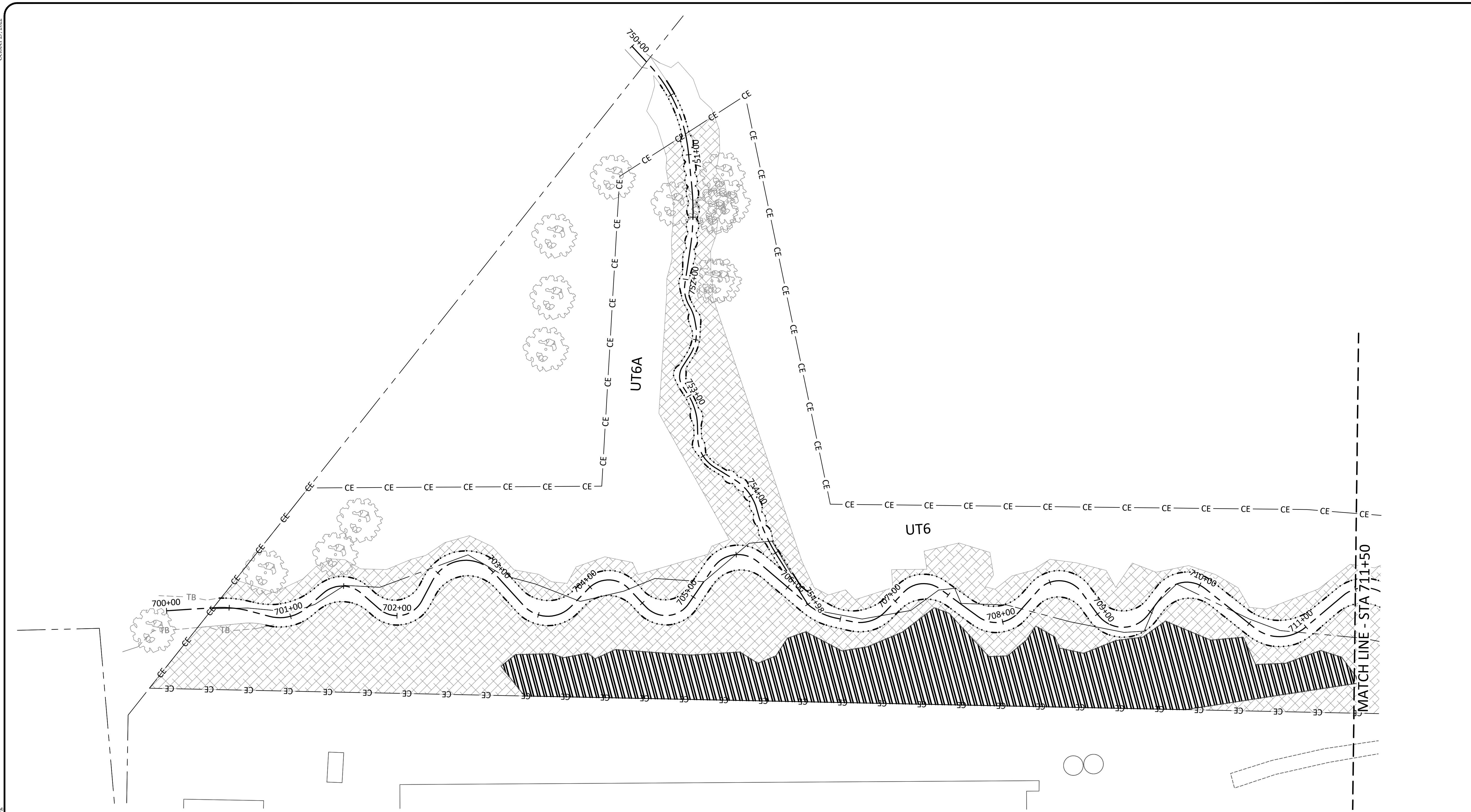
Sheet 4.4.1



Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Zone 4 - Permanent Seeding Outside Easement

Zone 5 - Supplemental Planting Zone

Note: Non-hatched areas within easement are currently vegetated. Buffer planting will occur within the Limits of Disturbance

0' 40' 80' 120'
(HORIZONTAL)

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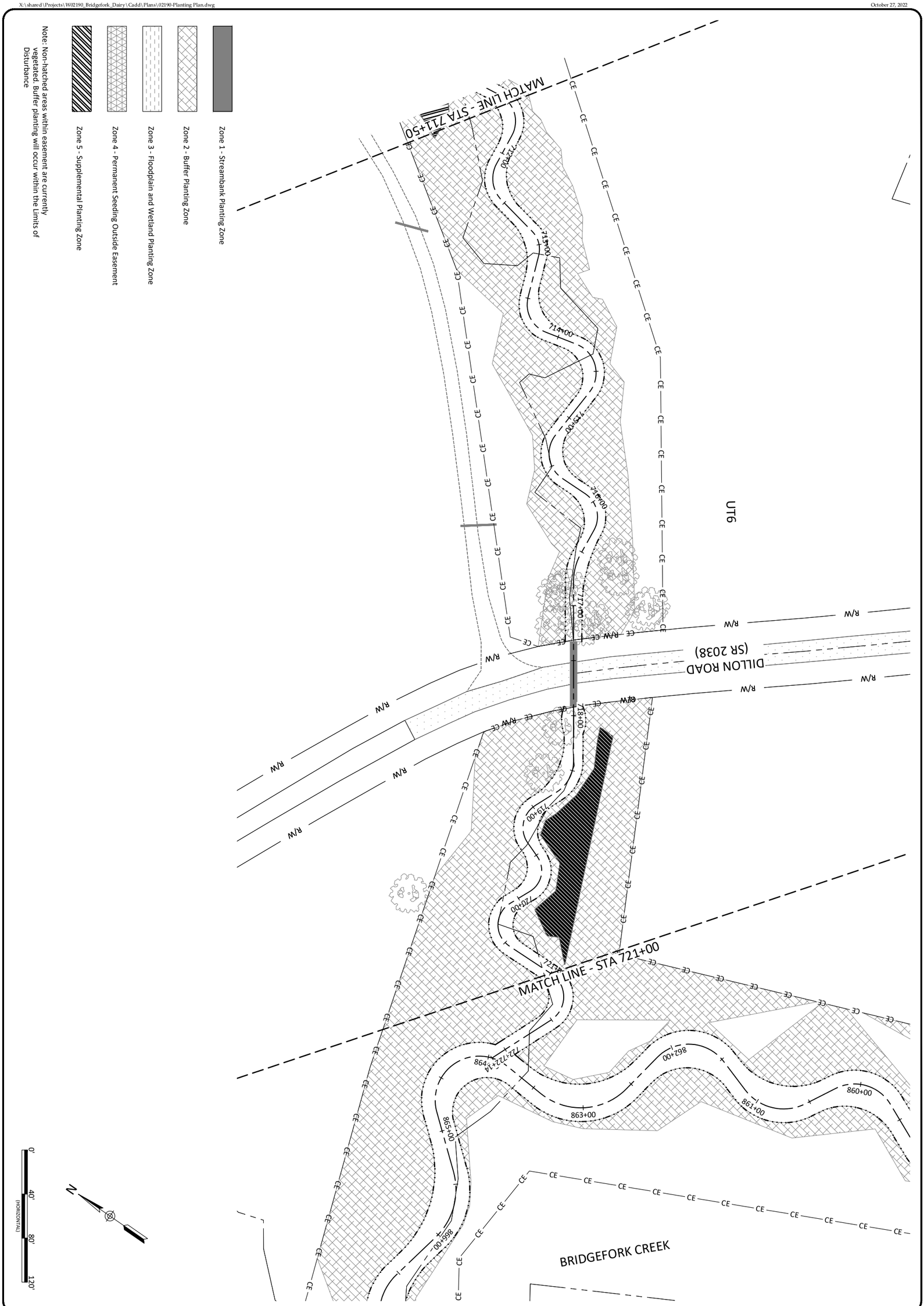
Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT6 & UT6A
Planting Plan

Revisions:

Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 4.5.1



Date:	10.27.2022
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
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Revisions:

4.5.2
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT6
Planting Plan

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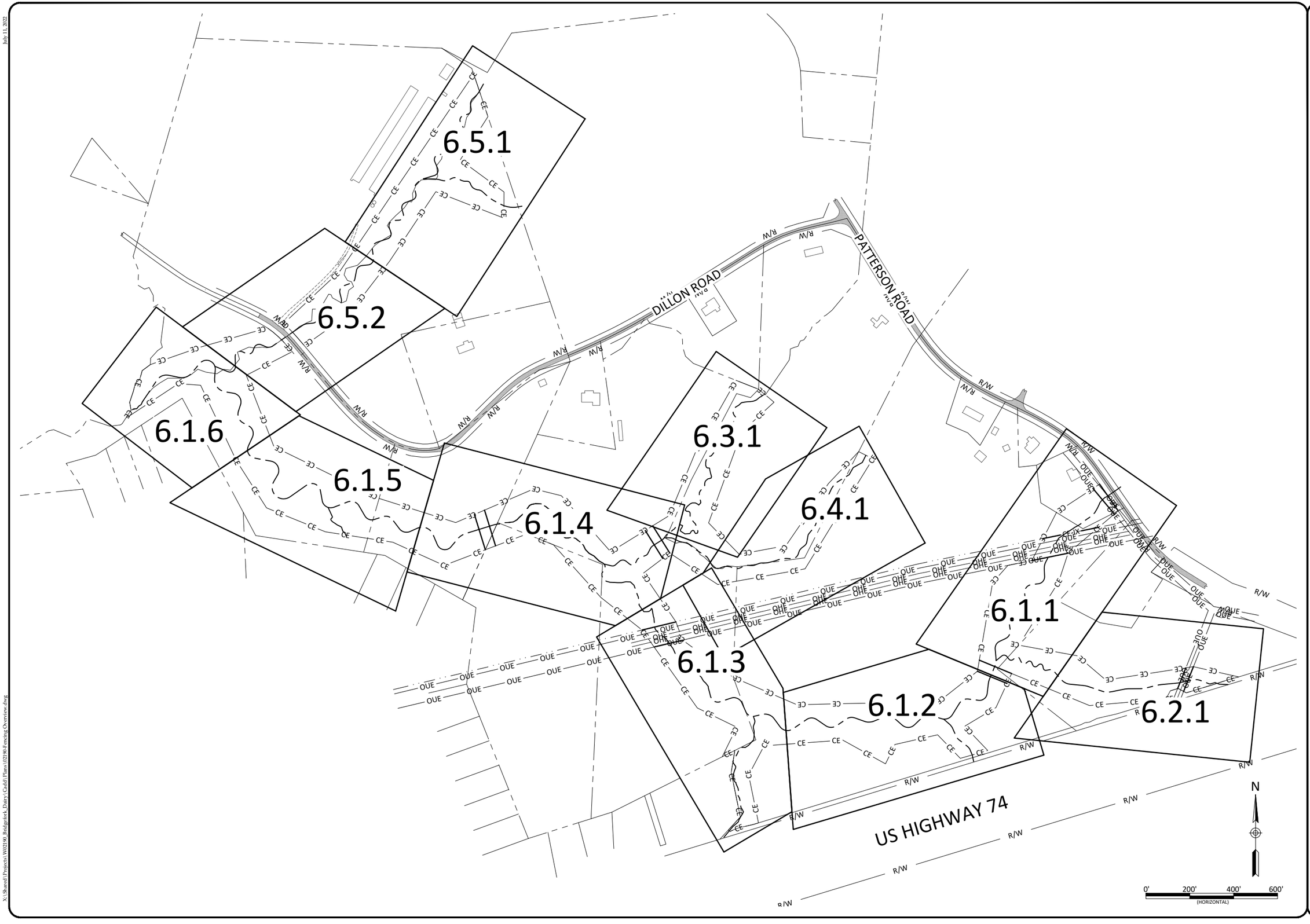
July 11, 2023



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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Fencing Plan Overview

Revisions:

Date:	07.11.22
Job Number:	005-02150
Project Engineer:	EFN
Drawn By:	CAW
Checked By:	CDB

Sheet 6.0.0

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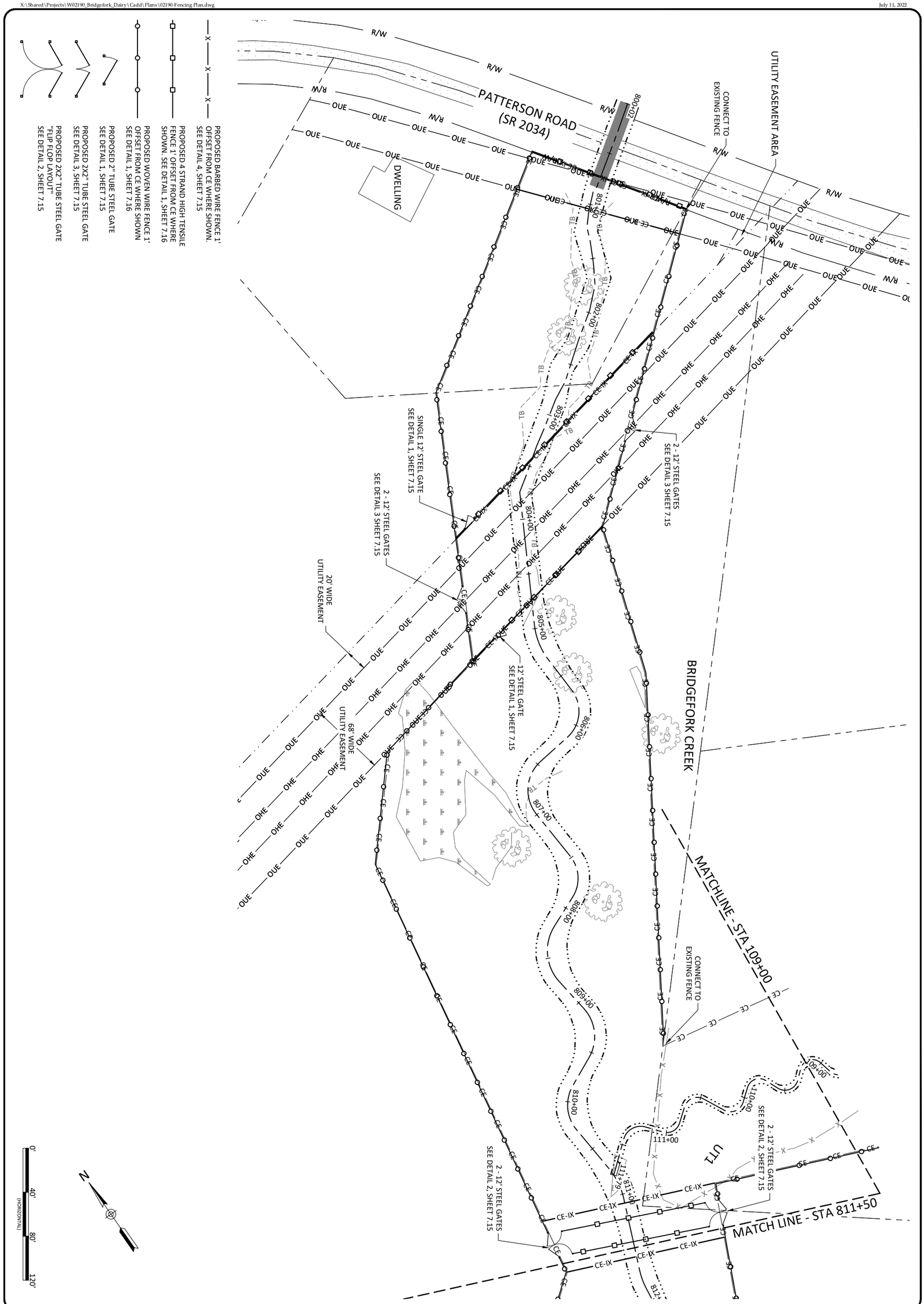

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

6.1.1
Sheet

Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek
Fencing Plan

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July 11, 2023

US HIGHWAY 74

R/W

VARIABLE WIDTH
WATERLINE EASEMENT

200+00

201+00

202+00

202+75

UT2

BRIDGEFORK CREEK

SINGLE 12' STEEL GATE
SEE DETAIL 1, SHEET 7.15

MATCH LINE - STA 823+00

813+00

814+00

816+00

817+00

818+00

819+00

820+00

821+00

822+00

823+00

2 - 12' STEEL GATES
SEE DETAIL 2, SHEET 7.15

UT1

812+00

811+79

811+00

810+00

CE-IX

MATCH LINE - STA 811+50

2 - 12' STEEL GATES
SEE DETAIL 2, SHEET 7.15

CE

PROPOSED BARBED WIRE FENCE 1' OFFSET FROM CE WHERE SHOWN. SEE DETAIL 4, SHEET 7.15

PROPOSED 4 STRAND HIGH TENSILE FENCE 1' OFFSET FROM CE WHERE SHOWN. SEE DETAIL 1, SHEET 7.16

PROPOSED WOVEN WIRE FENCE 1' OFFSET FROM CE WHERE SHOWN SEE DETAIL 1, SHEET 7.16

PROPOSED 2" TUBE STEEL GATE SEE DETAIL 1, SHEET 7.15

PROPOSED 2X2" TUBE STEEL GATE SEE DETAIL 3, SHEET 7.15

PROPOSED 2X2" TUBE STEEL GATE "FLIP FLOP LAYOUT" SEE DETAIL 2, SHEET 7.15

N

0' 40' 80' 120'
(HORIZONTAL)

X:\Shared\Projects\WI0190_Bridgefork_Dairy\Cadd\Plans\020190 Fencing Plan.dwg

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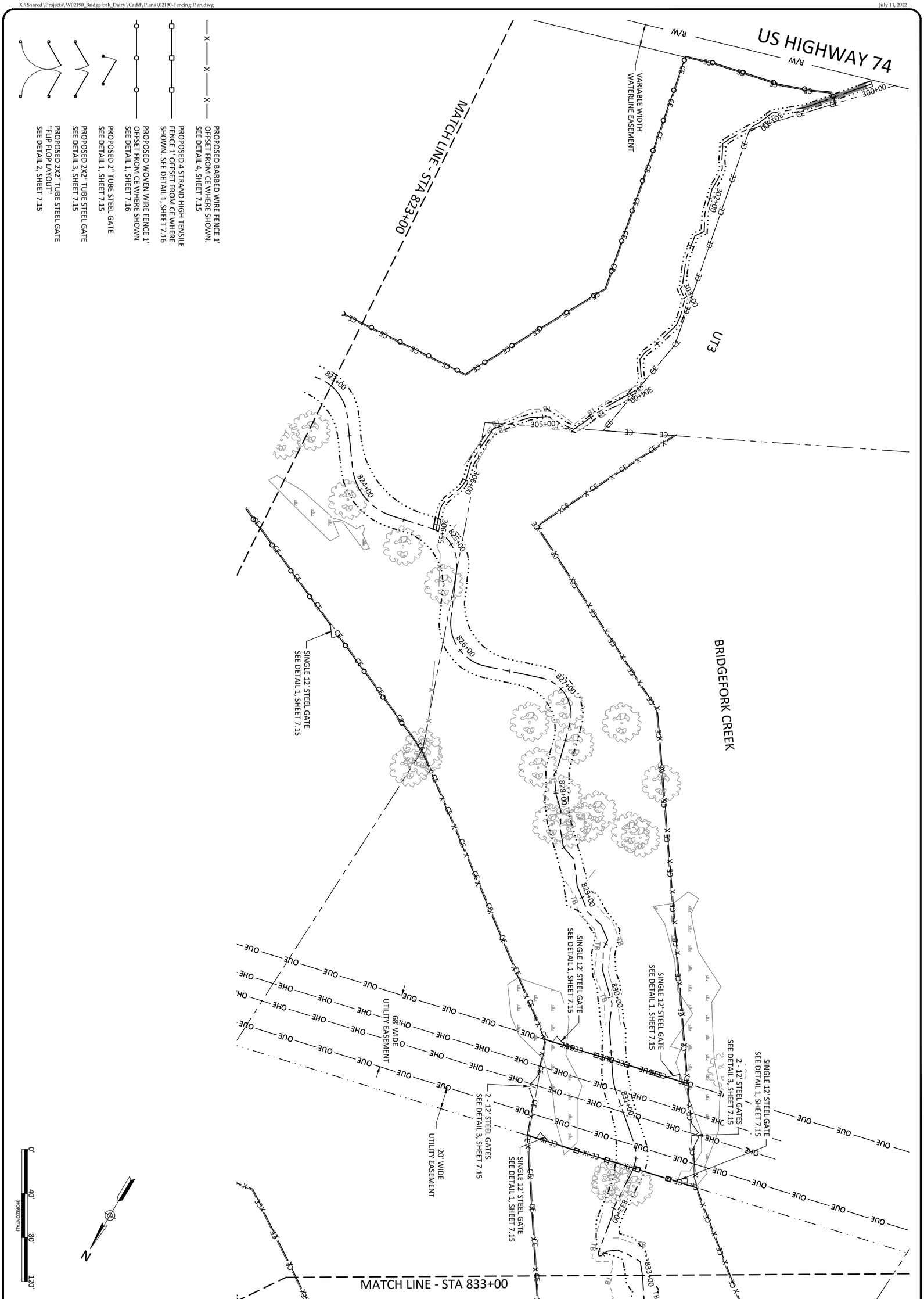
Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek & UT2
Fencing Plan

Revisions:

Date: 07.11.22
Job Number: 085-02194
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Sheet 6.1.2



Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

6.1.3
Sheet

Revisions:

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek & UT3
Fencing Plan

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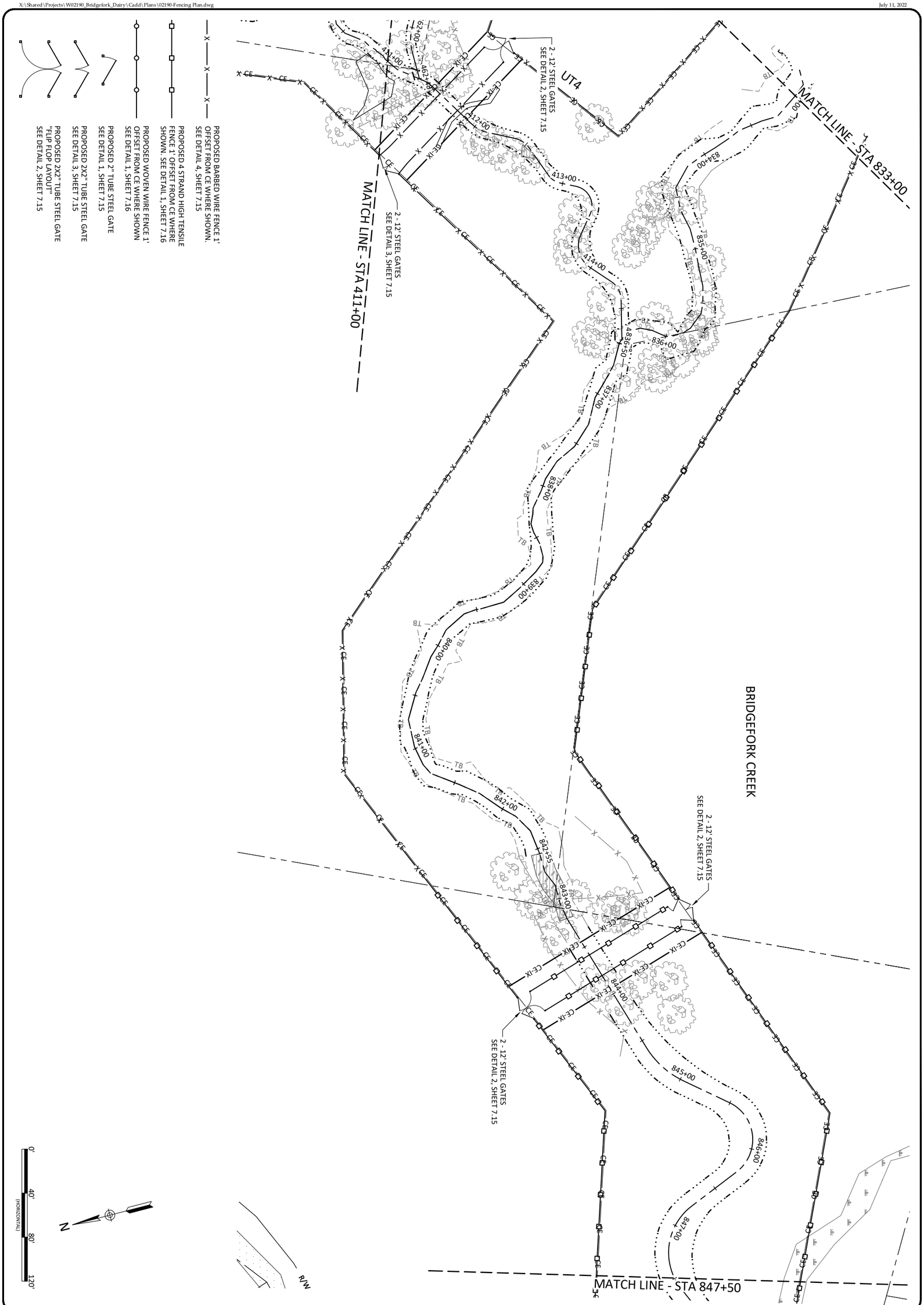

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

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6.1.4
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Bridgefork Dairy Mitigation Site
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Bridgefork Creek
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PROPOSED BARBED WIRE FENCE 1' OFFSET FROM CE WHERE SHOWN. SEE DETAIL 4, SHEET 7.15

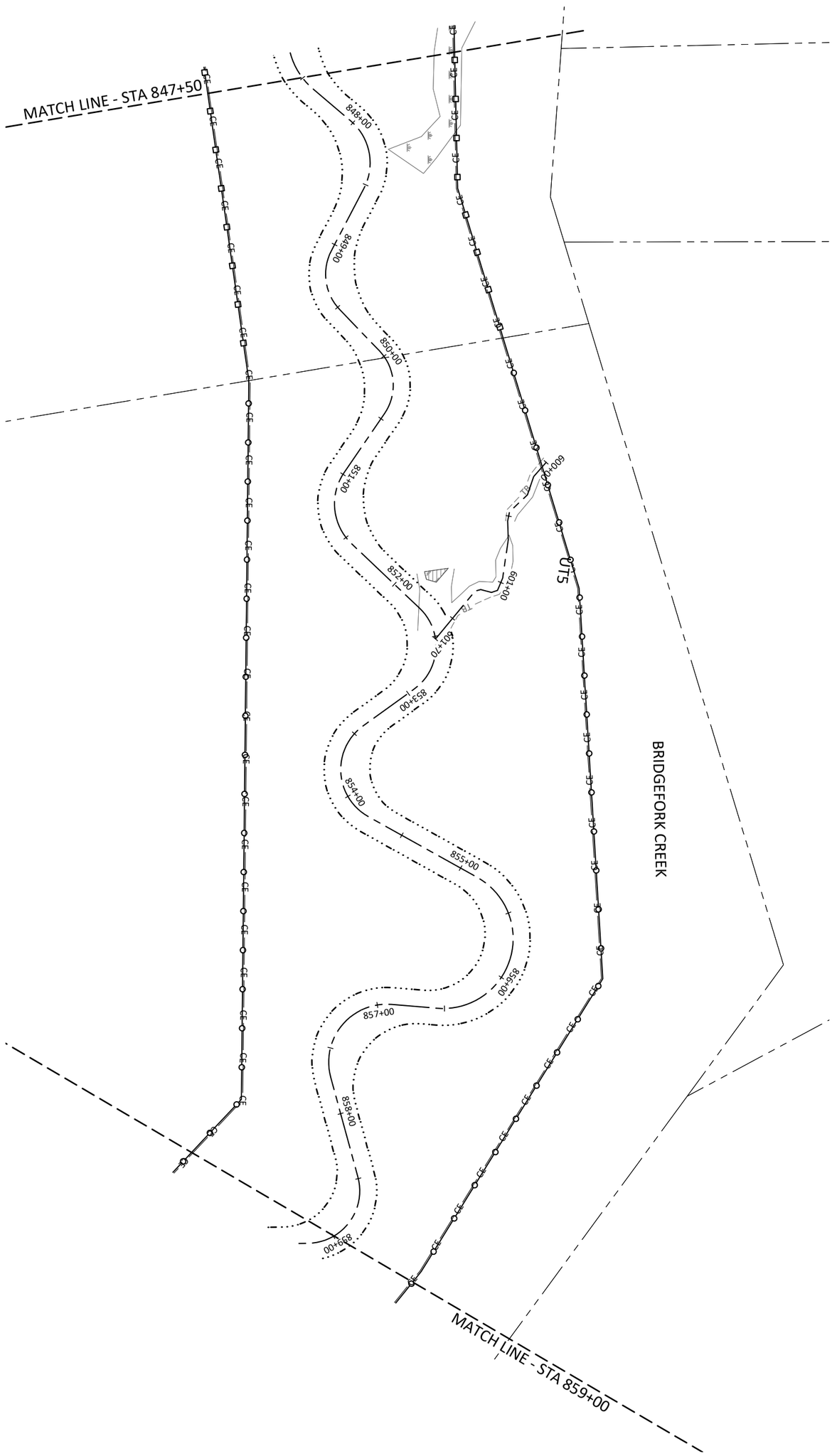
PROPOSED 4 STRAND HIGH TENSILE FENCE 1' OFFSET FROM CE WHERE SHOWN. SEE DETAIL 1, SHEET 7.16

PROPOSED WOVEN WIRE FENCE 1' OFFSET FROM CE WHERE SHOWN SEE DETAIL 1, SHEET 7.16

PROPOSED 2" TUBE STEEL GATE SEE DETAIL 1, SHEET 7.15

PROPOSED 2X2" TUBE STEEL GATE SEE DETAIL 3, SHEET 7.15

PROPOSED 2X2" TUBE STEEL GATE "FLIP FLOP LAYOUT" SEE DETAIL 2, SHEET 7.15



0' 40' 80' 120'
(HORIZONTAL)

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Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

6.1.5
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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek & UT5
Fencing Plan

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PROPOSED BARBED WIRE FENCE 1'
OFFSET FROM CE WHERE SHOWN.
SEE DETAIL 4, SHEET 7.15

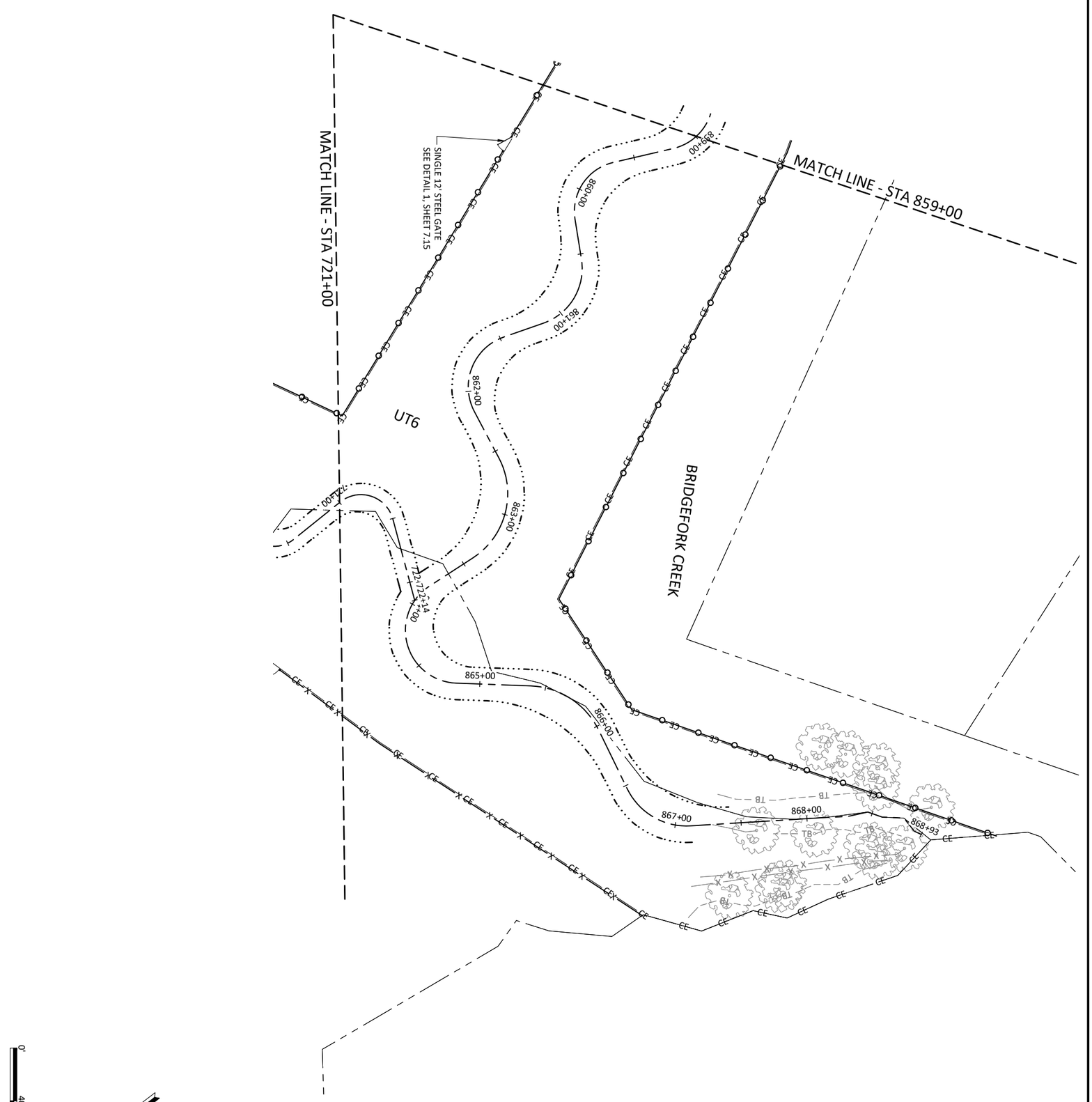
PROPOSED 4 STRAND HIGH TENSILE
FENCE 1' OFFSET FROM CE WHERE
SHOWN. SEE DETAIL 1, SHEET 7.16

PROPOSED WOVEN WIRE FENCE 1'
OFFSET FROM CE WHERE SHOWN
SEE DETAIL 1, SHEET 7.16

PROPOSED 2" TUBE STEEL GATE
SEE DETAIL 1, SHEET 7.15

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 3, SHEET 7.15

PROPOSED 2X2" TUBE STEEL GATE
"FLIP FLOP LAYOUT"
SEE DETAIL 2, SHEET 7.15



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Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
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6.1.6
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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Bridgefork Creek
Fencing Plan

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July 11, 2023

US HIGHWAY 74

UT1

SINGLE 12' STEEL GATE
SEE DETAIL 1, SHEET 7.15

VARIABLE WIDTH
WATERLINE EASEMENT

30' OVERHEAD
UTILITY EASEMENT

MATCHLINE - STA 811+50

MATCHLINE - STA 109+00

PROPOSED BARBED WIRE FENCE 1' OFFSET FROM CE WHERE SHOWN. SEE DETAIL 4, SHEET 7.15

PROPOSED 4 STRAND HIGH TENSILE FENCE 1' OFFSET FROM CE WHERE SHOWN. SEE DETAIL 1, SHEET 7.16

PROPOSED WOVEN WIRE FENCE 1' OFFSET FROM CE WHERE SHOWN SEE DETAIL 1, SHEET 7.16

PROPOSED 2" TUBE STEEL GATE SEE DETAIL 1, SHEET 7.15

PROPOSED 2X2" TUBE STEEL GATE SEE DETAIL 3, SHEET 7.15

PROPOSED 2X2" TUBE STEEL GATE "FLIP FLOP LAYOUT" SEE DETAIL 2, SHEET 7.15

N

0' 40' 80' 120'
(HORIZONTAL)

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Bridgefork Dairy Mitigation Site
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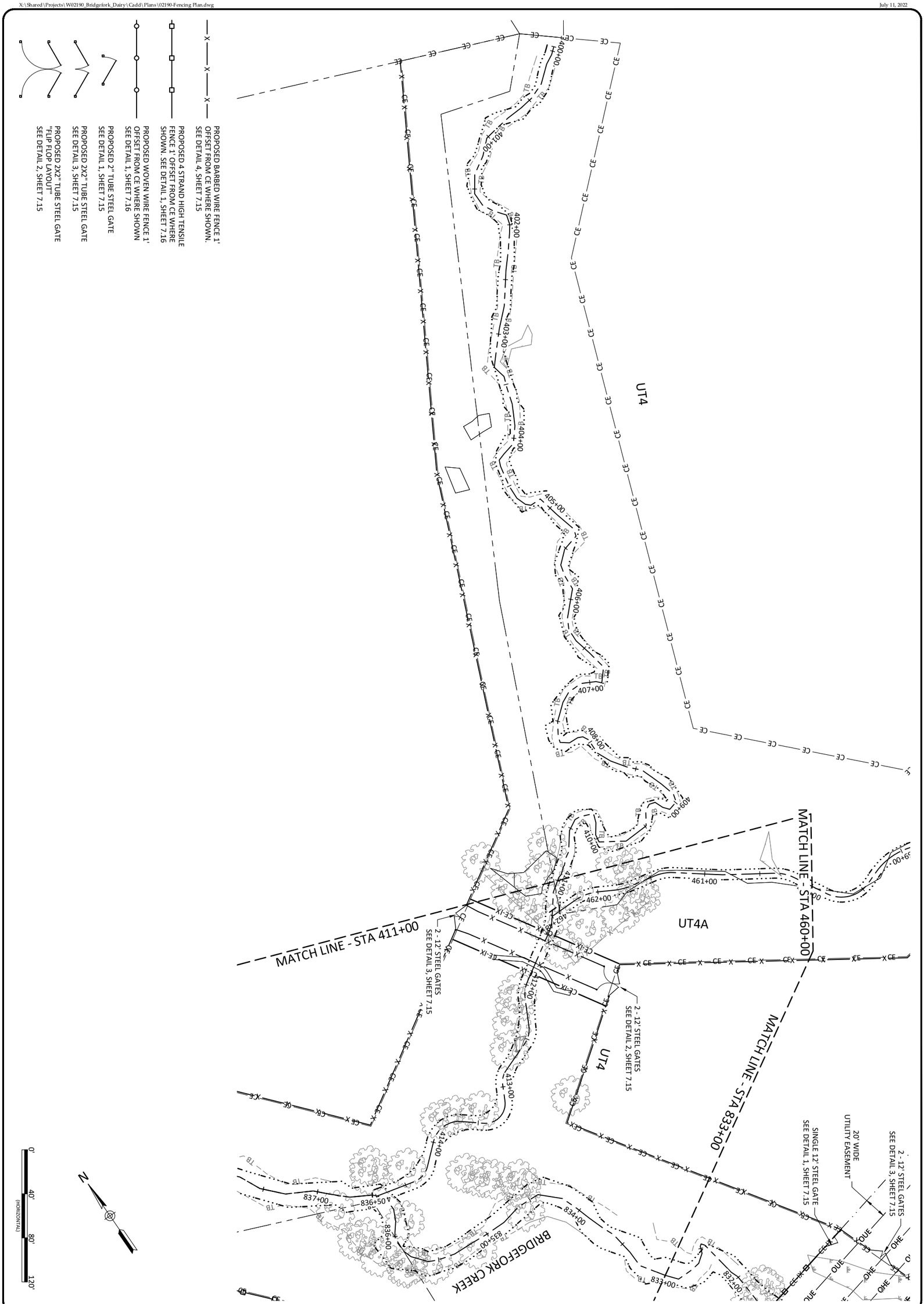
UT1
Fencing Plan

Revisions:

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 6.2.1



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6.3.1
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT4
Fencing Plan

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UT4A

SINGLE 12' STEEL GATE
SEE DETAIL 1, SHEET 7.15

20' WIDE
UTILITY EASEMENT

68' WIDE
UTILITY EASEMENT

MATCH LINE - STA 833+00

MATCH LINE - STA 460+00

MATCHLINE - STA 0+00

2 - 12' STEEL GATES
SEE DETAIL 2, SHEET 7.15

UT4

UT4A

UT4

PROPOSED BARBED WIRE FENCE 1' OFFSET FROM CE WHERE SHOWN. SEE DETAIL 4, SHEET 7.15

PROPOSED 4 STRAND HIGH TENSILE FENCE 1' OFFSET FROM CE WHERE SHOWN. SEE DETAIL 1, SHEET 7.16

PROPOSED WOVEN WIRE FENCE 1' OFFSET FROM CE WHERE SHOWN SEE DETAIL 1, SHEET 7.16

PROPOSED 2" TUBE STEEL GATE SEE DETAIL 1, SHEET 7.15

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PROPOSED 2X2" TUBE STEEL GATE "FLIP FLOP LAYOUT" SEE DETAIL 2, SHEET 7.15

N

0' 40' 80' 120'
(HORIZONTAL)

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UT4A
Fencing Plan

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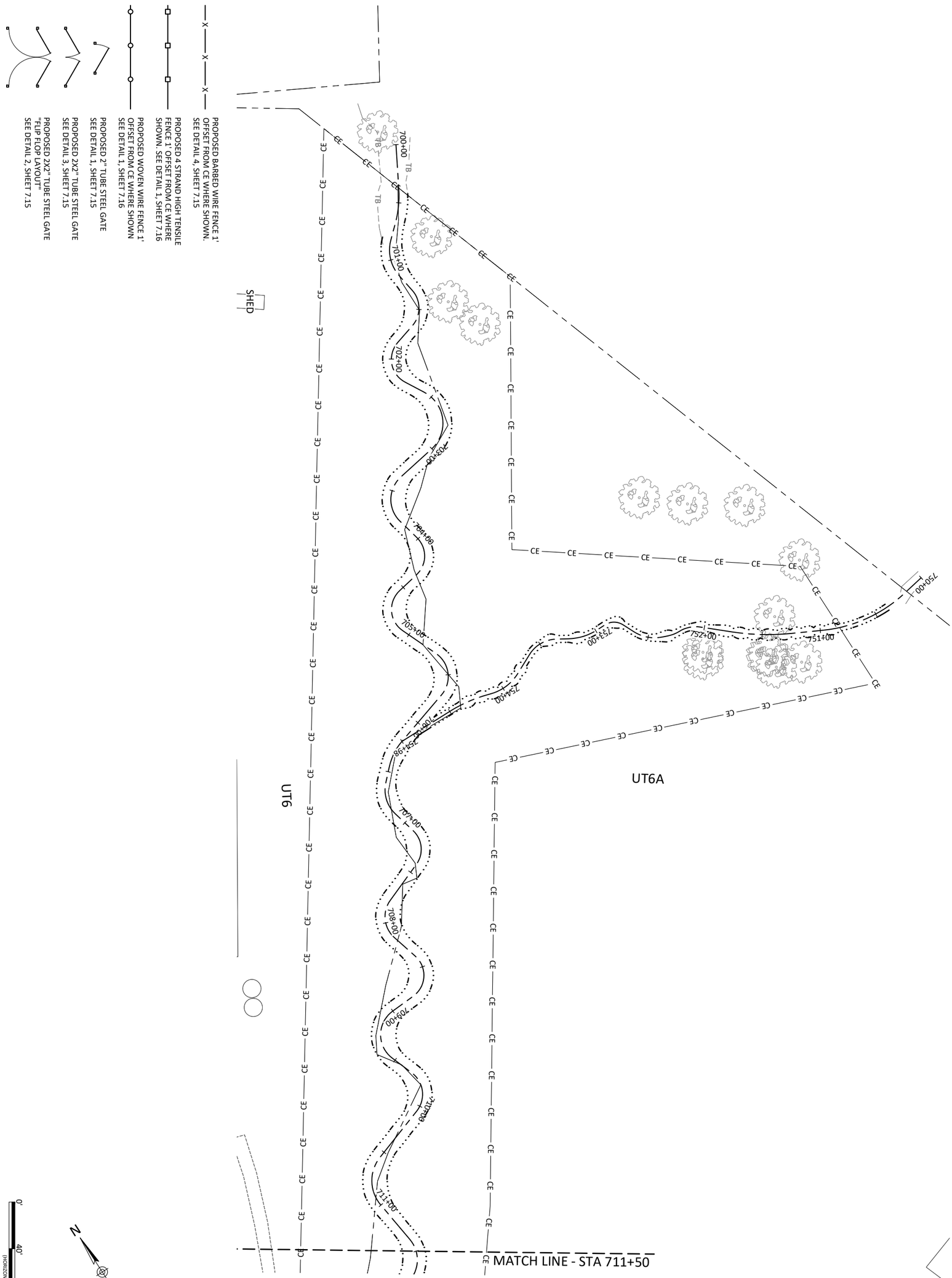
Date: 07.11.22
Job Number: 005-02190
Project Engineer: EPN
Drawn By: CAW
Checked By: CDB

Sheet 6.4.1



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6.5.1
Sheet

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

UT6 & UT6A
Fencing Plan

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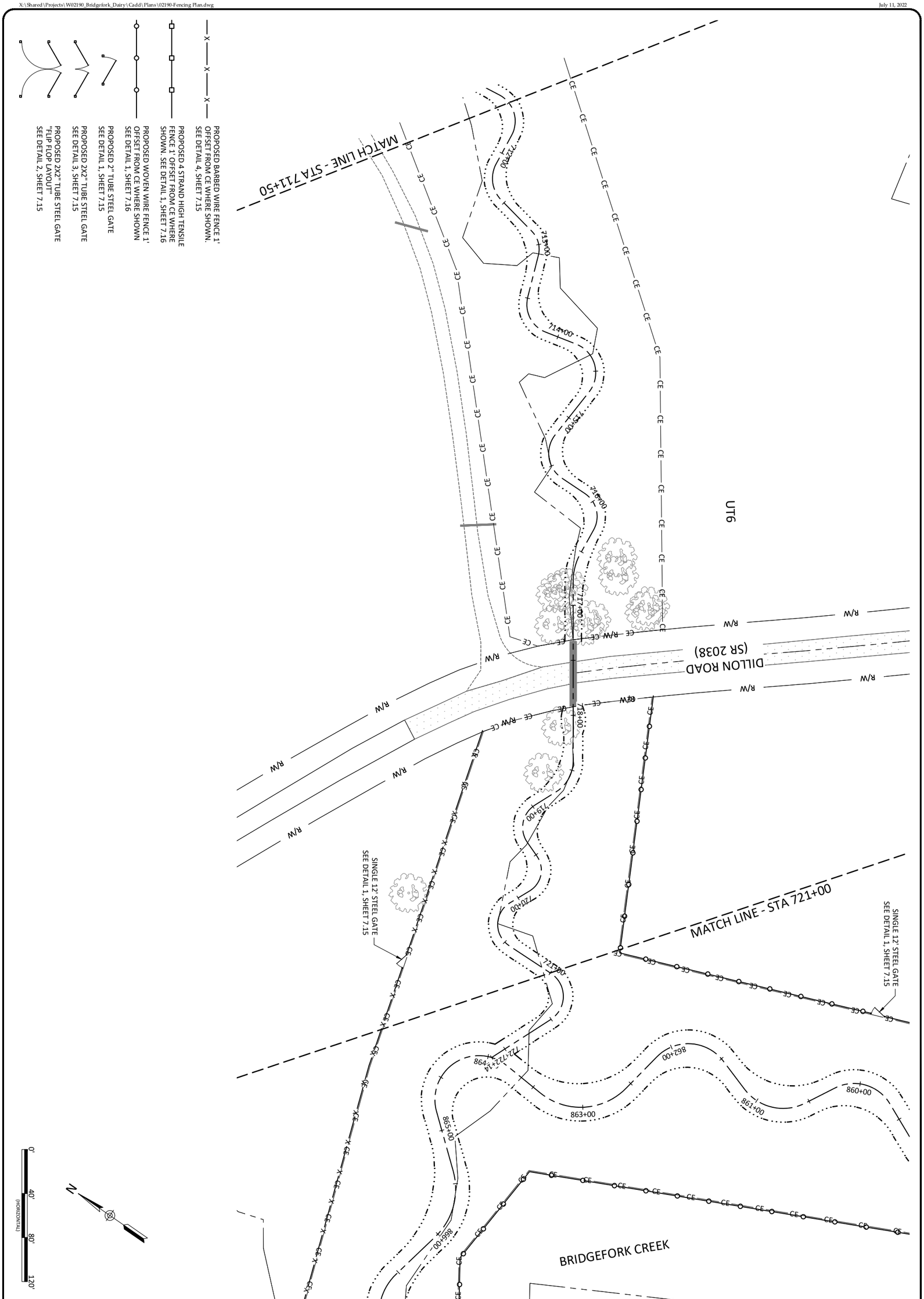

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6.5.2
Sheet

Bridgefork Dairy Mitigation Site
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UT6
Fencing Plan

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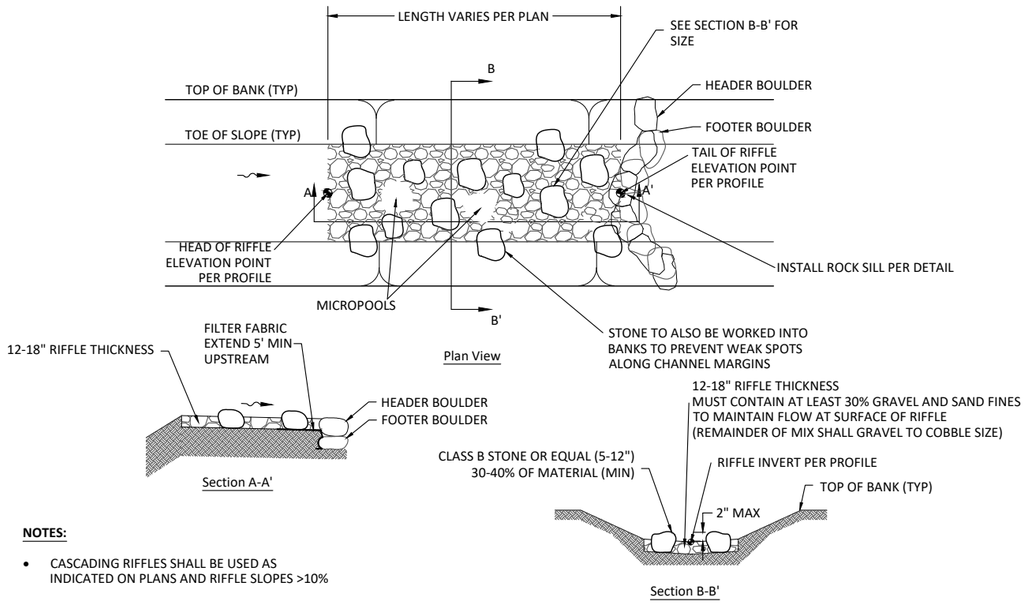
RIFFLE MATERIAL TABLE - ALL RIFFLE TYPES			
REACH	BOTTOM WIDTH (FT)	RIFFLE THICKNESS (IN)	RIFFLE MATERIAL STONE SIZE EQUIVALENTS (% OF MATRIX)

TO BE INCLUDED IN FINAL PLANS

NOTES:

1. ALL RIFFLE MATERIAL SHALL BE COMPACTED IN LIFTS AT A THICKNESS NOT TO EXCEED DMAX.

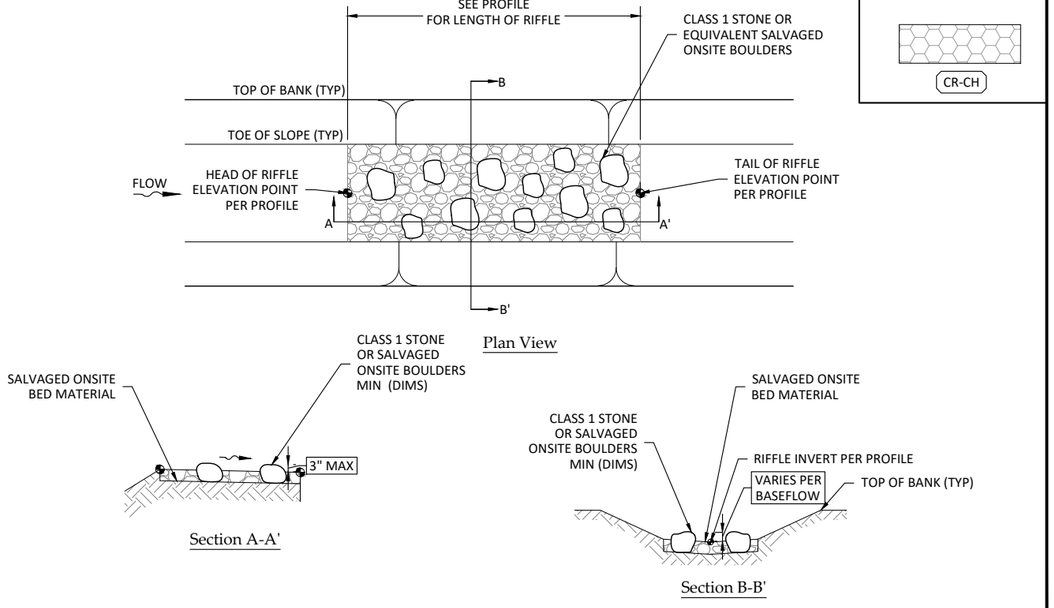
1 / 7.0 Riffle Material Table
Not to Scale



NOTES:

- CASCADING RIFFLES SHALL BE USED AS INDICATED ON PLANS AND RIFFLE SLOPES >10%

2 / 7.0 Cascade Riffle
Not to Scale



3 / 7.0 Chunky Riffle
Not to Scale

NOTE:

1. IF NECESSARY, SALVAGED ONSITE ROCK MAY BE SUBSTITUTED WITH QUARRY ROCK OF SIMILAR SIZE.

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Sheet 7.0

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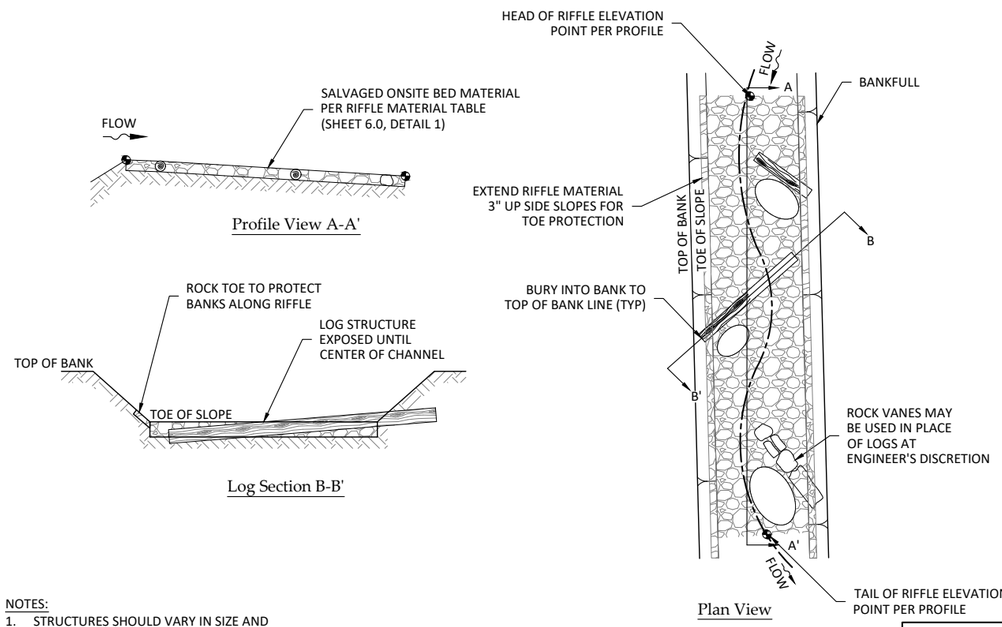
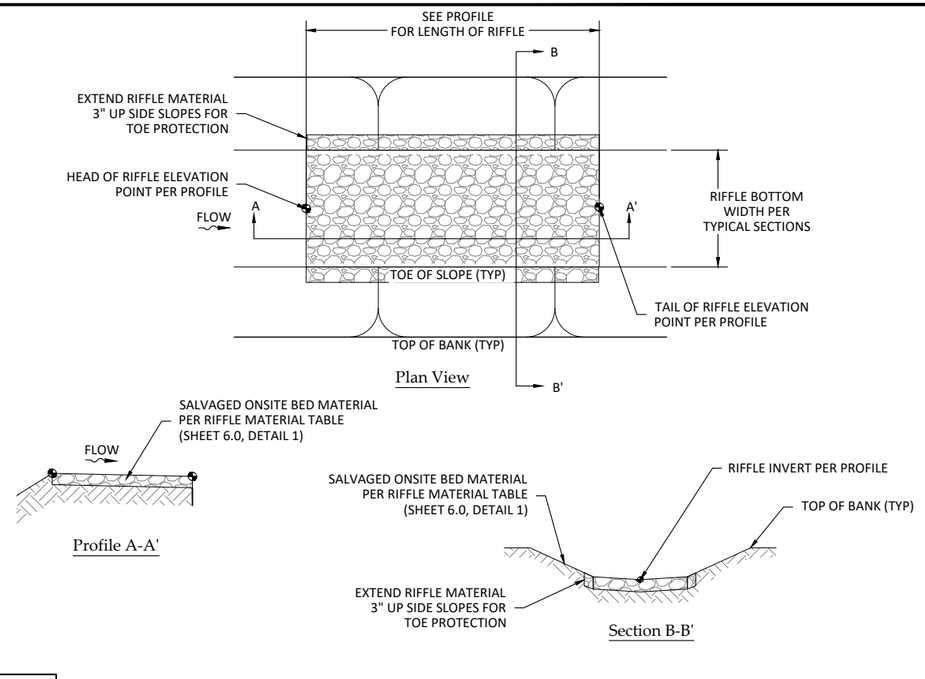


NOTES:
1. STRUCTURES SHOULD VARY IN SIZE AND TYPE WITHIN EACH RIFFLE.
2. ROCK MAY BE SUBSTITUTED FOR LOGS AT ENGINEER'S DISCRETION.
3. LOG LENGTH AND PLACEMENT TO BE CONFIRMED WITH ENGINEER IN FIELD DURING CONSTRUCTION.

1 / 7.1 Jazz Riffle
Not to Scale



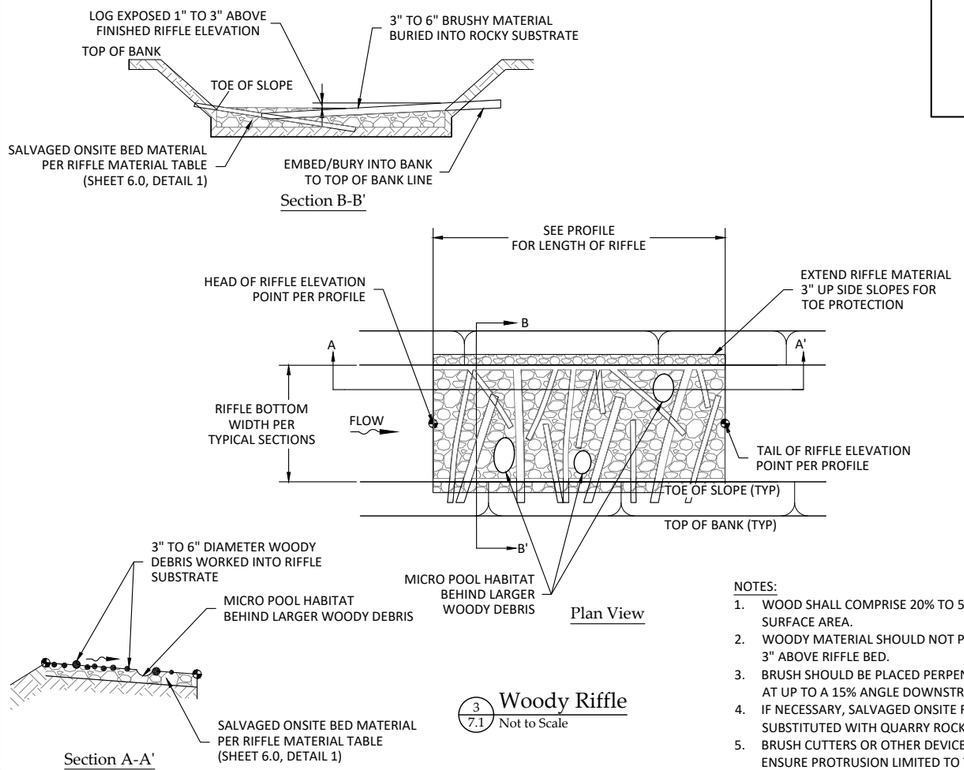
2 / 7.1 Native Material Constructed Riffle
Not to Scale

NOTE:
1. IF NECESSARY, SALVAGED ONSITE ROCK MAY BE SUBSTITUTED WITH QUARRY ROCK OF SIMILAR SIZE.

CR-JZ

CR-NM

CR-WD



3 / 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.

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Date:	07.11.22
Job Number:	005-02150
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Sheet 7.1

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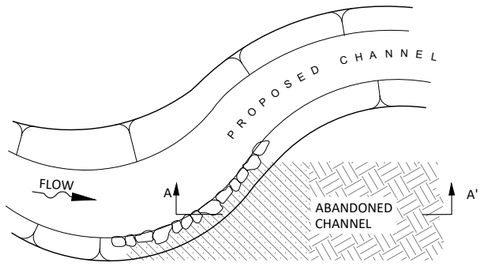
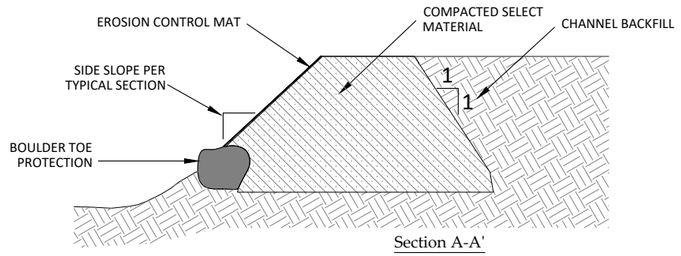
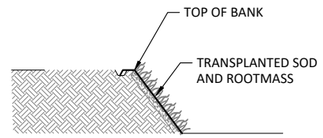


Plan View



Section A-A'

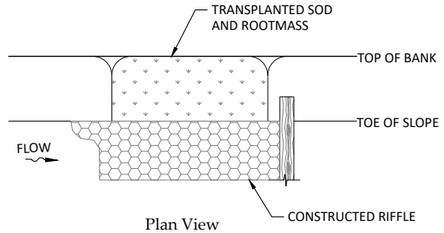
1/7.2 Boulder Toe
Not to Scale



Section View
Riffle Installation

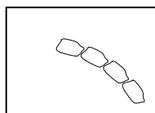
NOTES:

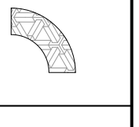
- PREPARE THE BANK WHERE THE SOD MAT WILL BE TRANSPLANTED BY RAKING & FERTILIZING.
- EXCAVATE TRANSPLANT SOD MATS WITH A WIDE BUCKET AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE.
- PLACE TRANSPLANT ON THE BANK TO BE STABILIZED.
- FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
- ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
- PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.



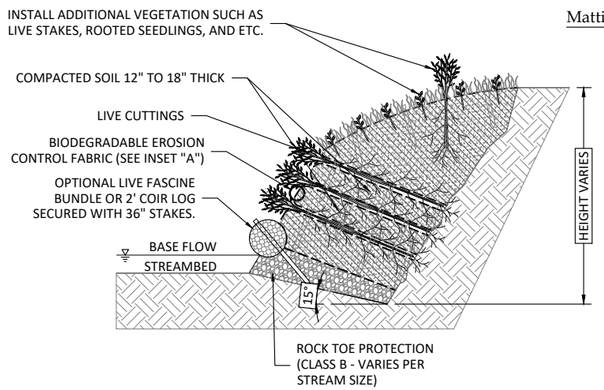
Plan View
Riffle Installation

2/7.2 Transplanted Sod Mat
Not to Scale

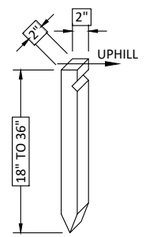




Inset "A"
Matting and Blanket



Section View



Typical Stakes

NOTES:

1. ROOTED/LEAFED CONDITION OF THE LIVING PLANT MATERIAL IS NOT REPRESENTATIVE OF THE TIME OF INSTALLATION.
2. BOTTOM OF FIRST COMPACTED EARTH LIFT TO BE PLACED 6" ABOVE NORMAL BASEFLOW.
3. NUMBER OF COMPACTED EARTH LIFTS TO VARY DEPENDING ON DESIGN TOP OF BANK HEIGHT.

3/7.2 Vegetated Soil Lift
Not to Scale

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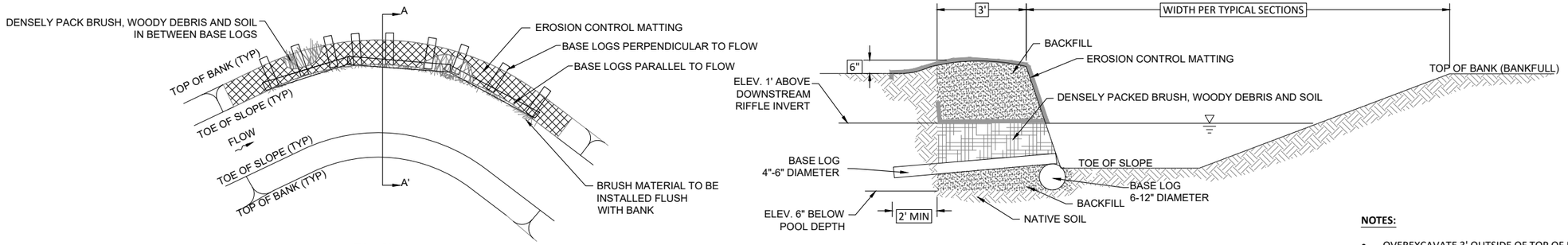
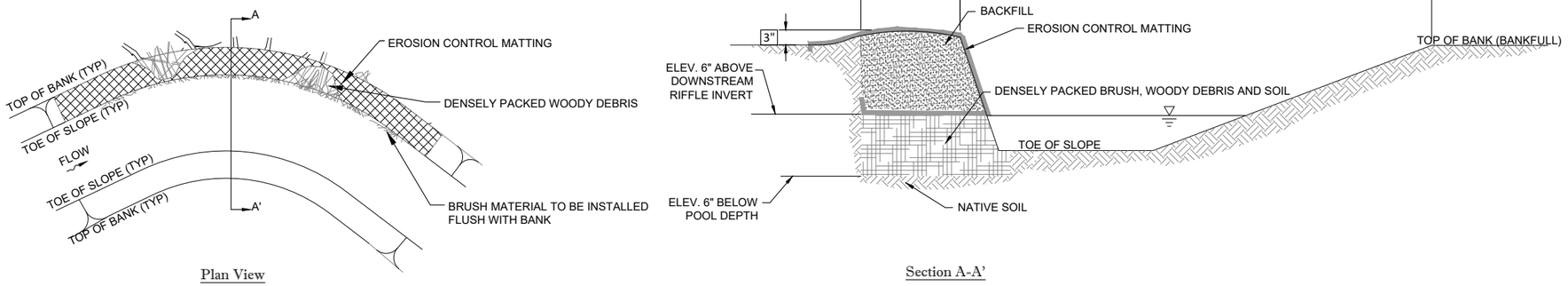


1 / 7.3 Brush Toe - Large Streams
Not to Scale

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.
- INSTALL FILTER FABRIC OVER BRUSH/WOODY DEBRIS.
- INSTALL EARTH BACKFILL OVER BRUSH/WOODY LAYER ACCORDING TO TYPICAL SECTION DIMENSIONS.
- SEED, MULCH AND INSTALL EROSION CONTROL MATTING AND BANK STABILIZATION PER PLANS.



2 / 7.3 Brush Toe - Small Streams - UT2, UT3, UT4, UT5, UT6
Not to Scale

NOTES:

- OVEREXCAVATE 3' 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 FILTER FABRIC OVER BRUSH/WOODY DEBRIS.
- INSTALL EARTH BACKFILL OVER BRUSH/WOODY LAYER ACCORDING TO TYPICAL SECTION DIMENSIONS.
- SEED, MULCH AND INSTALL EROSION CONTROL MATTING AND BANK STABILIZATION PER PLANS.

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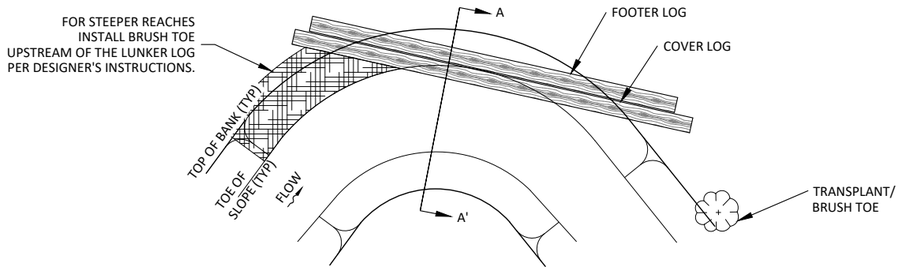
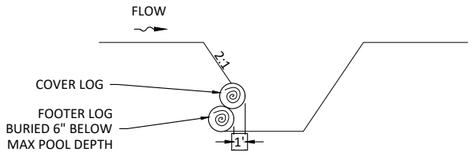
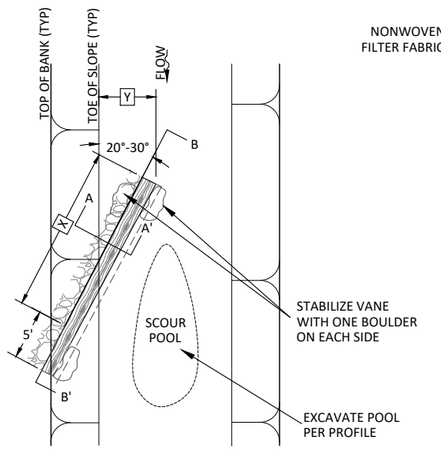


Plan View

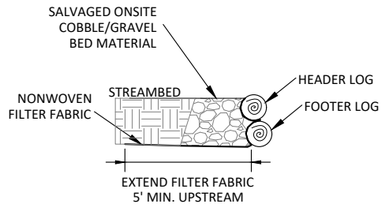


Section A-A'

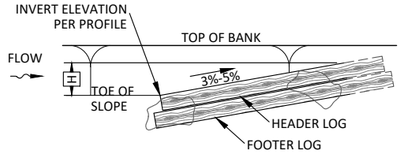
1 / 7.4 Lunker Log
Not to Scale



Plan View



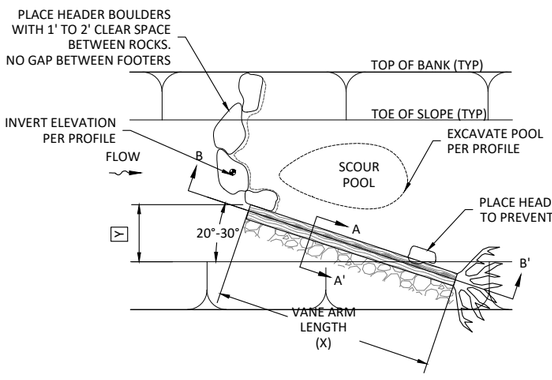
Section A-A'



Profile B-B'

2 / 7.4 Log Vane
Not to Scale

NOTES:
1. ON SMALLER STREAMS THE STABILIZATION BOULDER MAY BE REMOVED PER ENGINEER'S DISCRETION.



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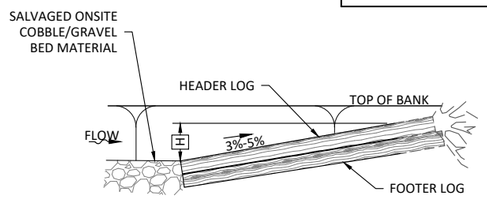

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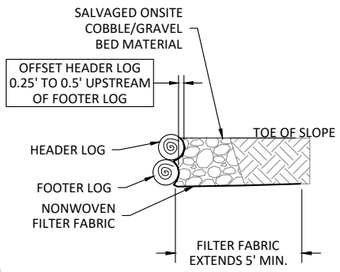
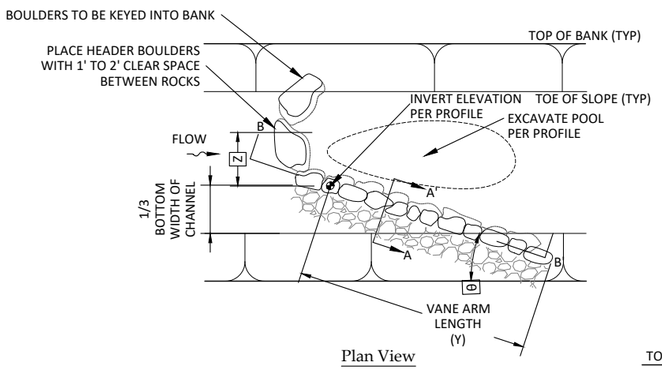
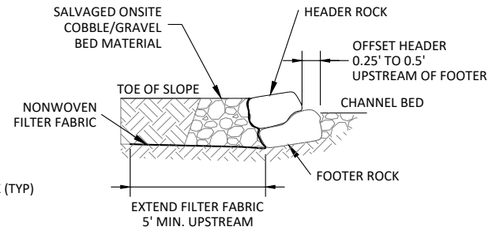


Section A-A'

3 / 7.4 Log J-Hook
Not to Scale



Plan View



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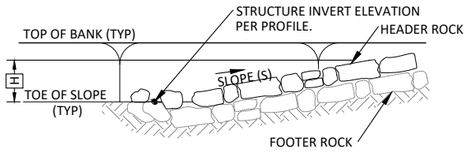

Profile View B-B'

4 / 7.4 Rock J-Hook
Not to Scale

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Details

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Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Sheet 7.4

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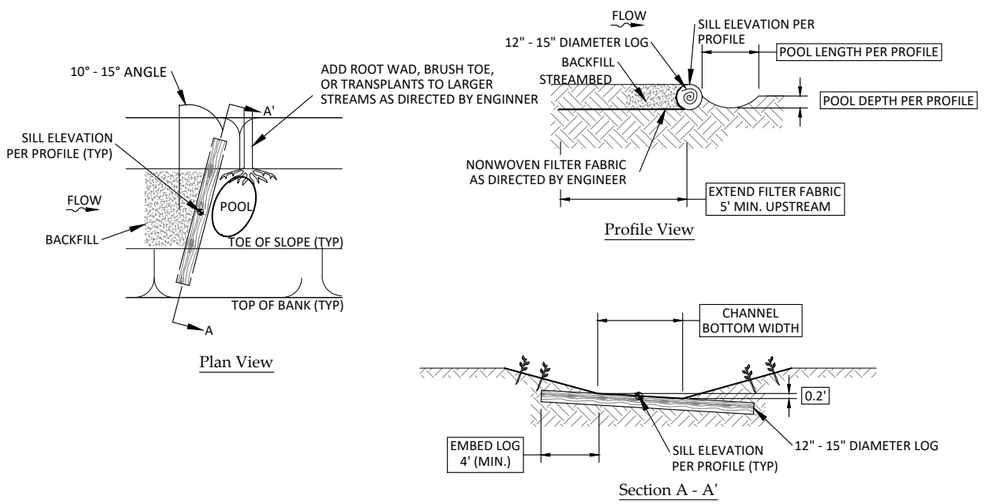
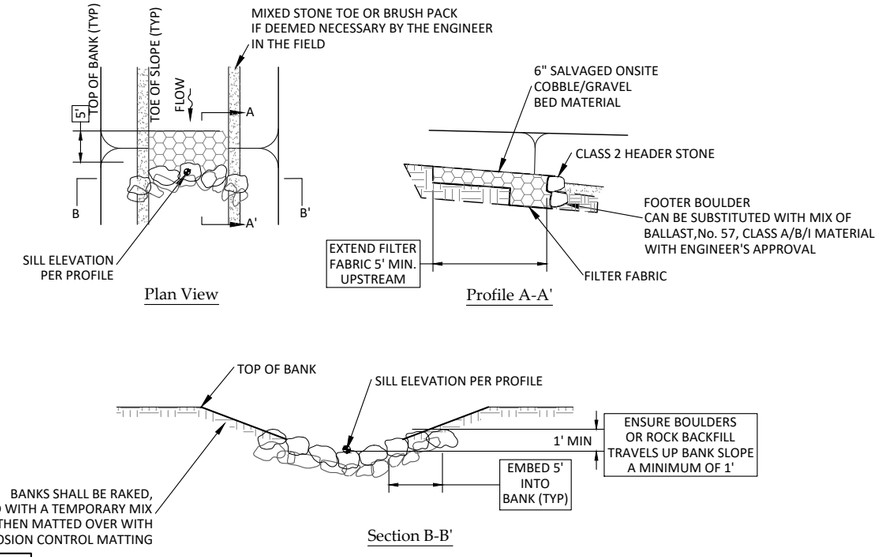


1 / 7.5 Log Sill
Not to Scale



2 / 7.5 Rock Sill
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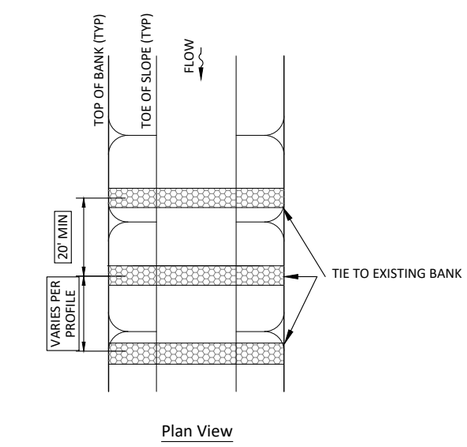

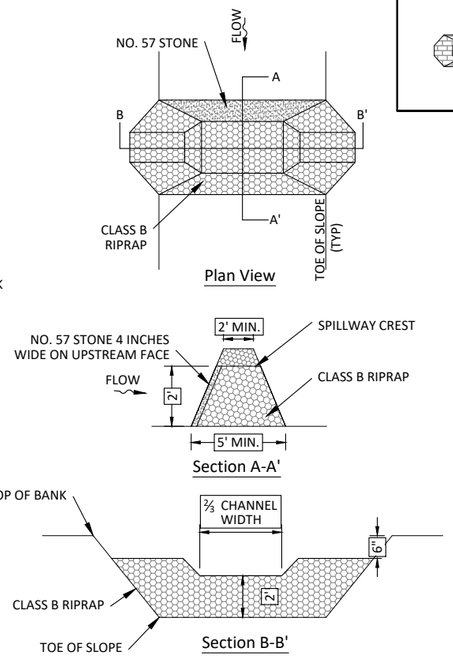

3 / 7.5 Check Dam
Not to Scale

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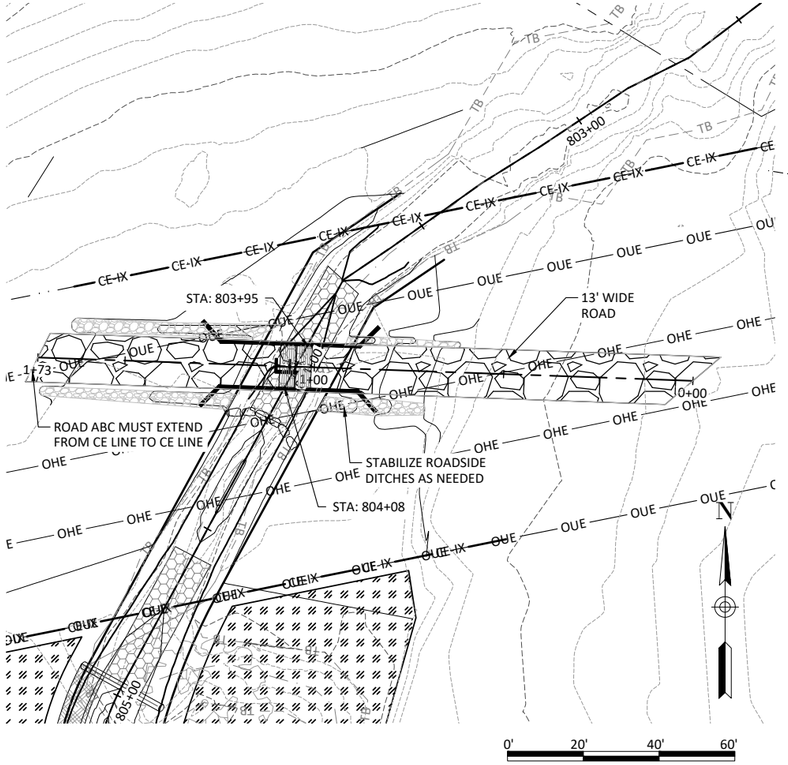

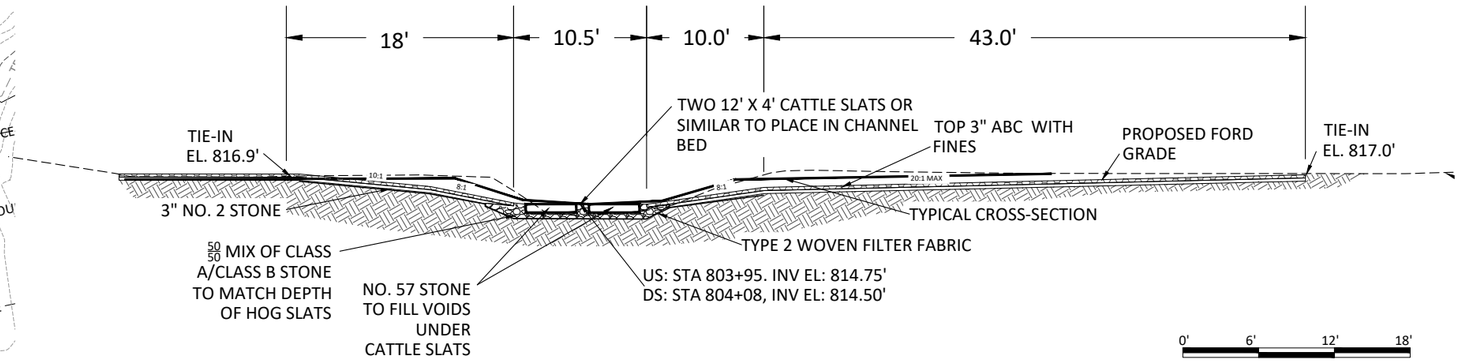

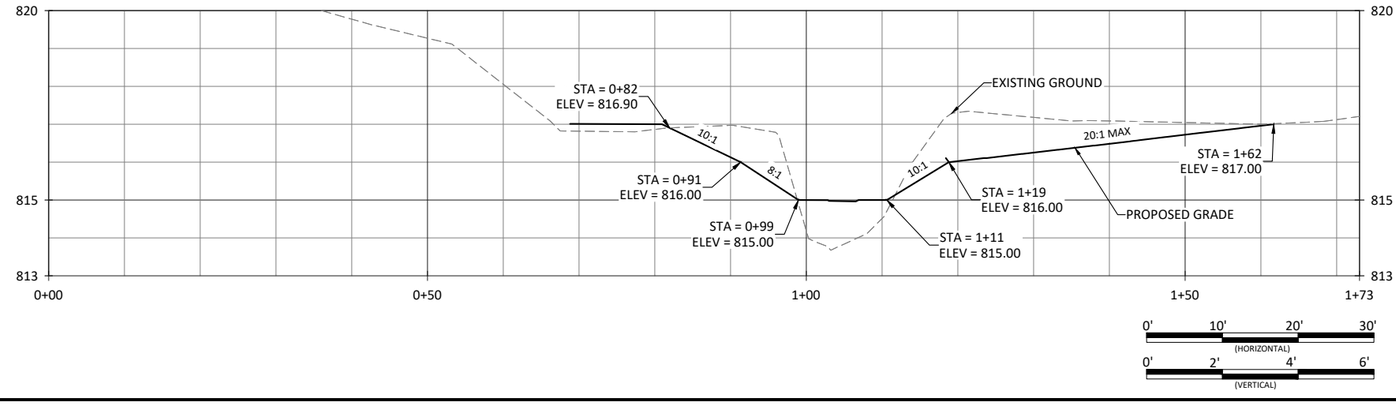

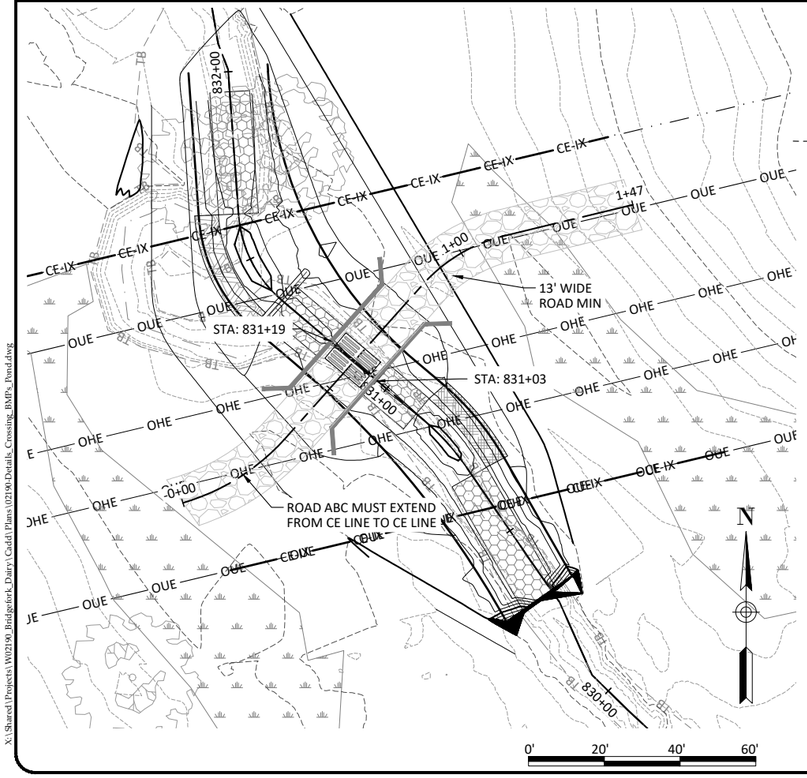

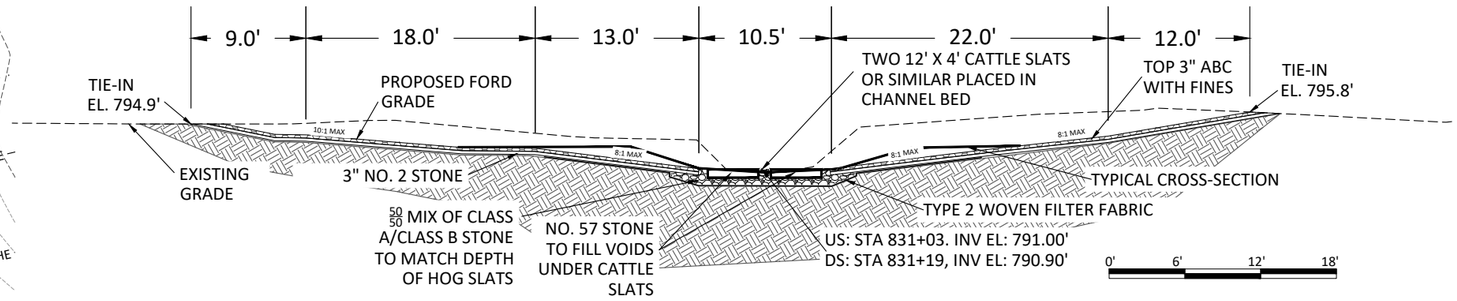

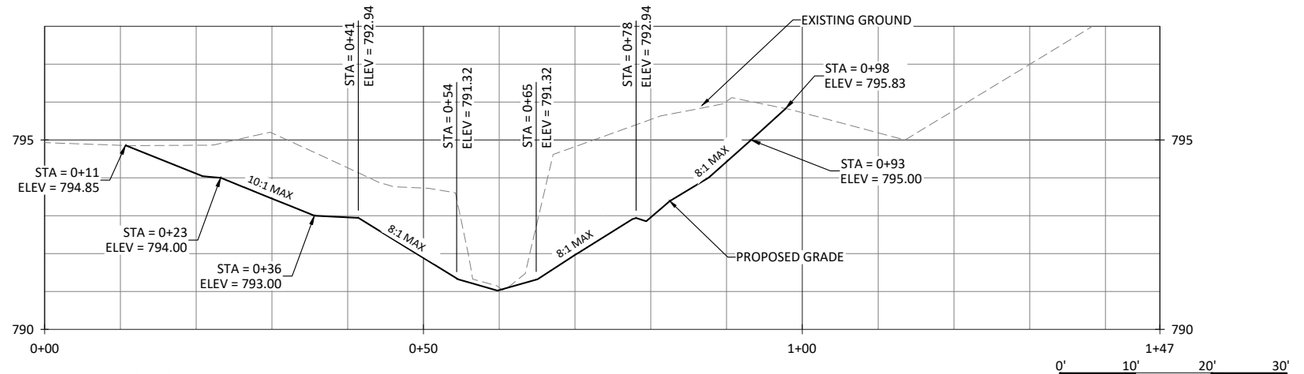

2/7.6 Ford Crossing - Bridgefork Creek Sta. 831+00
Not to Scale

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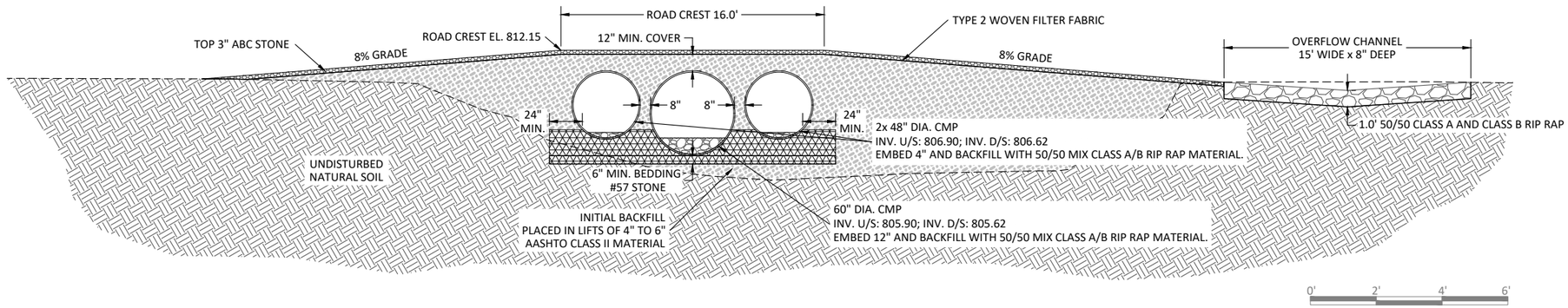
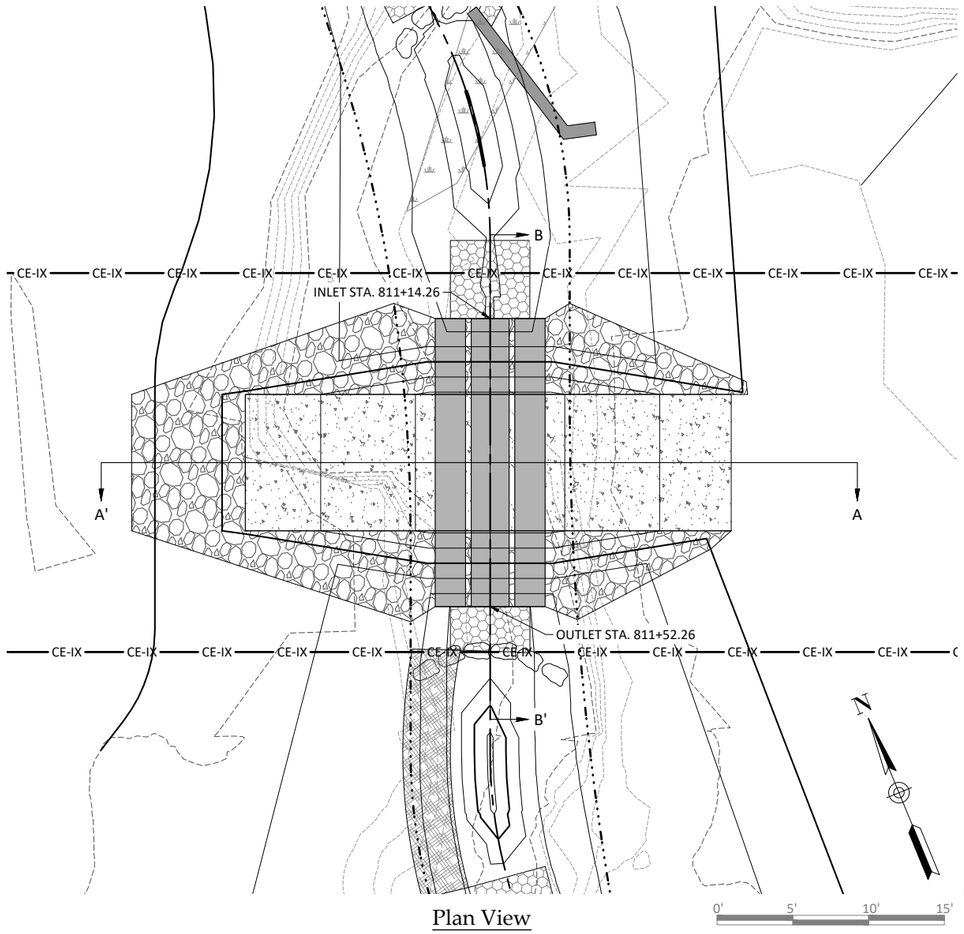
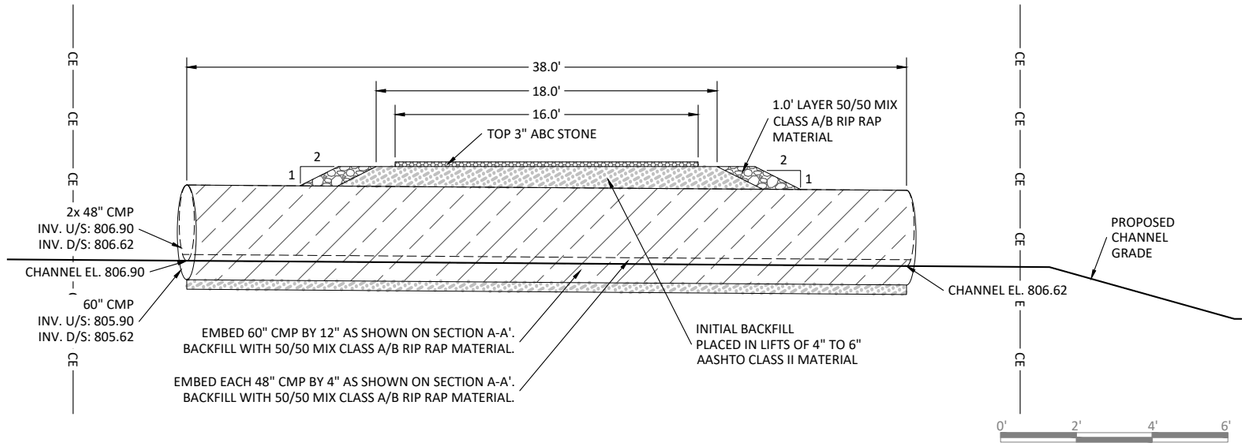


Section A-A'



Plan View



Section B-B'

1/7.7 Culvert Crossing - Bridgefork Creek Sta. 811+33
Not to Scale

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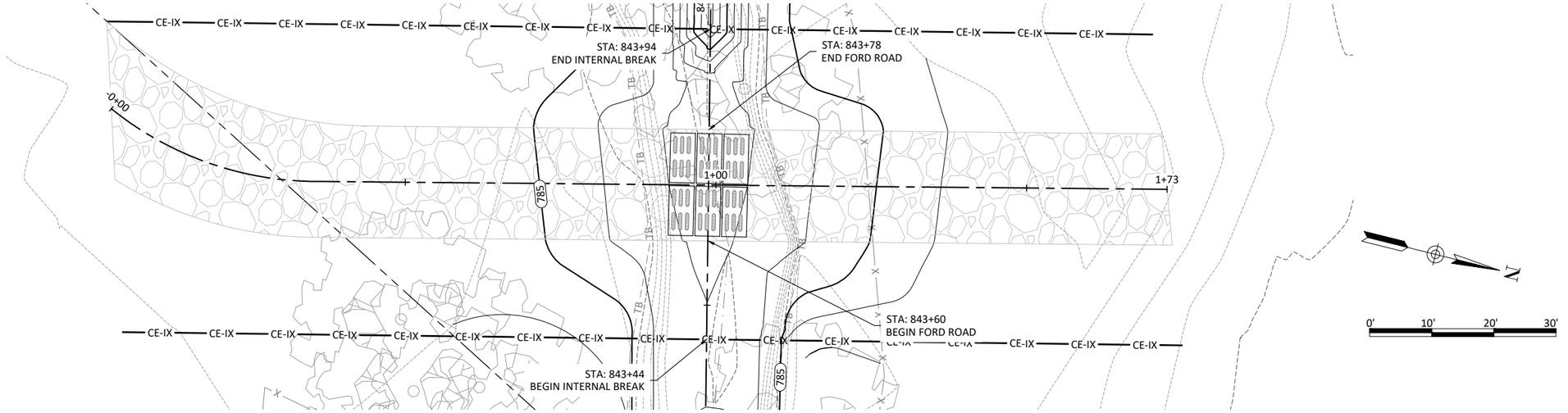
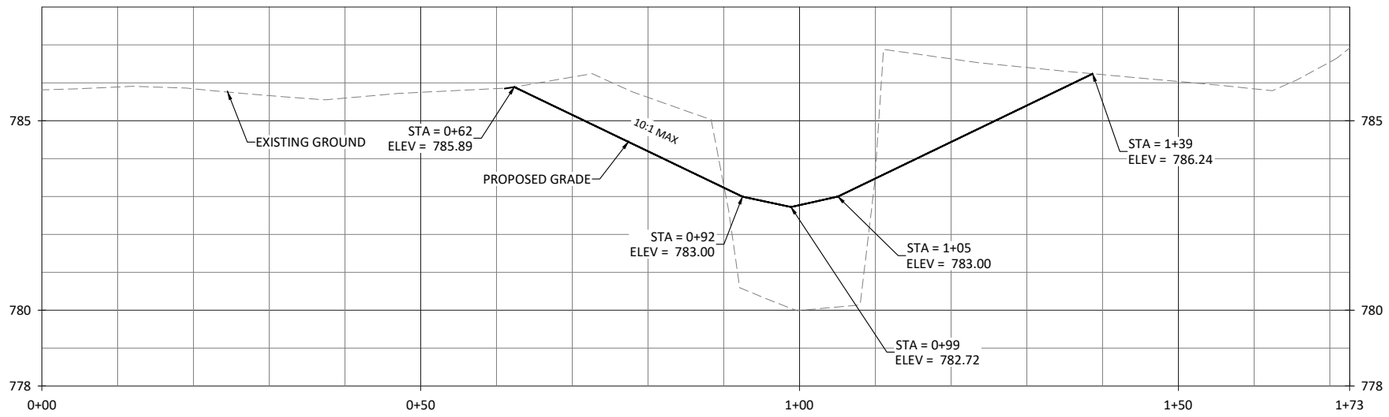
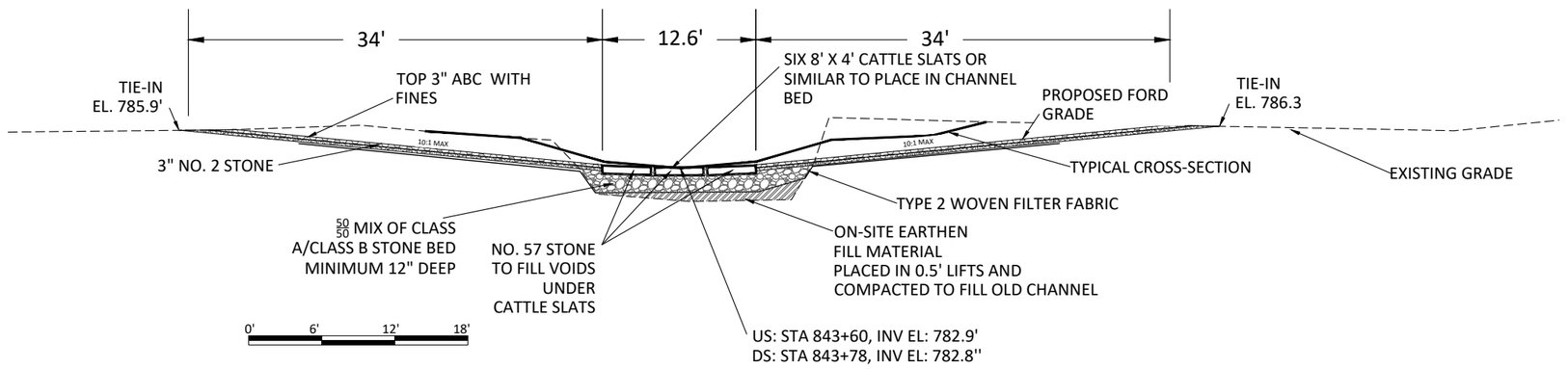
July 12, 2023







1/7.8 Ford Crossing - Bridgefork Creek Sta. 843+60

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Sheet 7.8

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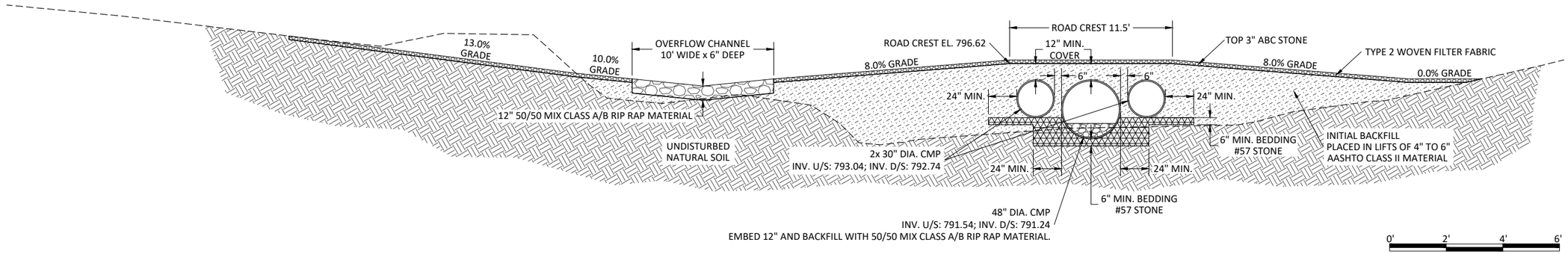
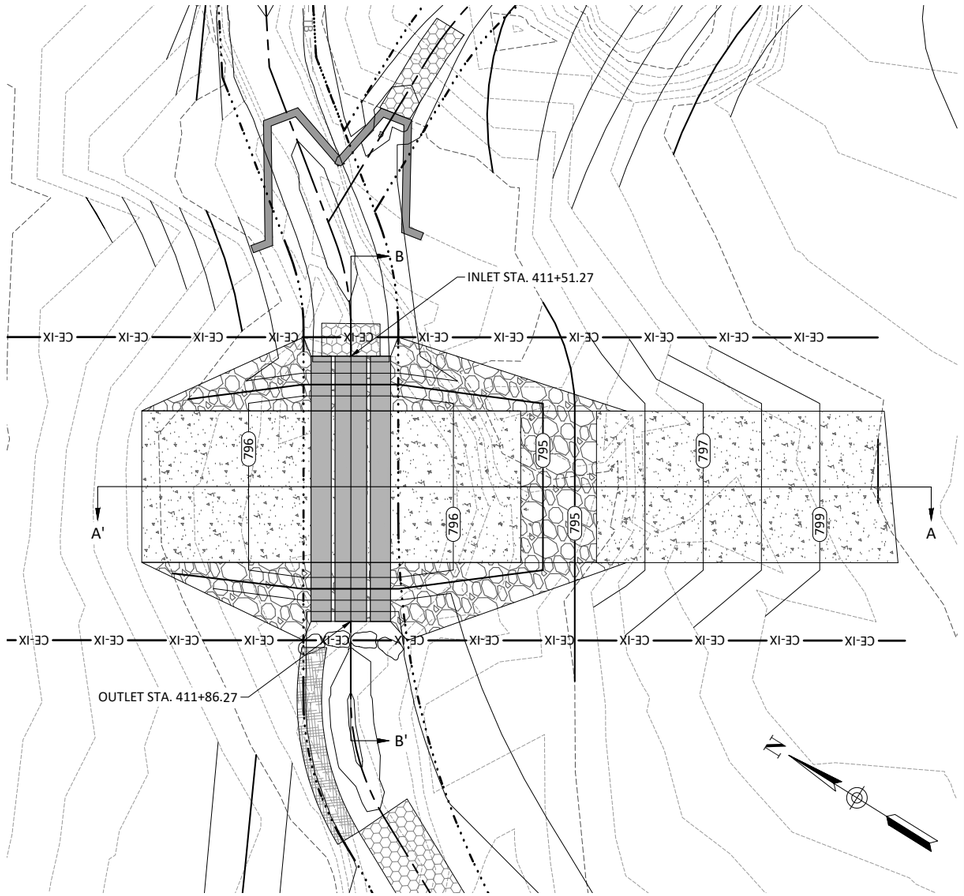
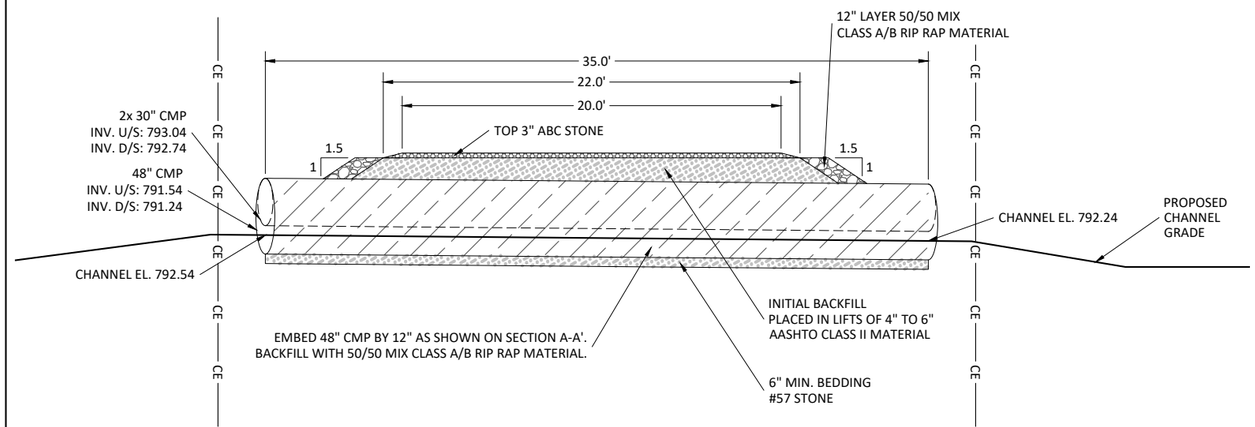
October 21, 2023



Section A-A'



Plan View



Section B-B'

1/7.9 Culvert Crossing - UT4 Sta. 411+69
Not to Scale

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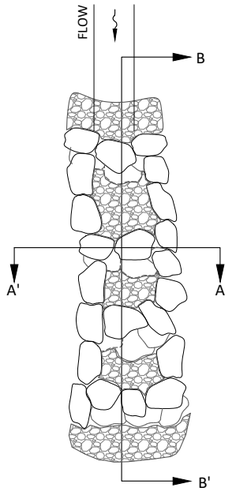
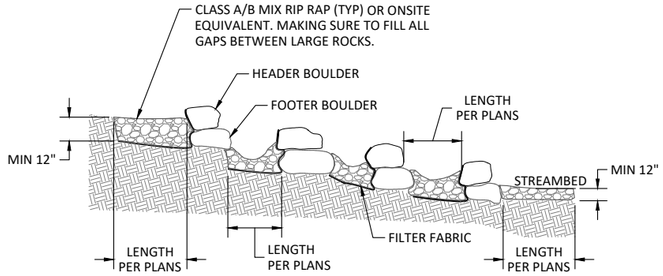


Plan View



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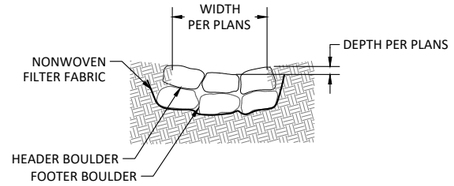


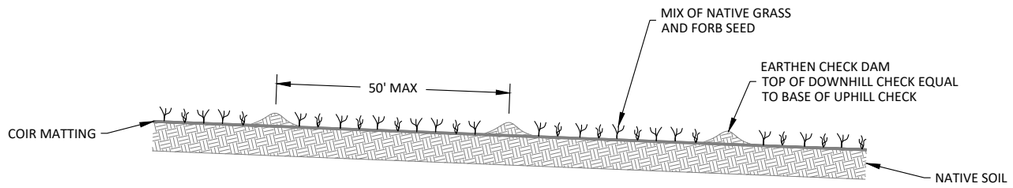
Section A-A'

2 7.10 Step-Pool Stormwater Conveyance (SPSC)

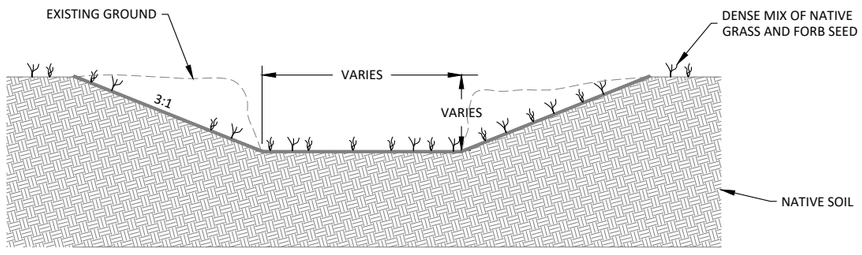
Not to Scale

NOTE:

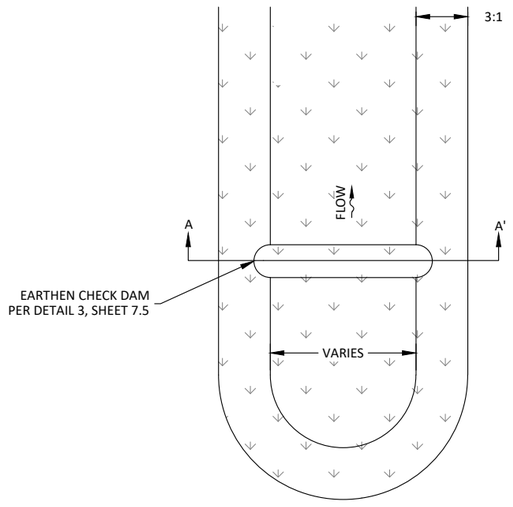
1. STEP-POOL STORMWATER CONVEYANCE (SPSC) TO BE INSTALLED PER PLAN AND PROFILE SHEETS 2.0-2.7.
2. MINIMUM 2'x2'x1' BOULDERS TO BE USED FOR HEADER AND FOOTER ROCKS.
3. BOULDERS MUST BE INSTALLED SUCH THAT THEY EXTEND A MINIMUM OF 5' INTO EACH CHANNEL BANK.
4. IF NATIVE ROCK IS NOT AVAILABLE, QUARRIED ROCK MAY BE SUBSTITUTED IN THE SAME SIZES.
5. ALL SMALLER ROCK SHALL BE HETEROGENEOUS AND WELL MIXED.
6. WHERE HYDROLOGIC CONDITIONS ARE APPROPRIATE, LIVESTAKES AND/OR JUNCUS PLUGS MAY BE PLANTED ON BANKS AS DETERMINED BY THE ENGINEER.



Profile



Section A-A'



Linear Wet Swale Plan View

2 7.10 Linear Wet Swale with Earthen Check Dam

Not to Scale

NOTES:

1. SWALES TO BE INSTALLED PER PLAN AND PROFILE SHEETS 2.0-2.7..
2. LEAVE EXISTING BOTTOM WIDTH AND DEPTH AND GRADE SIDES SLOPES BACK AT 3:1 SLOPE.
3. REGRADE SOIL, APPLY TEMPORARY AND PERMANENT SEED MIX, AND THEN INSTALL COIR MATTING. HERBACEOUS PLUGS TO BE INSTALLED ALONG TOP OF BANKS AT 4' SPACING PER DETAIL.
4. IF LONGITUDINAL SLOPE IS GREATER THAN 5%, INSTALL CHECK DAMS WITH A MAXIMUM SPACING OF 50'. MINIMUM OF TWO CHECK DAMS.
5. CHECK DAMS SHALL BE INSTALLED PER DETAIL 3, SHEET 7.5.

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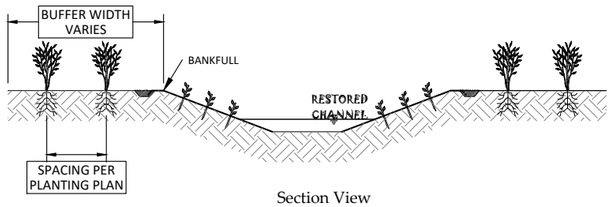
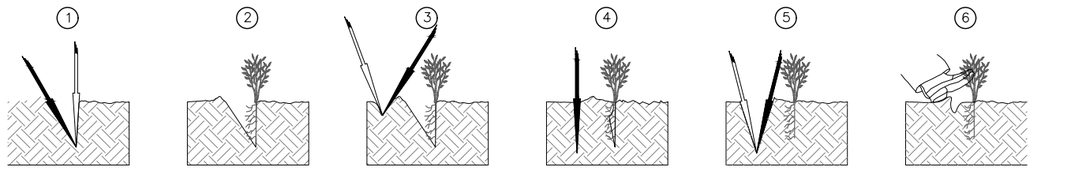


Section View

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.

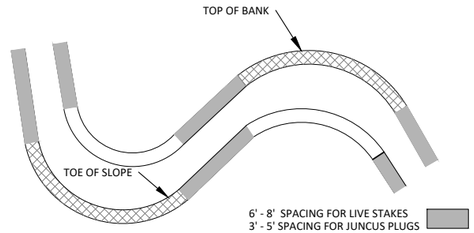
ROOTING PRUNING
ALL ROOTS SHALL BE PRUNED TO AN APPORIATE LENGTH TO PREVENT J-ROOTING.



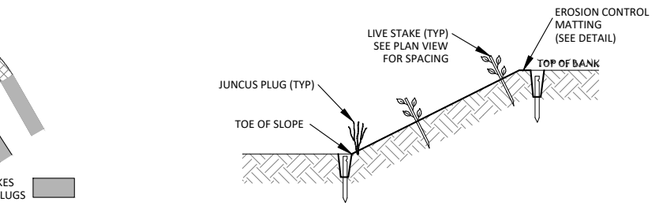
1. INSERT THE DIBBLE, OR SHOVEL, STRAIGHT DOWN INTO THE SOIL TO THE FULL DEPTH OF THE BLADE AND PULL BACK ON THE HANDLE TO OPEN THE PLANTING HOLE. (DO NOT ROCK THE SHOVEL BACK AND FORTH AS THIS CAUSES SOIL IN THE PLANTING HOLE TO BE COMPACTED, INHIBITING ROOT GROWTH.
2. REMOVE THE DIBBLE, OR SHOVEL, 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.

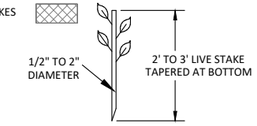
1/7.11 Bare Root Planting
Not to Scale



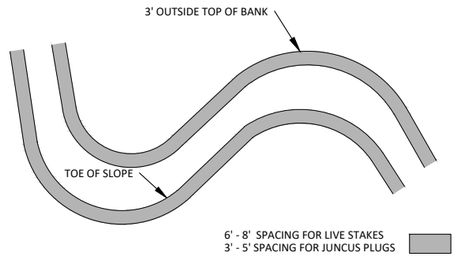
Plan View - Large Streams
Bridgefork Creek & UT6



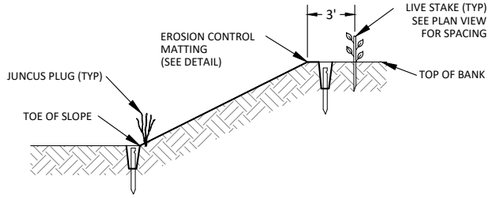
Section View - Large Streams
Bridgefork Creek & UT6



Live Stake Detail



Plan View - Small Streams
UT1, UT2, UT3, UT4, UT4A, UT5, UT6A



Section View - Small Streams
UT1, UT2, UT3, UT4, UT4A, UT5, UT6A

2/7.11 Live Staking and Juncus Plugs
Not to Scale

NOTE:
1. LIVE STAKES TO BE PLANTED IN AREAS AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.

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Tel: 828.774.5547
License No. F-0831

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Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Details

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

Sheet 7.11

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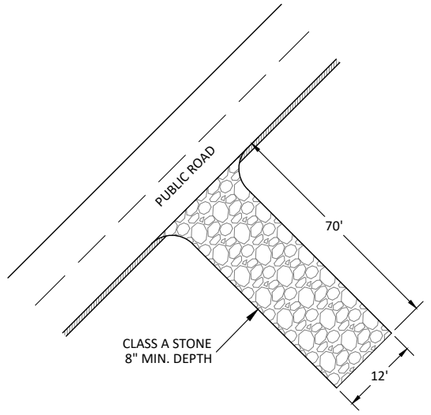
July 11, 2023

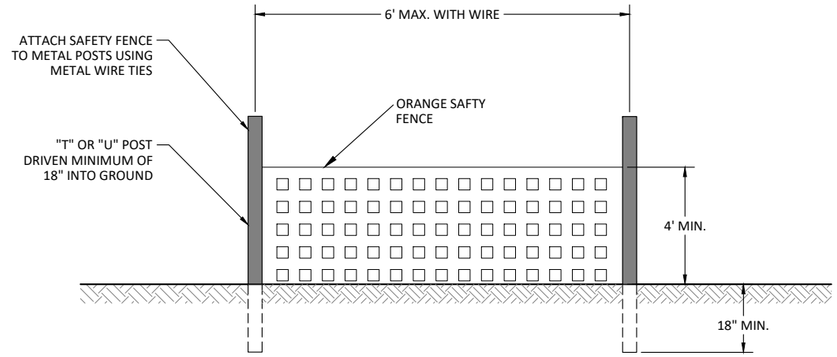


NOTES:

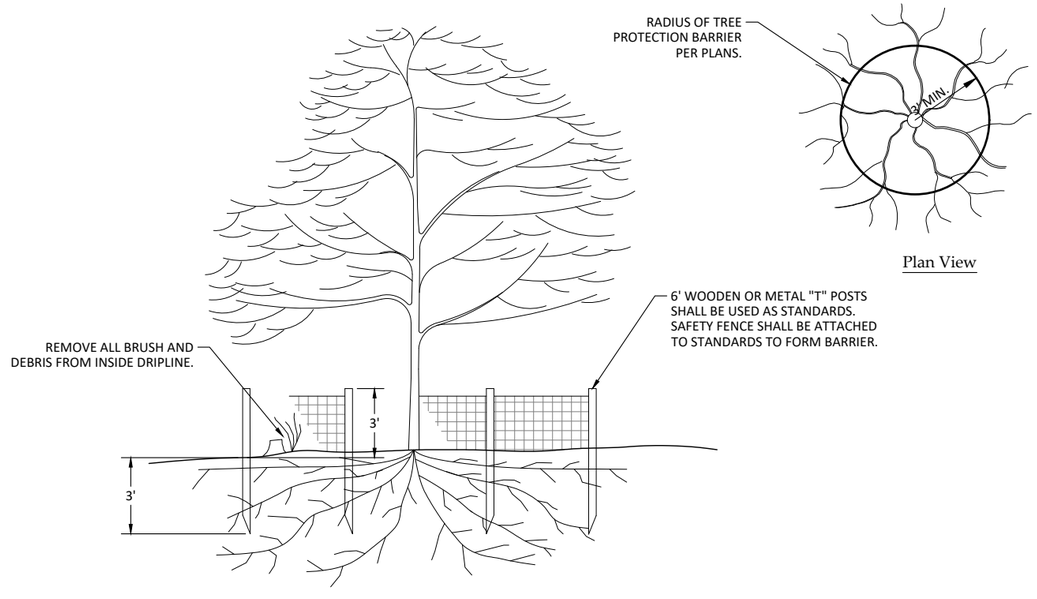
1. PROVIDE TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS.
5. LOCATE CONSTRUCTION ENTRANCE AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. PROVIDE FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE.
6. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW 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.

1 / 7.12 Construction Entrance
Not to Scale

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



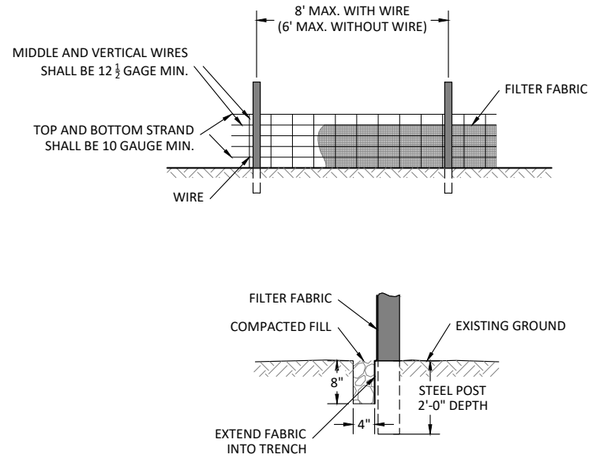
2 / 7.12 Safety Fence
Not to Scale



NOTES:

1. ALL TREE PROTECTION BARRIERS SHALL BE REMOVED PRIOR TO CONTRACTOR DEMOBILIZATION.
2. SEE PLANS FOR LOCATION OF ALL TREE PROTECTION BARRIERS.

3 / 7.12 Tree Protection
Not to Scale



4 / 7.12 Temporary Silt Fence
Not to Scale

NOTES:

1. USE WIRE A MINIMUM OF 32" IN WIDTH AND WITH A MINIMUM OF 6 LINES OF WIRES WITH 12" STAY SPACING.
2. USE FILTER FABRIC A MINIMUM OF 36" IN WIDTH AND FASTEN ADEQUATELY TO THE WIRES AS DIRECTED BY THE ENGINEER.
3. PROVIDE 5' STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE. ANGLE STEEL TYPE.

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Drawn By:	CAW
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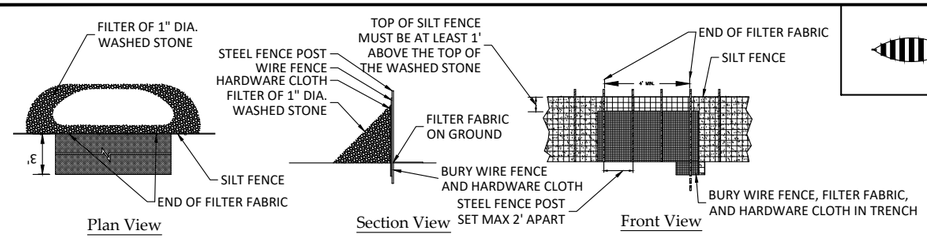
Sheet 7.12

July 11, 2023

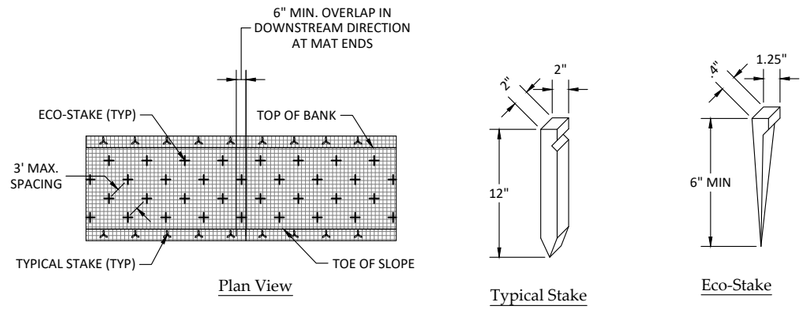


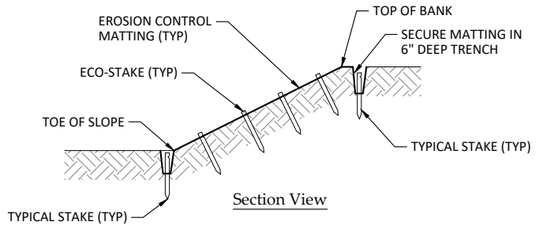
INSTALLATION:
REFER TO THE PLANS FOR LOCATIONS AND SPECIFICATIONS. DURING INSTALLATION OF THE SILT BARRIER OR SILT FENCE, INSPECT THE INSTALLATION TO DETERMINE IF OUTLETS ARE NEEDED ACCORDING TO THE CRITERIA SET FORTH IN THE SPECIFICATIONS FOR THE BARRIER AND FENCE. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER, ARCHITECT, OR RESPONSIBLE PERSONNEL ON THE SITE FOR ASSISTANCE. EROSION CONTROL PERSONNEL HAVE COPIES OF INSTRUCTIONS AND MAY HAVE PHOTOGRAPHS OF PROPERLY INSTALLED OUTLETS AS AN AID TO INSTALLATION.
IF THE SILT FENCE OUTLET IS NOT INSTALLED CORRECTLY THE FIRST TIME, IT WILL HAVE TO BE REBUILT.
DETERMINE THE EXACT LOCATION ON THE GROUND BEFORE COMPLETING INSTALLATION OF THE SILT FENCE, TAKING INTO CONSIDERATION:
INSTALL THE OUTLET AT THE LOWEST POINT (S) IN THE BARRIER OR FENCE WHERE WATER WILL POND.
INSTALL THE OUTLET WHERE IT IS ACCESSIBLE FOR INSTALLATION, MAINTENANCE, AND REMOVAL.
ALLOW AT LEAST:
15 FEET BETWEEN THE BARRIER OR FENCE AND SINGLE-STORY BUILDINGS.
25 FEET FOR FORK LIFTS BETWEEN THE BARRIER OR FENCE AND MULTIPLE-STORY BUILDINGS.
10 FEET BETWEEN THE BARRIER OR FENCE AND THE TOE OF FILL SLOPES.
PLACE THE OUTLET SO THAT WATER FLOWING THROUGH IT WILL NOT CREATE AN EROSION HAZARD BELOW: AVOID STEEP SLOPES BELOW THE OUTLET AND AREAS WITHOUT PROTECTIVE VEGETATION. USE SLOPE DRAINS IF NECESSARY.
DETERMINE THE LOCATION OF THE OUTLET: FOR A SILT BARRIER, WHEN THE TRENCH IS DUG TO BURY THE BOTTOM OF THE FABRIC BECAUSE THE BARRIER WILL BE OMITTED AT THE OUTLET; FOR A SILT FENCE, WHEN THE WIRE FENCE IS IN PLACE BECAUSE THE FILTER FABRIC WILL BE OMITTED AT THE OUTLET.
REFER TO THE ILLUSTRATIONS OF THE OUTLET IN THE PLAN.
CLEAR STUMPS AND ROOTS FROM THE LOCATION OF THE OUTLET. CLEAR ADEQUATE ACCESS FOR THE EQUIPMENT NEEDED FOR INSTALLATION, MAINTENANCE, AND REMOVAL.

FOR A SILT BARRIER:
JUST BELOW THE GAP IN THE BARRIER, PLACE A LAYER OF FILTER FABRIC ON THE GROUND TO PROTECT THE SOIL FROM EROSION BY OUTFLOW FROM THE OUTLET; PLACE 6 INCHES OF THE UPPER EDGE IN THE TRENCH. STAKE THE REMAINING EDGES OF THE FABRIC TO HOLD IT IN PLACE.
ALONG THE GAP WHERE THE OUTLET WILL GO, PLACE STEEL FENCE POSTS FOR STRENGTH. THE POSTS MUST BE A MAXIMUM OF 2 FEET APART AND DRIVEN INTO SOLID GROUND AT LEAST 18 INCHES.
PLACE HARDWARE CLOTH (WELDED GALVANIZED SCREEN WITH SQUARE 1/4 - 1/2-INCH HOLES) ON THE UPHILL SIDE OF THE POSTS TO HOLD THE WASHED STONE IN PLACE. PUT 6 INCHES OF THE BOTTOM OF THE CLOTH IN THE TRENCH AND FASTEN IT TO THE POSTS WITH LENGTHS OF WIRE.
BURY THE BOTTOM OF THE HARDWARE CLOTH AND THE UPPER EDGE OF THE FILTER FABRIC BELOW THE OUTLET IN THE TRENCH AND COMPACT THE FILL.
PLACE A FILTER OF 1-INCH DIAMETER WASHED STONE ON THE UPHILL SIDE OF THE OUTLET.
PILE THE STONE UP TO THE TOP OF THE HARDWARE CLOTH AND OVER THE JOINT BETWEEN THE OUTLET AND THE BARRIER.

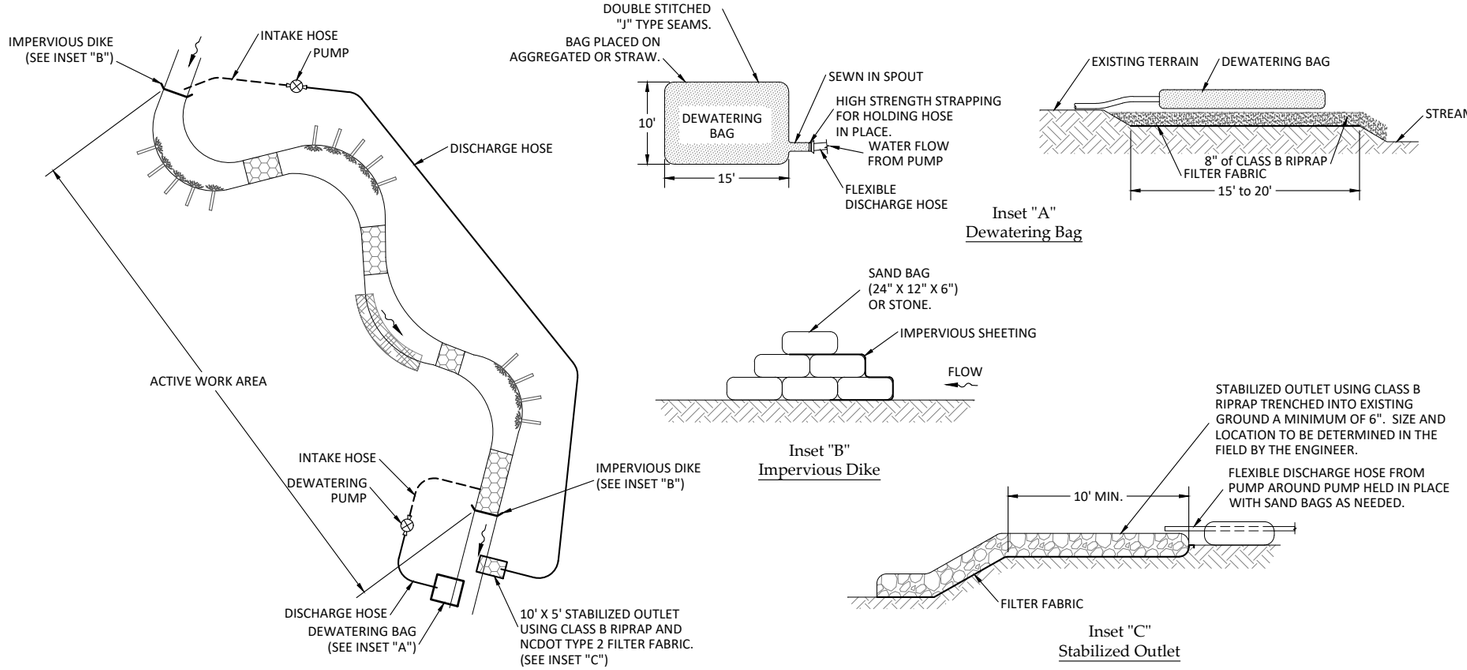
FOR A SILT FENCE:
JUST BELOW THE GAP IN THE BARRIER, PLACE A LAYER OF FILTER FABRIC ON THE GROUND TO PROTECT THE SOIL FROM EROSION BY OUTFLOW FROM THE OUTLET; PLACE 6 INCHES OF THE UPPER EDGE IN THE TRENCH. STAKE THE OTHER EDGES OF THE FABRIC TO HOLD IT IN PLACE.
ALONG THE GAP WHERE THE OUTLET WILL GO, PLACE ADDITIONAL STEEL FENCE POSTS FOR STRENGTH. THE POSTS MUST BE A MAXIMUM OF 2 FEET APART AND DRIVEN INTO SOLID GROUND AT LEAST 18 INCHES.
PLACE HARDWARE CLOTH (WELDED GALVANIZED SCREEN WITH SQUARE 1/4 - 1/2-INCH HOLES) ON THE UPHILL SIDE OF THE POSTS TO HOLD THE WASHED STONE IN PLACE. PUT 6 INCHES OF THE BOTTOM OF THE CLOTH IN THE TRENCH AND FASTEN IT TO THE POSTS WITH LENGTHS OF WIRE.
BURY THE BOTTOM OF THE HARDWARE CLOTH, THE UPPER EDGE OF THE FILTER FABRIC BELOW THE OUTLET, AND THE WIRE FENCE IN THE TRENCH AND COMPACT THE FILL.
PLACE A FILTER OF 1-INCH DIAMETER WASHED STONE ON THE UPHILL SIDE OF THE OUTLET.
PILE THE STONE UP TO THE TOP OF THE HARDWARE CLOTH AND OVER THE JOINT BETWEEN THE OUTLET AND THE SILT FENCE.

1 / 7.13 Temporary Silt Fence Gravel Outlet
Not to Scale





2 / 7.13 Erosion Control Matting
Not to Scale



3 / 7.13 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.

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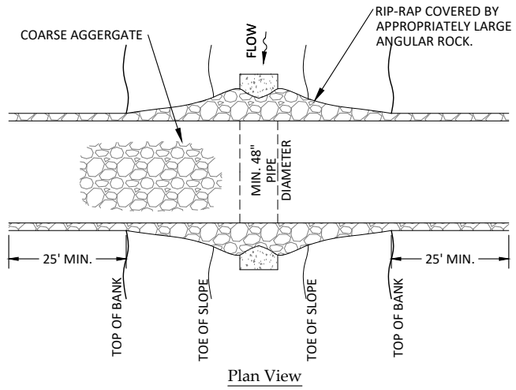
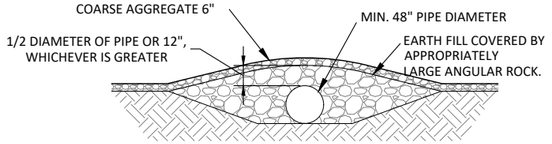


Plan View

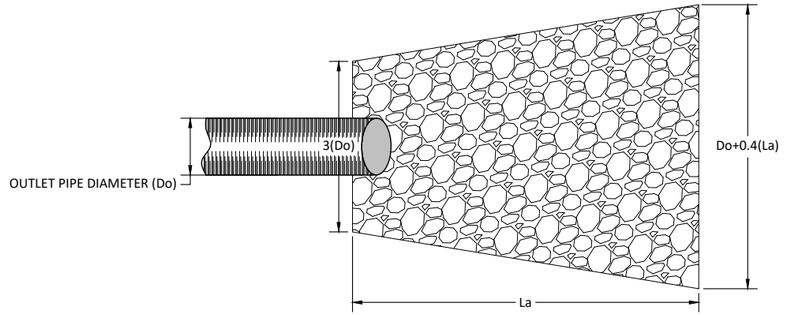


Section View

NOTES:

1. THIS TYPE OF CROSSING CAN BE INSTALLED IN BOTH A WET OR DRY WEATHER STREAM CONDITION WHERE THE DRAINAGE AREA EXCEEDS 10 ACRES.
2. REMOVE DURING CLEANUP.
3. CONTRACTOR MAY ELECT TO USE A TEMPORARY BRIDGE CROSSING. IF HE/SHE DOES, IT MUST CONFORM TO THE "MANUAL FOR EROSION AND SEDIMENT CONTROL IN [STATE]".

1/7.14 Temporary Stream Crossing - Culvert
Not to Scale

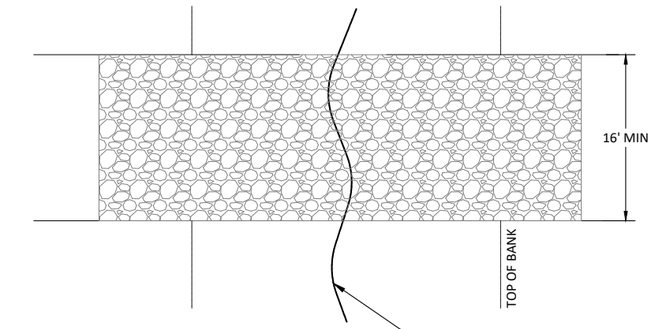


CULVERT TABLE						
CULVERT I.D.	Do (FT)	La (FT)	D50 (FT)	Dmax (FT)	APRON THICKNESS (FT)	VOLUME (CY)
1						
2					TO BE INCLUDED IN FINAL PLANS	
X						
X						

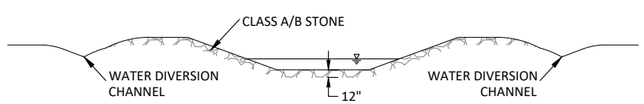
2/7.14 Outlet Protection
Not to Scale

FILL

TL



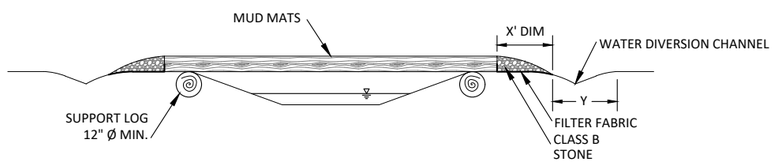
Plan View



NOTES:

1. FORD CROSSING SHALL BE INSTALLED PERPENDICULAR TO CHANNEL BANKS.
2. MAINTAIN DIVERSION CHANNEL TO INSURE RUNOFF DOES NOT ENTER CHANNEL.
3. CONTRACTOR SHALL DISCUSS APPROPRIATE FORD DIMENSIONS WITH DESIGNER.

3/7.14 Temporary Stream Crossing - Ford
Not to Scale



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.

4/7.14 Temporary Stream Crossing - Timber
Not to Scale

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Cleveland County, North Carolina

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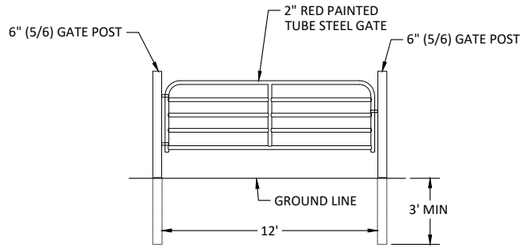
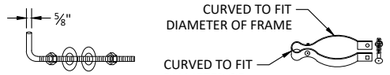
July 11, 2023



Access Gate

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.

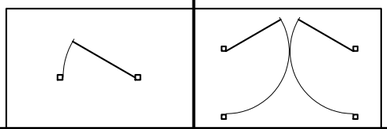


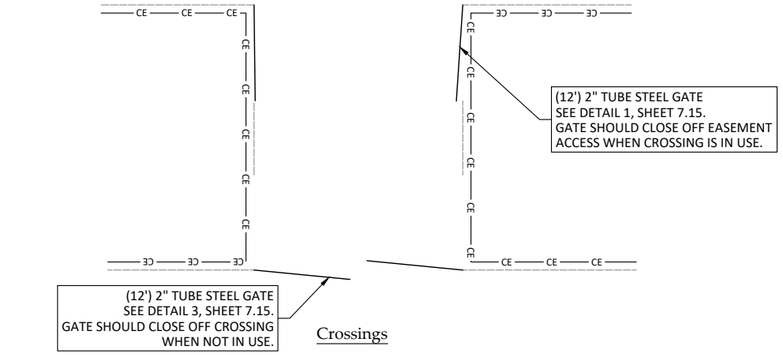
Bolt Hinge (2 Required)

Hinge Clamp (2 Required)

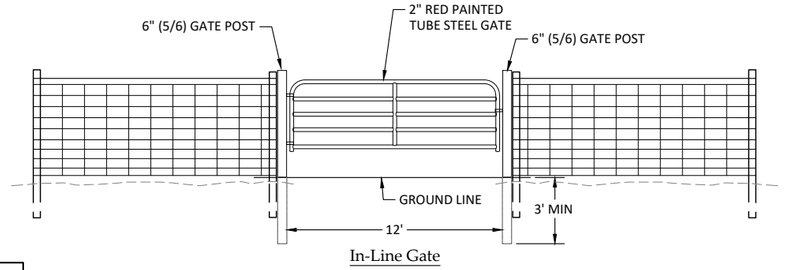
Hinge Assembly

1 / 7.15 Single 2" Tube 12' Steel Gate
Not to Scale



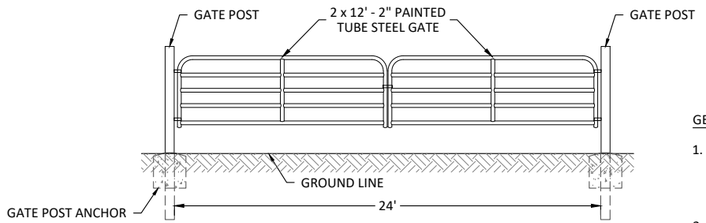


Crossings

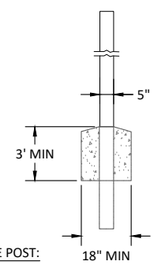


In-Line Gate

2 / 7.15 Gate Layouts
Not to Scale



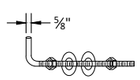
Access Gate



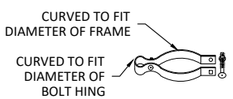
GATE POST:

USE CLASS "B" CONCRETE AT GATE POSTS OR WHERE REQUIRED BY SOIL CONDITIONS. CONCRETE MAY ALSO BE USED IN LIEU OF SETTING POSTS TO THEIR MAXIMUM DEPTH.

Detail of Gate Post Anchor



Bolt Hinge (2 Required Per Gate)



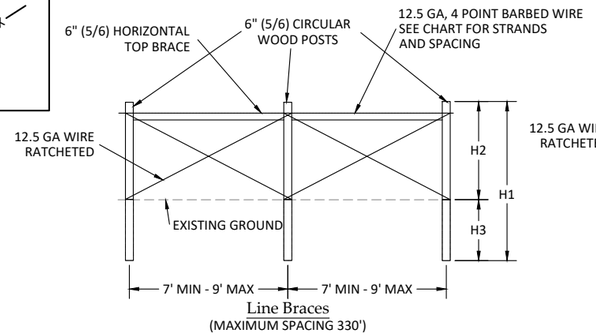
Hinge Clamp (2 Required Per Gate)

Hinge Assembly

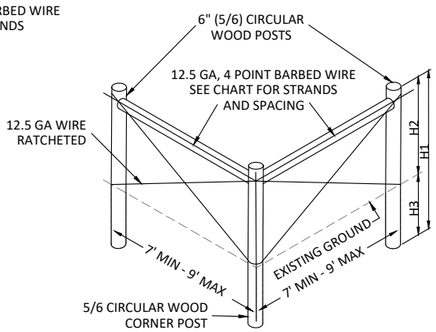
3 / 7.15 Double 2" Tube 12' Steel Gate
Not to Scale

GENERAL NOTES:

1. ALL POSTS AND BRACES MAY BE EITHER ROUND OR SQUARE AT THE OPTION OF THE CONTRACTOR, PROVIDED THE SAME TYPE IS USED THROUGHOUT THE PROJECT.
2. DIMENSIONS SHOWN ARE THE DIAMETER OF ROUND OR EDGE DIMENSIONS OF SQUARE POSTS AND BRACES.
3. ERECT LINE BRACES BETWEEN END, CORNER OR GATE POSTS. PLACE LINE BRACES AT INTERVALS NOT TO EXCEED 300' AND AT THE END OF THE WIRE ROLL.
4. THE 300' INTERVAL MAY BE REDUCED BY THE ENGINEER ON CURVES WHERE THE DEGREE OF CURVATURE IS GREATER THAN 3 DEGREES.
5. NOTCH BRACE POSTS 1" MINIMUM FOR HORIZONTAL BRACES. PLACE TWO GALVANIZED 12d OR THREE GALVANIZED 10d NAILS AT EACH END OF ALL BRACES.
6. PLACE THE BRACE WIRE AROUND THE POST. DRAW ALL BRACE WIRE TAUT BY TWISTING BETWEEN EACH POST.
7. 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. SEE NCDOT STD. 866.02 FOR FENCING AT DITCH CROSSINGS, BREAKS IN GRADES AND R/W BREAKS.
8. 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.
9. ANY COMBINATION OF GATE AND FENCE TYPE MEETING THE APPROVAL OF THE ENGINEER IS ACCEPTABLE AND IS NOT LIMITED TO THE EXAMPLES SHOWN HEREON.



Line Braces (MAXIMUM SPACING 330')



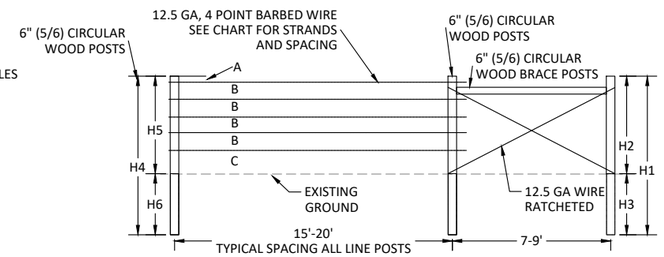
Corner Braces

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"



End or Gate Braces

4 / 7.15 Barbed Wire Fence
Not to Scale

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Details

Revisions:

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Project Engineer: EFN
Drawn By: CAW
Checked By: CDB

Sheet 7.15

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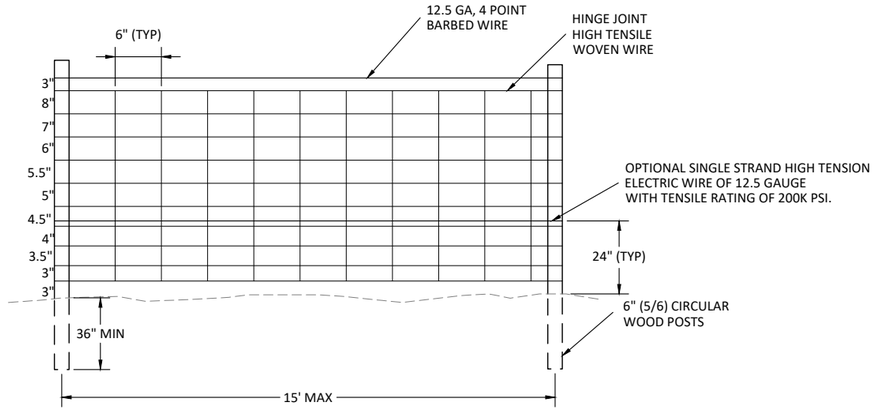
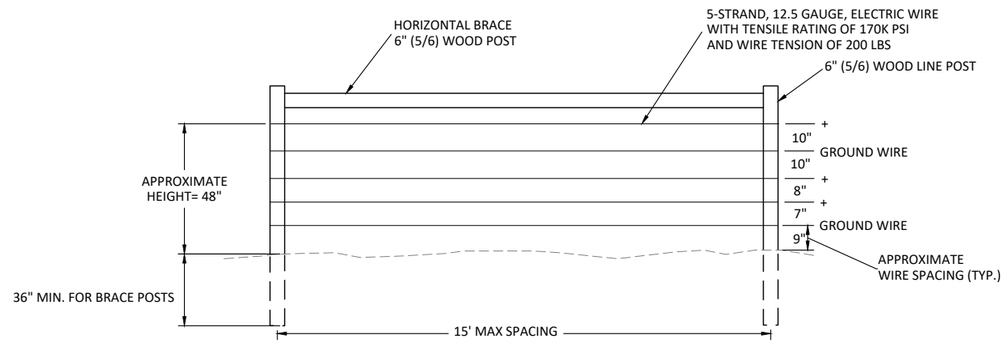
July 11, 2022



NOTES:

1. THE FENCE SHALL MEET CLASSIFICATION FOR HINGE JOINT HIGH TENSILE WOVEN WIRE.
2. A SINGLE STRAND HIGH TENSION ELECTRIC WIRE OF 12.5 GAUGE WITH A TENSILE RATING OF 200K PSI SHALL BE INSTALLED 24 INCHES ABOVE THE GROUND ON THE LIVESTOCK SIDE OF THE FENCE.
3. MAXIMUM SPACING BETWEEN LINE POSTS SHALL BE 15 FEET ON CENTER AND SET AT LEAST 30 INCHES INTO THE GROUND.
4. LINE POSTS SHALL BE 6" (5/6) CIRCULAR WOOD POSTS.
5. BRACE POSTS SHALL BE 6" (5/6) CIRCULAR WOOD POSTS AND SET 36" IN THE GROUND.
6. ALL CORNERS, FENCE LINE ENDS, AND GATE OPENINGS REQUIRE DOUBLE H BRACE ASSEMBLIES. STRAIGHT LINE FENCE SHALL BE 660 FEET MAXIMUM SPACING. STRAIGHT FENCE SPANS 330 FEET OR LESS SHALL USE SINGLE H BRACE ASSEMBLIES.
7. REFER TO THE SPECIFICATIONS FOR MORE INFORMATION ON FENCING.

1 / 7.16 Woven Wire Fence
Not to Scale



NOTES:

1. THE FENCE SHALL BE BUILT ACCORDING TO THE NRCS SPECIFICATION 382 FOR 5-STRAND ELECTRIC WIRE HIGH TENSILE FENCE. (March 2014)
2. 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.
3. LINE POSTS SHALL BE 6" (5/6) PRESSURE TREATED WOOD WITH A MAXIMUM SPACING OF 15 FEET AND A MINIMUM POST HEIGHT OF 68".
4. BRACE POSTS SHALL BE 6" (5/6) PRESSURE TREATED WOOD AND SET 36" INTO THE GROUND. HORIZONTAL BRACE POSTS SHALL BE 6" (5/6) PRESSURE TREATED WOOD. BRACING SHALL BE ACCORDING TO THE TABLE BELOW:
5.

PULL DISTANCE	END/CORNER/GATE BRACE SPECIFICATION	INLINE BRACE SPECIFICATION
< 660 FEET	SINGLE H OR SINGLE DIAGONAL ASSEMBLY	NOT REQUIRED
660 - 2,000 FEET	SINGLE H OR SINGLE DIAGONAL ASSEMBLY	SINGLE H OR SINGLE DIAGONAL ASSEMBLY
> 2,000 FEET	DOUBLE H OR DOUBLE DIAGONAL ASSEMBLY	SINGLE H OR SINGLE DIAGONAL ASSEMBLY

6. REFER TO THE SPECIFICATIONS FOR MORE INFORMATION ON FENCING.

2 / 7.16 High Tensile Electric Wire Fence
Not to Scale

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DRAFT

Bridgefork Dairy Mitigation Site
Cleveland County, North Carolina

Details

Date:	07.11.22
Job Number:	005-02190
Project Engineer:	EPN
Drawn By:	CAW
Checked By:	CDB

Revisions:

Sheet 7.16

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