FINAL MITIGATION PLAN

July 2020

BANNER FARM MITIGATION SITE

Henderson County, NC
NCDEQ Contract No. 7530
DMS ID No. 100062

French Broad River Basin
HUC 06010105

USACE Action ID No. SAW-2018-01153
RFP #: 16-007334

PREPARED FOR:

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

PREPARED BY:

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

DRAFT MITIGATION PLAN

BANNER FARMS MITIGATION SITE

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This mitigation Plan has been written in conformance with the requirements of the following:

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

These documents govern DMS operations and procedures for the delivery of compensatory mitigation.

Contributing Staff:
Eric Neuhaus, PE, *Project Manager*
Jake McClean, PE*, Water Resources Engineer*
Shawn Wilkerson, *Principal in Charge*
Jacob Wiseman, *Designer*
Mimi Caddell, *Lead Scientist*
Scott Gregory, *Senior Scientist*
Jordan Hessler, *Scientist*
Emily Reinicker, PE, *Lead Quality Assurance*

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

REPLY TO
ATTENTION OF:

June 12, 2020

Regulatory Division

Re: NCIRT Review and USACE Approval of the NCDMS Banner Farm Mitigation Site / Henderson Co./ SAW-2018-01153/ NCDMS Project # 100062

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

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Banner Farm Draft Mitigation Plan, which closed on May 8, 2020. 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 appropriate USACE field office at least 30 days in advance of beginning construction of the project. Please note that this approval does not preclude the inclusion of permit conditions in the permit authorization for the project, particularly if issues mentioned above are not satisfactorily addressed. Additionally, this letter provides initial approval for the Mitigation Plan, but this does not guarantee that the project will generate the requested amount of mitigation credit. As you are aware, unforeseen issues may arise during construction or monitoring of the project that may require maintenance or reconstruction that may lead to reduced credit.

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

Sincerely,

Kim Browning
Mitigation Project Manager
for Tyler Crumbley

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Matthew Reid, Paul Wiesner—NCDMS
Eric Neuhaus, John Hutton—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 May 28, 2020

MEMORANDUM FOR RECORD

SUBJECT: Banner Farm Mitigation Site - NCIRT Comments during 30-day Mitigation Plan Review

PURPOSE: The comments listed below were received during 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.

NCDMS Project Name: Banner Farm Mitigation Site, Henderson County, NC

USACE AID#: SAW-2018-01153
NCDMS #: 100062
30-Day Comment Deadline: May 8, 2020

DWR Comments, Mac Haupt & Erin Davis:

1. Page 3, Section 3.3 – It's stated that watershed processes and stressors from outside the project are likely to remain consistent through project closeout. What about after closeout? Please consider potential future land use changes in evaluating project risks and uncertainties for long-term site stability and protection (e.g. risk of encroachment). This could include consulting utility companies, local/county planning departments and NCDOT on anticipated projects in the vicinity.
2. Page 6, Table 5 – Wetland restoration requires the uplift of multiple functions. Shouldn't hydrologic and vegetative methods be listed for wetland areas proposed for restoration?
3. Page 9, Section 3.6 – For existing culvert crossings proposed to remain, please include a description of their current condition to confirm that sizing is appropriate and that they are not perched, buried or otherwise inhibiting aquatic passage.
4. Page 13, Section 5.0 – This Plan does not include a "Site Constraints to Functional Uplift" subsection. DWR considers easement breaks as site constraints since fragmentation impacts the site's potential functional uplift. Please include a discussion on the coordination completed to minimize the quantity and width of proposed stream crossings. Is herbicide spraying a standard maintenance activity implemented within these utility corridors?
5. Page 33, Section 8.6.4 – DWR is concerned with proposed wetland restoration areas represented by cross-section #4 on Sheet 3.4 and cross-section #6 on Sheet 3.5 where 2-3 feet of soil will be excavated. DWR supports a wetland creation credit ratio of 3:1 for areas excavated more than 12 inches. Additionally, DWR is concerned about the drainage effect these cut areas will have on adjacent proposed wetland restoration areas and we request groundwater gauges be placed to demonstrate the attainment of the 12% hydroperiod.
6. Page 35, Section 8.7.1 – The proposed work on Banner Creek Reach 1 appears more associated with an Enhancement 1 approach, additional justification is needed to support

Restoration credit. DWR is concerned about tree mortality if a restoration scale approach is implemented.

7. Page 34, Section 8.7.1 – Since establishment of vegetative cover and vigor can be a challenge on Priority II restoration banks/benches, please include a discussion on how the soil restoration will be addressed during construction and reference potential adaptive management.
8. Page 36, Section 8.7.2 – DWR would like to see trees removed during construction, which are not used for in-stream structures or habitat, be scattered as LWD within wetland restoration areas. Also, wetland areas should be disked to reduce compaction and DWR would prefer furrows not exceed a depth of 6 inches.
9. Page 36, Section 8.8 –
    a. Please identify the target community types.
    b. Please indicate if fescue will be treated prior to or during site construction. DWR recommends early treatment based on observations of fescue impeding planted vegetation establishment and vigor.
    c. Please reference the planting window specified in the 2016 NCIRT Mitigation Update Guidance.
10. Page 37, Section 8.9 – Please confirm whether any maintained pedestrian trails for future hunting activities are proposed within the mitigation site. If so, approximate locations of trails should be shown on the site figure or design drawings. DWR does not support any new vehicle access paths/roads, including for ATV use, within the site.
11. Page 37, Section 8.10 – Table 17 is a helpful summary of easement break information, could you possibly add whether the breaks include culvert crossings and if the culverts will remain or be replaced. Also, based on the number of Duke Energy utility easement breaks and the proposed work to be completed within their easements (e.g. channel filling, culvert removal), please provide a brief summary of the coordination and authorization process.
12. Page 39, Section 9.4 – DWR appreciates that gauge ground surface elevation and soil profile data will be recorded and included in the MY0 Report.
13. Page 40, Section 10.0 – DWR requests the inclusion of red-line drawings in the baseline monitoring report comparing record drawings to final mitigation plan design sheets.
14. Page 41, Table 18 – Please remove the phrase “based on the soil type”. The proposed 12% hydroperiod applies to all wetland restoration areas as stated in Section 9.4.
15. Page 42, Section 10.1 – Please also include visual monitoring photo locations at proposed crossings.
16. Page 43, Section 11.0 –
    a. Please specific an expected maximum duration between “periodic” inspections.
    b. Adequate signage should be installed along CE boundaries abutting utility corridors and road right-of-ways that are regularly maintained. Of particular concern are the two cut outs for individual utility poles along Banner Farm Road.
17. Page 44, Section 12.0 – Please include the IRT/DWR in adaptive management planning coordination.
18. Page 44, Section 13.0 – DWR would support a 2:1 ratio for wetland rehabilitation areas as being more representative of the functional uplift delta based on existing wetland hydrology, soils and vegetation.
19. Figure 10 – DWR requests one additional gauge and five groundwater gauge relocations – see figure markup (attached).
20. Appendix 7 – Please include the coordinates for the Sierra Nevada well location.
21. Appendix 8 –
    a. Sheet 0.3 – For clarity, can you please reference the “CR, JR, CH, RR” used within the proposed bankfull icon on the plan views.
    b. Sheet 0.3 – It would help our review to see the existing channel areas proposed to be filled as a shaded feature on the plan view sheets.

c. Sheet 2.1.4 – There appears to be an existing stormwater pipe that discharges within the proposed easement. Please confirm that this structure will be removed.
d. Sheet 2.2.1 – Please explain the design rationale for starting UT1 west of the existing channel rather that to the east. The original concept plan shows the UT1 relocated east of the existing channel where there appears to be area to achieve moderate sinuosity between stream crossing constraints. DWR is concerned about the current design's high sinuosity with regard to long-term stability and adequate sediment transport.
e. Sheet 4.1 –
    i. American beech is listed twice under the open area buffer planting.
    ii. Please confirm that the appropriate stratum is listed for the buffer zone species.
    iii. DWR appreciates the diversity of species and stratum incorporated into the buffer and riparian zone planting lists. However, the wetland planting zone accounts for approx. 80% of the site's planting area and only has 6 species proposed, of which 3 species comprise 75% of the total stems. Since red maple is already present at the site, it should be removed from the planting list. DWR requests that the wetland planting list be revisited to enhance species and stratum diversity, with no single species comprising more than 20%.
f. Sheet 6.2 – DWR recommends footer logs be incorporated in all log sills.
g. Sheet 6.3 – Please rename Lunker Log or Cover Log for consistency with legend icon.
h. Sheet 6.4 – Where is channel stabilization (fully lined with erosion control matting) proposed?

22. Appendix 9 – DWR appreciates the removal technique details included. The kudzu and bamboo onsite are particularly concerning. Please identify which species were treated and where in the annual monitoring reports.
23. Appendix 10 – DWR appreciated the site-specific maintenance plan, including mention of visits after major flooding events.

NCWRC Comments, Andrea Leslie:

1. There will not be a trout moratorium required for this project.
2. The reestablishment and rehabilitation of nearly 40 acres of wetland in the French Broad floodplain is very exciting. Many of the French Broad floodplain wetlands have been lost, and this project has the opportunity to provide an important ecological role for the area, especially in terms of habitat.
3. Please provide a single map that shows the planting plan for the entire site, noting where the different zones of plantings will occur (e.g., wetland, open area buffer planting, partially vegetated area buffer planting, riparian planting).
4. We appreciate the planting plan for the open area buffer, partially vegetated area buffer, and riparian planting zones. Good attention has been given to canopy, shrub/subcanopy, and herbaceous strata. We recommend removing silver maple from the planting list, as it can be invasive. It is known from wetlands in Henderson County, but it will likely come in on its own.
5. However, the wetland planting plan only consists of 6 tree species, with no other strata (including herbaceous) addressed. As the wetland acreage of this site is significant, we ask the designer to round out their wetland planting plan with other strata and with a more diverse tree list. Were the Sierra Nevada wetland and Henry Fork wetland used as plant reference sites? If so, the Henry Fork site may not be the best reference for vegetation, given it is a piedmont site. Given its setting, we recommend gearing this to the Montane Alluvial Forest Large River Subtype in the Guide to the Natural Communities of North Carolina (see https://files.nc.gov/dncr-nhp/documents/files/Natural-Community-Classification-Fourth-Approximation-2012.pdf <Blockedhttps://files.nc.gov/dncr-nhp/documents/files/Natural-Community-Classification-Fourth-Approximation-2012.pdf). NCWRC is open to working with Wildlands on the planting plan.

6. We consulted with the NC Natural Heritage program and offer the following recommendations on the planting plan:
    a. Trees: Eliminate Willow Oak, as it is not a Blue Ridge species. We recommend eliminating Red Maple as well, as it will come in on its own. Here is a list of tree species that would be worthy additions – Box Elder, Black Willow, River Birch, Tulip Poplar, Shingle Oak, Black Gum, Pitch Pine (on hummocks, higher ground). We recommend bringing in at least 4 of these species into your planting plan.
    b. Shrubs/understory trees: Develop a list of shrubs/smaller trees, considering Sweetspire, Viburnum rufidulum, Viburnum prunifolium, Viburnum nudum, Leucothoe racimosa, Leucothoe fontanesiana, Spice Bush, Buttonbush, Sweet Birch, Ironwood, American Holly, River Birch.
    c. Herbaceous species: We assume that the designer already has a set of species for the wetland herbaceous layer that didn't make it into the plan. Worth adding to this list would be Cinna arundinacea, Glyceria striata, Glyceria septentrionalis, Virginia Wildrye, River Oats.
7. We encourage Wildlands to incorporate rivercane into their project. Rivercane is found on the French Broad River floodplain; it has been eliminated from much of its former extent in western NC, and there is a renewed effort to reestablish this species.

USACE Comments, Kim Browning:

1. Please add some discussion regarding the outlet at STA 37+97 to the French Broad River since this area is prone to backwater flooding.
2. Figure 6 shows existing groundwater gages, while Figure 11 shows gages in different locations. Will the existing gages still be monitored, or just moved during construction? It would be beneficial to have gages in approximately the same areas to compare pre and post construction data and justify functional uplift.
3. Please remove red and silver maple from the planting plan.
4. Table 5: It would be beneficial to show the current NCSAM rating in this table.
5. Rehabilitation areas indicate that hydrology is already above 12% and are currently jurisdictional and providing wetland functions. This would be more appropriate for an enhancement ratio of 2:1 based on functional uplift.
6. Page 33: There is concern with proposed wetland restoration areas where more than 12" of soil will be excavated. The text cites that 12% of reestablishment and 18% of rehab wetlands will be graded deeper than 12", which is a considerable amount. Typically, these areas would be more appropriate for a wetland creation credit ratio of 3:1; however, after receiving clarification from WEI, I feel more comfortable that the grading is to support the slope requirements for the stream restoration. Attached is additional information received from WEI to justify that the grading is not for wetland hydrology needs.
7. Given the flat slope and the huge sediment load coming into the system from The French Broad River, there is concern that without sufficient flow, the stream channels may fill in with sediment and become more wetland-like.
    a. Section 9.1.1: Recommend adding a performance standard to maintain channel characteristics and an OHWM. Backwater flooding of the French Broad River will likely cause aggradation, and clearing sediment and vegetation from the channel after monitoring year two is not recommended.
8. Figure 6 shows Wetland T, but Figure 10 shows this area as a small tributary. Table 9 indicates that this area will have a temporary impact of 0.04 ac from floodplain grading. Please clarify what is happening in this area when submitting the PCN.
    a. Additionally, please estimate the number or acres of trees to be cleared to address the NLEB 4(d) rule.

b. When submitting the PCN, please combine all impacts by reach. For example, if there are three 60’ culverts on reach 1, list it as 180’ of permanent impact rather than listing it as three separate impacts. But permanent and temporary impacts still need to be separated.

9. Reach 1, as presented, seems to be more appropriate as an enhancement level 1 reach at 1.5:1. Please provide additional justification why this reach is proposed as restoration at 1:1.
10. Section 8.7.2: It would be beneficial to add some coarse woody debris to the depressional areas in the buffers and throughout the adjacent wetlands for habitat, and to help store sediment, increase water storage/infiltration, and absorb water energy during overbank events. I was pleased to see the inclusion of wood in the stream design for habitat.
11. Section 8.8: In addition to the planting plan in the design sheets, it would be helpful to see a map view of the different planting zones.
12. Section 8.9: It would be beneficial to add a discussion regarding utility line maintenance and potential for the road culverts to be replaced in the future.
13. What is the situation with Banner Creek Reach 2, above Banner Farm Road, where no channel work is proposed?
14. There is a section of Banner Creek Reach 3 that runs under the powerline. Please clarify that this is a non-credited section.
15. Recommend adding a performance standard for invasive species to be less than 5% of the conservation easement, and a zero tolerance for kudzu and bamboo.
16. Table 18: The IRT prefers the use of pressure transducers over crest gages.

Kim Browning
Mitigation Project Manager
Regulatory Division

Memorandum to the Record
May 6, 2020

Agency Comments for the Banner Farm Stream and Wetland Mitigation Site (SAW-2018-01153) Mitigation Plan Associated with the NCDMS In-Lieu Fee Program in Henderson County, NC

Kim,

Thank you for the opportunity to provide feedback and comments on the Banner Farm Stream and Wetland Mitigation Site (the Site or Project) Mitigation Plan as an addition to the North Carolina Division of Mitigation Resources In-Lieu Fee Program (NCDMS ILF). Wildlands Engineering, Inc., has presented a potentially suitable plan to provide compensatory mitigation for jurisdictional wetland impacts associated with the US Army Corps of Engineers Clean Water Act Section 404 permit program. The project involves the restoration of approximately 6,300 existing linear feet of incised and straightened streams and the restoration of over 35.7 acres of historically altered wetlands. Restoration of project streams and wetlands will provide 6,294 cool stream mitigation units (SMUs) and 34.8 wetland mitigation units (WMUs). The Site will be protected by a 46.6-acre conservation easement and was selected by NCDMS to provide SMUs and WMUs in the French Broad River Catalog Unit 06010105 (French Broad 05). No nutrient offsets or riparian buffers are presented specifically for additional compensatory mitigation credit.

Note: It is understood that site visits have been made by IRT members during the development of site feasibility to provide mitigation credit. In that regard, I feel it necessary to denote that I have not been on-site during this process and that my comments may reflect a lack of on-site observation and evaluation.

The EPA Region 4 Ocean, Wetlands and Stream Protection Branch offers the following site-specific comments as they pertain to the Banner Farm Draft Mitigation Plan dated April 1, 2020. Page numbers refer to the entire pdf document offered for review:

- Section 6.0/Page 29 Regulatory Considerations:
    - Recommend citing the Public Notice issued under Section 404 (SAW-2018-01153) on August 28, 2018.
- Section 8.7/Page 35 Project Implementation:
    - Sponsor may want to state actual buffer widths along Banner Creek. According to the plans/drawings the buffer appears to be 50’ in width along the entire Banner Creek Reach 1. I wish to commend Wildlands for providing minimum buffer widths of 50 feet or more throughout the project.
- Section 8.8/Page 50 Vegetation and Planting Plan (see Sheet 4.1 also)
    - Sponsor needs to justify the choice of *Quercus falcata* var *pagodifoli*a for this site. That tree species is chiefly found in the coastal plain and is not known in NC

mountain counties such as Henderson. (source: Radford et. al. Manual of Vascular Flora of the Carolinas 1964)

- Recommend removing *Alnus serrulata* listed as an Alternate and replaced with a more suitable canopy reaching species.

- Section 8.9/Page 51 Project Risk and Uncertainties
  - Has the sponsor considered expanding the project further south of the UT2 wetland area to capture more of the agriculture area and include it within the CE? It sounds like the landowners would be fine with abandoning the field if they could still hunt on it. Are there cost considerations and a lack of wetland credits needed?
- Section 9.2/Page 53 Vegetation.
  - Plot number (24 fixed and 12 mobile) and size (0.024 ac or 100m^2) should be included here. (per Table 19)
- Table 18/Page 55: Monitoring Plan
  - Recommend adding stem heights for MY 5 and MY 7 in vegetation.

Thank you for the opportunity to provide feedback, comments and concerns with the Banner Farm Stream and Wetland Draft Mitigation Site Plan in Henderson County, NC. The sponsor has provided a potentially suitable plan to offset impacts and provide compensatory stream and wetland credits to the NCDMS ILF program within the French Broad 05 watershed geographic service area. If you or the sponsor have any questions or need clarification on any of the comments stated above, please contact me at 404-562-9225 or at bowers.todd@epa.gov.

Best Regards,

Todd Bowers

Comments submitted to Kimberly Brown (SAW-PM) via email on May 6, 2020

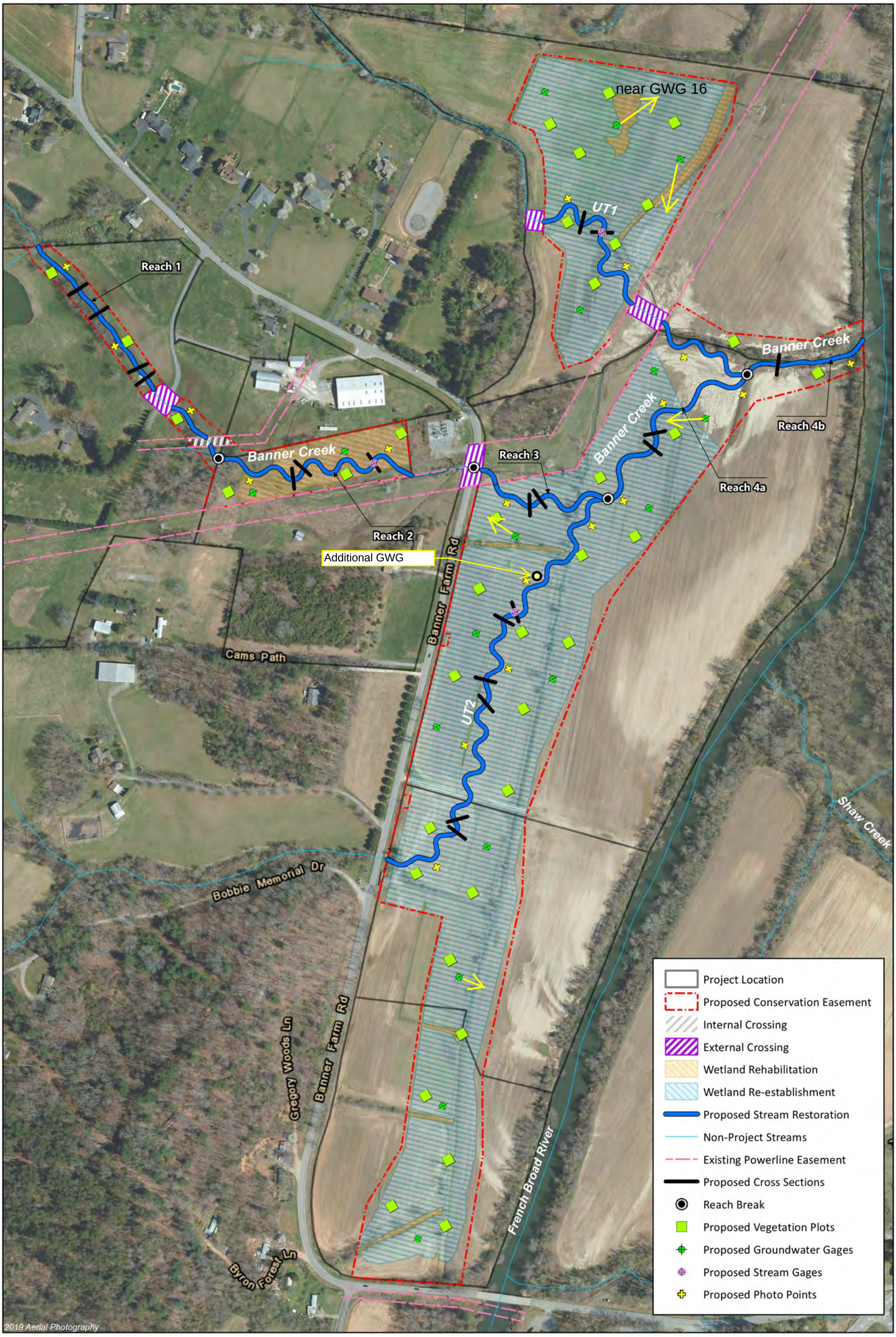

Figure 11 Monitoring Components Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

WILDLANDS ENGINEERING

0 300 600 Feet

Henderson County, NC

From: Eric Neuhaus <eneuhaus@wildlandseng.com>
Sent: Thursday, May 28, 2020 1:27 PM
To: Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Cc: Reid, Matthew <matthew.reid@ncdenr.gov>; John Hutton <jhutton@wildlandseng.com>
Subject: Banner Farms Wetland Grading: Mit Plan Discussion

Kim,

I wanted to follow up after our phone conversation yesterday regarding Banner Farms, the potential wetland grading, and the proposed crediting ratios within the submitted mitigation plan. I understand the concerns regarding the wetland grading depths over 12 inches. As we discussed on the phone, the grading within the proposed wetland areas is not dictated by wetland hydrology or the exposure of relic hydric soils, but rather the removal of extensive agricultural manipulation and the overall function of the stream/wetland complex as it relates to sediment transport and existing grade constraints.

Design evaluations and site observations indicate that a high sand load from the French Broad River is regularly delivered to the project streams through either overbank events and/or backwater conditions. Based on these observations, channel aggradation was identified as a fundamental risk to project assets, particularly stream crediting. To alleviate this design risk, minimum bankfull stream slopes of 0.1% were maintained for the designed channels. Pool slopes were held at zero, and riffles were shortened where possible to increase slopes (>0.2%) and maintain adequate stream power to flush high sand loads from the built channels incurred from the French Broad River. To maintain these slopes and work within existing site constraints, grading over 12 inches was required within proposed wetland areas. The grading was minimized as much as possible and only represents 4.47-acres of the proposed 35.78-acres of restored wetland as indicated in the NCDMS comment responses and the associated wetland grading exhibit provided with the NCDMS comments.

The upstream end of UT2, where the stream is being transitioned to a Priority 1 approach from the Banner Farm Road culvert represents 0.5 acres of the cut that exceeds 12 inches. Additionally, the agricultural berm/channel side cast material between the old channel of UT2 and the proposed alignment of UT2, which can be seen in Sheet 3.3 in wetland cross sections 2 and 3 represents 1.2 acres of cut that exceeds 12-inches. I highlight these areas to further emphasize that grading depths were a product of stream design, site constraints, and agricultural manipulation. While I understand the concern regarding the grading depths, I believe the design of the streams and their associated slopes is pivotal to the success of the project as a stream and wetland complex.

If you have questions or want to discuss further, feel free to reach out.

Thanks!

. . . . . .

Eric Neuhaus, PE | *Water Resources Engineer*
O: 828.774.5547 x105 **M**: 865.207.8835

Wildlands Engineering, Inc.
167-B Haywood Road
Asheville, NC 28806

March 23, 2020

N

0' 150' 300' 450'
(HORIZONTAL)

Grading with cut greater than 12" depth

Grading with cut less than 12" depth

*Areas not shaded may be ungraded or fill areas.

Wetland Re-establishment Boundary

Wetland Rehabilitation Boundary

EXISTING POND

STA: 0+08
START BANNER CREEK REACH 1 - RESTORATION

Mitchell & Wendy Gaither
PIN: 9630826726
DB: 1598 PG: 219

BANNER CREEK

STA: 9+34
END BANNER CREEK REACH 1 - RESTORATION
START BANNER CREEK REACH 2 - RESTORATION

MOUNTAIN BEAN HOLDINGS, INC.
PIN: 9630924395
DB: 3150 PG: 641
TRACK 1

PROPOSED WETLAND REHABILITATION BOUNDARY

VINE RIPE INVESTMENTS, INC.
PIN: 9630912884
DB: 3150 PG: 631

PROPOSED WETLAND RE-ESTABLISHMENT BOUNDARY

STA: 200+18
START UT2 - RESTORATION

STA: 18+00
END BANNER CREEK REACH 2 - RESTORATION

STA: 21+16
START BANNER CREEK REACH 3 - RESTORATION

STA: 100+83
START UT1 - RESTORATION

BANNER FARM ROAD

UT 1

KIRBY & SHERRI JOHNSON
PIN: 9539895929
DB: 1426 PG: 625

UT 2

KIRBY & SHERRI JOHNSON
PIN: 9630900480
DB: 3403 PG: 159

KIRBY & SHERRI JOHNSON
PIN: 9630919204
DB: 831 PG: 23

STA: 218+97
END UT2 - RESTORATION

BANNER CREEK

STA: 25+83
END BANNER CREEK REACH 3 - RESTORATION
START BANNER CREEK REACH 4A - RESTORATION

MOUNTAIN BEAN HOLDINGS, INC.
PIN: 9640028341
DB: 3150 PG: 641
TRACK 2

STA: 112+82
END UT1 - RESTORATION

STA: 33+77
END BANNER CREEK REACH 4A - RESTORATION
START BANNER CREEK REACH 4B - RESTORATION

FRENCH BROAD RIVER

STA: 37+97
END BANNER CREEK REACH 4B - RESTORATION

L:\Active Projects\005-0172 Banner Farm Mitigation Site\CadD\Archive\CAD Files\Wet Plan Submittal 03-2020\Plans\005172-Overview.dwg

WILDLANDS ENGINEERING
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Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Banner Farm Mitigation Site
Henderson County, NC

Wetland Grading Exhibit
Cut Depth

Revisions:

Date: 03.17.2020
Job Number: 005-021752
Project Engineer: JDN
Drawn By: JDW
Checked By: JM

Sheet 1 of 1

July 8, 2020

ATTN: CESAW-RG/Browning
Ms. Kim Browning
US Army Corps of Engineers – Wilmington District
69 Darlington Avenue
Wilmington, NC 28403-1343

RE: Banner Farm Mitigation Site
Henderson County, NC
Response to NCIRT Comments during 30-day Mitigation Plan Review
USACE Action ID No: SAW-2018-01153
DWR Project ID: 20181032
NCDMS Project No: 100062

Dear Ms. Browning:

Wildlands Engineering, Inc. (Wildlands) has reviewed DWR's, NCWRC's, USACE's, and US EPA's comments from the Banner Farm Mitigation Plan package. The following Wildlands responses to *DWR's, NCWRC's, USACE's, and USEPA's comments* are noted below.

DWR Comments, Mac Haupt & Erin Davis:

1. *Page 3, Section 3.3 – It's stated that watershed processes and stressors from outside the project are likely to remain consistent through project closeout. What about after closeout? Please consider potential future land use changes in evaluating project risks and uncertainties for long-term site stability and protection (e.g. risk of encroachment). This could include consulting utility companies, local/county planning departments and NCDOT on anticipated projects in the vicinity.*

   Wildlands Response:
   Based on Wildlands evaluation of the watershed over the last 60 years, it is anticipated that the watershed will maintain its low density residential, rural, and agricultural make-up beyond the close-out period. The current Horse Shoe Community Plan defines zoning within the watershed as Residential 2 – Rural, Residential 2, and some R-40, with major areas of the watershed defined with farmland or agriculture-horticulture designations. It is proposed within the planning document that the R-40 zoning area within the watershed be rezoned to standard density R2, consistent with current low-density rural development in the watershed. Current stormwater regulations implemented by Henderson County within the water supply watershed should mitigate potential hydrologic effects from future development to the Site long term. Banner Farm Road is briefly discussed within the planning documentation, but there is no indication that the road experiences heavy traffic or will need to be widened based on anticipated future development. The conservation easement is subject to the full right of way of Banner Farm Road and the easements of Duke Power and Southern Bell and all appropriate title work was obtained during the process of recording the conservation easement. Wildlands does not anticipate any future risk to the conservation easement based on the existing planning documents, proposed Site design, and current title information obtained while recording the conservation easement.

2. *Page 6, Table 5 – Wetland restoration requires the uplift of multiple functions. Shouldn't hydrologic and vegetative methods be listed for wetland areas proposed for restoration?*

Wildlands Response:
Wildlands identifies the most pertinent method of restoration or enhancement within Table 5. Table 5 is intended to document the condition of existing wetlands. Proposed restoration and anticipated uplift are outlined and detailed within many other sections of the report (including Section 5.0, Section 7.0, Table 10, and Section 8.6).

3. *Page 9, Section 3.6 – For existing culvert crossings proposed to remain, please include a description of their current condition to confirm that sizing is appropriate and that they are not perched, buried or otherwise inhibiting aquatic passage*.

Wildlands Response:
Three existing culverts which are outside the conservation easement on project streams are proposed to remain in place. On Banner Creek they include the landowner driveway crossing at Station 6+73 (Reach 1) and the NC DOT culvert under Banner Farm Road at Station 19+98 (Reach 3). Additionally, at the upstream extents of UT2 (Station 200+00) there is an existing NCDOT culvert under Banner Farm Road. Current crossing conditions are outlined below, however, it should be noted that it was discussed with the NCIRT at the post-contract field walk that given the locations of the crossings, these crossings would not be reset or replaced as part of the project mitigation.

The landowner driveway crossing on Banner Creek (Reach 1, Station 6+73) consists of a 72" corrugated metal pipe (CMP) that is approximately 20 feet long. The metal pipe is incorporated into a rock and concrete crossing. The culvert was assessed to be in good condition with no perching or buried inlets. The design slope of the culvert is 0.3% and modeling showed the culvert should pass approximately 210 cfs (about a 10-year flow event) before overtopping occurs. During base flow conditions outlet velocities are estimated below 2 ft/s, ideal for aquatic organism passage.

The NCDOT culvert under Banner Farm Road (Reach 3, Station 19+98) consists of approximately 42 linear feet of 60" CMP. The culvert was assessed to be in good condition and no perching or buried inlets were noted. Wildlands has proposed a rock sill just downstream of the culvert at Station 20+43 to hold grade through the culvert and reduce the potential for channel degradation downstream of the culvert, which often results in a perched condition. The design slope of the culvert is 0.77% and modeling showed the culvert should pass approximately 185 cfs (between a 5-yr and 10-year flow event) before overtopping occurs. During base flow conditions outlet velocities range between 2 ft/s and 3 ft/s which should allow for aquatic organism passage upstream through the culvert.

The NCDOT culvert located where UT2 passes under Banner Farm Road and then enters the project area (Station 200+00) is a 72" CMP that is approximately 30 feet long. The culvert was assessed to be in good condition and no perching or buried inlets were noted. Wildlands has proposed a constructed riffle ending with a rock sill just downstream of the culvert outlet (Station 200+18 to 200+53) to hold grade through the culvert and reduce the potential for channel degradation below the culvert. The slope of the culvert is 0.2% and modeling showed the culvert should pass over 200 cfs before overtopping, more than a 50-yr event for this small watershed. During base flow conditions outlet velocities range between 0.5 ft/s and 1 ft/s which should allow for aquatic organism passage upstream through the culvert.

4. *Page 13, Section 5.0 – This Plan does not include a "Site Constraints to Functional Uplift" subsection. DWR considers easement breaks as site constraints since fragmentation impacts the site's potential functional uplift. Please include a discussion on the coordination completed to minimize the quantity*

and width of proposed stream crossings. Is herbicide spraying a standard maintenance activity implemented within these utility corridors?

Wildlands Response:
A description of the proposed conservation easement breaks, their proposed use (culvert, utility, etc.), and associated maintenance and coordination are included in Table 17, Section 8.10, and Figure 10.

5. *Page 33, Section 8.6.4 – DWR is concerned with proposed wetland restoration areas represented by cross-section #4 on Sheet 3.4 and cross-section #6 on Sheet 3.5 where 2-3 feet of soil will be excavated. DWR supports a wetland creation credit ratio of 3:1 for areas excavated more than 12 inches. Additionally, DWR is concerned about the drainage effect these cut areas will have on adjacent proposed wetland restoration areas and we request groundwater gauges be placed to demonstrate the attainment of the 12% hydroperiod.*

   Wildlands Response:
   Wetland grading and associated crediting is discussed within the email correspondence with Kim Browning provided with these comments as well as Wildlands response to USACE comments 5 and 6 below. Credit ratios were reduced as described in the below comments and corresponding revised plans and mitigation plan. As highlighted, the proposed grading was minimized as much as feasible to ensure adequate sediment transport processes for the proposed streams. Proposed monitoring gage locations were updated in accordance with comment #19.

6. *Page 35, Section 8.7.1 – The proposed work on Banner Creek Reach 1 appears more associated with an Enhancement 1 approach, additional justification is needed to support Restoration credit. DWR is concerned about tree mortality if a restoration scale approach is implemented.*

   Wildlands Response:
   The proposed design for Banner Creek Reach 1 modifies stream pattern, profile, and dimension. The proposed alignment corrects multiple existing stream issues including actively eroding and mass wasting banks. Additionally, a relic crossing will be removed along Reach 1 and aquatic organism passage will be improved at the existing driveway crossing, and at the upstream extents of the reach. During the post contract IRT site walk, it was determined that Wildlands would evaluate the elevations, project constraints, and existing stream condition and submit the appropriate approach (See Appendix 13 – IRT Meeting Minutes, #10). Given all the existing data Wildlands proposed a stream restoration approach at a 1:1 credit ratio and believes this is the correct approach for this portion of the project.

   While some tree mortality along this reach is a possible, implementing an Enhancement 1 approach would not alleviate risks of tree mortality as the water table elevation would still be expected to increase based on the alteration of the stream profile and dimension. Most of the trees along the right bank are river birches (*Betula nigra*), which can adapt to moist soils and should not struggle with increases in water tables. Wildlands will take precautions during construction to decrease tree mortality. Erosion and Sediment Control and construction sequencing instructions to the contractor will require as much work as possible to occur from the left bank only, to avoid equipment tracking through where a majority of the larger trees are located (along the existing right bank).

7. *Page 34, Section 8.7.1 – Since establishment of vegetative cover and vigor can be a challenge on Priority II restoration banks/benches, please include a discussion on how the soil restoration will be addressed during construction and reference potential adaptive management.*

   Wildlands Response:

Section 8.8 – Vegetation and Planting Plan of the plan states:
"Mechanical site preparation will be implemented where necessary to create soil physical properties favorable for tree growth. In the agricultural field, the planted area will be ripped in a grid-like pattern with a maximum rip shank spacing of six feet. Ripping will be performed during the driest conditions feasible to maximize shatter of the plow pan. Construction practices are intended to minimize effects to soil properties, but some impacts are unavoidable. Ripping may be implemented to reduce soil compaction resulting from haul roads, stockpile areas, etc. Where grading is required, topsoil will be stockpiled and reapplied. Soil amendments may be incorporated to augment survival and growth of planted vegetation as determined necessary by soil testing."

Wildlands will strip and stockpile topsoil before grading and reapply the material after finished grading but prior to roughening to help establish vegetation in priority II and wetland grading areas. Topsoil and subsoils within proposed grading areas will be tested for typical soil parameters and amendments will be considered based upon the results. If vegetative cover struggles to establish in planted areas of the project. Wildlands will resample the affected area and implement soil amendments based on the results of a soil test during the monitoring period.

It is important to note the Site receives backwater from the French Broad River frequently inundating the areas proposed for grading. Frequent inundation events and prolonged excessive saturation will lead to slow growing or stunted vegetative growth. The following text was added to Section 9.2 in reference to the vegetation performance standards "Given the inundation periods anticipated for areas proposed for wetland restoration, woody vegetation growth may be hindered, resulting in stunted heights in early monitoring years. Wildlands will evaluate vigor and height of vegetation plots in wetland restoration areas on a case-by-case basis and will discuss any potential issues within annual monitoring reports."

8. *Page 36, Section 8.7.2 – DWR would like to see trees removed during construction, which are not used for in-stream structures or habitat, be scattered as LWD within wetland restoration areas. Also, wetland areas should be disked to reduce compaction and DWR would prefer furrows not exceed a depth of 6 inches.*

   Wildlands Response:
   Wildlands will use excess wood left over after in-stream structures are constructed at the Site as habitat by scattering and incorporating it into the floodplain.

   Section 8.8 and 8.7.2 of the plan reference disking and roughening as part of the proposed wetland restoration. Text within Section 8.7.2 was updated to read: "Furrows shall not exceed 6" in depth."

9. *Page 36, Section 8.8*
   - *Please identify the target community types.*

     Wildlands Response:
     The target community types are now refenced in the mitigation plan in Sections 8.7.1 and 8.8.

   - *Please indicate if fescue will be treated prior to or during site construction. DWR recommends early treatment based on observations of fescue impeding planted vegetation and vigor.*

     Wildlands Response:

Wildlands will use a combination of mechanical and chemical applications to remove fescue prior to and during Site construction. The Site has minimal fescue within the project area. Most fescues are found on Banner Creek reaches 1 & 2. Treatments on invasive species populations, including fescue, were conducted in 2019 and 2020 prior to construction. Mechanical removal of remaining fescue populations will take place during construction if necessary.

- *Please reference the planting window specified in the 2016 NCIRT Mitigation Update Guidance.*

  Wildlands Response:
  The planting window of November 15 to March 15 is now referenced in the mitigation plan in Section 8.8.

10. *Page 37, Section 8.9 – Please confirm whether any maintained pedestrian trails for future hunting activities are proposed within the mitigation site. If so, approximate locations of trails should be shown on the site figure or design drawings. DWR does not support any new vehicle access paths/roads, including for ATV use, within the site.*

    Wildlands Response:
    The property owners have not discussed any intention to install maintained pedestrian trails within the conservation easement.

11. *Page 37, Section 8.10 – Table 17 is a helpful summary of easement break information, could you possibly add whether the breaks include culvert crossings and if the culverts will remain or be replaced. Also, based on the number of Duke Energy utility easement breaks and the proposed work to be completed within their easements (e.g. channel filling, culvert removal), please provide a brief summary of the coordination and authorization process.*

    Wildlands Response:
    Table 17 was updated to include the presence of existing culverts and whether culverts will remain or be replaced during construction.

    Duke Energy's easements grants them the right to construct, maintain and operate on the project parcels. The property is still owned by the associated property owners, and as such, no notification is required for the property owner to alter grades within easements. During construction NC811 will be utilized to mark underground utilities within the limits of disturbance.

12. *Page 39, Section 9.4 – DWR appreciates that gauge ground surface elevation and soil profile data will be recorded and included in the MY0 Report.*

    Wildlands Response:
    Wildlands will ensure this data in included in the MY0 report.

13. *Page 40, Section 10.0 – DWR requests the inclusion of red-line drawings in the baseline monitoring report comparing record drawings to final mitigation plan design sheets.*

    Wildlands Response:
    Typically, red-line drawings are included in the DMS As-Built Baseline Monitoring Report Template and Wildlands plans to submit red-line drawings at that time. As mentioned in Section 10.0 of the mitigation plan: "Using the DMS As-Built Baseline Monitoring Report Template (June 2017), a baseline monitoring document and as-built record drawings of the project will be developed upon completion of the planting and monitoring installation on the restored Site."

14. Page 41, Table 18 – Please remove the phrase "based on the soil type". The proposed 12% hydroperiod applies to all wetland restoration areas as stated in Section 9.4.

Wildlands Response:
"Based on soil type" was removed from Table 18.

15. Page 42, Section 10.1 – Please also include visual monitoring photo locations at proposed crossings.

Wildlands Response:
Additional monitoring photo point locations have been added to proposed crossings. Figure 11 Monitoring Component Map and Table 19 have been updated.

16. Page 43, Section 11.0 –

a. Please specific an expected maximum duration between "periodic" inspections.

Wildlands Response:
Text within Section 11 was edited to read:

"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 annual inspection of the Site to ensure that restrictions required in the conservation easement are upheld."

b. Adequate signage should be installed along CE boundaries abutting utility corridors and road right-of-ways that are regularly maintained. Of particular concern are the two cut outs for individual utility poles along Banner Farm Road.

Wildlands Response:
Wildlands will mark the conservation easement in accordance with the Survey and Boundary Marking Requirements specified within the Survey Requirements for Full Delivery Projects with Boundary Design and Fencing Guidelines provide by NCDMS in January of 2020.

17. Page 44, Section 12.0 – Please include the IRT/DWR in adaptive management planning coordination.

Wildlands Response:
Major adaptive management activities will be presented to the IRT, DWR, and NCDMS. Routine maintenance including but not limited to minor invasive removal and easement marking, may be performed by Wildlands without notification of the IRT, DWR, or NCDMS.

18. Page 44, Section 13.0 – DWR would support a 2:1 ratio for wetland rehabilitation areas as being more representative of the functional uplift delta based on existing wetland hydrology, soils and vegetation.

Wildlands Response:
Wetland Rehabilitation mitigation ratios were reduced to 2:1 sitewide. Further discussion regarding wetland crediting is included in USACE comments 5 and 6 below.

19. Figure 10 – DWR requests one additional gauge and five groundwater gauge relocations – see figure markup (attached).

Wildlands Response:
Wildlands updated Figure 11 with the groundwater gages per the supplied Figure 11 provided with the comments. Please see updated Figure 11 Monitoring components map. During as-built monitoring device installation, Wildlands will use best professional judgment to ensure the groundwater gage locations sufficiently define the boundary and are representative of the proposed wetland restoration areas.

20. Appendix 7 – Please include the coordinates for the Sierra Nevada well location.

Wildlands Response:
A latitude and longitude were added to the Sierra Nevada Reference Well information sheet included within Appendix 7.

21. Appendix 8 –

a. Sheet 0.3 – For clarity, can you please reference the "CR, JR, CH, RR" used within the proposed bankfull icon on the plan views.

Wildlands Response:
An explanation for the riffle labels was placed with the Constructed Riffle symbol on Sheet 0.3

b. Sheet 0.3 – It would help our review to see the existing channel areas proposed to be filled as a shaded feature on the plan view sheets.

Wildlands Response:
Area to be filled were shaded on the project overview (Sheet 0.2). Note that shaded areas indicate ditches or existing channels that will be filled to the existing top of bank for those entities. Other areas of ditches or existing channels that show proposed grading (proposed topography contours) will also likely be filled, however they may not be filled all the way to the top of bank. Areas with proposed topography contours should be interpreted independently based on the contours.

c. Sheet 2.1.4 – There appears to be an existing stormwater pipe that discharges within the proposed easement. Please confirm that this structure will be removed.

Wildlands Response:
The existing stormwater pipe shown on Sheet 2.1.4 will be removed from the proposed conservation easement. A note was added to the sheet that reads "Excavate and remove stormwater pipes from easement"

d. Sheet 2.2.1 – Please explain the design rationale for starting UT1 west of the existing channel rather that to the east. The original concept plan shows the UT1 relocated east of the existing channel where there appears to be area to achieve moderate sinuosity between stream crossing constraints. DWR is concerned about the current design's high sinuosity with regard to long-term stability and adequate sediment transport.

Wildlands Response:
During the concept phase, preliminary data showed the upstream portion of UT1 prior to it turning and flowing south/southeast as entirely on the proposed project parcel. However, once an official boundary survey was completed, it was determined that the upstream portion of UT1 is partially on the adjacent property owner's parcel. As such, it would require permission from the adjacent property owner to allow Wildlands to relocate the stream as part of the project. The property owner was contacted and did not have interest in providing Wildlands the required permissions to move the stream. Therefore, it was required to keep the stream along the existing parcel line until UT1 turns and fully enters the project parcel. The upstream portion of UT1 which had to remain in place due to the property issue, has a steeper valley slope and would have been designed with a lower sinuosity, however, as UT1 turns south/southeast and enters the project parcel, the valley flattens and broadens. To match the valley type, UT1 was designed as a Rosgen E-type stream. Reference reaches for E-type streams have sinuosity values between 1.2 and 1.6. The current design has a sinuosity of about 1.35. Bankfull slopes are 0.1% outside of transition areas along the stream. Reference data confirms that low stream and valley slopes are synonymous with highly sinuous stream systems. With such a low channel and valley slope, adequate sediment transport capacity within the channel was identified during design as

a concern. To address this concern, the width to depth ratio of the designed channel was lowered to 10.0 to increase base flow stream power and stream power during bankfull events. Additionally, pool slopes were flattened, and riffles were steepened where possible to increase stream power and improve stream capacity. Wildlands believes the surrounding row crop agricultural fields provide a portion of the sediment load to the stream (rather than from streambank erosion or livestock impacts) and is optimistic that planting and stabilizing this source of sediment should reduce the sediment load in the stream in addition to the measures discussed above.

e. Sheet 4.1 – American beech is listed twice under the open area buffer planting.

Wildlands Response:
Sheet 4.1 was corrected, and American beech is now only listed once on the planting plan.

ii. Please confirm that the appropriate stratum is listed for the buffer zone species.

Wildlands Response:
Stratum information was confirmed and updated as necessary on Sheet 4.1.

iii. DWR appreciates the diversity of species and stratum incorporated into the buffer and riparian zone planting lists. However, the wetland planting zone accounts for approx. 80% of the site's planting area and only has 6 species proposed, of which 3 species comprise 75% of the total stems. Since red maple is already present at the site, it should be removed from the planting list. DWR requests that the wetland planting list be revisited to enhance species and stratum diversity, with no single species comprising more than 20%.

Wildlands Response:
Wildlands updated the planting plan to include more diversity. Species selected were based on target community types of Montane Alluvial Forest Large River Subtype and Bottomland Hardwood Forest as well as on previous experience with wetland restoration plantings, and discussion with plant sourcing subcontractors.

f. Sheet 6.2 – DWR recommends footer logs be incorporated in all log sills.

Wildlands Response:
Wildlands has revised the detail to require footer logs.

g. Sheet 6.3 – Please rename Lunker Log or Cover Log for consistency with legend icon.

Wildlands Response:
Sheet 6.3 (Details) was updated to "Cover Log," consistent with Sheet 0.3 (Notes and Symbols).

h. Sheet 6.4 – Where is channel stabilization (fully lined with erosion control matting) proposed?

Wildlands Response:
Exact locations for this measure are not shown on the plans at the 60% submittal. However, Wildlands prefers to have this detail in the plans so that the contractor can reference it when they are instructed to apply it during construction. Additional notes were added to Detail 4 on Sheet 6.3 to clarify the intent of the detail.

22. Appendix 9 – DWR appreciates the removal technique details included. The kudzu and bamboo onsite are particularly concerning. Please identify which species were treated and where in the annual monitoring reports.

Wildlands Response:
Invasive plant species abundance and location will be identified in annual monitoring reports.

23. Appendix 10 – DWR appreciated the site-specific maintenance plan, including mention of visits after major flooding events.

Wildlands Response:
Wildlands appreciates the acknowledgement of this effort**.**

NCWRC Comments, Andrea Leslie:
1. There will not be a trout moratorium required for this project.

Wildlands Response:
Wildlands acknowledges that no trout moratorium is required for this project.

2. The reestablishment and rehabilitation of nearly 40 acres of wetland in the French Broad floodplain is very exciting. Many of the French Broad floodplain wetlands have been lost, and this project has the opportunity to provide an important ecological role for the area, especially in terms of habitat.

Wildlands Response:
It is exciting to Wildlands to have the opportunity to restore a major agricultural area in the floodplain of the French Broad River to a natural floodplain wetland system which will be protected from future development.

3. Please provide a single map that shows the planting plan for the entire site, noting where the different zones of plantings will occur (e.g., wetland, open area buffer planting, partially vegetated area buffer planting, riparian planting).

Wildlands Response:
An overview of the planting plan for the entire site (Planting Zone Exhibit) is included with these comment responses.

4. We appreciate the planting plan for the open area buffer, partially vegetated area buffer, and riparian planting zones. Good attention has been given to canopy, shrub/subcanopy, and herbaceous strata. We recommend removing silver maple from the planting list, as it can be invasive. It is known from wetlands in Henderson County, but it will likely come in on its own.

Wildlands Response:
Silver maple has been removed from the proposed planted species; however, it has been included on the list of alternate species. Wildlands wants to be able to include this species during monitoring if volunteers are found to be establishing within the conservation easement.

5. However, the wetland planting plan only consists of 6 tree species, with no other strata (including herbaceous) addressed. As the wetland acreage of this site is significant, we ask the designer to round out their wetland planting plan with other strata and with a more diverse tree list. Were the Sierra Nevada wetland and Henry Fork wetland used as plant reference sites? If so, the Henry Fork site may not be the best reference for vegetation, given it is a piedmont site. Given its setting, we recommend gearing this to the Montane Alluvial Forest Large River Subtype in the Guide to the Natural Communities of North Carolina. NCWRC is open to working with Wildlands on the planting plan.

Wildlands Response:
Reference wetland plant communities were part of the information used to generate the planting plan, but Site goals and previous restoration experience were also considered while developing the planting plan for the Site. Wildlands updated the planting plan to better fit the goal of establishing the suggested community type of Montane Alluvial Forest Large River Subtype as well as a Bottomland Hardwood Forest based on the existing wetland types within the wetland restoration areas. The updated planting list is shown on Sheet 4.1 in the plans.

6. We consulted with the NC Natural Heritage program and offer the following recommendations on the planting plan:

a. Trees: Eliminate Willow Oak, as it is not a Blue Ridge species. We recommend eliminating Red Maple as well, as it will come in on its own. Here is a list of tree species that would be worthy additions – Box Elder, Black Willow, River Birch, Tulip Poplar, Shingle Oak, Black Gum, Pitch Pine (on hummocks, higher ground). We recommend bringing in at least 4 of these species into your planting plan.

Wildlands Response:
Wildlands updated the wetland species list shown on Sheet 4.1 of the plans based on the recommendations above. Species were chosen based on the recommendations above, previous wetland restoration experience, and discussions with planting subcontractors regarding species availability. Wildlands does not intend to plant red maple but lists red maple on the species list to allow it to be counted towards success as a volunteer. Per the 2016 NCIRT Updated Mitigation Guidance: "For a tree stem to count towards success for standard 1 or 2 it may be either planted or volunteer, but it must be a species from the approved planting list included in the Mitigation Plan. Other species not included on the planting list may be considered by the IRT on a case-by-case basis."

b. Shrubs/understory trees: Develop a list of shrubs/smaller trees, considering Sweetspire, Viburnum rufidulum, Viburnum prunifolium, Viburnum nudum, Leucothoe racimosa, Leucothoe fontanesiana, Spice Bush, Buttonbush, Sweet Birch, Ironwood, American Holly, River Birch.

Wildlands Response:
Wildlands updated the wetland species list shown on Sheet 4.1 of the plans based on the recommendations above.

c. Herbaceous species: We assume that the designer already has a set of species for the wetland herbaceous layer that didn't make it into the plan. Worth adding to this list would be Cinna arundinacea, Glyceria striata, Glyceria septentrionalis, Virginia Wildrye, River Oats.

Wildlands Response:
Wildlands updated the wetland species list shown on Sheet 4.1 of the plans based on the recommendations above.

7. We encourage Wildlands to incorporate rivercane into their project. Rivercane is found on the French Broad River floodplain; it has been eliminated from much of its former extent in western NC, and there is a renewed effort to reestablish this species.

Wildlands Response:
Wildlands incorporated rivercane into the planting plan and believes it is a great way to establish grade control near the confluence of The French Broad River. However, rivercane can expand rapidly through asexual reproduction from its rhizomatous root systems. It is common and natural for rivercane to establish and become a monoculture typically called canebrakes in disturbance areas. The French Broad River inundates the Site regularly causing a frequent enough moderate disturbance. Wildlands wants WRC and the IRT to understand that areas surrounding the plantings of rivercane could become monocultures of the species. Wildlands will control the species if it does become a nuisance on site. Please see updated planting plan on Sheets 4.1 - 4.5 for rivercane planting location.

USACE Comments, Kim Browning:
1. Please add some discussion regarding the outlet at STA 37+97 to the French Broad River since this area is prone to backwater flooding.

Wildlands Response:

The outlet of Banner Creek to the French Broad River experiences backwater conditions on a somewhat frequent basis. Backwater conditions were documented during several large flow events during the winter and spring of 2018-2019. Wildlands main concern during these events is sand or silt material from the French Broad River depositing along the outlet of Banner Creek and blocking or altering the proposed flow path. The current outlet does exhibit evidence of large depositions of sand/silt material on banks, benches, and to a lesser degree in the main channel of Banner Creek. However, since the Fall of 2018, no blockages of Banner Creek were documented nor has the orientation of Banner Creek changed substantially. Banner Creek was found to begin flowing normally very shortly after French Broad River water levels receded. Wildlands took the relative stability of the existing outlet into account during the design process. The proposed design ties to the outlet at nearly the same elevation as the existing and is oriented to the French Broad River (outlet pointing slightly downstream) in a similar manner to the existing outlet. The outlet was designed so the proposed orientation would not increase the risk for deposition and aggradation in this area but instead would keep the risk nearly the same as the existing stream. Wildlands designed the outlet of Banner Creek to remain relatively stable, however some small shifts in location or elevation should not be unexpected as these are natural processes which can be observed in stable small stream systems that tie down to larger drainages.

Another concern related to potential backwater conditions is the possibility of slowed vegetation growth in these areas. Wildlands planting plan has taken this into account by planting herbaceous riparian species very close to the channel, river cane at slightly higher elevations, and finally the typical bare root planting above that. While Wildlands recognizes the backwater conditions as a potential risk to the project, backwater areas of the French Broad River are also considered critical for certain life stages of fish and amphibians of the waterway and is vanishing as habitat in the region.

2. Figure 6 shows existing groundwater gages, while Figure 11 shows gages in different locations. Will the existing gages still be monitored, or just moved during construction? It would be beneficial to have gages in approximately the same areas to compare pre and post construction data and justify functional uplift.

Wildlands Response:

Groundwater gages will be removed before construction so that they are not damaged during grading. Where feasible, groundwater gages will be re-installed in approximately the same locations as the existing gages.

3. Please remove red and silver maple from the planting plan.

Wildlands Response:

See responses to NCWRC comment 4 and comment 6A.

4. Table 5: It would be beneficial to show the current NCSAM rating in this table.

Wildlands Response:

Wildlands added NCWAM ratings to the wetland summary information located in Table 5.

5. Rehabilitation areas indicate that hydrology is already above 12% and are currently jurisdictional and providing wetland functions. This would be more appropriate for an enhancement ratio of 2:1 based on functional uplift.

Wildlands Response:

Wildlands maintained the 'wetland rehabilitation' approach but reduced crediting ratios within wetland rehabilitation areas to 2:1.

6. Page 33: There is concern with proposed wetland restoration areas where more than 12" of soil will be excavated. The text cites that 12% of reestablishment and 18% of rehab wetlands will be graded deeper than 12", which is a considerable amount. Typically, these areas would be more appropriate for a wetland creation credit ratio of 3:1; however, after receiving clarification from WEI, I feel more comfortable that the grading is to support the slope requirements for the stream restoration. Attached is additional information received from WEI to justify that the grading is not for wetland hydrology needs.

Wildlands Response:
Given the concerns expressed by the USACE above and DWR in comment #5 regarding the wetland cut depths and associated ratios. Wildlands altered the crediting ratios and approaches as follows: Credit ratios for proposed wetland re-establishment areas with limited cut and/or evidence of heavily manipulated ground surfaces (field crowns, side cast ditches, etc.) remained at 1:1, credit ratios for all wetland rehabilitation areas were reduced from 1.5:1 to 2:1, and the downstream portion of the proposed wetland restoration where cut is over 12-inches was changed to wetland creation and the proposed credit ratio was reduced to 3:1. These changes were made throughout the plans as well as throughout the mitigation plan, including the Asset Table (Table 21).

7. Given the flat slope and the huge sediment load coming into the system from The French Broad River, there is concern that without sufficient flow, the stream channels may fill in with sediment and become more wetland-like.

a. Section 9.1.1: Recommend adding a performance standard to maintain channel characteristics and an OHWM. Backwater flooding of the French Broad River will likely cause aggradation, and clearing sediment and vegetation from the channel after monitoring year two is not recommended.

Wildlands Response:
The following text was added to section 9.1.1 to address channel aggradation and maintenance: "In channels where some aggradation is expected, cross-sections should show maintenance of single channel characteristics and an ordinary high water mark. No maintenance of channel dimension, including the removal of sediment, will be performed after monitoring year two without coordination and/or discussion with the NCIRT."

8. Figure 6 shows Wetland T, but Figure 10 shows this area as a small tributary. Table 9 indicates that this area will have a temporary impact of 0.04 ac from floodplain grading. Please clarify what is happening in this area when submitting the PCN.

Wildlands Response:
Wildlands will clarify impacts to wetland T when submitting the PCN. All indices of wetland T as a small tributary have been removed from all mitigation maps and plans.

a. Additionally, please estimate the number or acres of trees to be cleared to address the NLEB 4(d) rule.

Wildlands Response:
The estimated acres of trees to be cleared will be included in the endangered species section of the PCN. This area is minimal, given the lack of established native vegetation.

b. When submitting the PCN, please combine all impacts by reach. For example, if there are three 60' culverts on reach 1, list it as 180' of permanent impact rather than listing it as three separate impacts. But permanent and temporary impacts still need to be separated.

Wildlands Response:
Wildlands will document impacts as requested above.

9. Reach 1, as presented, seems to be more appropriate as an enhancement level 1 reach at 1.5:1. Please provide additional justification why this reach is proposed as restoration at 1:1.

Wildlands Response:
See Wildlands response to DWR Comment #6 above regarding the proposed credit ratio and approach along Banner Creek Reach 1.

10. Section 8.7.2: It would be beneficial to add some coarse woody debris to the depressional areas in the buffers and throughout the adjacent wetlands for habitat, and to help store sediment, increase water storage/infiltration, and absorb water energy during overbank events. I was pleased to see the inclusion of wood in the stream design for habitat.

Wildlands Response:
See Wildlands response DWR Comment #8

11. Section 8.8: In addition to the planting plan in the design sheets, it would be helpful to see a map view of the different planting zones.

Wildlands Response:
See Wildlands response to NCWRC Comment #3.

12. Section 8.9: It would be beneficial to add a discussion regarding utility line maintenance and potential for the road culverts to be replaced in the future.

Wildlands Response:
These areas are outside the boundaries of the recorded conservation easement and associated mitigation Site. Wildlands has no control over utility maintenance and/or future NCDOT projects. As such, Wildlands did not include information about these items within the mitigation plan. No project assets are being generated within these areas.

13. What is the situation with Banner Creek Reach 2, above Banner Farm Road, where no channel work is proposed?

Wildlands Response:
This portion of stream is not on the project property. A property line runs down the middle of the stream in this area and Wildlands was not able to obtain permission from the left bank property owner to complete work or establish conservation easements on this section of stream.

14. There is a section of Banner Creek Reach 3 that runs under the powerline. Please clarify that this is a non-credited section.

Wildlands Response:
As shown in the plans on Sheet 2.1.4, Banner Creek Reach 3 begins at Station 18+00 and an easement break also begins at Station 18+00. Sheet 2.1.5 shows the end of the easement break at Station 21+16 and this is the station where the credited length of Reach 3 begins. The end of Reach 3 is located on Sheet 2.1.6 at Station 25+83. The total length of Reach 3 is 783 ft; however, the credited length is 467 ft as shown in Table 21 (Asset Table) of the Mitigation Plan.

15. Recommend adding a performance standard for invasive species to be less than 5% of the conservation easement, and a zero tolerance for kudzu and bamboo.

Wildlands Response:
It is stated in Appendix 9 – Invasive Species Plan "If, during the monitoring period, invasive species threaten the survivability of planted woody vegetation in an area that exceeds 1% of the planted easement acreage, the invasive species shall be treated." Any observed areas (of any size) of kudzu and bamboo will be aggressively treated to prevent those species from becoming established on the Site.

16. Table 18: The IRT prefers the use of pressure transducers over crest gages.

Wildlands Response:
Automated pressure transducers will be installed to document bankfull events. Wildlands refers to these devices as "crest gages (CG)." The report text has been updated for clarity.

USEPA Comments, Todd Bowers:

1. *Section 6.0/Page 29 Regulatory Considerations:*
   - *Recommend citing the Public Notice issued under Section 404 (SAW-2018- 01153) on August 28, 2018.*

Wildlands Response:
The issued public notice was added to Table 8 in Section 6.0.

2. *Section 8.7/Page 35 Project Implementation:*
   - *Sponsor may want to state actual buffer widths along Banner Creek. According to the plans/drawings the buffer appears to be 50' in width along the entire Banner Creek Reach 1. I wish to commend Wildlands for providing minimum buffer widths of 50 feet or more throughout the project.*

Wildlands Response:
Note that the required buffer width for this project is 30 feet.

3. *Section 8.8/Page 50 Vegetation and Planting Plan (see Sheet 4.1 also)*
   - *Sponsor needs to justify the choice of Quercus falcata var pagodifolia for this site. That tree species is chiefly found in the coastal plain and is not known in NC mountain counties such as Henderson. (source: Radford et. al. Manual of Vascular Flora of the Carolinas 1964).*

Wildlands Response:
Quercus falcata var. pagodifolia was removed from the planting list.

   - *Recommend removing Alnus serrulata listed as an Alternate and replaced with a more suitable canopy reaching species.*

Wildlands Response:
Alnus serrulata was kept on the planting list and placed in the proper stratum category sub-canopy/shrub.

4. *Section 8.9/Page 51 Project Risk and Uncertainties*
   - *Has the sponsor considered expanding the project further south of the UT2 wetland area to capture more of the agriculture area and include it within the CE? It sounds like the landowners would be fine with abandoning the field if they could still hunt on it. Are there cost considerations and a lack of wetland credits needed?*

Wildlands Response:
Wildlands investigated the option of expanding the project South of UT2; however, the results of a licensed soil scientist analysis determined wetland potential did not exist between the French Broad River and UT2 based on the presence of a natural levy created by the drainage effects of the French Broad River.

5. *Section 9.2/Page 53 Vegetation.*
   - *Plot number (24 fixed and 12 mobile) and size (0.024 ac or 100m2) should be included here. (per Table 19)*

Wildlands Response:
Section 9.2 was updated with the vegetation plot quantities and size.

6. *Table 18/Page 55: Monitoring Plan*
   - *Recommend adding stem heights for MY 5 and MY 7 in vegetation.*

Wildlands Response:
The stem heights performance standard was added to Table 18.

Hard copies of the Final Mitigation Plan package can be provided upon request. Please contact me at (865) 207-8835 if you have any questions.

Sincerely,

Eric Neuhaus, PE
Project Manager
eneuhaus@wildlandseng.com

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
TIM BAUMGARTNER
Director

NORTH CAROLINA
Environmental Quality

March 10, 2020

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

Subject: Draft Mitigation Plan for the
Banner Farm Mitigation Site
French Broad River Basin – CU# 06010105
Henderson County
DMS Project ID No. 100062
Contract # 7530

Dear Mr. Neuhaus:

On February 10, 2020, the Division of Mitigation Services (DMS) received the draft mitigation plan for the Banner Farm Mitigation Site from Wildlands Engineering, Inc. (WEI).

The report establishes the proposed mitigation activities on the project site. Anticipated mitigation on the site includes 6,294 Linear Feet (LF) of Stream Restoration; 32.960 acres of Wetland Re-Establishment and 2.760 acres of Wetland Rehabilitation for a total of 6,294 Stream Mitigation Units (SMUs) and 34.800 Wetland Mitigation Units (WMUs). The following are our comments on the draft mitigation plan report and preliminary plan set:

Title Page: Please update RFP# to 16-007334.

Page 3, Table 3: Evard soils does not appear on Figure 5. This series may be outside of the area of interest. Please verify and update.

Page 4, Table 4: UT1 and UT2 appear to be ditches rather than modified streams (as seen in the Lidar generated DEMs) as they enter the project boundary. Is there a federal or state jurisdictional call for these streams within the project boundary? If these features are streams, please provide evidence.

Given UT1 and UT2 may be ditches (within the project boundary), what evidence or experience does WEI have to suggest the proposed alignment of these streams (constructed through the wetland) will remain streams?

3.5.2 Hydric Soils: Second paragraph in section indicates that wetland restoration, rehabilitation and re-establishment are proposed for the project; however, there is only rehabilitation and re-establishment proposed on Table 21. Please revise as necessary.

5.2.3 Channel Geomorphology: Have these features been ditched and then maintained, or have they incised based on a different activity?

8.2.1 UT to South Mills River: UT to South Mills River was used as a reference for discharge. The description indicates that it is impounded by a small pond upstream in the watershed. Is WEI confidant using an impounded stream as a reference reach?

8.4.2 Regional Flood Frequency Analysis: Last paragraph in section indicates that the Wildlands regional flood frequency analysis 1.2-year predictions are plotted on Figure 9. This analysis is not currently plotted on Figure 9. Please update.

Page 30, Table 15: The table indicates bankfull flows will be moving most particle sizes on all reaches. Is this the intention of design or are the ranges due to the low and high estimates from two different methods? Please be a bit more specific regarding sediment competence estimates and explanation.

8.6.2 Hydric Soils within Wetland Restoration Areas: Last sentence indicates preliminary and detailed LSS reports are in Appendix 3. These reports are located in Appendix 7. Please update.

8.6.4 Hydrologic Modeling, Page33: Plan indicates that there are areas requiring more than 12" of grading. The wetland cross sections show that these areas are limited to berms and a few areas adjacent to streams. Areas requiring 12" of grading are typically considered creation and credited at a different ratio. Can WEI quantify the total area requiring more than 12" of grading and add additional discussion in plan for clarification.

Table 16a: The modeled results for UT2 during normal precipitation year indicate no month(s) during the growing season when average water level would be within 12" of the soil surface; while the dry year model results indicated a single month. Please verify the results in the report are correct. If this is the case, does this raise a concern for meeting the 12% hydro period specified in the performance standards? If the results are correct and the assumption is that due to on-site soils differing from mapped soils, specifically on-site determinations resulting in soils indicative of groundwater interaction as opposed to fluvial dominance it may be helpful to state this since the model did not address changes in groundwater interactions on site.

13.0 Determination of Credits: Rehabilitation wetlands have a ratio of 1.5:1 in Table 21. In the Post Contract Meeting Minutes, the IRT commented that 2:1 may be more applicable to the rehabilitation areas (Note #9). Please justify the change in crediting ratio for rehabilitation.

Section 1.0/Figure 1 Vicinity Map: Horse Shoe is not shown on Figure 1 as discussed in Section 1.0. Please update.

Appendix 6: Please label cross sections correctly as pavement-subpavement or pavement only.

Plansheets:

Sheet 0.2 Project Overview: Please include north arrow and scale.

UT1 and UT2: Please explain the need for meander bend revetments in the downstream reaches of UT1 and UT2 when the design gradient is 0.002? Does WEI expect instability on these streams?

Sheet 4.1 Planting List: Wetland Area Planting: Green ash is specified at a density of 15%, but it should be limited to a maximum of 5% due to emerald ash borer concerns.

General QA/QC

5.2.5 Biology: Second paragraph spelling error "continues" is likely "continuous".

Page 17, Table 9: Wetland K and Wetland L acreage amounts contains two decimals (ex: 0..16).

7.0 Mitigation Site Goals and Objectives: Remove "and" from last sentence.

Page 31, last paragraph: Remove "in" from "included in for both".

Page 32, fifth paragraph in section 8.6.4: Remove period between "channels. within".

Page 33, last paragraph: Typo referring Table 16a as 165a.

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, NC DMS

FROM: Eric Neuhaus, PE

DATE: April 1, 2020

RE: Banner Farm Mitigation Site
Henderson County, NC
French Broad River Basin 06010105
DMS Project ID No. 100062
Response to NCDMS Mitigation Plan Comments

This memo documents NCDMS's initial Draft Mitigation Plan review comments (*in italics*) received from Matthew Reid's letter dated 03/10/2020, the project team's responses, and where the revisions have been included in the final Mitigation Plan.

Mitigation Plan Comments:

- ***Title Page:*** *Please update RFP# to 16-007334*
  - RFP number has been updated.
- ***Page 3, Table 3:*** *Evard soils does not appear on Figure 5. This series may be outside of the area of interest. Please verify and update.*
  - Evard Soils were located outside of the area of interest and references to it were removed from Table 3.
- ***Page 4, Table 4:*** *UT1 and UT2 appear to be ditches rather than modified streams (as seen in the Lidar generated DEMs) as they enter the project boundary. Is there a federal or state jurisdictional call for these streams within the project boundary? If these features are streams, please provide evidence. Given UT1 and UT2 may be ditches (within the project boundary), what evidence or experience does WEI have to suggest the proposed alignment of these streams (constructed through the wetland) will remain streams?*
  - UT1 and UT2 show on included historic aerial photos upstream of the project, portions of the reaches have been identified as solid blue line streams (indicating perennial flow) on the USGS 7.5-minute quadrangle map for Horse Shoe and the most current NRCS Soil survey for Henderson County. UT1 and UT2 have drainages upstream of the project area of 128 acres (0.2 square miles) and 63 acres (0.098 square miles), respectively. Additionally, Wildlands received an approved Preliminary Jurisdictional Determination included in Appendix 3 on the property which included a field walk with ACOE representative David Brown. UT1 and UT2 were identified as non-wetland waters and within the approval it was noted:
    - "The streams on the property are UTs of the French Broad River, which all exhibit

physical ordinary high water mark (OHWM) indicators including, break in slope; developed bed and bank; shelving; absence of vegetation; leaf litter wash away; sediment deposition and sorting; presence of aquatic life; water staining; presence of debris; and scour."

- In addition to the information above, Wildlands filled out NC DWQ Stream Identification Forms for all reaches, which are included in Appendix 5. UT1 and UT2 both scored as perennial stream channels with scores of 35.5 and 34.5, respectively.
- Given the information above, and the time spent on Site observing the hydrology within the streams and upstream of the project boundary, Wildlands does not believe these channels are ditches and is not concerned about them maintaining dimension due to lack of flow. As shown in the preliminary design plans included in Appendix 8, there are existing ditches within the project boundary that Wildlands plans to fill as part of the wetland restoration that do not maintain adequate flow and/or geomorphology to be stream channels. These ditches do not receive drainage upstream of the Site as UT1 and UT2 do. These portions of the project were classified as open water based on the jurisdictional determination. Section 3.6.7 – Site Ditches was added to the report to provide further clarification and outline resources used for jurisdictional determination of UT1 and UT2 at the Site.

- ***3.5.2 Hydric Soils****: Second paragraph in section indicates that wetland restoration, rehabilitation and re-establishment are proposed for the project; however, there is only rehabilitation and re-establishment proposed on Table 21. Please revise as necessary.*
  - Per Wilmington District ACOE Mitigation Guidance and per RFP 16-007334, wetland restoration methods include two categories: re-establishment and rehabilitation. Hence the discussion in the report regarding wetland restoration is used to refer to all areas (both re-establishment and rehabilitation). Some wetland terminology was revised for clarification, but general use of the term wetland restoration was not removed from the report.
- ***5.2.3 Channel Geomorphology****: Have these features been ditched and then maintained, or have they incised based on a different activity?*
  - All streams on the site, except for Banner Creek Reach 1, have likely been ditched and maintained for several years. This has likely contributed greatly to the streams current incised condition. Banner Creek Reach 1 may have been ditched at some point in its history, however, it does not appear to be actively ditched.
- ***8.2.1 UT to South Mills River*****:** *UT to South Mills River was used as a reference for discharge. The description indicates that it is impounded by a small pond upstream in the watershed. Is WEI confidant using an impounded stream as a reference reach?*
  - Given that there are approximately 5 ponds upstream of Banner Creek Reach 1 within the project watershed, Wildlands believes having a reference reach that includes a small farm pond upstream provides valuable information to the project design.
- ***8.4.2 Regional Flood Frequency Analysis:*** *Last paragraph in section indicates that the Wildlands regional flood frequency analysis 1.2-year predictions are plotted on Figure 9. This analysis is not currently plotted on Figure 9. Please update.*

- Figure 9 was updated with the 1.2-year predictions from Wildlands' regional flood frequency analysis.

- ***Page 30, Table 15*****:** *The table indicates bankfull flows will be moving most particle sizes on all reaches. Is this the intention of design or are the ranges due to the low and high estimates from two different methods? Please be a bit more specific regarding sediment competence estimates 0and explanation.*
    - The Competence Analysis looks at proposed stream dimensions and existing bed materials on Site. Currently, the streams receive high sand loads from the adjacent agricultural fields as well as stream bank erosion which has created very low D50 values. Our analysis shows that the streams are capable of moving these smaller particles. When specifying the rock size for proposed in-stream structures, a rock mix will be selected with a D50 that is larger than what our competence analysis suggests will move through the stream system. The end result will be a system that is primarily stable (with riffle material mostly staying in place during bankfull events) but that still has some mobile particles, as is typical in most stable, natural streams. Text was updated in Section 8.5.2 to further clarify the analysis and results.
- ***8.6.2 Hydric Soils within Wetland Restoration Areas:*** *Last sentence indicates preliminary and detailed LSS reports are in Appendix 3. These reports are located in Appendix 7. Please update.*
    - Reference was changed to indicate that the LSS reports are located in Appendix 7
- ***8.6.4 Hydrologic Modeling, Page 33:*** *Plan indicates that there are areas requiring more than 12" of grading. The wetland cross sections show that these areas are limited to berms and a few areas adjacent to streams. Areas requiring 12" of grading are typically considered creation and credited at a different ratio. Can WEI quantify the total area requiring more than 12" of grading and add additional discussion in plan for clarification.*
    - A Wetland Grading Exhibit is attached showing a graphical representation of proposed wetland areas being graded as part of the design. Graded areas are color coded to show grading depths less than 12" and greater than 12". Areas not color coded within the proposed wetland boundaries are not slated for any cut, but adjacent ditches will be filled. The total area within the proposed wetland re-establishment with greater than 12" of cut is 3.976 AC or approximately 12%. The total area within the proposed wetland rehabilitation with greater than 12" of cut is 0.489 AC or approximately 18%. Text was added to section 8.6.4 outlining the quantities of wetland restoration and rehabilitation with grading over 12 inches.
- ***Table 16a:*** *The modeled results for UT2 during normal precipitation year indicate no month(s) during the growing season when average water level would be within 12" of the soil surface; while the dry year model results indicated a single month. Please verify the results in the report are correct. If this is the case, does this raise a concern for meeting the 12% hydro period specified in the performance standards? If the results are correct and the assumption is that due to on-site soils differing from mapped soils, specifically on-site determinations resulting in soils indicative of groundwater interaction as opposed to fluvial dominance it may be helpful to state this since the model did not address changes in groundwater interactions on site.*
    - Wildlands assumes the comment is referring to Table 16b not 16a as listed. The modeled

results were verified and are correct as listed in the report. Wet, dry, and average years are identified based on annual rainfall as well as growing season rainfall. For 2012, annual rainfall is average, and growing season rainfall is average, but rainfall in January and February is lower than precipitation values in the dry year. The low early year rainfall draws groundwater tables in the model down dramatically, and the model has difficultly recovering or rewetting during the growing season. This is a limitation of the model that Wildlands is aware of and it is consistent across groundwater models used previously (DrainMOD, Wetbud, ModFlow). Based on previous experience with water budget modeling and its limitation this does not raise concern for meeting the 12% hydroperiod specified in the performance standards given the results of the other modeled years and the assumptions made within the model.

- ***13.0 Determination of Credits:*** *Rehabilitation wetlands have a ratio of 1.5:1 in Table 21. In the Post Contract Meeting Minutes, the IRT commented that 2:1 may be more applicable to the rehabilitation areas (Note #9). Please justify the change in crediting ratio for rehabilitation.*
    - Portions of the proposed wetland rehabilitation is within the managed agriculture. Additionally, the portion of wetland rehabilitation upstream of Banner Farm Road is currently being drained by an incised and channelized stream and is routinely brush hogged outside of seasonal growth left for hunting. Based on the level of effort and uplift potential including hydrologic uplift through stream restoration, Wildlands believes a crediting ratio of 1.5:1 is appropriate.
- ***Section 1.0/Figure 1 Vicinity Map:*** *Horse Shoe is not shown on Figure 1 as discussed in Section 1.0. Please update.*
    - Horse Shoe was added to Figure 1.
- ***Appendix 6:*** *Please label cross sections correctly as pavement-subpavement or pavement only.*
    - Graph titles were updated in Appendix 6 to correctly indicate the graph contents.

<u>Plansheets:</u>

- ***Sheet 0.2 Project Overview:*** *Please include north arrow and scale.*
    - North arrow and scale were added to the Overview Sheet. Other Sheets were reviewed to verify that
- ***UT1 and UT2:*** *Please explain the need for meander bend revetments in the downstream reaches of UT1 and UT2 when the design gradient is 0.002? Does WEI expect instability on these streams?*
    - Brush toe revetments were added mid-reach to both UT1 and UT2 to provide additional habitat within the stream. Brush Toe provides woody recesses and a refuge from the main current of the stream for aquatic species. Wildlands wants to encourage aquatic species from the French Broad River to navigate up the UTs during low flows and providing refuge should encourage this.
    - In addition to providing quality habitat, a majority of meander bend revetments on UT1 and UT2 were added where the stream bank in the proposed channel is passing through the old existing channel. Wildlands recognizes this as an area with some potential for instability. The brush toe revetments should provide an additional factor of safety in these specific bends.

- ***Sheet 4.1 Planting List:*** *Wetland Area Planting: Green ash is specified at a density of 15%, but it should be limited to a maximum of 5% due to emerald ash borer concerns.*
    - Planting lists were revised so that Green Ash made up no more than 5% of any of the planting species for planting type. Only the "Wetland Area Planting" species mix was revised to lower the Green Ash content to 5%.

General QA/QC:

- ***5.2.5 Biology:*** *Second paragraph spelling error "continues" is likely "continuous".*
    - "Continues" was changed to "continuous."
- ***Page 17, Table 9:*** *Wetland K and Wetland L acreage amounts contains two decimals (ex: 0..16).*
    - Extra decimals were removed.
- ***7.0 Mitigation Site Goals and Objectives:*** *Remove "and" from last sentence.*
    - "And" was deleted.
- ***Page 31, last paragraph:*** *Remove "in" from "included in for both".*
    - "In" was removed from the paragraph.
- ***Page 32, fifth paragraph in section 8.6.4:*** *Remove period between "channels. within".*
    - The period was removed.
- ***Page 33, last paragraph:*** *Typo referring Table 16a as 165a.*
    - The "5" was removed from the table reference.

March 23, 2020

N

0' 150' 300' 450'
(HORIZONTAL)

Grading with cut greater than 12" depth

Grading with cut less than 12" depth

*Areas not shaded may be ungraded or fill areas.

Wetland Re-establishment Boundary

Wetland Rehabilitation Boundary

EXISTING POND

STA: 0+08
START BANNER CREEK REACH 1 - RESTORATION

Mitchell & Wendy Gaither
PIN: 9630826726
DB: 1598 PG: 219

BANNER CREEK

STA: 9+34
END BANNER CREEK REACH 1 - RESTORATION
START BANNER CREEK REACH 2 - RESTORATION

MOUNTAIN BEAN HOLDINGS, INC.
PIN: 9630924395
DB: 3150 PG: 641
TRACK 1

PROPOSED WETLAND REHABILITATION BOUNDARY

VINE RIPE INVESTMENTS, INC.
PIN: 9630912884
DB: 3150 PG: 631

PROPOSED WETLAND RE-ESTABLISHMENT BOUNDARY

STA: 200+18
START UT2 - RESTORATION

STA: 18+00
END BANNER CREEK REACH 2 - RESTORATION

STA: 21+16
START BANNER CREEK REACH 3 - RESTORATION

STA: 100+83
START UT1 - RESTORATION

BANNER FARM ROAD

UT 1

KIRBY & SHERRI JOHNSON
PIN: 9539895929
DB: 1426 PG: 625

UT 2

KIRBY & SHERRI JOHNSON
PIN: 9630900480
DB: 3403 PG: 159

KIRBY & SHERRI JOHNSON
PIN: 9630919204
DB: 831 PG: 23

STA: 218+97
END UT2 - RESTORATION

BANNER CREEK

STA: 25+83
END BANNER CREEK REACH 3 - RESTORATION
START BANNER CREEK REACH 4A - RESTORATION

MOUNTAIN BEAN HOLDINGS, INC.
PIN: 9640028341
DB: 3150 PG: 641
TRACK 2

STA: 112+82
END UT1 - RESTORATION

STA: 33+77
END BANNER CREEK REACH 4A - RESTORATION
START BANNER CREEK REACH 4B - RESTORATION

FRENCH BROAD RIVER

STA: 37+97
END BANNER CREEK REACH 4B - RESTORATION

L:\Active Projects\005-0172 Banner Farm Mitigation Site\CadD\Archive\CAD Files\Wet Plan Submittal 03-2020\Plans\005172-Overview.dwg

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Banner Farm Mitigation Site
Henderson County, NC

Wetland Grading Exhibit
Cut Depth

Revisions:

Date: 03.17.2020
Job Number: 005-021752
Project Engineer: JDN
Drawn By: JDW
Checked By: JM

Sheet 1 of 1

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 Introduction

The Banner Farms Mitigation Site (Site) is located in Henderson County approximately 5 miles west of Hendersonville near Horse Shoe (Figure 1). The project is located within the French Broad River Basin Hydrologic Unit (HU) 06010105020010 and NC Division of Water Resources (DWR) Subbasin 04-03-02. The project limits include Banner Creek and two associated tributaries which drain to the French Broad River. The Site (Figure 2) was selected by DMS to provide stream mitigation units (SMUs) and wetland mitigation units (WMUs) in the French Broad River Catalog Unit 06010105 (French Broad 05). The project involves the restoration of approximately 6,300 existing linear feet of incised and straightened streams, the restoration of 33.2 acres of historically altered wetlands, and the creation of 1.14 acres of floodplain wetland. Restoration of project streams and wetlands will provide 6,294 SMUs and 33.58 WMUs. The Site will be protected by a 46.6 - acre conservation easement. The Site Protection Instrument detailing the conservation easement is located in Appendix 1. General project information is shown below in Table 1.

Table 1: Project Attribute Table Part 1

Project Information	
Project Name	Banner Farm Mitigation Site
County	Henderson
Project Area (acres)	47
Project Coordinates (latitude and longitude)	35° 21’ 7"N 82° 33' 13"W
Planted Acreage (acres of woody stems planted)	45

2.0 Watershed Approach and Site Selection

The 2009 French Broad River Basin Restoration Priorities (RBRP) describes major stressors within the basin as excessive fecal coliform bacteria, nutrient enrichment, habitat fragmentation, habitat degradation, streambed scour, and streambank erosion. The RBRP also states that stressors from agriculture and transportation-related sources have impacted the biological communities within the basin, including federally threatened and endangered species. Development, urbanization, and agriculture are cited as the major contributors to non-point source pollution within the watershed.

The proposed project drains directly to the French Broad River. At its confluence with Banner Creek, the French Broad River is defined in the 2016 North Carolina Integrated Report as Class WS-IV waters. Class WS-IV (Water Supply IV- Highly Developed) waters are protected for drinking, culinary, food processing, aquatic life, secondary recreation, and fresh water purposes, and are generally in highly developed watersheds.

The French Broad River Basin is also discussed in the 2015 North Carolina Wildlife Resource Commission’s (NCWRC) Wildlife Action Plan (WAP). In the report, non-point source pollution including nutrient enrichment, highway construction and its associated impacts, development, urbanization, and agriculture contribute to sources of non-point source pollution and sediments. This report notes the importance of stream restoration and land protection efforts in the watershed to address the observed stressors.

Restoration of Site stream and wetlands will directly and indirectly address key CU-wide restoration goals identified in the RBRP and the NCWRC WAP by reducing sediment and nutrient loads from agricultural lands, creating stable stream banks, restoring a forested wetland in agriculturally

maintained buffer areas, and preserving existing forested buffers. The project will slow surface runoff, increase retention times, provide shade to streams, and reconnect the streams to their historic floodplains and riparian wetlands, which will reduce sediment and nutrient loads that contribute to eutrophication of downstream waters. In addition, restoration will provide and improve aquatic terrestrial (riparian and wetland) habitats while improving stream stability and overall hydrology.

3.0 Baseline and Existing Conditions

The Site watershed (Table 2 and Figure 3) is located in a southeast HU of the French Broad 05 CU. It is situated in the rural countryside just west of Hendersonville in Henderson County. The following sections describe the existing conditions of the watershed and watershed processes, including disturbance and response.

Table 2: Project Attribute Table Part 2

Project Watershed Summary Information	
Physiographic Province	Blue Ridge
Ecoregion (Level IV)	Broad Basins
River Basin	French Broad
USGS HUC (8 digit, 14 digit)	06010105, 06010105020010
NCDWR Sub-basin	04-03-02
Project Drainage Area (acres)	722
Project Drainage Area Percentage of Impervious Area	1.5%
CGIA Land Use Classification	44% cultivated crops and hay; 27% forest; 2.5% shrub/grassland/herbaceous; 0.5% wetlands; 26% residential

3.1 Existing Site Conditions

The proposed project is located on multiple parcels totaling 140 acres which are immediately adjacent to the French Broad River and project streams drain directly to the river. A majority of the property (approximately 70%) has been used for row crop agriculture for decades. The remaining acreage is a mixture of residential and wooded. Currently, the agricultural fields are used to grow primarily field corn. These fields are extensively ditched. Perennial and intermittent streams on the Site have clearly been channelized and relocated to increase crop production. Aerial photography dating back to 1964 (Appendix 2) shows that the Site has remained in nearly the same configuration since that time.

3.2 Landscape Characteristics

3.2.1 Physiography and Topography

The Site is located in the Blue Ridge Belt of the Blue Ridge physiographic province. The Blue Ridge province is characterized as a mountainous area with steep ridges and valleys and elevations ranging from 1,500 to over 6,000 feet above sea level. The Site topography, as indicated on the Horse Shoe, NC USGS 7.5 minute topographic quadrangle, shows moderately sloped valleys generally running north to southeast throughout the Site (Figure 4). The Site topography and relief are typical of the French broad floodplain. The project streams traverse flat, low lying pastures and agricultural fields at the upstream and downstream ends of the project.

3.2.2 Geology and Soils

The Blue Ridge Belt contains a combination of igneous, sedimentary, and metamorphic rocks that have been repeatedly heated and deformed through such processes as folding, faulting, and fracturing. The

underlying geology of the Site is mapped as middle Proterozoic age (1.2 billion years in age) migmatitic biotite-hornblende gneisses (Ymg). The unit is described as layered biotite-granite gneiss, biotite-hornblende gneiss, amphibolite, and calc-silicate rock that locally contains relict granulite facies rock (NCGS, 1985). No exposed bedrock was observed on-site.

The proposed project is mapped by the Henderson County Soil Survey. The predominant project area soils as mapped by the Natural Resources Conservation Service (NRCS) are described below in Table 3. Figure 5 is a soil map of the Site.

Table 3: Project Soil Types and Descriptions

Soil Name	Description
Bradson Gravelly loam	This is a well-drained soil with low slopes of 0-15%. The soil has medium surface runoff and moderate infiltration. The soils are typically found in broad stream terraces and fans.
Codorus loam	This is somewhat poorly drained soil with slow surface runoff and high infiltration. These soils are typically found in floodplains.
Delanco loam	This is a moderately well drained soil with slopes from 0-7%. Surface runoff is slow, and infiltration is high. The soils are typically found in depressions on stream terraces.
Hayesville loam	This is a well-drained soil with moderate slopes of 15-30%. Surface runoff is high, and infiltration is moderate. These soils are found in ridges and hillslopes.
Rosman loam	This is a well-drained soil with very slow surface runoff and moderate infiltration. Typically, these soils are found in floodplains.
Suncook loamy sand	This is a well-drained soil with very slow surface runoff and low infiltration. Typically, these soils are found in natural levees and floodplains.
Tate fine sandy loam	This is a well-drained soil with slopes of 7-15% and moderate surface runoff and high infiltration. Typically, these soils are found on fans, coves, and drainageways.
Toxaway silt loam	This is a very poorly drained soil with very high surface runoff and moderate infiltration. Typically, these soils are found in depressions on floodplains.

Source: Henderson County Web Soil Survey

3.3 Land Use/Land Cover

The project watershed totals 1.13 square miles and the primary land use is agricultural which comprises 44% of the area. Cultivated row crops make up the majority of the agricultural practices at 44% of the drainage area. The next largest category of land use is forested land, which covers 27% of the watershed. Wetlands make up about 0.5% of the watershed while 2.5% is covered by scrub/shrub or grassland/herbaceous land uses, 26% by residential. The impervious area within the project watershed was calculated to be 10.8 acres, or approximately 1.5% of the watershed. The watershed areas and current land uses for each of the project reaches are summarized in Table 4, below.

Aerial photos of the project site and surrounding area from 1964 to 2019 were reviewed for changes in land use and land cover. The land use and land cover patterns in this area have changed slightly over that time period. The agricultural fields on the Site parcels have been in row crop production from 1964 to present. Throughout the watershed, agricultural land uses decline from 1964 to 1994. Residential and forested areas increase throughout that time. In the past 25 years since 1994, the watershed has remained relatively stable with only minor changes in land use. In general, this area has maintained its rural, agricultural character over the last roughly 60 years. This consistency in land use within the project watershed indicates that watershed processes affecting hydrology, sediment supply, and nutrient and pollutant delivery have not varied widely over this time period. With a lack of development pressure,

watershed processes and stressors from outside the project limits are likely to remain consistent throughout the implementation, monitoring, and closeout of this project. These stressors and processes are discussed further in Section 4 below.

Table 4: Drainage Areas and Associated Land Use

Reach Name	NCDWR Stream Identification Form Scores	Intermittent/ Perennial	Watershed Area (acres)	Watershed Area (sq. mi.)	Land Use
Banner Creek Reach 1	38.50	Perennial	390	0.61	42% cultivated crops; 30% forest; 27% residential; 4% shrub/herbaceous
Banner Creek Reach 2	38.50+	Perennial	422	0.66	43% Cultivated crops; 29% forest: 24% residential; 4% shrub/herbaceous
Banner Creek Reach 3	38.50+	Perennial	429	0.67	44% Cultivated crops; 29% forest: 24% residential; 3% shrub/herbaceous
Banner Creek Reach 4a	38.50+	Perennial	634	0.99	44% Cultivated crops; 29% forest: 22% residential; 5% shrub/herbaceous
Banner Creek Reach 4b	38.50+	Perennial	722	1.13	44% Cultivated crops; 27% forest: 26% residential; 3% shrub/herbaceous
UT1	35.50	Perennial	81	0.13	44% Cultivated crops; 35% forest: 19% residential; 2% shrub/herbaceous
UT2	34.50	Perennial	190	0.30	63% residential; 34% Cultivated crops; 3% forest

3.4 Existing Vegetation

3.4.1 Banner Creek Reach 1 and Reach 2

A majority of the streamside vegetation on this reach consists of a regularly maintained lawn that abuts the streams banks. A narrow row of river birch (*Betula nigra*) and Chinese privet (*Ligustrum sinense*) exists above and below the driveway crossing. At the lower portion of Banner Creek Reach 1, the wooded buffer extends on the right bank with more variety including tulip poplar (*Liriodendron tulipifera)*, eastern white pine (*Pinus strobus*), white oak (*Quercus alba*), American holly (*Ilex opaca*), hickory (*Carya*), river cane (*Arundinaria gigantea*), multiflora rose (*Rosa multiflora*), and Japanese honeysuckle (*Lonicera japonica*).

Downstream, the riparian vegetation of Reach 2 consists of row crops on the left floodplain and managed herbaceous under the powerline easement. Along the banks, a narrow row of vegetation including scattered tulip poplar, river birch, Bradford pear (*Pyrus calleryana*), blackberry (*Rubus sp*.), and Japanese honeysuckle.

3.4.2 Banner Creek Reach 3 and Reach 4a

Below the Banner Farm Road crossing, these reaches continue through row crops on the right floodplain and managed herbaceous cover on the left floodplain. A narrow row of vegetation along the straightened banks including scattered small sycamore (*Plantanus occidentalis*), silky dogwood (*Cornus amomum*), Bradford pear, blackberry, and Japanese honeysuckle.

3.4.3 Banner Creek Reach 4b

Banner Creek Reach 4b continues to flow through row crops along both floodplains. A thin buffer exists consisting of mature sycamore, tulip poplar, silky dogwood, river birch, elderberry (*Sambucus canadensis*), blackberry, river cane, and Japanese honeysuckle. Near the confluence with the French Broad River, there exist small pockets of golden bamboo (*Phyllostachys aurea*) and kudzu (*Pueraria montana*).

3.4.4 UT1

The upstream portion of UT1 flows along the property line with a thin woody buffer along the right bank consisting of tulip poplar, red oak (*Quercus rubra*), hackberry (*Celtis laevigata*), Chinese privet, multiflora rose, and Japanese honeysuckle. As UT1 makes a southern turn and flows through a culvert, the floodplain consists of row crops that abut the stream on both banks.

3.4.5 UT2

Similar to the other project streams south of Banner Farm Road, the floodplain of UT2 consist of row crops on both sides. A narrow woody buffer along both banks consists of silky willow (*Salix sericea*), river birch, sycamore, and blackberry.

3.5 Existing Conditions - Wetlands

3.5.1 Jurisdictional Wetlands

On June 2, 23, and 29, 2019, Wildlands investigated potential waters of the United States within the project area. These areas were delineated using the USACE routine On-Site Determination method presented in the 1987 Corps of Engineers delineation manual, the subsequent Regional Supplement for the Eastern Mountains and Piedmont Region, groundwater hydrology data, and the evaluator's best professional judgement. All jurisdictional Waters of the U.S. were located by sub-meter GPS. The Preliminary Jurisdictional Determination (PJD) package was submitted on August 30, 2019. The approved PJD was issued on November 19, 2019 and is attached in Appendix 3. Existing wetlands within the proposed conservation easement are summarized in Table 5.

There are 23 jurisdictional wetland features located within the proposed easement (Wetlands A-W) (Figure 6). Jurisdictional wetland features on site exhibit prolonged saturation within the upper 12 inches of the soil profile, hydrophytic vegetation, and a depleted matrix or darkened surface horizons. Common vegetation species present in wetlands include duck potato (*Sagittaria latifolia*), sycamore, red maple (*Acer Rubrum*), and jewel weed (*Impatiens capensis*).

Existing wetland areas were classified and 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 a specific wetland type. Existing wetlands were classified as headwater forests and bottomland hardwood forest and overall ratings range from low to medium. The primary impairment to existing wetlands is the presence of ditches and berms which result in reduced surface and subsurface water storage and limited hydrologic connectivity with streams. This is reflected in both the hydrology and water quality function ratings. Habitat quality varies among wetlands depending on vegetation composition and structure. NCWAM field assessment forms and rating calculator output is attached in Appendix 3.

Table 5: Existing Wetland Summary

Wetland Summary Information				
Parameter	**Wetland A**	**Wetland B**	**Wetland C**	**Wetland D**
Size of Wetland within CE (acres)	0.54	0.09	<0.01	0.17
Wetland Type (NCWAM Classification)	Bottomland Hardwood Forest	Bottomland Hardwood Forest	Bottomland Hardwood Forest	Bottomland Hardwood Forest
Wetland NCWAM Rating	Low	Low	Low	Low
Mapped Soil Series	Toxaway/Rosman	Rosman	Toxaway	Toxaway/Codorus
Drainage Class	VPD/WD	WD	VPD	VPD/SPD
Soil Hydric Status	Yes/No	No	Yes	Yes/No
Source of Hydrology	Ditch Overflow	Ditch Overflow	Surface Runoff	Groundwater Discharge
Restoration or enhancement method (hydrologic, vegetative, etc)	Hydrologic	Hydrologic	None	Hydrologic
Wetland Summary Information				
Parameter	**Wetland E**	**Wetland F**	**Wetland G**	**Wetland H**
Size of Wetland within CE (acres)	<0.01	0.03	0.01	0.13
Wetland Type (NCWAM Classification)	Bottomland Hardwood Forest	Bottomland Hardwood Forest	Bottomland Hardwood Forest	Bottomland Hardwood Forest
Wetland NCWAM Rating	Low	Low	Low	Low
Mapped Soil Series	Toxaway	Toxaway	Delanco	Codorus/Delanco
Drainage Class	VPD	VPD	MWD	SPD/MWD
Soil Hydric Status	Yes	Yes	No	No
Source of Hydrology	Groundwater Discharge	Groundwater Discharge	Groundwater Discharge	Ditch Overflow
Restoration or enhancement method (hydrologic, vegetative, etc)	Hydrologic	Hydrologic	None	Hydrologic
Wetland Summary Information				
Parameter	**Wetland I**	**Wetland J**	**Wetland K**	**Wetland L**
Size of Wetland within CE (acres)	0.02	0.11	0.16	0.04
Wetland Type (NCWAM Classification)	Bottomland Hardwood Forest	Bottomland Hardwood Forest	Bottomland Hardwood Forest	Bottomland Hardwood Forest
Wetland NCWAM Rating	Low	Low	Low	Low
Mapped Soil Series	Codorus	Codorus/Delanco	Codorus/Bradson	Codorus
Drainage Class	SPD	SPD/MWD	SPD/WD	SPD

Soil Hydric Status	No	No	No	No
Source of Hydrology	Groundwater Discharge	Groundwater Discharge	Groundwater Discharge	Ditch Overflow
Restoration or enhancement method (hydrologic, vegetative, etc)	Hydrologic	Hydrologic	Hydrologic	Vegetative
Wetland Summary Information				
Parameter	**Wetland M**	**Wetland N**	**Wetland O**	**Wetland P**
Size of Wetland within CE (acres)	<0.01	<0.01	0.01	0.01
Wetland Type (NCWAM Classification)	Headwater Forest	Headwater Forest	Headwater Forest	Headwater Forest
Wetland NCWAM Rating	Medium	Medium	Medium	Medium
Mapped Soil Series	Codorus	Codorus	Codorus	Tate
Drainage Class	SPD	SPD	SPD	WD
Soil Hydric Status	No	No	No	No
Source of Hydrology	Groundwater Discharge	Groundwater Discharge	Groundwater Discharge	Groundwater Discharge
Restoration or enhancement method (hydrologic, vegetative, etc)	Vegetative	Vegetative	Vegetative	Vegetative
Wetland Summary Information				
Parameter	**Wetland Q**	**Wetland R**	**Wetland S**	**Wetland T**
Size of Wetland within CE (acres)	0.14	0.15	1.62	0.04
Wetland Type (NCWAM Classification)	Bottomland Hardwood Forest	Bottomland Hardwood Forest	Bottomland Hardwood Forest	Headwater Forest
Wetland NCWAM Rating	Low	Low	Low	Medium
Mapped Soil Series	Tate/Bradson	Codorus/Delanco	Codorus/Bradson	Codorus
Drainage Class	WD/WD	SPD/MWD	SPD/WD	SPD
Soil Hydric Status	No	No	No	No
Source of Hydrology	Groundwater Discharge	Groundwater Discharge	Groundwater Discharge	Groundwater Discharge
Restoration or enhancement method (hydrologic, vegetative, etc)	Vegetative	Vegetative	Vegetative	Vegetative
Wetland Summary Information				
Parameter	**Wetland U**	**Wetland V**	**Wetland W**	
Size of Wetland within CE (acres)	0.04	<0.01	0.28	
Wetland Type (NCWAM Classification)	Headwater Forest	Headwater Forest	Bottomland Hardwood Forest	
Wetland NCWAM Rating	Medium	Medium	Low	
Mapped Soil Series	Codorus	Codorus	Toxaway	

Drainage Class	SPD	SPD	VPD	
Soil Hydric Status	No	No	No	
Source of Hydrology	Groundwater Discharge	Groundwater Discharge	Groundwater Discharge	
Restoration or enhancement method (hydrologic, vegetative, etc)	Vegetative	Vegetative	Vegetative	

3.5.2 Hydric Soils

A preliminary soil investigation was performed by a licensed soil scientist (LSS) on November 15, 2017. At the preliminary stage, soil borings were taken in and around the proposed project boundary to confirm the presence of potentially hydric soils. An additional detailed soils investigation was performed by the same LSS on October 24, 2018 to expand the study area and map the location and extents of hydric soils within the project area. The results of these investigations, along with existing hydrology data and site observations were used to indicate wetland re-establishment potential. Preliminary soils mapping for Henderson County via the NRCS Web Soils Survey shows on Site soils as Toxaway, Rosman, and Codorus. The LSS observed higher clay content than the above soil series and noted that site soils are more like the Hemphill and Chatuge soil series depending on site locations and current hydrology.

Soil borings taken during the investigation were classified as one of the following: non-hydric, depleted soils lacking hydrology indicators, depleted soils with hydrology indicators, and depleted soils with clay/loam subsoils. Areas mapped with depleted soils indicating hydric potential are proposed for wetland restoration. Many of the areas mapped as depleted soils with hydrology were delineated as jurisdictional wetlands and are proposed for wetland rehabilitation. Areas mapped with depleted soils which lack hydrology indicators are proposed for wetland re-establishment. Copies of the preliminary and detailed LSS reports along with borings location maps and typical soil profiles are included in Appendix 7.

3.5.3 Existing Hydrology

Fifteen groundwater monitoring gages were installed throughout the proposed wetland restoration boundary to evaluate the existing hydrology on the Site. Gages 1 through 8 were installed in October of 2018. Gages 9 through 16 were installed in April of 2019. Groundwater gage 5 was eliminated during the additional gage install based on the Site conditions, proposed gage locations, and potential equipment malfunctions. As such, Gages 1 through 8 show Site groundwater data from January 1, 2019 through September 4, 2019. Gages 9 through 16 show Site groundwater data from April 17, 2019 to September 4, 2019. An evaluation of the existing ground water gage data is shown below in Table 6. Additionally, plots of the existing groundwater gage data are included in Appendix 7.

Review of the data from the gages suggests that four of the fifteen gages currently exhibit wetland hydrologic regime under normal rainfall conditions based on a consecutive saturation threshold of 26 days during the growing season (12%). Groundwater gage 1 (Figure 2) is within the proposed wetland rehabilitation area which is separate from current agriculture and currently delineates as jurisdictional wetland; it was anticipated that this area would currently meet expected wetland hydrology standards. Groundwater gages 2, 8, and 9 (Figure 2) are installed the furthest from major ditching activities on-site and currently exhibit hydrology considered typical for floodplain wetlands. Gage data for these locations supports that the proposed mitigation approach of filling ditching and restoring ditched streams will raise hydrology within currently ditched areas to adequately meet wetland hydrology standards. Groundwater gages installed within the current agricultural area proposed for wetland restoration exhibit drained hydrology from adjacent agricultural ditches. A rapid recession of groundwater tables after precipitation events can be seen in existing hydrology plots.

Table 6: Existing Groundwater Monitoring Gage Data and Analysis Results

SUMMARY OF GROUNDWATER GAGE RESULTS FOR EXISTING SITE HYDROLOGY				
Gage	**Consecutive Days in Growing Season Wells Met Groundwater Depth Criterion Under Normal Rainfall Conditions (Days)**	**Consecutive Percent Growing Season Wells Groundwater Depth Criterion Under Normal Rainfall Conditions (%)**	**Evaluated Dates**	**Wetland Approach**
1	51	23.8%	4/1/19-11/1/19	Rehabilitation
2	44	20.6%	4/1/19-11/1/19	Re-establishment
3	10	4.7%	4/1/19-11/1/19	Re-establishment
4	6	2.8%	4/1/19-11/1/19	Re-establishment
6	13	6.1%	4/1/19-11/1/19	Re-establishment
7	13	6.1%	4/1/19-11/1/19	Re-establishment
8	28	13.1%	4/1/19-11/1/19	Re-establishment
9	35	16.4%	4/16/19-11/1/19	Re-establishment
10	15	7.0%	4/16/19-11/1/19	Re-establishment
11	6	2.8%	4/16/19-11/1/19	Re-establishment
12	6	2.8%	4/16/19-11/1/19	Re-establishment
13	6	2.8%	4/16/19-11/1/19	Re-establishment
14	12	5.6%	4/16/19-11/1/19	Re-establishment
15	3	1.4%	4/16/19-11/1/19	Re-establishment
16	13	6.1%	4/16/19-11/1/19	Re-establishment

3.6 Existing Conditions - Streams

The Site includes three perennial streams: Banner Creek, UT1, and UT2. The stream assessments were conducted by Wildlands on December 18, 2018. NC DWR Stream Identification Forms (Version 4.11) and USACE Stream Assessment Method (NC SAM Version 2.1) forms are included in Appendix 5. Stream features are described in detail below. Tables 7a-7b provide a summary of existing stream conditions within the project limits. Existing conditions are also illustrated in Figure 6.

3.6.1 Banner Creek Reach 1

Banner Creek enters the project area at the northern limits of the Site and flows to the south toward the French Broad River. The stream valley is unconfined with a broad flat floodplain. Mature hardwoods are located directly along the stream corridor, usually near top of bank, for approximately 70% of the reach. Beyond top of bank the floodplain consists of a large fescue field maintained as lawn by the landowner. The stream is relatively low slope throughout this reach (water slope of 0.6%) and contains strong bedform consisting of riffles, pools, and runs. In addition, depositional point bars along meander bends and some depositional bench areas were identified during assessment. Streambed material consisted mostly of gravel and small cobbles as well as sand and silt. While the stream does exhibit some meandering, the sinuosity and belt widths are both very low, likely due to stream straightening and channelization in the past.

A majority of Banner Creek Reach 1 is in Stage V: Aggradation and Widening of the Simon channel evolution model. Several banks exhibit actively eroding raw banks located along the outside of meander bends. Bank sloughing along riffles and runs was also noted. The stream is incised (BHR of 2.2) throughout the reach. The stream most closely classified as a C4 stream type (cross section plots provided in Appendix 6.)

3.6.2 Banner Creek Reach 2

Banner Creek Reach 2 begins as the stream exits from the tree-lined banks of Reach 1. The wide, flat floodplain continues through this reach with bank and floodplain vegetation consisting of fescue and large swaths of sedges and other wetland/riparian vegetation. Large, woody vegetation is almost non-existent along the reach with just a few small trees being present. Here the stream is much more ditch-like and exhibits very little meandering, likely due to historical straightening and manipulation. Bedform is less prevalent in Reach 2 when compared with Reach 1, however, some riffles, step pools, and grade control (small, woody drops) were noted during assessment. Streambed material is similar to Reach 1 with gravel and cobbles present, as well as sand and silt.

A majority of Banner Creek Reach 2 is classified in Stage IV: Degradation and Widening. Sloughing banks were noted along a majority of the reach and small active headcuts were also identified in several areas of the reach. A Bank Height Ratio (BHR) of 1.4 for the reach indicated the stream is slightly incised and the stream is classified as a C4 type stream.

3.6.3 Banner Creek Reach 3

Banner Creek Reach 3 begins at the large easement break that spans a non-project property parcel and the existing culvert under Banner Farm Road. Once past this culvert the stream flows into the floodplain of the French Broad River which is broad and very flat within the project boundaries. The current land use of the floodplain is for row crop production, typically corn or soybeans, with crop production extending very close to the top of bank of Banner Creek. These fields were noted as being persistently wet and even inundated at times during the assessment period. Here, Banner Creek has been heavily manipulated to promote drainage from the agricultural fields. No meanders are present in this reach as the stream has been straightened/channelized and bedform is non-existent. While there is some cobble in the streambed, a majority of the material is sand and silt. Although the stream has been highly manipulated, it is classified as a Rosgen C-type stream.

Banner Creek Reach 3 is characterized as being in Stage III: Degradation. The reach is incised with a BHR of 1.7 calculated (cross section plots provided in Appendix 8.)

3.6.4 Banner Creek Reaches 4a and 4b

Banner Creek Reach 4 begins after the confluence with UT2 at the Site. The reach is broken into two slightly different reaches, Reaches 4a and 4b, due to the changing stream characteristics within the reach. The surrounding floodplain conditions are the same as described for Reach 3 – persistently wet, row crop fields managed to the stream top of bank. Reach 4a stream conditions are also very similar to Reach 3 – a highly channelized ditch with evidence of recent maintenance. Some eroded banks and sloughed banks are noted. No bedform or drops are identified in the reach and streambed material consisted of sand and silt. After the confluence with UT1, Banner Creek Reach 4b begins and the stream increases in depth in the landscape and becomes incised with a BHR of 2.1, higher than Reach 3 or Reach 4a. The slope also decreases to between 0.1% and 0.4%. This reach is thought to be highly influenced by the stage of the French Broad River and was noted to be entirely in backwater flow conditions during flooding events that occurred during the stream assessment period. Reach 4b does contain mature woody vegetation along its banks and depositional areas along low benches that occur intermittently below the existing top of bank. The bed of the stream is characterized as completely

covered in sand with few other particle sizes present. Both reaches are labeled as Rosgen C-type streams.

Banner Creek Reach 4a was identified as being in Stage IV: Degradation and Widening. The reach is channelized and incised and there is evidence that streambanks are eroding and sloughing into the stream. Reach 4b is also classified as Stage IV: Degradation and Widening, however, Reach 4b may also undergo periods of Stage V: Aggradation and Widening when under backwater conditions.

3.6.5 UT1

UT1 enters the project area as a small incised stream that has likely been moved to the toe of a small slope at some point in history. While the stream has been straightened/channelized, some bedform does exist in this upper area of the stream including short riffles and small pools. A majority of the floodplain is agricultural row crops managed similarly to the agricultural fields adjacent to Banner Creek Reach 3 and 4. At its upstream extent, the stream makes a hard-southern turn through a culvert crossing and shows evidence of channel maintenance for agriculture. Evidence of active maintenance of the channel was present during the assessment period. The bottom width of the channel is quite large and contains several depositional bars and some vegetation growing in the channel. Signs of active bank sloughing are also present and, in some cases, small, vegetated benches have formed within the existing channel. While some gravel and cobble were identified in the upper area of UT1, a majority of the streambed consists of sand and silt material.

Overall, the stream is very incised with a BHR of 2.1. The channel slope is very low (0.3%) and the stream is classified as a Rosgen type E/C channel. UT1 is classified as Stage IV: Degradation and Widening.

3.6.6 UT2

UT2 enters the project area through a culvert under Banner Farm Road. The stream has established mature woody vegetation along its top of bank for the first 250 feet of stream. This section of the stream displays some riffle-pool bedform and a few small, stable drops with tree roots acting as grade control. The floodplain beyond top of bank is agricultural row crops that are managed similarly to the floodplain described adjacent to Banner Creek Reaches 3 and 4.

Beyond the initial 250 feet of stream, the stream becomes very channelized and displays no bedform. The stream flows parallel to the flow of the French Broad River until the confluence with Banner Creek Reach 3. Streambed material for the entire reach consists of sand and silt material.

The overall slope for the reach is 0.5% and the stream is slightly incised with a BHR of 1.4. The stream is classified as an E/C5 stream and was thought to be in Stage IV: Degradation and Widening.

3.6.7 Site Ditches

The Site contains an extensive ditch network shown in Figure 2 that has been maintained to drain adjacent agricultural fields for planting. Wildlands did thorough investigation during the jurisdictional determination to understand what channels on the Site are ditches and what channels are streams that have been historically altered. Resources including stream identification forms, historic aerial photography, discussion with the property owners, upstream sources of hydrology, drainage area delineation, discussion with the Army Corps of Engineers, USGS quadrangle mapping, NRCS soil survey mapping, and Site observations were all used to determine stream jurisdiction. Based on information gathered from these sources, it was determined that UT1, UT2, and Banner Creek are all jurisdictional streams. Outside of these specific reaches, ditches were jurisdictionally determined to be either open water features or existing linear wetland features depending on their Site location. Jurisdictional determinations of ditches are shown in Figure 6, an approved Preliminary Jurisdictional Determination is included in Appendix 3 and stream identification forms for all reaches are included in Appendix 5.

Table 7a: Stream Resources

Parameter	Banner Creek Reach 1	Banner Creek Reach 2	Banner Creek Reach 3	Banner Creek Reach 4a	Banner Creek Reach 4b
Valley Confinement (confined, moderately confined, unconfined)	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined
Drainage Area (acres)	390	422	429	634	722
Perennial, Intermittent, Ephemeral	P	P	P	P	P
NCDWR Water Quality Classification	WS-IV (WSW)				
Stream Classification[1]	C4	C4	C4	C5/4	C5/4
Evolutionary Trend (Simon)	V. Aggradation and Widening	IV. Degradation and Widening	III. Degradation	IV. Degradation and Widening	IV. Degradation and Widening
FEMA Classification	Zone AE				

1. The Rosgen classification system (Rosgen, 1994) is for natural streams. These channels have been heavily manipulated by livestock and man and therefore may not fit the classification category as described by this system. Results of the classification are provided as a basis for discussion of existing channel form.

Table 7b: Stream Resources

Parameter	UT1	UT2
Valley Confinement (confined, moderately confined, unconfined)	Unconfined	Unconfined
Drainage Area (acres)	83	192
Perennial, Intermittent, Ephemeral	P	P
NCDWR Water Quality Classification	WS-IV (WSW)	
Stream Classification[1]	E/C5	E/C5
Evolutionary Trend (Simon)	IV. Degradation and Widening	IV. Degradation and Widening
FEMA Classification	Zone AE	

1. The Rosgen classification system (Rosgen, 1994) is for natural streams. These channels have been heavily manipulated by livestock and man and therefore may not fit the classification category as described by this system. Results of the classification are provided as a basis for discussion of existing channel form.

4.0 Watershed and Channel Disturbance and Response

As discussed above in Section 3.3, there has been very little change in the watersheds of the project reaches for several decades. Some small-scale residential development and clearing of small areas of forest has occurred but these minor disturbances are the not the main driver of the degradation of the Site. The primary causes of degradation on the Site were the original clearing, production of crops, and channelization of the project streams, which occurred prior to 1964 (the date of the earliest available aerial photo). The channelization involved straightening and deepening of the streams. Multiple ditches were also cut through wetland areas draining the historic wetlands. This manipulation resulted in degraded terrestrial and aquatic habitats, denuded riparian zones, cutting the streams off from their floodplains, lowering of the local water table, and elimination of wetland functions. It also led to increased shear stresses in the streams which may have caused additional degradation of the channels over time. Signs of on-going bank erosion are apparent in places along most of the project reaches. The current condition of most the reaches on the Site is that they are severely incised and have on-going lateral erosion. The areas that were previously wetland have been somewhat drained (although evidence of extended wet periods was still present) and the hydrophytic vegetation has been removed.

5.0 Functional Uplift Potential

5.1 Wetland Functional Uplift Potential

Areas proposed for wetland re-establishment are currently lacking adequate vegetation and hydrology to provide functions typically associated with wetlands. Areas proposed for wetland rehabilitation are currently providing some functions typically associated with wetlands, however functions are actively diminished through management for agricultural practices. Functional uplift to existing wetland areas is expected as a result of the proposed activities on site. Elimination of the extensive ditch network will decrease drainage and raise the water table. Construction of appropriately sized stream channels will restore stream and floodplain connection and re-establish a natural hydrologic interaction. Wetland restoration areas will be planted with native vegetation to create an appropriate forested riparian wetland community. These activities will result in uplift of various wetland functions including increased water storage, increased groundwater recharge, water quality treatment through retention, and increased habitat for aquatic and terrestrial species.

5.2 Stream Functional Uplift Potential

The potential for functional uplift for streams is described in this section according to the Stream Functions Pyramid (Harman, 2012). The Stream Functions Pyramid describes a hierarchy of five stream functions, each of which supports the functions above it on the pyramid (and sometimes reinforces those below it). The five functions in order from bottom to top are hydrology, hydraulics, geomorphology, physicochemical, and biology.

5.2.1 Hydrology

Detailed land use and land cover analysis provided in Section 3.3 and Table 4. Vegetation within the watershed has been historically maintained for agricultural use. Primary land use is cited as agricultural practices including row cropping. Clearing and agricultural planting and harvesting typically results in reductions in rainfall interception and evapotranspiration, leading to an increase in runoff and water yield (Dunne and Leopold, 1978). Higher runoff typically increases peak flows and base flows with varying magnitude based on watershed size. Initial increases in water yield usually change over time as vegetation regrows and crops are planted. Clearing of the land in this particular watershed (27% remains forested) likely increased local hydrology during agricultural establishment. However, these changes primarily occurred several decades ago (prior to 1964 based on available aerial photography). Wildlands

believes the watershed has adjusted to its hydrologic regime and is currently stable. No measurements of existing conditions in watershed hydrology have been made to date for this project.

A stream restoration project performed at a specific Site does not often result in uplift to hydrology (Harman, 2012). Even though a major portion of agricultural land use will be converted to forest via the proposed planting within the conservation easement, this will not result in improvements to the rainfall-runoff relationship at the watershed scale. Therefore, there is little opportunity to improve the watershed hydrology function.

5.2.2 Hydraulics

The streams on the Site have been historically straightened, channelized, and dredged to increase agricultural production in the immediate floodplains. With altered slopes, disconnected floodplains, elevated bank height ratios, and low entrenchment ratios, the overall hydraulic function has been severely degraded and would be classified as non-functioning.

The channels will be reconstructed with appropriate pattern to encourage helical flow and appropriate hydraulic function. The dimension of the proposed streams is designed with a bank height ratio of 1.0, connecting the streams to the relic floodplain wetlands and restoring a natural flooding regime. Shear stress in the channels will be maintained at functioning levels and groundwater exchange and adjacent wetland hydrology will be improved as a result of the increased frequency of floodplain inundation. The post-construction hydraulic function will be functioning.

5.2.3 Channel Geomorphology

The channelization and incision of the streams on the Site represent streams within Stage III/IV of the Simon Evolution Model. There is no pattern to the existing project streams which have all been straightened and channelized. Beyond Banner Creek Reach 1, no woody debries or riparian buffer exisits along the project streams. Streams within the floodplain of the French Broad River are devoid of bedform and inundated with fine sediment from active upstream bank erosion. The geomorphic function of the project streams is rated as not functioning.

This project offers an excellent opportunity to improve the geomorphology function on the Site. The incision and bank erosion will be corrected. Restored streams with the appropriate pattern for the surrounding landscape will be constructed. Bedform will be diversified and spaced with appropriate design ratios. Habitat will be added to the system through construction of instream structures and bank revetments and the riparian buffer will be replanted anywhere it has been cleared for agricultural purposes. Post construction, the geomorphology function will be rated functioning.

5.2.4 Physicohemical

No water quality sampling has been conducted on the project streams. As outlined in Section 2.0 of this report, the 2009 French Broad RBRP identifies major stressors within the basin as excessive nutrient enrichment, habitat fragmentation, habitat degradation, and streambank erosion. The RBRP also states that stressors from agriculture-related sources have impacted the biological communities within the basin, including federally threatened and endangered species. The agricultural operations at the project level are likely a major contributor of nutrients and other pollutants to the project streams. In addition, sediment loading is likely high due to bank erosion on the project streams. However, because no water quality data are available to evaluate the current level of physicochemical functioning, this function is not rated.

There is potential to improve the physicochemical functioning of the project streams at the Site level. Removing the crop production will decrease the nutrient and sediment loads to the project streams and ultimately the French Broad River. Restoring a large forested wetland within the floodplain of the French Broad River will provide increased retention times and surface water storage, which will increase

treatment potential and decrease nutrient loading. Filling agricultural ditches and replacing them with forested wetland areas will remove a potential point source for surface water to discharge contaminants into the receiving waters. Ultimately, while not quantified with water quality testing, the level of physicochemical functioning will be improved at the Site level.

5.2.5 Biology

There are no available biological data for the Site, however, the habitat conditions on the Site are poor based on a lack of stream bedform, no riparian vegetation, and current agricultural management.

There is opportunity to improve the instream and riparian habitat in addition to the physicochemical function described above. Habitat will be improved by reconstructing channels of appropriate size with a variety of types of riffles and pools of varying depth. Other types of instream structures with a variety of woody materials will be incorporated into the restoration reaches further diversifying habitat types. In addition, re-establishment of floodplain forested wetlands within active agricultural fields will provide continuous and diversified natural corridors along French Broad River. However, because there are no pre-construction biological data the functional uplift potential will not be rated.

5.2.6 Overall Functional Uplift Potential for Streams

Due to severely degraded hydraulics and geomorphology (both not-functioning) and suspected poor biology and physicochemical functions of the Site, there is substantial potential for ecological uplift. Due to the proposed improvements described above, the functional uplift potential is a reclassification from not-functioning to functioning. This change in overall classification is related to improvements in hydraulics and geomorphology between the existing and proposed conditions and expected improvements in physicochemical and biology functions. The watershed hydrology function will not be substantially improved by the project because watershed-scale reforestation would be required to drive improvement in this function. The degree to which the physicochemical and biology functions can improve on the Site is limited by the watershed conditions beyond the project limits, upstream water quality, and the presence of source aquatic communities upstream and downstream of the Site.

6.0 Regulatory Considerations

Table 8, below, is a summary of regulatory considerations for the Site. These considerations are explained in more detail in Sections 6.1-6.3.

Table 8: Regulatory Considerations

Parameters	Applicable?	Resolved?	Supporting Docs?
USACE Public Notice - Section 404	Yes	Yes	SAW-2018-01153[1]
Water of the United States - Section 404	Yes	No	PCN[2]
Water of the United States - Section 401	Yes	No	PCN[2]
Endangered Species Act	Yes	Yes	Appendix 9
Historic Preservation Act	Yes	Yes	Appendix 9
Coastal Zone Management Act	No	No	N/A
FEMA Floodplain Compliance	Yes	No	No-Rise Certification
Essential Fisheries Habitat	No	N/A	N/A

1. Public Notice was issued on August 28, 2018.
2. PCN to be submitted to DMS with Final Mitigation Plan for IRT submittal.

6.1 Biological and Cultural Resources

A Categorical Exclusion for the Banner Farm Mitigation Site was approved by the Federal Highway Administration (FHWA) on January 11, 2019 (Appendix 9). This document included investigation into the presence of threatened and endangered species on the 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 biological conclusion for the Site, per the Categorical Exclusion research is that "any incidental take that may result from the associated activities [from the project] is exempt under the 4(d) rule." All correspondence with USFWS and a list of Threatened and Endangered Species in Henderson County, NC is included in Appendix 9. The State Historic Preservation Office was contacted regarding on-site cultural resources. The State Historic Preservation Office recommended a comprehensive survey be conducted to identify and evaluate any archaeological sites within the project area. The results of a Phase I Identification Survey determined the project would not involve any notable archaeological resources. For additional information and regulatory communications please refer to the Categorical Exclusion document.

6.2 FEMA Floodplain Compliance and Hydrologic Trespass

The project stream channels do not have an associated regulated floodplain and are not located along a studied section of stream. However, all project streams lie within the floodway and flood fringe of the French Broad River, mapped FEMA Zone AE (Figure 7). French Broad River base flood elevations have been defined and a detailed study has been performed with floodway areas mapped on Henderson County FIRM panels 9539, 9630, and 9640. Wildlands will coordinate with Henderson County on any local permitting requirements. No-rise hydraulic modeling and an associated flood study are anticipated as a part of the permitting process. Wildlands has navigated this permitting process multiple times on similar sites and believes a no-rise condition can be obtained based on the Site's current design.

6.3 401/404

As part of the existing conditions assessment at the Site, Wildlands documented and classified the on-site wetlands. Classifications were applied based on wetland function and potential for wetland improvement through the stream design approach. Based on these classifications, Wildlands designers used this information to prioritize higher quality wetlands for avoidance and minimization and to incorporate stream design approaches to improve hydrologic and vegetative conditions of impaired wetlands. Wetlands within the conservation easement or limit of disturbance will be denoted in the final construction plans on the erosion and sediment control plan and detail plan sheets, as well as in the project specifications. Floodplain grading will result in temporary impacts to wetlands while channel realignment and ditch filling will result in permanent impacts. Wildlands expects a net gain of wetland area and function as a result of filling drainage ditches and construction of the new channels. Table 9 estimates the anticipated impacts to wetland areas. The PCN, including these data, will be submitted with the Final Mitigation Plan.

Table 9: Estimated Impacts to Wetlands and Ditches

Jurisdictional Feature	Classification	Acreage	Permanent (P) Impact		Temporary (T) Impact	
			Type of Activity	Impact Area (acres)	Type of Activity	Impact Area (acres)
Wetland A	Bottomland Hardwood Forest	0.54	Fill Ditch	0.262	Wetland rehabilitation grading	0.276

Jurisdictional Feature	Classification	Acreage	Permanent (P) Impact		Temporary (T) Impact	
			Type of Activity	Impact Area (acres)	Type of Activity	Impact Area (acres)
Wetland B	Bottomland Hardwood Forest	0.09	Fill Ditch	0.089	-	-
Wetland D	Bottomland Hardwood Forest	0.17	Fill Ditch	0.116	-	-
Wetland E	Bottomland Hardwood Forest	0.01	-	-	Wetland rehabilitation grading	0.003
Wetland F	Bottomland Hardwood Forest	0.03	-	-	Wetland rehabilitation grading	0.026
Wetland G	Bottomland Hardwood Forest	0.01	-	-	Wetland rehabilitation grading	0.005
Wetland H	Bottomland Hardwood Forest	0.13	Fill Ditch	0.127	-	-
Wetland I	Bottomland Hardwood Forest	0.02	-	-	Wetland rehabilitation grading	0.024
Wetland J	Bottomland Hardwood Forest	0.11	Fill Ditch	0.111	-	-
Wetland K	Bottomland Hardwood Forest	0.16	Fill Ditch	0.150	-	-
Wetland L	Bottomland Hardwood Forest	0.04	-	-	Wetland rehabilitation grading	0.040
Wetland M	Headwater Forest	0.003	Conversion to stream resource	0.003	-	-
Wetland N	Headwater Forest	0.003	Conversion to stream resource	0.002	Floodplain grading	0.001
Wetland O	Headwater Forest	0.01	Conversion to stream resource	0.002	Floodplain grading	0.012
Wetland Q	Bottomland Hardwood Forest	0.14	Conversion to stream resource	0.002	Floodplain grading	0.138
Wetland R	Bottomland Hardwood Forest	0.15	Conversion to stream resource	0.145	Floodplain grading	0.009
Wetland S	Bottomland Hardwood Forest	1.62	Conversion to stream resource	0.607	Wetland Rehabilitation	0.903
Wetland T	Headwater Forest	0.04	Conversion to stream resource	0.004	Floodplain grading	0.040

Jurisdictional Feature	Classification	Acreage	Permanent (P) Impact		Temporary (T) Impact	
			Type of Activity	Impact Area (acres)	Type of Activity	Impact Area (acres)
Wetland U	Headwater Forest	0.04	Conversion to stream resource	0.041	Floodplain grading	0.002
Wetland V	Headwater Forest	0.01	Conversion to stream resource	0.002	Floodplain grading	0.002
Wetland W	Bottomland Hardwood Forest	0.28	-	-	Reestablishment grading	0.284
Open Water 1	Open Water	0.40	Fill Ditch	0.40	-	-
			Total P Impact	2.063	**Total T Impact**	1.765

7.0 Mitigation Site Goals and Objectives

The project aims to improve stream functions as described in Section 5 through stream restoration, wetland rehabilitation and re-establishment, and riparian buffer re-vegetation. The project goals and related objectives and outcomes are described in Table 10. Project goals are desired project outcomes and are verifiable through measurement and/or visual assessment. Objectives are activities that will result in the accomplishment of goals. The project will be monitoredafter construction to evaluate performance as described in Section 10 of this report.

Table 10: Mitigation Goals and Objectives

Goal	Objective	Expected Outcomes
Improve the stability of stream channels.	Construct stream channels that will maintain a stable pattern and profile. Stabilize stream bed and banks using bank vegetation, bank revetments, and in-stream structures to protect restored/enhanced channels.	Reduce and control sediment inputs; Contribute to protection, or improvement, of a Water Supply IV- Highly Developed water.
Improve instream habitat.	Install habitat features such as constructed riffles, cover logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Improve aquatic communities in project streams.
Reconnect channels with floodplains and riparian wetlands.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain.	Reduce shear stress on channel; Hydrate adjacent wetland areas; Filter pollutants out of overbank flows.
Restore wetland hydrology, soils, and plant communities.	Restore and enhance riparian wetlands by raising stream beds, plugging and filling existing agricultural ditches, removing berm	Improve terrestrial habitat; Contribute to protection of or improvement of a Water Supply IV- Highly Developed water.

Goal	Objective	Expected Outcomes
	material over relic hydric soils, and planting native wetland species.	
Restore and enhance native floodplain vegetation.	Plant native tree species in riparian zone where currently insufficient.	Reduce and control sediment inputs; Reduce and manage nutrient inputs; Provide a canopy to shade streams and reduce thermal loadings; Contribute to protection, or improvement, of a Water Supply IV- Highly Developed water.
Permanently protect the project Site from harmful uses.	Establish conservation easements on the Site.	Ensure that development and agricultural uses that would damage the site or reduce the benefits of the project are prevented.

8.0 Design Approach and Mitigation Work Plan

8.1 Design Approach Overview

The design approach for this Site was developed to meet the goals and objectives described in Section 7 which were formulated based on the potential for uplift described in Section 5. The design is also intended to provide the expected outcomes in Section 7, though these are not tied to performance criteria. The project streams 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. Adjacent wetlands will be restored (either re-established or rehabilitated) by plugging and filling an extensive network of agricultural drainage ditches. The floodplains and wetlands will be planted with native tree species where necessary. Instream structures will be constructed 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. Table 11 summarizes the stressors of each project reach and the mitigation activities expected to address those stressors.

The design approach for this Site utilized a combination of analog and analytical approaches for stream restoration. Reference reaches were identified to serve as the basis for design parameters. Channels were sized based on design discharge hydrologic analysis. This approach has been used on many successful restoration projects and is appropriate for the goals and objectives for this Site.

Table 11: Stream Stressors and Restoration Approach

Project Reach	Primary Stressors/Impairments	Approach	Mitigation Activities
Banner Creek Reach 1	Poor Buffer, bank erosion, incised	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
Banner Creek Reach 2	Poor buffer, channelization, bank erosion, incised	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
Banner Creek Reach 3	Non-existent buffer, channelization, bank erosion, incised, no bedform	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement

Project Reach	Primary Stressors/Impairments	Approach	Mitigation Activities
Banner Creek Reach 4a	Non-existent buffer, channelization, bank erosion, incised, no bedform	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
Banner Creek Reach 4b	Poor Buffer, Channelization, bank erosion, incised, weak bedform	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
UT1	Non-existent buffer, channelization, bank erosion, incised, no bedform	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
UT2	Non-existent buffer, channelization, bank erosion, incised, no bedform	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement

8.2 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. A total of twelve reference reaches were identified for the Site and used to support the design of the project streams (Figure 8). Project streams were clustered into four groups based on important design factors such as drainage area, slope, channel type, and bed material. Reference reaches sharing similar characteristics were assigned to each of the four project stream groups to help develop design parameters (Tables 12a – 12d). Only five of the twelve reference reaches were used in the discharge analysis to strengthen the reference reach discharge-drainage area curve (described in Section 8.4 below). The majority of the reference reaches are located within the Piedmont region of North Carolina (10 of 12) but exhibit similarities in channel geometry and planform characteristics to project reaches on Site that are dictated by the low slope, broad valley floodplain within which the Site is situated. Geomorphic parameters for these reference reaches are summarized in Appendix 10. The references to be used for the specific streams are shown in Tables 13a – 13d and a description of each reference reach is included below.

Table 12a: Stream Reference Data Used in Development of Design Parameters for Banner Creek Reaches 1-3

	UT to South Mills River	Cooleemee Plantation	Deep Creek	UT to Lyle Creek
Stream Type:	**B4c/E4**	**C5**	**C5**	**C5**
Reference Type:	Discharge	Dimension, Pattern, Profile	Dimension, Pattern, Profile	Dimension, Pattern, Profile

Table 12b: Stream Reference Data Used in Development of Design Parameters for Banner Creek Reaches 4a-4b

	Long Branch	Foust Creek	Boyd Branch	UT to Catawba River Reach 1
Stream Type:	**C/E4**	**C4**	**E4**	**E5**
Reference Type:	Dimension, Pattern, Profile	All	All	Discharge

Table 12c: Stream Reference Data Used in Development of Design Parameters for UT1

	Candy Creek	UT at Lake Norman Group Camp (upstream)	Reedy Creek Nature Preserve – South Fork
Stream Type:	**-**	**E5**	**B4c**
Reference Type:	Dimension, Pattern, Profile	Dimension, Pattern, Profile	Discharge

Table 12d: Stream Reference Data Used in Development of Design Parameters for UT2

	UT to Lyle Creek	UT to South Crowders	Reedy Creek Nature Preserve – South Fork
Stream Type:	**C5**	**E4**	**B4c**
Reference Type:	Dimension, Pattern, Profile	Dimension, Pattern, Profile	All

8.2.1 UT to South Mills River

UT to South Mills River is a 0.64 square mile tributary to South Mills River in the Upper French Broad basin located in Mills River, NC. The tributary drains a predominantly forested watershed and is impounded by a small pond halfway up the watershed where the valley is narrower and steeper. The reference reach is located lower in the watershed where it flows through the left floodplain of the South Mills River before emptying into it. A stable succession of riffles and pools are common throughout this sinuous reach, with pools located in meander bends and downstream of logs and debris jams. Channel slope is 0.72 percent and sinuosity measures approximately 1.5. The channel classifies as a Rosgen B4c/E4 stream type due its moderate entrenchment (1.8) and low width to depth ratio (8.6). The channel along much of the reach contains small, stable bankfull benches with recent sediment deposition. The reach is bordered by a forested wetland along much of the left bank and agriculture (active row crops) on the right bank beyond a narrow vegetative buffer. Vegetation within the riparian corridor consists of a lush understory of ferns and other herbaceous species and an overstory that includes American beech and holly trees.

8.2.2 UT to Catawba River Reach 1

UT to Catawba River Reach 1 is a perennial stream that flows into the wide and flat Catawba River floodplain from the adjacent steep wooded valley, east of NC Highway 10. The stream drains a 1.60-square mile watershed. The stream reach is well-connected to the floodplain, has a low width to depth ratio ranging from 8.1 to 8.9, and has a channel slope of 0.5%. The channel substrate is predominantly sand and exhibits good bedform diversity with well-established pools at the outside of channel bends, several well-developed riffles, and habitat features such as woody debris jams, fallen logs across the channel, and root mats along the banks. Reach 1 classifies as a Rosgen E5 stream type.

8.2.3 Foust Creek

Foust Creek is located within the Carolina Slate Belt region of the Piedmont, approximately 12 miles south of Burlington, NC, in Alamance County. The Foust Creek reference reach has a drainage area of 1.4 square miles, a valley slope of 0.95% and a channel slope of 0.9%. The reach is classified as a C4 stream

type and has a d50 of 43 mm. This reach flows through a mature forest and, although it is stable, it lacks sinuosity.

8.2.4 Boyd Branch

The reference reach of Boyd Branch is located within the Bent Creek Experimental Forest near Asheville. Boyd Branch drains a 0.9-square mile, forested watershed. The site was surveyed in December 2014 by Confluence Engineering and was found to have a measurable pattern on USGS quadrangle maps. The reach has a slope of approximately 0.9 percent. With a width-depth ratio of 11.8, an entrenchment ratio greater than 3 and gravel sized bed material, Boyd Branch is classified as an E4 stream type.

8.2.5 Reedy Creek Nature Preserve – South Fork

South Fork is a headwater reference reach located within the Reedy Creek Nature Preserve in Charlotte, NC, and drains into Reedy Creek. The stream receives drainage from a 0.23 square mile watershed. South Fork here is dominated by gravels and cobbles. The stream's width-to-depth ratio ranges from 6.0 to 11.7 and the overall channel slope is 0.67%. Habitat features include meander pools, pools formed around logs and debris, rock riffles, root mats, and woody debris in the stream. This portion of South Fork classifies as a Rosgen B4c-type stream.

8.2.6 UT to Lyle Creek

UT to Lyle Creek is a perennial stream flowing through the broad, flat floodplain of Lyle Creek. UT to Lyle's watershed is wooded, and the stream is fully connected to the floodplain with a bank height ratio of 1.0 and an entrenchment ratio of over 5.0. The width-to-depth ratio ranges from approximately 15 to 18, and the overall valley slope is approximately 0.8%. UT to Lyle Creek has a sinuosity of 1.1 and classifies as a straight, C5 stream channel. In-stream habitat features within this reach include shallow pools, woody debris, and small sections of tree roots.

8.2.7 Cooleemee Plantation

The Cooleemee Plantation Reference Reach is in southeast Davie County, NC approximately 9 miles east of Mocksville, NC. The reference tributary flows through the wider floodplain of the Yadkin River. A detailed survey of the stream was conducted in January 2017. The C-type stream channel has a 0.68 square mile drainage area with a width to depth ratio between 15 and 24. The valley and stream slope are relatively flat (less than 0.5%). Soils on the site were mapped as Chewacla. Vegetation on the site included white oak, red oak, river birch, green ash, sycamore, tulip poplar, and American beech.

8.2.8 UT to South Crowders

UT to South Crowders is a perennial stream located in Crowder Mountain State Park that receives 0.22 square miles of drainage from the forested mountain side. The stream is quite sinuous given the 2.57% valley, with a sinuosity of 2.2. UT to South Crowders is an example of a classic, small E4 stream within a higher sloped setting, with a width to depth ratio ranges from 5.7 to 8.2 and a high entrenchment ratio ranging from 3.7 to 4.2. The stream is fully connected to its alluvial floodplain, and supports varied habitats including root mats, deep meander pools, rock riffles, and woody debris in the channel.

8.2.9 UT at Lake Norman Group Camp (upstream)

Group Camp Tributary is located in Lake Norman State Park and receives drainage from a predominantly forested watershed and portions of two park shelters. The stream has a sinuosity of 1.6 and an entrenchment ratio ranging from 1.9 to 2.5. The width to depth ratio is 5.2 to 5.5. The channel slope is 1.7%. Group Camp tributary is classified as a Rosgen E5b.

8.2.10 Deep Creek

Deep Creek Mitigation Bank is in the Yadkin River basin in southeast Yadkin County, NC. Originally designed and constructed in 2003, the intent of the mitigation effort was to restore a Bottomland

Hardwood Forest Wetland by restoring wetland hydrology in borderline hydric soil areas. Stream restoration efforts included fillings ditches and modifying stream dimension, pattern, and profile. Wildlands identified that the site location, project intent, and soil conditions were like that of the Banner Farm Mitigation Site. A short profile and cross-section of the restored C-type channel were surveyed to evaluate its stability and similarity to the proposed reaches at the Banner Farm Mitigation Site. The low-sloped, moderate width-depth ratio channel was consistent with project goals for Banner Farm Mitigation Site.

8.2.11 Candy Creek

This reference reach is an unnamed tributary to Candy Creek (UT3) in Guilford County, NC which was identified as a preservation reach for the Candy Creek Mitigation project. The 0.10 square mile drainage originates from a farm pond at the southeast end of the Candy Creek Mitigation project, has low bank heights, good connection to the floodplain, and flows through an existing jurisdictional, forested wetland. Vegetation within the buffer is typically a mature community similar to the Southern Piedmont Small Floodplain and Riparian Forest ecotype, bordered by a mature Southern Piedmont Mixed Mesic Forest ecotype.

8.2.12 Long Branch

Long Branch is located in the central portion of Orange County northwest of Chapel Hill. The drainage area is 1.49 square miles and the land use within the drainage area is low-density residential, agricultural lands, and forest. The Long Branch reference site was classified as a C4 channel type. The channel has a width to depth ratio ranging from 8.8 to 13.8 and an entrenchment ratio of >2.5. The reach has a valley slope of 0.6% while the channel slope is 0.4%. The bed material D50 for the reach is 7.6 mm. Two riffles were surveyed during the site visit. These riffles had width to depth ratios of 9.4 and 7.9 and entrenchment ratios of 11.7 and 12.1. Some cross sections are more typical of E stream types while others would classify as a C stream type.

8.3 Design Channel Morphological Parameters

Reference reaches were an important source of information used to develop the pattern and profile design parameters for the streams. Ranges of pattern parameters were developed within the reference reach parameter ranges with some exceptions based on best professional judgement and knowledge from previous projects. The streams were designed with pool widths to be at least 1.2 times the width of riffles to provide adequate point bars and riffle pool transition zones. Pool depths were designed to be a minimum of 1.2 times deeper than riffles to provide habitat variation. Cross-section parameters such as area, depth, and width were designed based on the design discharge, stable bank slopes, and width to depth ratios similar to reference conditions. Key morphological parameters for the restoration reaches are listed in Tables 13a through 13d. Complete morphological tables for existing, reference, and proposed conditions are located in Appendix 7.

Table 13a: Summary of Morphological Parameters for Banner Creek Reach 1-3

Parameter	Existing Parameters			Reference Parameters			Proposed Parameters	
	Banner Creek Reach 1	Banner Creek Reach 2	Banner Creek Reach 3	Cooleemee Plantation	Deep Creek	UT to Lyle Creek	Banner Creek Reach 1 & 2	Banner Creek Reach 3
Contributing Drainage Area (acres)	390	422	429	435	429	160	390-422	429
Channel/Reach Classification	C4	C4	C4	C5	C5	C5	C4	C4

Parameter	Existing Parameters			Reference Parameters			Proposed Parameters	
	Banner Creek Reach 1	Banner Creek Reach 2	Banner Creek Reach 3	Cooleemee Plantation	Deep Creek	UT to Lyle Creek	Banner Creek Reach 1 & 2	Banner Creek Reach 3
Design Discharge Width (ft)	9.8	10.4	7.4	11.7 – 15.9	12.9	7	13.5	14.8
Design Discharge Depth (ft)	1.7	2.3	2.1	1.2 – 1.4	2.3	1.05	1.7	1.7
Design Discharge Area (ft^2)	12.0	11.6	11.9	9.9	17.1	3.8	14.0	17.3
Design Discharge Velocity (ft/s)	3.4	4.0	3.6	1.6	2.4	-	2.8	2.3
Design Discharge (cfs)[1]	40.5	45.7	42.5	16	40.9	18	40-43	44
Water Surface Slope	0.0057	.007	.009	0.0027	0.0028	0.004	0.002	0.002
Sinuosity	1.08	1.01	1.00	1.1	1.6	1.1	1.2	1.3
Width/Depth Ratio	8.2	9.3	4.6	14.4 – 24.8	9.6	16.6	13.0	13
Bank Height Ratio	2.2	1.4	1.7	1.1 – 1.4	0.9 – 1.1	0.75	1.0-1.1	1.0-1.1
Entrenchment Ratio	2.5	14.4	4.2	8.8 – 12.5	10.5+	6.05	2.2 - 5	2.2-5.0

[1] Existing parameters design discharge values are based on existing condition stream cross-sections, slopes, and field identified bankfull calls. Proposed parameter design discharge values are based on design discharge analysis (see section 8.4 for more details).

Table 13b: Summary of Morphological Parameters for Banner Creek Reach 4a-4b

Parameter	Existing Parameters[1]	Reference Parameters			Proposed Parameters	
	Banner Creek Reach 4	Long Branch	Foust Creek	Boyd Branch	Banner Creek Reach 4a	Banner Creek Reach 4b
Contributing Drainage Area (acres)	722	954	896	576	634	722
Channel/Reach Classification	C5/4	C/E4	C4	E4	C5/4	C5/4
Design Discharge Width (ft)	19.4	16.7	19.0	15.1	19.8	20.8
Design Discharge Depth (ft)	2.6	2.4	2.0	1.8	2.5	2.5
Design Discharge Area (ft^2)	32.4	67.5	24.0	14.6	30.3	32.7
Design Discharge Velocity (ft/s)	1.8	-	-	-	2.0	2.3
Design Discharge (cfs)[2]	57.5	112.5	95.2	51	60	70
Water Surface Slope	.001	0.004	0.009	0.009	0.0013	.0017
Sinuosity	1.02	1.3	-	1.6	1.20	1.20
Width/Depth Ratio	11.4	10.9	15	15.9	13.0	13.0
Bank Height Ratio	2.1	1.35	-	1.0	1.0	1.0
Entrenchment Ratio	1.2	3.4	4.1	2.65	2.2 - 5	2.2 – 5.0

[1] Streams have been heavily ditched, straightened, and otherwise altered, and therefore they do not display any natural pattern or cross-sectional traits.

[2] Existing parameters design discharge values are based on existing condition stream cross-sections, slopes, and field identified bankfull calls. Proposed parameter design discharge values are based on design discharge analysis (see section 8.4 for more details).

Table 13c: Summary of Morphological Parameters for UT1

Parameter	Existing Parameters[1]	Reference Parameters		Proposed Parameters
	UT1	Candy Creek	UT at Lake Norman Group Camp (upstream)	UT1
Contributing Drainage Area (acres)	81	64	64	81
Channel/Reach Classification	E/C5	-	E5	E5
Design Discharge Width (ft)	5.2 – 10.0	4.3	4.3	9.0
Design Discharge Depth (ft)	1.4 – 1.7	0.5	1.1	1.5
Design Discharge Area (ft^2)	3.6 – 7.8	1.35	3.47	8.4
Design Discharge Velocity (ft/s)	0.6 – 2.3	-	-	1.7
Design Discharge (cfs)[2]	5 - 8	2.1	12.2	14
Water Surface Slope	.003	0.0057	0.02	0.0020
Sinuosity	1.10	-	1.6	1.30
Width/Depth Ratio	7.5 – 12.9	12.9	5.4	10.0
Bank Height Ratio	2.0 – 2.1	1.0	1.0	1.0
Entrenchment Ratio	2.4 – 2.9	13.7	2.3	2.2 – 8.0

[1] Streams have been heavily ditched, straightened, and otherwise altered, and therefore they do not display any natural pattern or cross-sectional traits.

[2] Existing parameters design discharge values are based on existing condition stream cross-sections, slopes, and field identified bankfull calls. Proposed parameter design discharge values are based on design discharge analysis (see section 8.4 for more details).

Table 13d: Summary of Morphological Parameters for UT2

Parameter	Existing Parameters[1]	Reference Parameters			Proposed Parameters
	UT2	UT to Lyle Creek	UT to South Crowders	Reedy Creek Nature Preserve – South Fork	UT2
Contributing Drainage Area (acres)	190	160	141	128	190
Channel/Reach Classification	E/C5	C5	E4	B4c	C4
Design Discharge Width (ft)	4.6	7.0	7.3	9.7	12.0
Design Discharge Depth (ft)	1.2	1.1	1.4	1.6	1.7
Design Discharge Area (ft^2)	4.1	3.8	7.6	10.9	12.8

Parameter	Existing Parameters[1]	Reference Parameters			Proposed Parameters
	UT2	UT to Lyle Creek	UT to South Crowders	Reedy Creek Nature Preserve – South Fork	UT2
Design Discharge Velocity (ft/s)	2.3	-	-	-	1.7
Design Discharge (cfs)[2]	10-13	18.0	22.0	29.3	25.0
Water Surface Slope	0.0047	0.004	0.0091	0.0067	0.0020
Sinuosity	1.28	1.10	1.2	1.31	1.30
Width/Depth Ratio	5.1	16.6	6.9	8.9	11.0
Bank Height Ratio	1.4	0.8	1.8	2.0	1.0
Entrenchment Ratio	3.5	6.1	4.0	1.7	2.2 – 5.0

[1] Streams have been heavily ditched, straightened, and otherwise altered, and therefore they do not display any natural pattern or cross-sectional traits.

[2] Existing parameters design discharge values are based on existing condition stream cross-sections, slopes, and field identified bankfull calls. Proposed parameter design discharge values are based on design discharge analysis (see section 8.4 for more details).

8.4 Design Discharge Analysis

Multiple methods were used to develop bankfull discharge estimates for each of the project restoration reaches: the NC Rural Piedmont Regional Curve (Harman et al., 1999), a regional flood frequency analysis, a site-specific reference reach curve, and data from previous successful design projects. The resulting values were compared and concurrence between the estimates was evaluated. The purpose of using multiple methods to estimate bankfull discharge is to eliminate reliance on a single method as the basis of channel design. However, the methods commonly produce different results so professional judgement must be used to select the final design discharge for each restoration reach. For this analysis, there was some concurrence between the NC Rural Piedmont Regional Curve, the regional flood frequency analysis and the site-specific reference reach curve, however, the surveyed cross-sections were consistently lower than the other methods. Each of the methods used to estimate discharge are described below and the results of the analysis are summarized in Table 14 and illustrated in Figure 9.

8.4.1 Published Regional Curve Data

The NC Rural Piedmont Regional Curve published by Harman et al. in 1999 was used to estimate discharge based on the drainage area of each design reach. While the Site is not located in the Piedmont physiographic province, it was determined that the streams may be more similar to Piedmont streams due to the Site location in the landscape. As mentioned previously, a majority of the Site is located within the French Broad River floodplain, which is quite wide and flat at the Site location. As a result, existing streams display slopes of less than 2%, much lower than the 2-5% slopes that are often represented in the NC Mountain Regional Curve. The decision to use the Rural Piedmont Regional Curve was further confirmed when its results more closely agreed with the other discharge determination methods as compared to the NC Mountain Regional Curve. The updated NC regional curve (Walker, unpublished, shown as Alan Walker Curve on Figure 9) was not used in determining discharge values due to the lack of smaller drainage area streams in the dataset. The discharge values derived from the Rural Piedmont Regional Curve were consistently the highest among the methods utilized in this analysis and were considered the upper end of the range of probable discharge values.

8.4.2 Regional Flood Frequency Analysis

Wildlands developed a regional flood frequency analysis tool using published USGS gage station records for drainage basins within the Piedmont based on methodology described in the 2009 USGS publication *Magnitude and Frequency of Rural Floods in the Southeastern United States* (Weaver, et al., 2009). While the Site is not located in the Piedmont physiographic province, it was determined that the streams may be more similar to Piedmont streams due to the Site location in the landscape, as described in Section 8.4.1.

Wildlands evaluated 103 stations referenced in the publication, 12 stations with drainage areas ranging from 0.28 to 7.63 square miles were used in the development of the tool. The applicable stations were selected based on several criteria such as geographic region, drainage area, watershed characteristics, extent of available data, and dates of data collection. Peak flow data from the 12 USGS stream stations used for the creation of this relation were analyzed for homogeneity using Hosking and Wallis (1993) heterogeneity statistics in the statistics program R®. All stations were found to be acceptably homogeneous. The included gages are as follows:

- USGS 02227422 – Crooked Creek Tributary near Bristol, GA (DA = 0.28 mi^2)
- USGS 0209173190 – Unnamed Tributary to Sand Run near Lizzie, NC (DA = 0.57 mi^2)
- USGS 02227990 – Satilla River Tributary 2 at Atkinson, GA (DA = 0.0.67 mi^2)
- USGS 02169960 – Lake Marion Tributary near Vance, SC (DA = 2.12 mi^2)
- USGS 01668300 – Farmers Hall Creek near Champlain, VA (DA = 2.18 mi^2)
- USGS 021355013 – Davis Branch near Sumter, SC (DA = 2.50 mi^2)
- USGS 02136361 – Turkey Creak near Maryville, SC (DA = 4.25 mi^2)
- USGS 021720725 – Canton Creek near Moncks Corner, SC (DA = 4.82 mi^2)
- USGS 02148090 – Swift Creek near Camden, SC (DA = 4.90 mi^2)
- USGS 02130800 – Backswamp near Darlington, SC (DA = 6.22 mi^2)
- USGS 01661800 – Bush Mill Stream near Heathsville, VA (DA = 6.77 mi^2)
- USGS 02102908– Flat Creek near Iverness, NC (DA = 7.63 mi^2)

The data from these 12 gage stations were used to develop flood frequency curves for the 1-year, 1.2-year, 1.5-year, 1.8-year, and 2-year recurrence interval discharges. These relations can be used to estimate discharge of those recurrence intervals for ungaged streams in the same hydrologic region and were solved to determine the discharge of each project reach with the drainage area as the input. The Wildlands regional flood frequency analysis 1.2-year predictions are plotted in Figure 9. They are within the confidence interval for the NC Piedmont Regional Curve and consistent with reference reach data collected by Wildlands.

8.4.3 Site-Specific Reference Reach Curve

Five reference reaches were identified for this project to aid in developing bankfull design discharge. Each reference reach was surveyed to develop information for analyzing drainage area-discharge relationships as well as development of design parameters. Stable cross-sectional dimensions and channel slopes were used to compute a bankfull discharge with the Manning's equation for each reference reach. The resulting discharge values were plotted against drainage area to make a project-specific regional curve (Figure 9) and was used to compare with other discharge estimation methods. The discharge values derived from the resulting reference reach curve were comparable to those reported for the Wildlands regional flood frequency analysis (1.2-year event) and the on-site surveyed cross-sections but were generally lower than those of the published NC Rural Piedmont regional curve.

8.4.4 Existing Bankfull Indicators (Manning's Equation)

Riffle cross-sections were surveyed on several of the design reaches at the Site, totaling 6 cross-sections. Bankfull indicators were identified in the field during the survey and were included in the cross-section data collection. Manning's equation was used to calculate a corresponding discharge using the survey data for channel slope. While the existing channels at the site have been heavily manipulated in the past, the cross-section locations were selected such that obvious bankfull features were present and in locations were the cross-section was not heavily influenced by nearby infrastructure (culverts, bridges, etc). For Banner Creek, the surveyed cross-sections suggested that the bankfull discharge was 16% to 25% below the discharge that other methods predicted. Similarly, the on-site cross-sections for UT1 and UT2 were approximately 50% lower than discharges predicted by other methods. These lower estimated bankfull flows calculated via cross-section may have been due to several farm ponds within the immediate watershed providing some runoff mitigation in the watershed. For this reason, these field measured cross-sections were given particular weight compared to other methods as they were thought to better reflect the on-the-ground realities of the watershed. As a result, many of the final design values selected for discharge are lower than those predicted by the other methods.

8.4.5 Design Discharge Analysis Summary

The results of the design discharge analysis provided a range of discharge values. The most obvious convergence in values was between the existing bankfull indicators (Manning's equation) and the site-specific reference reach curve for all reaches of Banner Creek. These values were always within 20% of each other, and consistently the two lowest discharge predictions for the analysis. These two methods were more heavily weighted when determining the final design discharge for this site because they were thought to account for the low site slopes and in the case of the existing bankfull indicators the mitigation of runoff throughout the watershed. The regional flood frequency analysis and NC Rural Piedmont Curve varied between 25% and 50% higher than the existing bankfull indicators (Manning's Equation) and the site-specific reference reach and were considered the top end of probably discharge at the Site.

UT1 and UT2 predictive discharge methods produced a slightly different result. Again, the existing bankfull indicators predicted a much lower discharge than the other methods (approximately 50% lower). However, the site-specific reference reach values were much closer to the NC Rural Piedmont and Regional flood frequency analysis methods, varying by less than 5 cfs between methods for each reach. Due to this convergence of evidence, selected design values for these smaller streams were increased above the discharge predicted by the existing bankfull indicators.

Final design discharges were selected based on analysis of the methods discussed in this section. The final design discharges for the larger reaches (Banner Creek) weighted the site-specific reference reach and the existing bankfull indicators heavily to arrive at values that were well under the discharges predicted by the regional curves and the regional flood analysis. For the smaller reaches (UT1 and UT2), the methods were more evenly weighted and the selected design value is closer to the predicted values of the NC Rural Piedmont curve, the regional flood frequency analysis, and the site specific reference reach. The goal of the design was to achieve a balance between streams that would be highly connected to their riparian wetlands by flooding frequently and not undersizing channels to the point where vegetation and aggradation could choke the channel. Table 14 below gives a summary of the discharge analysis results and a plot illustrating the design discharge data is shown in Figure 9.

Table 14: Summary of Design Discharge Analysis for Banner Creek design reaches

		Banner Creek Reach 1	Banner Creek Reach 2	Banner Creek Reach 3	Banner Creek Reach 4a	Banner Creek Reach 4b	UT1	UT2
DA (acres)		390	422	429	634	722	81	190
DA(sq. mi.)		0.61	0.66	0.67	0.99	1.13	0.13	0.30
NC Rural Piedmont Regional Curve (cfs)		62	66	67	88	97	20	37
Regional Flood Frequency Analysis (cfs)	**1.2-year event**	54	57	58	77	85	17	32
	1.5-year event	77	82	83	110	121	25	46
Site Specific Reference Reach Curve		49	51	51	63	68	21	33
On-Site Surveyed Cross-Sections		41	46	43	58	58	5-8	10-13
Selected Design Discharge		**40-43**	**40-43**	**44**	**60**	**70**	**14**	**25**

8.5 Sediment Transport Analysis

To gain a better understanding of the quantity of sediment supplied to the project streams and how it is transported through the system, Wildlands performed a qualitative assessment of sediment supply and sources in the project watershed. In addition, Wildlands also performed a competence analysis to analyze the ability of the proposed streams to transport certain sizes of sediment and to support material sizing for constructed riffles. The following sections detail the sediment supply and competence analyses.

8.5.1 Sediment Supply

The watershed study consisted of an analysis of past, current, and projected future conditions of the watershed using the National Land Cover Database (NLCD) as well as historic and current aerial photography to characterize past and current land cover and potential sediment sources. For a breakdown of land uses, refer to Section 3.3 above. The watershed was largely cleared prior to the earliest aerial photo (1964) with predominantly agricultural land use. Some forested areas in the northern area of the watershed were present at this time and seemed to have remained undisturbed until the present. Since 1964, the most notable change in land cover has been some low-density residential development in the northern and eastern parts of the watershed.

Relatively low-density residential development and continued heavy agricultural presence are expected to continue to be the most important land uses in the watershed for the foreseeable future. The contributing areas above the beginning of the project are relatively stable and are not expected to become an important source of sediment to the stream system.

Visual inspection of the streams did reveal some excess sediment and sand in the stream with some depositional areas in all reaches, but especially large depositional areas were noted in the lower reaches of Banner Creek (Reach 4a and 4b) and UT1 and UT2. There was evidence of occasional maintenance of these reaches (removal of sediment and debris) to promote continued flow toward the system outlet. The land use around these reaches is agricultural row crops, typically farmed to within feet of the top of bank. The source of sediment in these reaches was thought to be from overland flow out of the agricultural fields as well as from the stream banks throughout the project area, including the upper reaches of Banner Creek (Reaches 1-3) where serious streambank erosion was noted.

The lower reaches of the project (Banner Creek Reaches 4a and 4b) see backwater conditions when the stage of the French Broad River is elevated. Based on Site observation, the French Broad River has a very high sand load and when these channels backwater, deposition often occurs within the existing stream channels. Wildlands can not control the French Broad River watershed, stage, or sediment regime and expects to see backwater conditions and potential aggradation and associated degradation in constructed stream channels following large flow events. These issues were considered during design and selection of specific parameters including proposed channel width to depth ratios, max channel pool depths, and proposed stream slope and profile. Some cycling of aggradation and degradation in these lowers reaches and their floodplains during large storm events is anticipated even after construction.

With the establishment of a stable riparian buffer around the project streams and by stabilizing stream banks during restoration, the sediment load to the project streams is expected to be reduced to a supply-limited condition (i.e. there is capacity to move sediment load greater than the supplied load). Therefore, the design channels are expected to remain stable and pass the sediment delivered from the watershed. The focus of the sediment transport analysis is therefore based on an evaluation of stream competence.

8.5.2 Competence Analysis

In natural streams, shear stress increases corresponding to an increase in discharge until the point at which the channel is flowing full and gains access to the floodplain. Floodplain access disperses the flow and prevents further increases in shear stress within the channel. This relationship of shear stress, channel dimension, and discharge influences erosion potential within the channel and the channel's ability to transport certain sizes of sediment. The latter is a measure of stream competency, which is quantified by shear stress as calculated by the Shields (1936) and Andrews (1984) equation described by Rosgen (2001). The results of the competence analysis are shown in Table 15.

Table 15: Results of Competence Analysis

	Banner Creek Reach 1	Banner Creek Reach 2	Banner Creek Reach 3	Banner Creek Reach 4a	Banner Creek Reach 4b	UT1	UT2
Abkf (sq ft)	14.0	14.0	14.0	30.3	32.7	8.4	12.8
Wbkf (ft)	13.5	13.5	13.5	19.8	20.8	9.0	12.0
Dbkf (ft)	1.0	1.0	1.0	1.5	1.6	1.0	1.1
Schan (ft/ft)	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Bankfull Velocity (fps)	2.8	2.8	2.8	2	2	1.7	1.7
Bankfull Shear Stress, t (lb/sq ft)	0.12	0.12	0.12	0.18	0.19	0.11	0.13
Movable particle size (mm)	9 - 33	9 - 33	9 - 33	13 - 44	14 - 45	8 - 30	9 - 33

Wildlands performed a competence analysis using the proposed stream dimensions and existing bed material determined from riffle 100 counts and subpavement samples. The goal of the analysis is to evaluate the potential stability of the channels post construction and determine if bed material will need to be supplemented with coarser material to prevent instability. Based on the analysis above, competence for Banner Creek Reach 1 and 2 indicate that there is likely enough shear stress to move the majority of existing bed material. The D50 of Banner Creek Reach 1 and 2 was a medium gravel (D50 of 11mm and 10mm respectively) and the Shields Curve indicated the movable particle size would be approximately 9mm for both reaches indicating that marginal aggradation could occur. The Rosgen curve predicted a far larger mobile particle size of 33mm. Based on this analysis and observations,

Wildlands will plan to reuse as much bed material as possible and supplement some of the bed material with coarser particles at high sloped transition zones and areas with erosion potential. Additionally, grade control structures including rock sill, log sills, and j-hooks will be used to prevent downcutting and provide habitat.

A majority of the bed material for Banner Creek Reach 3, 4a, 4b, UT1, and UT2 is sand with typical bed material particle sizes less than 2mm. The results of the analysis indicate that there is enough shear stress to move the sampled bed material. The range of particle sizes that will become mobile during a bankfull event is within size range of gravel. While this competence analysis could indicate potential for degradation, Wildlands believes these results are more influenced by the inundation of sand particles from adjacent agriculture within the bed and not related to erosional forces from high shear stresses. Based on these results, Wildland plans to supplement existing bed material with coarser material in riffles to increase the D50. However, Wildlands wants sand particles to remain mobile to ensure adequate geomorphic processes occur to maintain channel dimensions within the bottomland. Grade control structures will be installed along the bottomland reaches, particularly at transitional or high sloped sections of the reach.

8.6 Wetland Design

8.6.1 Wetland Design Overview

The project includes a large wetland re-establishment component, and smallerer components of wetland rehabilitation and creation. Areas proposed for wetland re-establishment and creation contain relic or currently hydric soils which were likely forested floodplain wetlands prior to agricultural conversion. These areas are currently and historically drained by the numerous drainage ditches and channelized streams that dissect the site. Areas of wetland creation are proposed as creation based on the grading depths required as part of the stream restoration design. Wetland rehabilitation zones are currently jurisdictional wetlands that are not fully functioning due to hydrologic and vegetative alterations. Analysis of existing groundwater hydrology data and Wetbud (version 01.07.00.56) simulations of existing and proposed conditions were used to support wetland re-establishment design.

8.6.2 Hydric Soils within Wetland Restoration Areas

Wildlands contracted with a Licensed Soil Scientist (LSS) to perform an investigation of the presence and extent of hydric soils on the Site. Further discussion of the hydric soils investigation and its results are included in Section 3.5.2 of this report. Overall, soils mapping for Henderson County via the NRCS Web Soils Survey shows on Site soils as Toxaway, Rosman, and Codorus. The LSS observed higher clay content than the above soil series and noted that Site soils are more like the Hemphill and Chatuge soil series depending on Site locations and current hydrology. Copies of the preliminary and detailed LSS reports along with borings location maps and typical soil profiles are included in Appendix 7.

8.6.3 Reference Wetland

Wildlands performed a property search using ArcGIS Online and remotely searched for potential reference wetland sites that share similar hydric soils, landscape position and hydrology as those in need of restoration on the mitigation site. Two reference wetland sites were selected for the project.

The Henry Fork reference wetland area is in a similar landscape position within the floodplain of a larger stream system. While the reference wetland is in the Piedmont Physiographic province, it is within a Bottomland Hardwood Forest with primary hydrology provided by adjacent tributaries, similar to the targeted project community. Soils mapped within the reference wetland are in the Hatboro series, which is listed as a geographically associated soil series to the Site mapped soil series (Toxaway and Rosman). Furthermore, Table 1 (wetland saturation threshold values) within the Wilmington District Stream and Wetland Compensatory Mitigation Update dated October 24, 2016, lists the wetland

saturation range for Hatboro soil series as 12% to 16%, which is consistent with saturation periods listed for the mapped soils series within the project area.

The Sierra Nevada reference wetland is 5.5 aerial miles from Banner Farm Mitigation site. The area is a mature bottomland hardwood forest that is located within the floodplain of the French Broad River. The surrounding forest is dominated by mature hardwoods and the herbaceous stratum is dominated by obligate sedges. The hydrology of this system is intermittently, temporarily, or seasonally flooded. Based on available aerial photography from 1994-2019 the immediate area has not been altered in that time span. A groundwater monitoring gage was installed on the reference site to document the reference wetland hydrology. Reference gage data including mapping and hydrology plots are included for both proposed reference wetlands in Appendix 7. In the future, this information will be used to provide a comparison for the re-established and rehabilitated wetland hydrology throughout the monitoring period.

8.6.4 Hydrologic Modeling

To further support that proposed Site changes will restore adequate wetland hydrology, average monthly wetland water budget models representing two separate proposed wetland re-establishment areas were developed using Wetbud software version 1.07.00.56. Model runs were performed for the wetland re-establishment areas adjacent to UT1 and UT2 for existing and proposed site conditions. Initial model set up included retrieving historical precipitation and temperature data for model input parameters. Global Surface Summary of the Day (GSOD) Asheville Regional Airport station was used for precipitation and temperature data.

Precipitation and weather data were obtained for historical periods between 1973 and 2019. The Asheville Regional Airport NC WETS station (NC300) was used to define growing season and evaluate dry, normal, and wet years. The dry, average, and wet year calculation tool which follows the procedure outlined by McLeod, 2013 within the Wetbud software was used to rank precipitation data from 1973 to 2019, evaluating annual precipitation and growing season precipitation for a 46-year period of record. Based on the analyzed data, 2007, 2012, and 2003 were determined as dry, average, and wet precipitation years, respectively.

Two existing conditions water budget models were developed based on current site conditions. Water inputs included precipitation and runoff. Precipitation values were measurements from stations listed above, runoff into the wetland was calculated using the SCS/NRCS curve number method. Existing model outputs included potential evapotranspiration (PET), groundwater out, and surface outflow. PET was estimated using the Thornthwaite method, surface outflow was calculated as free water above ground surface flowing out of the wetland and draining to the French Broad River, and groundwater out was used for model calibration based on the observed period of record. The calibration period was set up for January to November of 2019. Modeled wetland water levels within the proposed wetland re-establishment areas were compared to average wetland water budgets measured on Site using installed groundwater gages. A copy of the model calibration plots is included in Appendix 7.

Trends in the observed data are well-represented by the calibration simulations. Although hydrograph peaks between plots of observed and simulated data do not match exactly and the model results under-predict water levels during some periods, relative changes in water table hydrology because of precipitation events correspond well between observed data and model results and under predictions indicate that proposed conditions model results will be hydrologically conservative.

The proposed condition models were developed based on the calibrated existing condition models to predict whether average wetland water levels would be within 12-inches of the soil surface during wet, dry, and average years calculated above. Proposed plans for the site include realigning the streams to

increase sinuosity and raising the stream bed inverts. In addition, the extensive ditch network that currently drains the site will be filled or replaced with appropriately sized stream channels within the wetland zone. Grading is proposed to remove overburden and restore the natural valley topography of the site. Grading proposed within the wetland re-establishment and rehabilitation zones is dictated by minimum stream and valley slopes, restoration of natural topography altered by agriculture, and generation of fill material to fill the existing ditch networks. Benches and floodplains were cut around streams, but overall grading was minimized as much as possible in proposed wetland areas.

Based on the results of the hydric soils investigation outlined in Section 8.5.2 and 8.6.2, hydric soils are within 12 inches of the soil surface for areas proposed for wetland re-establishment on Site. To ensure positive drainage, adequate stream slope, and eliminate previous manipulation within the wetland including berms, side cast piles from ditches, and field crowning, areas of grading are required deeper than 12-inches. With the current stream and wetland design, approximately 3.976 acres of area will be graded more than 12 inches in the wetland re-establishment zone and 0.489 acres of area will be graded more than 12 inches in the wetland rehabilitation zone. A proposed wetland grading plan including valley cross-sections is included with design plans in Appendix 8. The proposed wetland areas will be disked and planted with native wetland plants.

Settings for the proposed condition models were altered to reflect the proposed design changes of the site. The most notable changes to the proposed conditions model were the incorporation of overbank flow from UT1 and UT2 as results of restoring and reconnecting these streams with relic floodplains. Wetbud builds a discharge unit hydrograph for the watershed which is the source of overbank flow. When overbank flow is calculated, daily precipitation data are used to estimate stream discharge for specific precipitation depths. Groundwater out was held constant between existing and proposed model runs to be conservative. While Wildlands believes a reduction in groundwater leaving the site will occur based on the removal of the ditch network, estimating the quantity of this reduction given the limited amount of data would be difficult.

The proposed condition models were run for wet, dry, and average years and results were compared to existing condition model results with focus on the growing season and a minimum saturation threshold of 12-inches below soil surface. Table 16a and 16b compare the number of months where average wetland water levels were within 12 inches of the ground surface. The model results support that proposed Site changes will increase overall hydrology within the proposed wetland areas and bring average wetland water levels within 12-inches of the soil surface for consecutive months, even during low or average precipitation years.

Table 16a Water Budget Components for Wetland Re-establishment along UT1

Modeled year	Hydrology Classification	Number and Corresponding Months with Average Wetland Water Levels Within 12-inches of the Ground Surface	
		Existing Conditions Model	Proposed Conditions Model
2007	Dry Year	2 Months – Jan, Feb	4 months -Jan, Feb, March, April
2003	Wet Year	2 Months – Jan, Feb	12 months – Jan, Feb, Mar, April, May, June, July, August, Sept, Oct, Nov, Dec
2012	Normal Year	2 Months – Jan, Feb	5 months – Jan, Feb, Mar, April, May
2019	Calibration Period	4 months – Jan, Feb, March, April	6 months – Jan, Feb, Mar, April, May, June

Table 16b Water Budget Components for Wetland Re-establishment along UT2

Modeled year	Hydrology Classification	Number and Corresponding Months with Average Wetland Water Levels Within 12-inches of the Ground Surface	
		Existing Conditions Model	Proposed Conditions Model
2007	Dry Year	1 Months – Jan	4 months -Jan, Feb, March, April
2003	Wet Year	1 Months – Jan	11 months – Jan, Feb, Mar, April, May, June, July, August, Sept, Oct, Nov
2012	Normal Year	1 Months – Jan	2 months – Jan, Feb
2019	Calibration Period	4 months – Jan, Feb, March, April	6 months – Jan, Feb, Mar, April, May, June

8.7 Project Implementation

8.7.1 Stream Restoration, Enhancement, and Preservation

The proposed Site includes a combination of stream restoration, wetland restoration, and wetland creation activities as described below. Project reaches proposed for restoration are currently heavily impacted by riparian management, bank erosion, and incision. Proposed wetland restoration and creation areas are currently heavily impacted by agricultural ditching, historic hydrologic manipulation, and riparian management. Activities have been selected to provide the highest degree of ecological uplift to the system. Figure 10 provides an overview of the proposed mitigation activities on the Site.

All streams are proposed for restoration. Restoration reaches will be constructed as Priority 1 where grades allow. Priority 2 sections of channel will be constructed where needed to transition grade from off-site tie-in to proposed elevations, avoid hydrologic trespass, and maintain minimum channel slopes. Restoration reaches have been designed to create stable, functional stream channels based on reference reach parameters, design discharge analysis, and sediment transport 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 riffles, boulders sills, log sills, log j-hooks, rock j-hooks, log vanes, brush toe, and cover logs. The structures will reinforce channel stability and serve as habitat features. Constructed riffles will be built from excavated on-site rock when possible. Quarry stone may be used if an on-site 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, diversity of habitat, and will create varied flow vectors. Log and rock j-hooks will deflect flow vectors away from banks while adding to habitat diversity. Log and boulder sills will be used to allow for small 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. Similarly, cover logs will also be used in some meander bends to provide pool habitat variability and stream bank stability. Sod harvested on-site and/or coir fiber matting will be used to provide bank protection.

All the project reaches will be placed in a conservation easement to protect the project in perpetuity. The streambanks and floodplains will be planted with native tree and shrub species as described below in Section 8.8.

Banner Creek

The primary stressors to Banner Creek Reach 1 and 2 are riparian buffer management and historic channelization. A lack of riparian vegetation has resulted in the stream downcutting and becoming disconnected with the current floodplain. This lack of floodplain connection has increased shear stresses and caused bank erosion, reducing bedform through fine sediment inundation. Priority 1 restoration is proposed for Banner Creek Reaches 1 and 2, outside transition zones. Banner Creek Reach 1 is designed as a low sinuosity C-type channel to take advantages of existing mature trees while restoring function to the system. Banner Creek 2 is designed as a Rosgen C-type channel that will be meandered through a current jurisdictional wetland proposed for rehabilitation.

Banner Creek Reach 3 and 4 have been heavily impacted by historic agricultural practices including channelization and straightening. Historic land deeds map a property line along Banner Creek Reach 4 and specifically call out stream meandering, which no longer exists in the streams current state. A lack of riparian vegetation and agricultural runoff has resulted in large quantities of fine sediment being introduced into the system, which also receives large volumes of sand load from the French Broad River as noted in Section 8.5.1. Priority 1 restoration is proposed for Banner Creek Reach 3 and Reach 4a outside of transition zones. Adjacent floodplains will be cut down to remove historic agricultural sediment and re-establish a stream and wetland complex in the floodplain of the French Broad River. Banner Creek Reach 4b is proposed for more of a Priority 2 restoration approach as the stream channel flows out of the proposed wetland restoration zones and ties down to the bed elevation of the French Broad River. Wildlands expects to see some backwater conditions and potential aggradation and degradation cycling in lower stream reaches following large flow events. These issues were considered during design and selection of specific parameters of the proposed stream channels.

A vegetated buffer will be established along the entirety of Banner Creek with native species with a target community type of bottomland hardwood forest and alluvial forest. The plantings will improve the riparian habitat, help the restored streams stay stable, shade the streams, and provide a source for LWD and organic material to the stream. In-stream structures will be added for grade control, bank protection, and habitat creation.

UT1 & UT2

UT1 and UT2 are proposed for stream restoration and will be constructed as Priority 1 restoration. The stream bed will be raised so that the bankfull elevation will coincide with the existing floodplain, the cross section will be constructed to convey the design discharge, and pattern will be reconstructed so that the channel meanders throughout flat areas on the historic floodplain where they likely existed prior to alteration. Stream valleys along UT1 and UT2 are typically very flat, with average valley slopes below 0.2%. Generally, this allows for a relatively high sinuosity in the design pattern to reflect the relationship between sinuosity and slope observed in reference reaches.

UT1 is designed as a Rosgen E-type channel with a lower width to depth ratio, higher sinuosity, and irregular meander pattern similar to reference E-type streams. This approach was chosen based on the landscape position of UT1, the channel slope, the adjacency to a large wetland area, and the quantity of fine sediment previously observed within the channel after flooding events in the French Broad River. The lower width to depth ratio was selected to help move fine sediment through the proposed channel and avoid clogging or choking issues observed in similar conditions.

UT2 is designed as a Rosgen C-type channel with a restored profile which will consist of alternating riffle-pool bed morphology. Pools will be constructed of varying depth for habitat diversity. The cross-sectional dimensions of the design channels will be constructed to frequently inundate adjacent floodplains and wetlands. The reconstructed channel banks will be built with stable side slopes, matted, and planted with native vegetation for long-term stability. Most of the proposed stream length traverses areas with relic hydric soils. Constructing channels in appropriate locations and raising streambeds in these areas will re-establish wetlands and improve the hydrology of existing wetlands.

8.7.2 Wetland Mitigation Activities

This project will include floodplain forested wetland re-establishment, rehabilitation, and creation. Evidence suggests much of the Site was historically wetland prior to relocation and channelization of project streams and subsequent lowering of the water table for agricultural purposes. Wetland re-establishment in relic hydric soils is proposed for most of the project area and nearly all of the proposed stream length will flow through wetland re-establishment zones.

Excavation within proposed wetland areas is dictated by stream profiles and sediment transport. Wetland creation is proposed where stream grading dictates a priority 2 approach with grading depths consistently greater than 12-inches. Relic material deposited over decades onto agricultural fields from flood events from the adjacent French Broad River along with consistent ditching and dredging of project streams has created unnatural levees, berms, and highpoints throughout the proposed wetland area. Historic material has begun to develop hydric soil indicators at many locations throughout the Site. Wildlands proposes to regrade the existing agricultural fields and restore a wide, consistent, and low sloped wetland valley to the project streams while simultaneously filling and plugging the extensive ditch network. Banner Creek Reaches 3 and 4, UT1, and UT2 will be constructed through areas proposed for wetland re-establishment and/or creation such that the streambed elevation will restore the natural water table elevation and natural overbank flooding regime. Ditches located in the fields will be filled to improve hydrology in the surrounding wetlands. Riparian wetlands within the project area will also be planted with native wetland species. Wetland areas will be disked to increase surface roughness and better capture rainfall which will improve groundwater recharge. Furrows will not exceed 6” in depth.

8.8 Vegetation and Planting Plan

The long-term objective of the planting plan is to establish a native riparian buffer composed of species appropriate for the site. The restored buffer will improve riparian habitat and connectivity to other habitat types, maintain stability of restored streams, provide shade, trap sediment, and provide large woody debris and organic matter to streams. The site will be planted to the extents of the conservation easement, except where stands of mature trees exist, following construction. Species designated for planting were selected based on compatibility of silvics with expected site conditions within a given planting zone, observation of reference communities, and best professional judgement. The reference communities are bottomland hardwood forest and Montane Alluvial Forest Large River Subtype. Species lists for each planting zone are listed on Sheet 4.1 of the preliminary design plans.

The wetland and buffer planting zones will be planted with bare root seedlings to the extent of the conservation easement or extent of disturbance where currently forested. The stream channel banks will be planted with live stakes and juncus plugs. Multiple species of herbaceous plugs will also be planted on restoration reaches. Permanent seed will be spread on streambanks, floodplain areas, and all disturbed areas within the conservation easement. Rivercane will be planted on stream banks at the confluence of UT1 and Banner Creek and plantings will continue down Reach 4B to the French Broad River. Plantings must be conducted between November 15 and March 15 per 2016 NCIRT Mitigation Updated Guidance.

Mechanical site preparation will be implemented where necessary to create soil physical properties favorable for tree growth. In the agricultural field, the planted area will be ripped in a grid-like pattern with a maximum rip shank spacing of six feet. Ripping will be performed during the driest conditions feasible to maximize shatter of the plow pan. Construction practices are intended to minimize effects to soil properties, but some impacts are unavoidable. Ripping may be implemented to reduce soil compaction resulting from haul roads, stockpile areas, etc. Where grading is required, topsoil will be stockpiled and reapplied. Soil amendments may be incorporated to augment survival and growth of planted vegetation as determined necessary by soil testing.

Preconstruction invasive treatments have been completed on site. Invasive vegetation within the project area will be treated and/or mechanically removed during construction, but additional treatment is expected. Invasive species presence will be monitored and treated as necessary throughout the monitoring period as described in Appendix 9.

8.9 Project Risk and Uncertainties

Wildlands acknowledges that changes proposed at the Site may result in an increase in the baseline water table elevation adjacent to the proposed wetland restoration. The increase in water table elevation could be considered negative for agricultural production in the adjacent fields. This subject has been discussed with all the current property owners and Wildlands holds a signed agreement which represents acknowledgment by all participating property owners. The current property owners believe that due to the site's poor drainage and the flooding of the French Broad River that the best use of the land may be hunting instead of agriculture. Crop yields have historically been low in comparison to other nearby land. Once construction of the project is completed, the property owners plan to use the project parcels and restored area solely for hunting instead of farming. Based on conversations with the property owner, an increase in water table elevation is considered positive for their desired hunting conditions.

As noted in previous sections of the report, French Broad River flooding could result in backwater and aggradation and degradation cycling of fine sediments within the proposed stream channels and on adjacent floodplains. Wildlands considered this risk during design and discusses adaptive management options in Appendix 10 and how this may affect long term monitoring in Section 9.0 below.

8.10 Proposed Breaks and Crossings

One internal easement crossing and three external easement breaks are proposed at the Site to maintain landowner access, use of adjoining property, and allow for overhead utility crossings. Crossings are summarized and numbered below in Table 17. Where possible, overhead utility line crossings and proposed culvert crossings were paired to reduce the number of required breaks along the project. The entire easement area can be accessed for construction, monitoring, and long-term stewardship from Banner Farm Rd.

Table 17: Easement Breaks and Crossings

No.	Width (ft)	Location	Internal or External	Crossing Type
1	80	Banner Creek Reach 1	External	Existing landowner driveway. Existing 72" CMP culvert to remain in place.
2	30	Banner Creek Reach 1	Internal	Existing utility easement[1]
3	317	Banner Creek Reach 3	External	Banner Farm Road and existing utility easement[1]. Existing 60" CMP culvert under Banner Farm Road to remain in place.

No.	Width (ft)	Location	Internal or External	Crossing Type
4	128	UT1	External	Existing utility easement[1] and existing culvert crossing to be replaced with new culvert during construction.

[1]Existing utility easements owned by Duke Energy and Southern Belle.

9.0 Performance Standards

The stream and wetland performance standards for the project will follow approved performance criteria presented in the DMS Mitigation Plan Template, the Annual Monitoring Template (June 2017), and the Stream Mitigation Guidelines issued October 2016 by the USACE and NCIRT. Annual monitoring and routine site visits will be conducted to assess the condition of the finished project. Specific performance standard components are proposed for stream morphology, hydrology, vegetation, and wetland hydrology. Performance standards will be evaluated throughout the seven-year post-construction monitoring period.

9.1 Streams

9.1.1 Dimension

Riffle cross-sections on the restoration reaches should be stable and should show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Per DMS guidance, bank height ratios shall not exceed 1.2 and entrenchment ratios shall be at least 2.2 for restored C and E channels to be considered stable. All riffle cross-sections should fall within the parameters defined for channels of the designed stream type. If changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg or eroding channel banks. Short term aggradation and subsequent degradation from backwater flooding of the French Broad River will not be considered an indicator of instability or threat to channel function. In channels where some aggradation is expected, cross-sections should show maintenance of single channel characteristics and an ordinary high water mark. No maintenance of channel dimension, including the removal of sediment, will be performed after monitoring year two without coordination and/or discussion with the NCIRT. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability.

9.1.2 Pattern and Profile

Visual assessments and photo documentation should indicate that streams are remaining stable and do not indicate a trend toward vertical or lateral instability.

9.1.3 Substrate

Channel substrate materials will be sampled with the pebble count method along restoration reaches. These reaches should show maintenance of coarser materials in the riffle features and smaller particles in the pool features. A reach-wide pebble count will be performed in each restoration reach for classification purposes during monitoring years 1, 2, 3, 5 and 7. A pebble count will be performed at each surveyed riffle cross-section, only during the as-built survey to characterize the pavement. If French Broad River flooding and backwater occur, the downstream reaches could see an increase in fine sediments within the channel substate. Flood and backwater events will be noted within subsequent monitoring reports to connect changes in channel substrate with identified flood events.

9.1.4 Photo Documentation

Photographs should illustrate the Site's vegetation and morphological stability on an annual basis. Cross-section photos should demonstrate no excessive erosion or degradation of the banks. Longitudinal photos should indicate the absence of persistent of mid-channel bars or vertical incision. Grade control structures should remain stable. Deposition of sediment on the bank side of vane arms is preferable. Maintenance of scour pools on the channel side of vane arms is expected.

9.1.5 Hydrology

The occurrence of bankfull events will be documented throughout the monitoring period. Four bankfull flow events must be documented on enhancement I and restoration streams during the seven-year monitoring period. The four bankfull events must occur in separate years. Stream monitoring will continue until performance standards in the form of four bankfull events in separate years have been documented.

9.2 Vegetation

Vegetative performance for riparian buffers associated with the stream restoration component of the project (buffer widths 0 – 50ft) will be in accordance with the Stream Mitigation Guidelines issued October 2016 by the USACE and NCIRT. The success criteria is an interim survival rate of 320 planted stems per acre at the end of monitoring year three (MY3), 260 stems per acre at the end of monitoring year 5 (MY5) and a final vegetation survival rate of 210 stems per acre at the end of monitoring year 7 (MY7). Planted vegetation must average 6 feet in height in each plot at the end of year 5 (MY5) and 8 feet in height in each plot at the end of year 7 (MY7) of monitoring. Given the inundation periods anticipated for areas proposed for wetland restoration, woody vegetation growth may be hindered, resulting in stunted heights in early monitoring years. Wildlands will evaluate vigor and height of vegetation plots in wetland restoration areas on a case-by-case basis and will discuss any potential issues within annual monitoring reports." Vegetation monitoring will be conducted between July 1st and the end of the of the growing season. The extent of invasive species coverage will be monitored and controlled as necessary throughout the required monitoring period (MY7).

A combination of permanent and random vegetation plots will be used to demonstrate vegetation coverage. Both fixed and mobile plots will be chosen randomly and will include a mix of the planted vegetation communities. All woody stems, including exotic invasive species, are to be counted within each plot.

A total of 24 permanent vegetation plots will be established after construction during the as-built baseline (MY0). Permanent plots will be visually marked in the field and planted woody stems within these plots will be marked annually as needed and given a coordinate, based off a known origin, so that they can be found in subsequent monitoring years. All plots will be established as either a standard 10 meter by 10 meter plot or a 5 meter by 20 meter plot. Individual plot data will include height, density, vigor, damage (if any), planted species versus volunteer species, and survival. Mortality will be determined from the difference between the previous year's living planted stems and the current year's living planted stems.

Mobile vegetation plots will not make up more than 50% of the total required plots. In addition, 12 mobile vegetation plots will be established in different locations throughout the planted conservation easement. Locations (GPS coordinates and orientation) of the random plots will be identified and included in the corresponding monitoring year's report. Plots will be physically marked in the field so that they may be evaluated during the monitoring year. Random plot data collected will include species and height using a circular or square/rectangular 100 square meter plot.

9.3 Visual Assessments

Visual assessments should support the specific performance standards for each metric as described above.

9.4 Wetlands

Groundwater monitoring will be conducted for seven years after construction to evaluate the hydrologic state of the restored wetland areas. A total of 17 groundwater monitoring gages will be established at the Site. A majority of the wetland area contains Codorus, Toxaway, and Rosman soils, which have a hydrology performance standard ranging between 7% and 16% of the growing season according to the Wilmington District Stream and Wetland Compensatory Mitigation Update issued in October 2016 by the USACE and NCIRT. Based on the NCIRT mitigation guidance, existing Site hydrology data, and wetland hydrologic modeling; the Site's proposed performance standard for wetland hydrology shall be free groundwater surface within 12 inches of the ground surface for a minimum of 12% (26 consecutive days) of the growing season for Henderson County under normal precipitation conditions.

Growing season dates for the project area are defined as April 2st to November 1st (213 days) by the Asheville Airport, North Carolina WETS table for 50% probability of soil temperatures greater than 28 degrees Fahrenheit. However, to determine a more Site-specific growing season, soil temperature probes will be installed on-site and soil temperature data will be collected for each individual monitoring year. Per USACE guidance, soil temperature probes will be located at a depth of 12 inches. The growing season will be defined as that portion of the year where soil temperature remains above 40 degrees Fahrenheit and should be corroborated with vegetative indicators, including bud burst and leaf drop. The growing season may not begin before March 1 of each year when calculating hydroperiods. If a wetland zone does not meet the performance standard for a given monitoring year, rainfall patterns will be analyzed, and the hydrograph will be compared to that of the reference wetlands to assess whether atypical weather conditions occurred during the monitoring period.

Soil profile descriptions will be recorded at each boring where a gage is installed before and after construction. The profile descriptions will present a record of the soil horizons, color, texture, and redoximorphic features.

Groundwater data will be downloaded from installed gages on a quarterly basis and reported annually in required monitoring reports. Ground elevation at gage locations will be measured at the initial installation and verified at each subsequent download. If elevations at the installed groundwater gage locations deviates substantially from initial installation elevations, this information will be updated accordingly within the annual monitoring report.

10.0 Monitoring Plan

The Site monitoring plan has been developed to ensure that the required performance standards are met, and project goals and objectives are achieved. Annual monitoring data will be reported using the DMS Annual Monitoring Reporting Template (April 2015). The monitoring report shall provide project data chronology that will facilitate an understanding of project status and trends, ease population of DMS databases for analysis and research purposes and assist in close-out decision making.

Using the DMS As-Built Baseline Monitoring Report Template (June 2017), a baseline monitoring document and as-built record drawings of the project will be developed upon completion of the planting and monitoring installation on the restored Site. Monitoring reports will be prepared in the fall of each monitoring year and submitted to DMS by November 30. These reports will be based on the DMS Annual Monitoring Template (June 2017) and Closeout Report Template (June 2017). Full monitoring reports will be submitted to DMS in monitoring years 1, 2, 3, 5, and 7. Abbreviated monitoring reports

will be submitted in monitoring years 4 and 6. Closeout monitoring period will be seven years beyond completion of construction or until performance standards have been met. Table 18, below, describes how the monitoring plan is set up in order to verify project goals and objectives have been achieved.

Table 18: Monitoring Plan

Goal	Objective	Performance Standard	Monitoring Metric
Stabilize eroding stream banks.	Reconstruct stream channels slated for Restoration with stable dimensions. Add bank revetments and in-stream structures to reaches to protect restored/enhanced streams.	Cross-sections should be stable and show little change in bankfull area, and width-to-depth ratio.	Cross-section monitoring and visual inspections.
Improve the stability of stream channels.	Construct stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions.	Entrenchment ratio stays over 2.2 and bank height ratio below 1.2 with visual assessments showing progression towards stability.	Cross-section monitoring and visual inspections.
Improve instream habitat.	Install habitat features such as constructed riffles, cover logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	There is no required performance standard for this metric.	N/A
Reconnect channels with floodplains and riparian wetlands.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain.	Four bankfull events in separate years within monitoring period.	Crest gages with transducers recording flow elevations.
Restore wetland hydrology, soils, and plant communities.	Restore and enhance riparian wetlands by raising stream beds, plugging existing ditches, removing berm material over relic hydric soils, and planting native wetland species.	Free groundwater surface within 12 inches of the ground surface for 12% of the growing season.	Groundwater gages will be placed in wetland re-establishment and rehabilitation areas and monitored annually.
Restore and enhance native floodplain vegetation.	Plant native tree species in riparian zone where currently insufficient.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. Average height of 6 feet in each plot at MY5 and 8 feet in each plot at MY7 for planted stems.	One hundred square meter vegetation plots will be placed on 2% of the planted area of the project and monitored annually.
Permanently protect the project Site from harmful uses.	Establish conservation easements on the Site.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.

10.1 Monitoring Components

Project monitoring components are listed in more detail in Table 19. Approximate locations of the proposed vegetation plots, cross-sections, and groundwater gage monitoring components are illustrated in Figure 11.

Table 19: Monitoring Components

Parameter	Monitoring Feature	Quantity/Length by Reach							Frequency	Notes
		Banner Reach 1	Banner Reach 2	Banner Reach 3	Banner Reach 4a	Banner Reach 4b	UT1	UT2		
Dimension	Riffle Cross-sections	2	2	1	1	1	1	3	Year 1, 2, 3, 5, and 7	1
	Pool Cross-sections	2	1	1	1	0	1	3		
Pattern	Pattern	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	
Substrate	Reach wide (RW) Pebble Count	1	1	1	1	1	1	1	Year 1, 2, 3, 5, and 7	3
Hydrology	Crest Gage (CG)	1 CG					1 CG	1 CG	Semi-Annual	4
Vegetation	CVS Level 2/Mobile Plots	36 Total (24 Permanent, 12 Mobile)							Year 1, 2, 3, 5, and 7	5
Wetland	Groundwater Gages	18							Quarterly	
Visual Assessment		Y	Y	Y	Y	Y	Y	Y	Semi-Annual	
Exotic and nuisance vegetation									Semi-Annual	6
Project Boundary									Semi-Annual	7
Reference Photos	Photographs	22							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. 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. Riffle 100-count substrate sampling will be collected during the baseline monitoring only. Substrate assessments in subsequent monitoring years will consist of reachwide substrate monitoring.
4. Crest gages will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. The transducer will be inspected and downloaded semi-annually.
5. Both mobile and permanent vegetation plots will be utilized to evaluate the vegetation performance for the open areas planted. 2% of the open and wetland planted acreage will be monitored with permanent plots and mobile plots. Permanent vegetation monitoring plot assessments will follow CVS Level 2 protocols. Mobile vegetation monitoring plot assessments will 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.
6. Locations of exotic nuisance vegetation, vegetation damage, boundary encroachments etc. will be mapped.

11.0 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 annual inspection of the Site to ensure that restrictions required in the conservation easement are upheld. 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 Site Protection Instrument can be found in Appendix 1. Activities included in the long-term management plan are included in Table 20.

Table 20: 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 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 fencing that meets the objectives of the mitigation project.
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 annual inspections 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.

12.0 Adaptive Management Plan

Upon completion of Site construction, Wildlands will implement the post-construction monitoring defined in Sections 9 and 10. Project maintenance will be performed during the monitoring years to address minor issues as necessary (Appendix 10). If, during the course of annual monitoring it is determined the Site's ability to achieve Site performance standards are jeopardized, Wildlands will notify the DMS of the need to develop a Plan of Corrective Action. Once the Plan of Corrective Action is prepared and finalized Wildlands will:

- Notify the USACE as required by the Nationwide 27 permit general conditions;
- Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE;
- Obtain other permits as necessary;
- Implement the Corrective Action Plan; and
- Provide the USACE a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

13.0 Determination of Credits

The final stream credits associated with the Site are listed in Table 21. Stream restoration is at a ratio of 1:1. Wetland re-establishment and rehabilitation are at a ratio of 1:1 and 2:1, respectively. Wetland creation is at a ratio of 3:1. The credit release schedule is located in Appendix 11.

Table 21: Asset Table

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)
Banner Creek Reach 1	705	797	Cool	R	PI/II	1.00000
Banner Creek Reach 2	945	866	Cool	R	PI/II	1.00000
Banner Creek Reach 3	357	467	Cool	R	PI/II	1.00000
Banner Creek Reach 4a	607	794	Cool	R	PI/II	1.00000
Banner Creek Reach 4b	802	420	Cool	R	PII	1.00000
UT1	620	1,071	Cool	R	PI/II	1.00000
UT2	2,042	1,879	Cool	R	PI/II	1.00000
Wetland Re-Establishment	0.000	31.820	RR	RE		1.00000
Wetland Rehabilitation	2.760	2.760	RR	RH		2.00000
Wetland Creation	0.000	1.140	RR	C		3.00000

Restoration Level	Stream			Riparian Wetland		Non-Rip Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riv		
Restoration		**6294.000**					
Re-establishment				**31.820**			
Rehabilitation				**1.380**			
Enhancement							
Enhancement I							
Enhancement II							
Creation				**0.380**			
Preservation							
Totals		**6294.000**		**33.580**			

14.0 References

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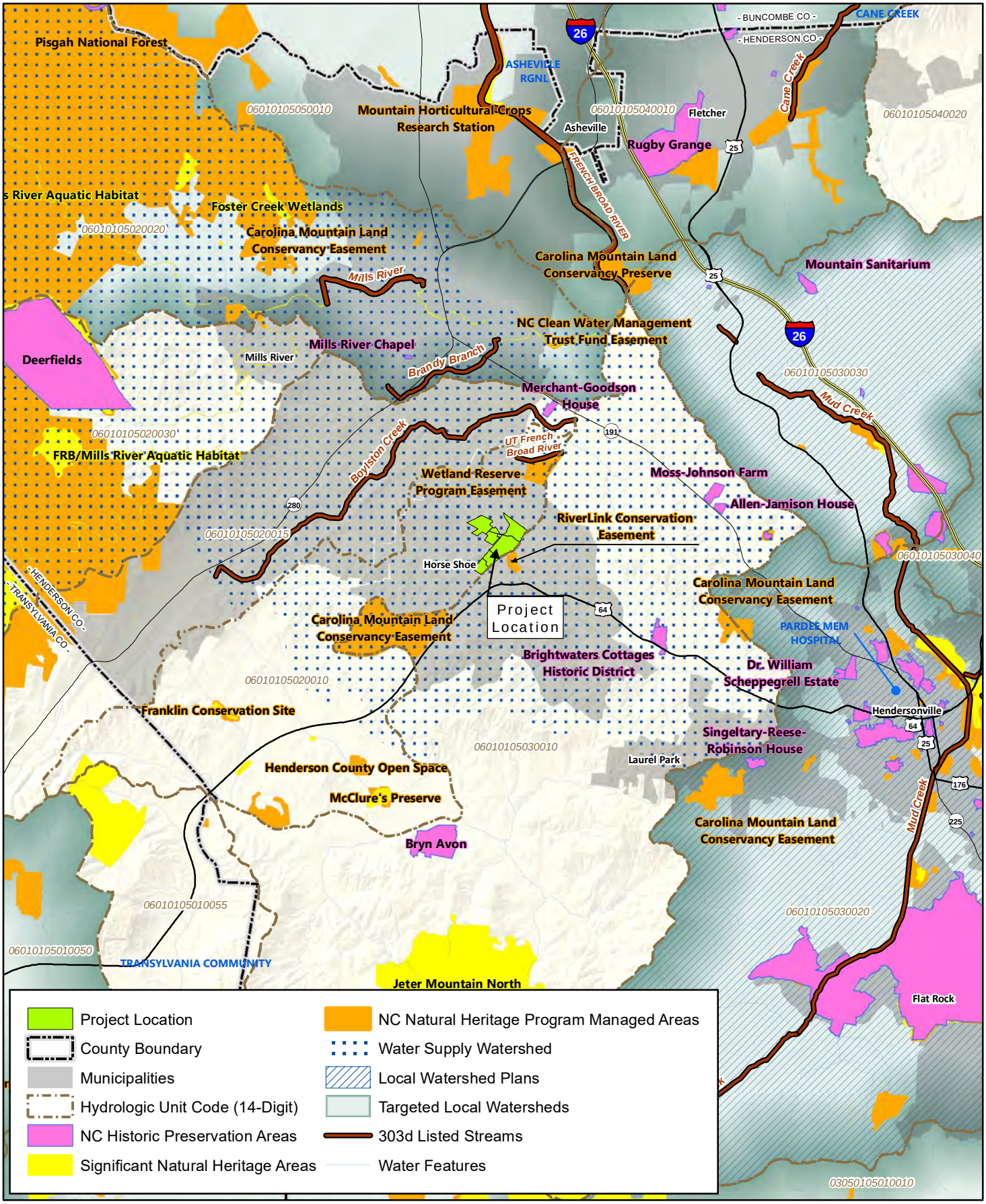
FIGURES



WILDLANDS ENGINEERING

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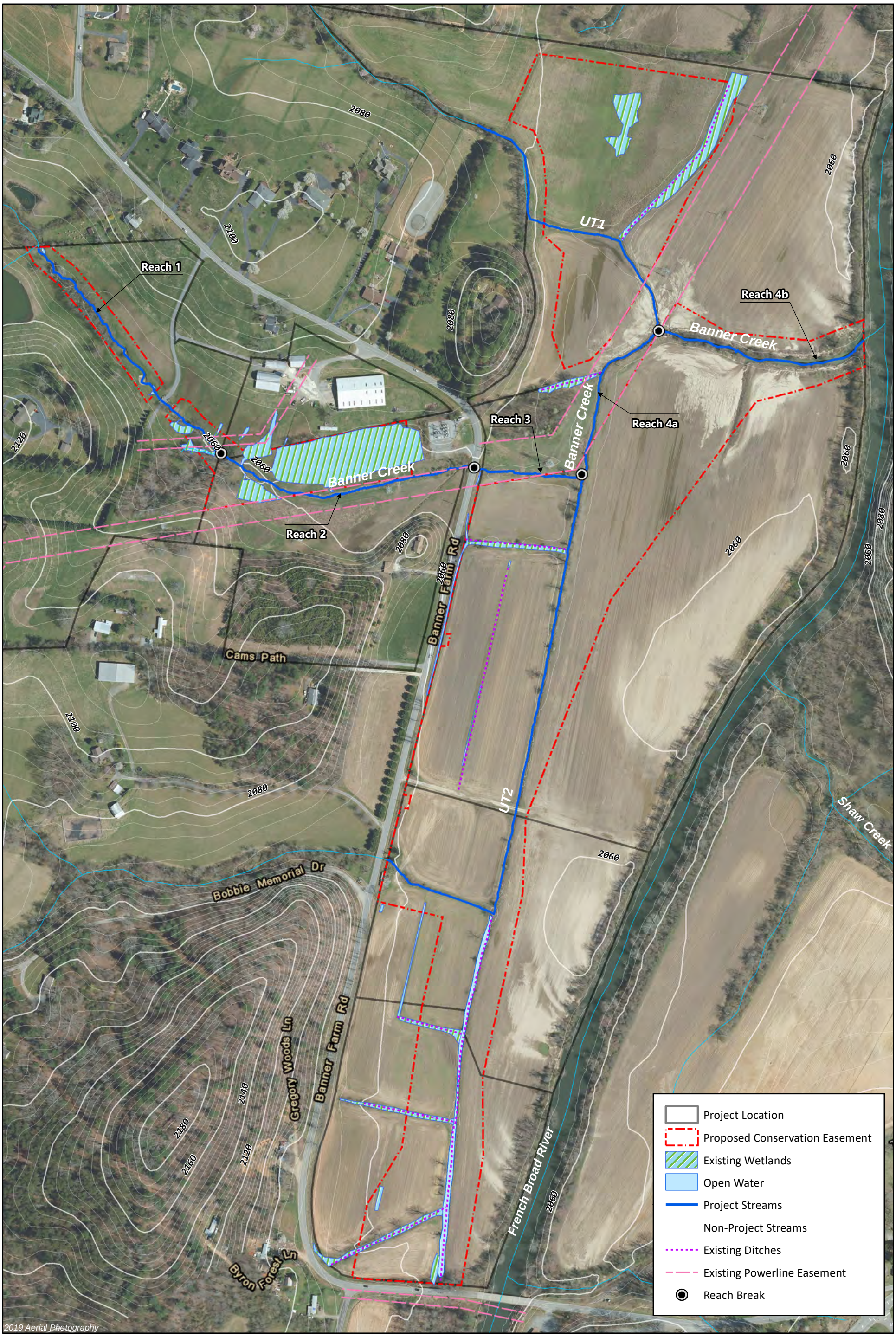
Figure 1 Vicinity Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

Henderson County, NC



WILDLANDS ENGINEERING

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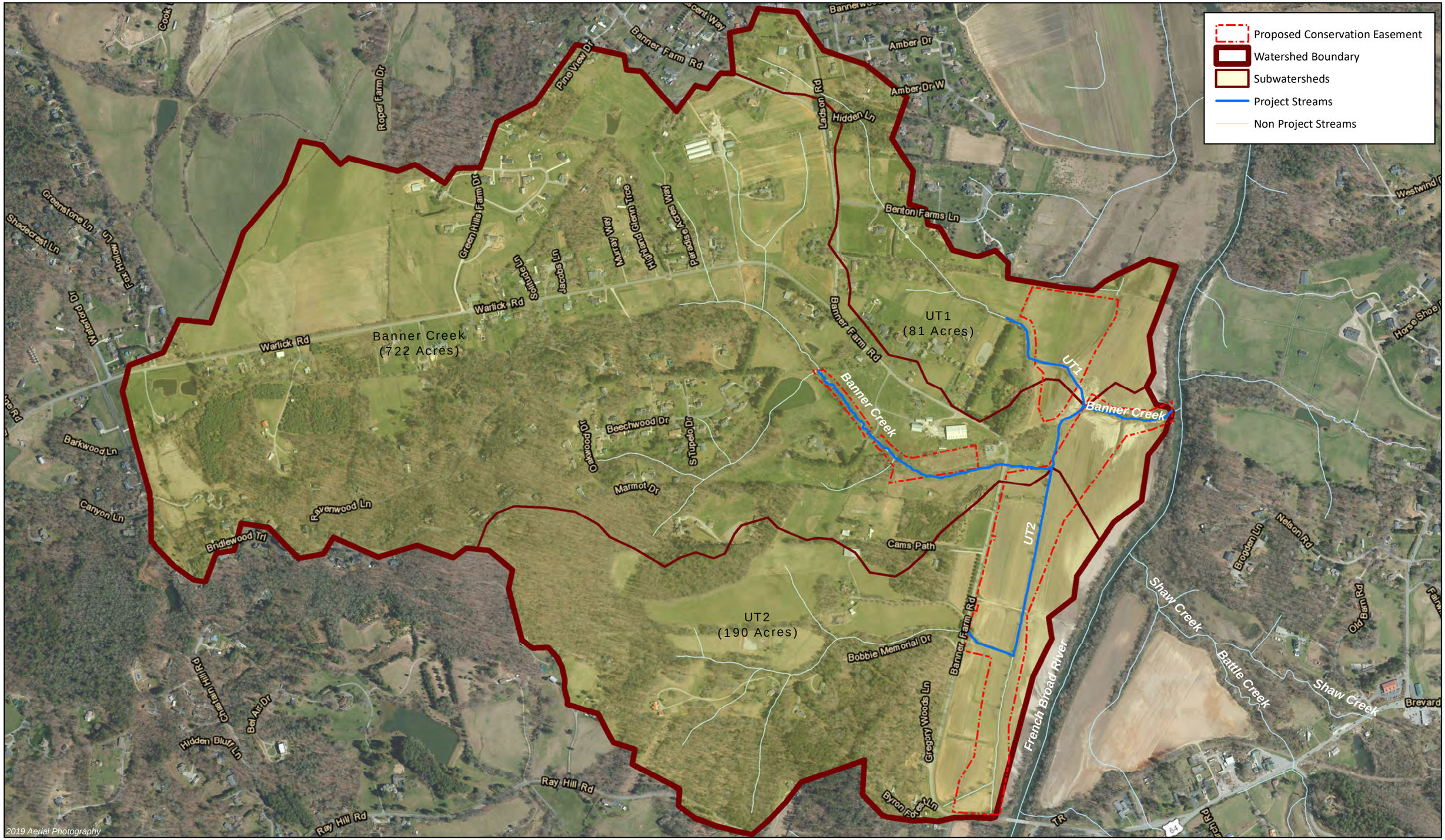
Figure 2 Site Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

Henderson County, NC



WILDLANDS ENGINEERING

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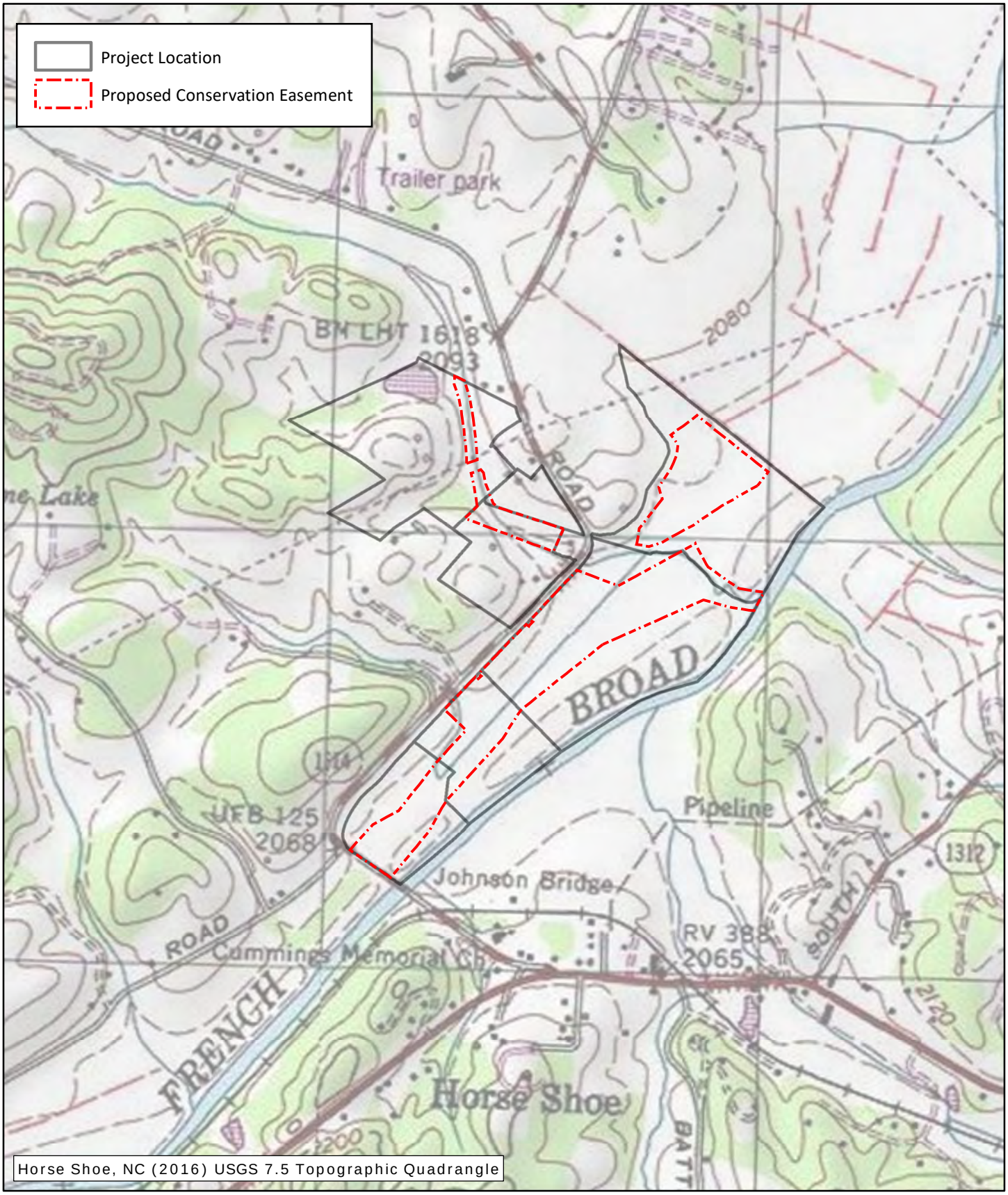
Figure 3 Watershed Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

Henderson County, NC



WILDLANDS ENGINEERING

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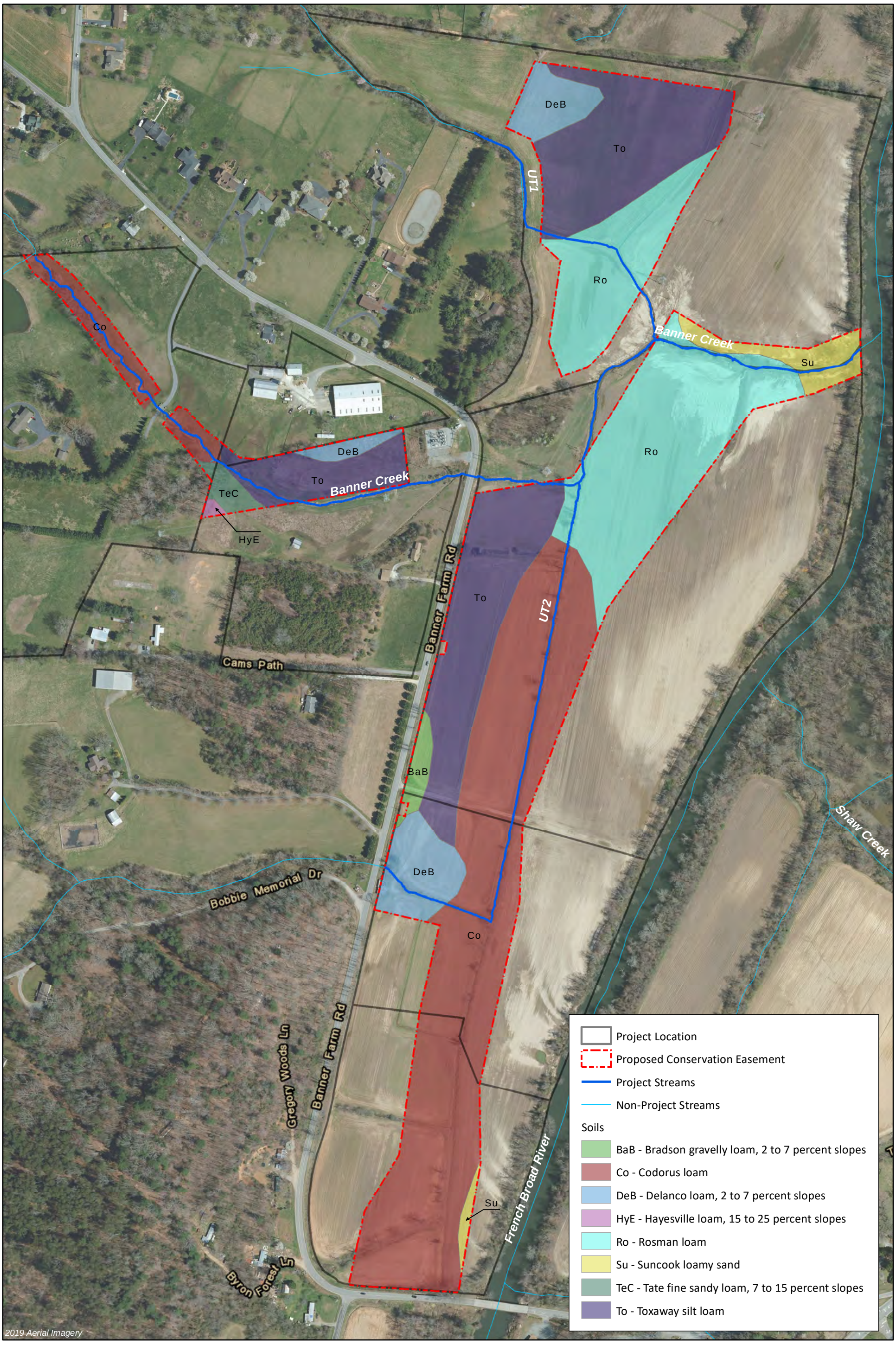
Figure 4 USGS Topographic Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

Henderson County, NC



WILDLANDS ENGINEERING

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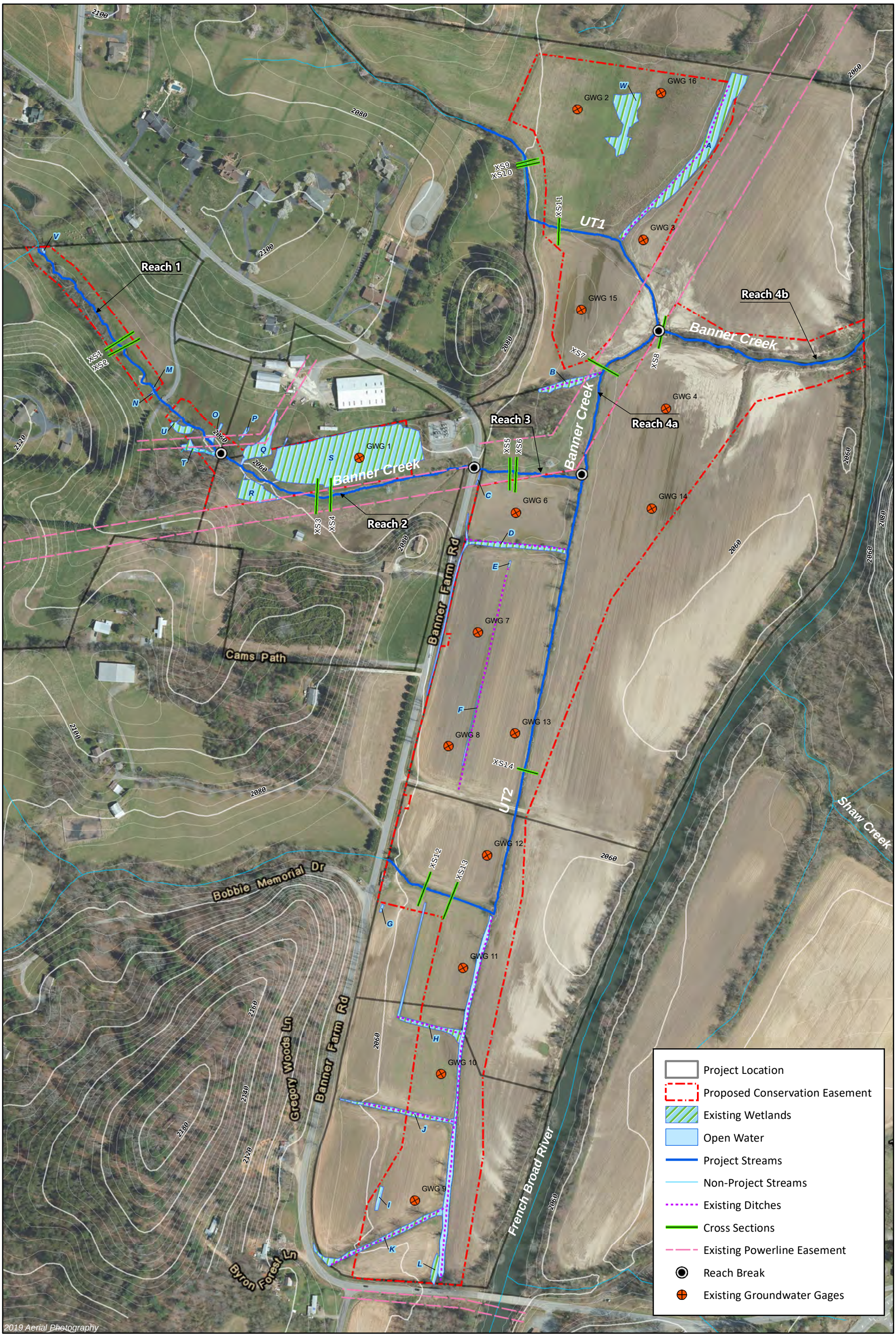
Figure 5 Soils Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

Henderson County, NC

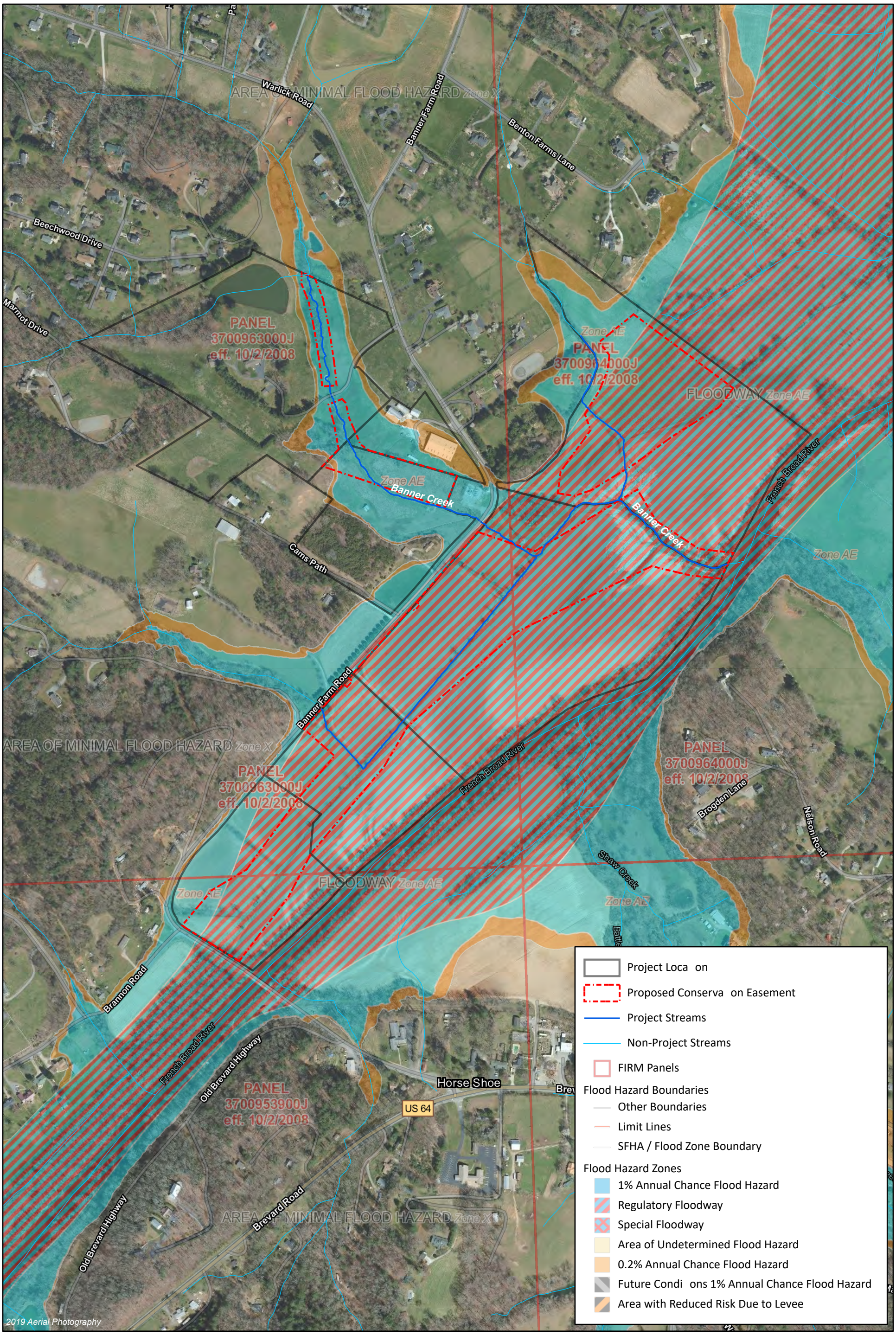


WILDLANDS ENGINEERING

0 300 600 Feet

Figure 6 Existing Conditions Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

Henderson County, NC



WILDLANDS ENGINEERING

0 600 1,200 Feet

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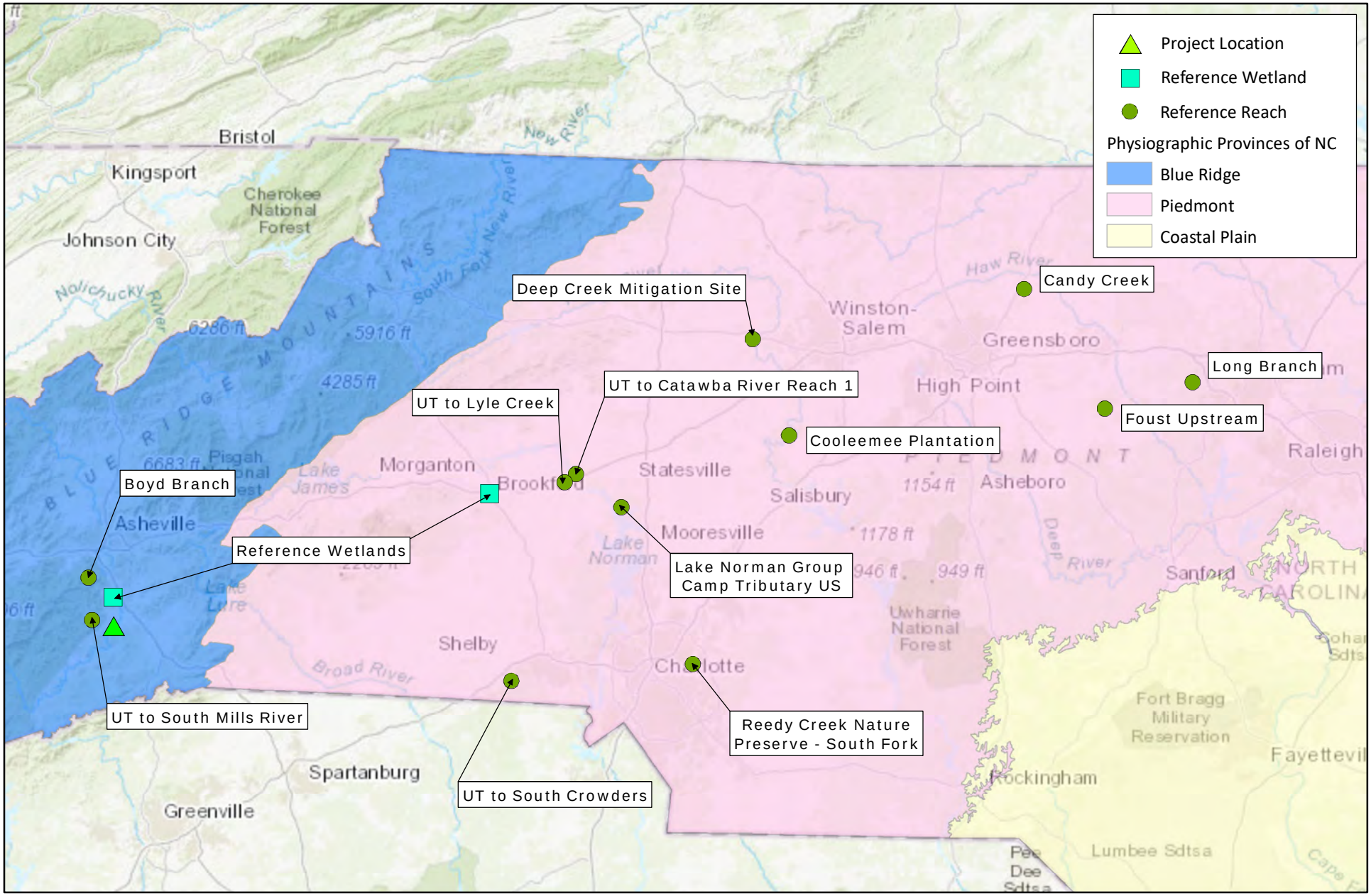
Figure 7 FEMA Floodplain Map
Banner Farm Mi ga on Site
French Broad River Basin 06010105

Henderson County, NC

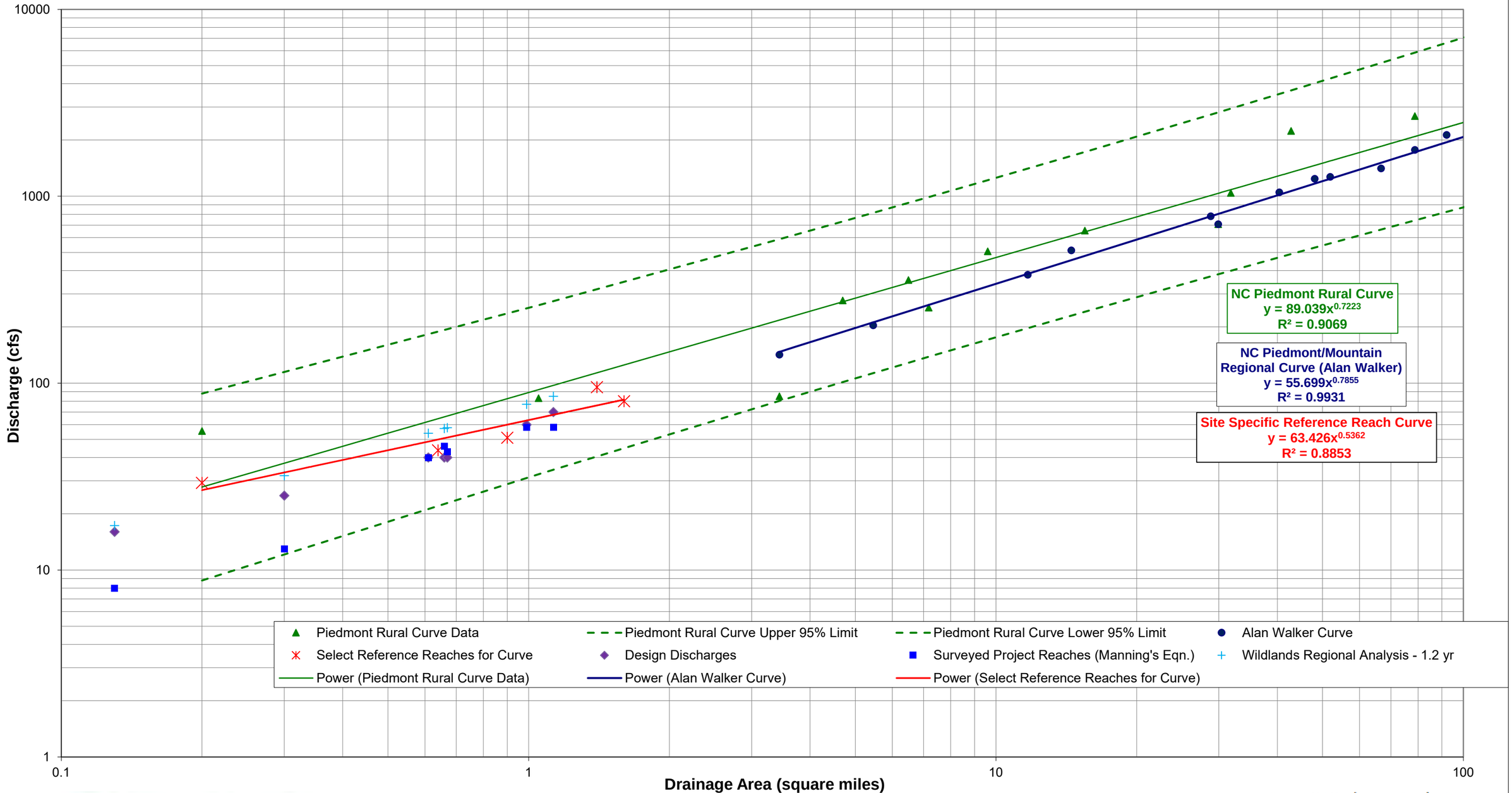


WILDLANDS ENGINEERING

Figure 8 Reference Reach Vicinity Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

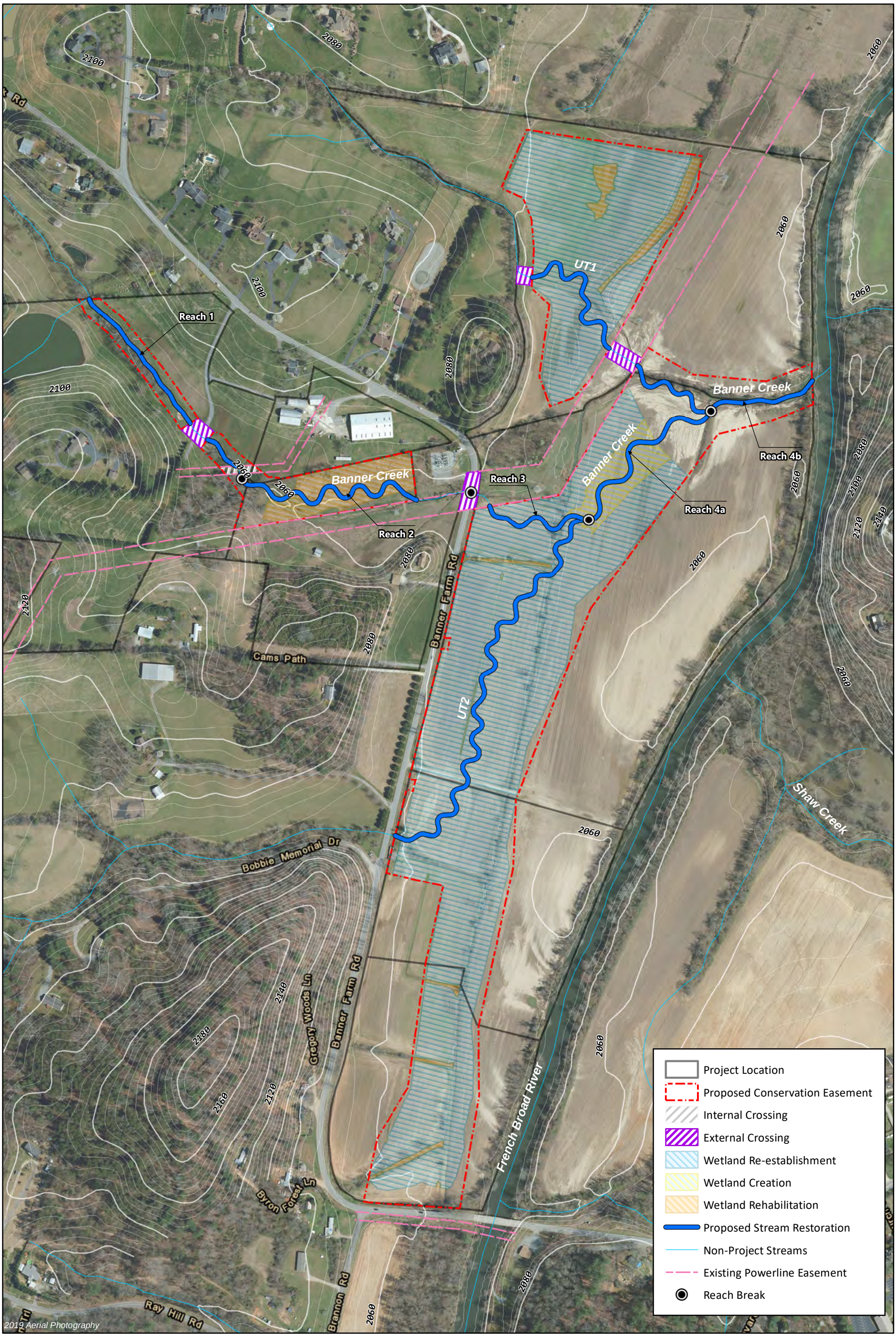
Henderson County, NC

Banner Farm Design Bankfull Discharge Plot



WILDLANDS ENGINEERING

Figure 9 Discharge Analysis
Banner Farm Mitigation Site
French Broad River Basin 06010105
Henderson County, NC

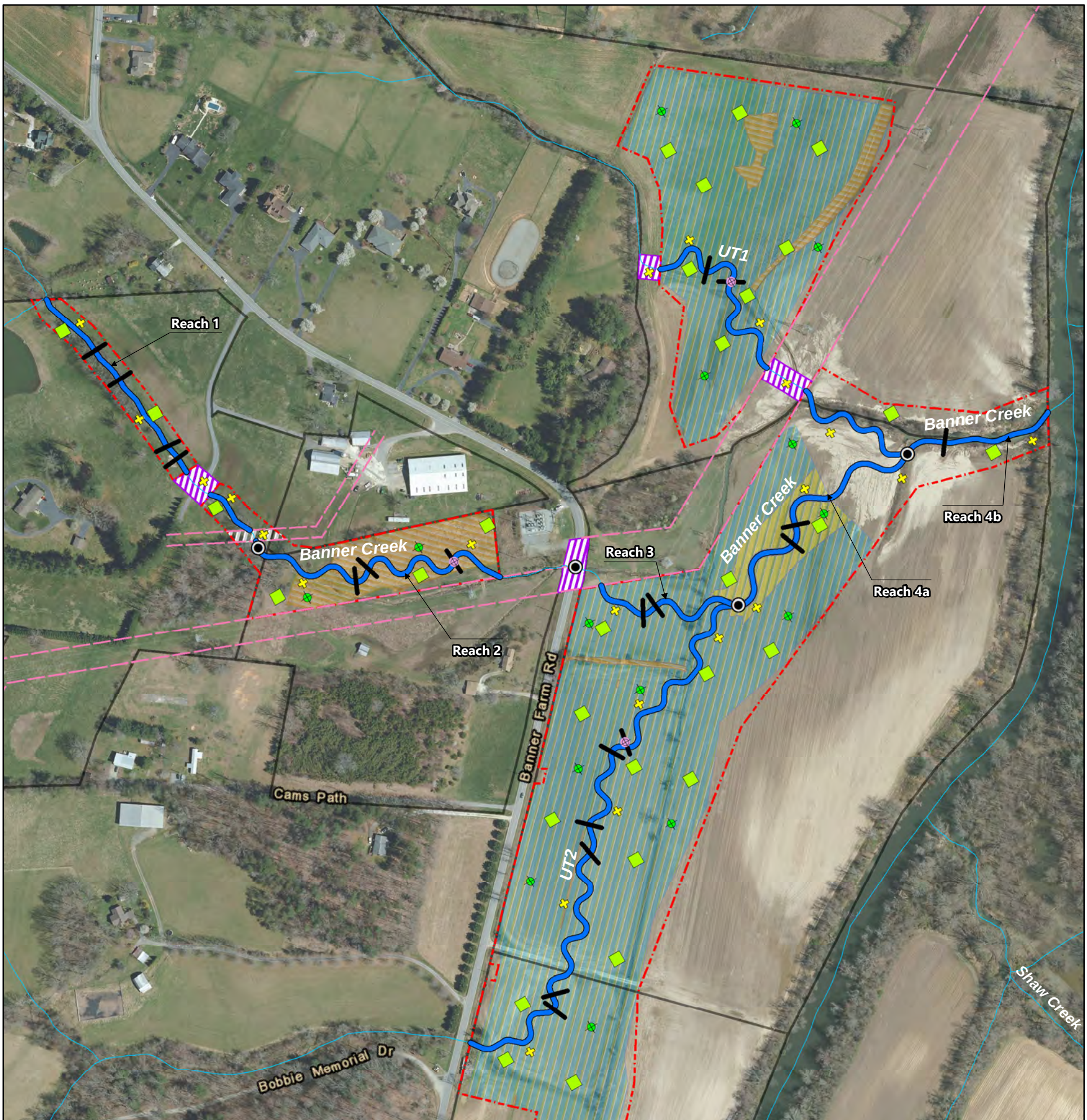


WILDLANDS ENGINEERING

0 300 600 Feet

Figure 10 Concept Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

Henderson County, NC



WILDLANDS ENGINEERING

0 300 600 Feet

Figure 11 Monitoring Components Map
Banner Farm Mitigation Site
French Broad River Basin 06010105

Henderson County, NC

APPENDIX 1
Site Protection Instrument

Appendix 1 Site Protection Instrument

The land required for construction, management, and stewardship of this mitigation project includes portions of the parcels listed in Table 1. All parcels are optioned for purchase by Wildlands Engineering, Inc. (Wildlands). Upon transfer of lands to Wildlands, a conservation easement will be recorded on the parcels and includes streams and wetlands being restored along with their corresponding riparian buffers.

Table 1: Site Protection Instrument – *Banner Farm Mitigation Site*

Current Landowner	PIN	County	Under Option to Purchase by Wildlands?	Memorandum of Option Conservation Easement Deed Book (DB) and Page Number (PG)	Acreage to be Protected
Mitchell & Wendy Gaither	9630826726	Henderson	Yes	DB: 1598 PG: 219	1.62 Ac
Mountain Bean Land, LLC	9630924395	Henderson	Yes	DB: 3388 PG: 494	0.09 Ac
Vine Ripe Rentals, LLC.	9630912884	Henderson	Yes	DB: 3388 PG: 488	2.68 Ac
Kirby & Sherri Johnson	9630919204	Henderson	Yes	DB: 831 PG: 23	18.84 Ac
Mountain Bean Land, LLC	9640028341	Henderson	Yes	DB: 3388 PG: 494	11.39 Ac
Kirby & Sherry Johnson	9630900480	Henderson	Yes	DB: 3403 PG: 159	6.08 Ac
Kirby & Sherry Johnson	9539895929	Henderson	Yes	DB: 1426 PG: 625 & DB: 1479 PG: 642	5.9 Ac

The conservation easement template that will be used for recordation is included in this appendix. All site protection instruments require 60-day advance notification to the USACE and or DMS prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

STATE OF NORTH CAROLINA

DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

_____ COUNTY

SPO File Number:
DMS Project Number:

Prepared by: Office of the Attorney General
Property Control Section
Return to: NC Department of Administration
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

THIS DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS, made this _____day of _____, 20__, by _____ *Landowner name goes here* , ("**Grantor**"), whose mailing address is _____ *Landowner address goes here* _____, to the State of North Carolina, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Division of Mitigation Services (formerly known as the Ecosystem Enhancement Program and Wetlands Restoration Program) within the Department of Environment and Natural Resources for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the

protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between *(insert name and address of full delivery contract provider)* and the North Carolina Department of Environment and Natural Resources, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number _____.

WHEREAS, The State of North Carolina is qualified to be the Grantee of a Conservation Easement pursuant to N.C. Gen. Stat. § 121-35; and

WHEREAS, the Department of Environment and Natural Resources and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Understanding, (MOU) duly executed by all parties on November 4, 1998. This MOU recognized that the Wetlands Restoration Program was to provide effective compensatory mitigation for authorized impacts to wetlands, streams and other aquatic resources by restoring, enhancing and preserving the wetland and riparian areas of the State; and

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the Division of Mitigation Services (formerly Ecosystem Enhancement Program) is to provide for compensatory mitigation by effective protection of the land, water and natural resources of the State by restoring, enhancing and preserving ecosystem functions; and

WHEREAS, the Department of Environment and Natural Resources, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, the North Carolina Division of Water Quality, the North Carolina Division of Coastal Management, and the National Marine Fisheries Service entered into an agreement to continue the In-Lieu Fee operations of the North Carolina Department of Natural Resources' Division of Mitigation Services (formerly Ecosystem Enhancement Program) with an effective date of 28 July, 2010, which supersedes and replaces the previously effective MOA and MOU referenced above; and

WHEREAS, the acceptance of this instrument for and on behalf of the State of North Carolina was granted to the Department of Administration by resolution as approved by the Governor and Council of State adopted at a meeting held in the City of Raleigh, North Carolina, on the 8th day of February 2000; and

WHEREAS, the Division of Mitigation Services in the Department of Environment and Natural Resources, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in _____ Township, _____ County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately _____ acres and being conveyed to the Grantor by deed as recorded in **Deed Book _____ at Page ____** of the _____ County Registry, North Carolina; and

WHEREAS, Grantor is willing to grant a Conservation Easement and Right of Access over the herein described areas of the Property, thereby restricting and limiting the use of the areas of the Property subject to the Conservation Easement to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept said Easement and Access Rights. The Conservation Easement shall be for the protection and benefit of the waters of ***if known, insert name of stream, branch, river or waterway here***.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement along with a general Right of Access.

The Conservation Easement Area consists of the following:

Tracts Number _____ containing a total of _____ **acres** as shown on the plats of survey entitled "Final Plat, Conservation Easement for North Carolina Division of Mitigation Services, Project Name: _____, SPO File No._____, EEP Site No. _____, Property of _____," dated _____, 20__ by *name of surveyor*, PLS Number _____ and recorded in the _____ County, North Carolina Register of Deeds at **Plat Book _____ Pages _____.**

See attached "**Exhibit A**", Legal Description of area of the Property hereinafter referred to as the "Conservation Easement Area"

The purposes of this Conservation Easement are to maintain, restore, enhance, construct, create and preserve wetland and/or riparian resources in the Conservation Easement Area that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; to maintain permanently the Conservation Easement Area in its natural condition, consistent with these purposes; and to prevent any use of the Easement Area that will significantly impair or interfere with these purposes. To achieve these purposes, the following conditions and restrictions are set forth:

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

The Conservation Easement Area shall be restricted from any development or usage that would impair or interfere with the purposes of this Conservation Easement. Unless expressly reserved as a compatible use herein, any activity in, or use of, the Conservation Easement Area by the Grantor is prohibited as inconsistent with the purposes of this Conservation Easement. Any rights not expressly reserved hereunder by the Grantor have been acquired by the Grantee. Any rights not expressly reserved hereunder by the Grantor, including the rights to all mitigation credits, including, but not limited to, stream, wetland, and riparian buffer mitigation units, derived from each site within the area of the Conservation Easement, are conveyed to and belong to the Grantee. Without limiting the generality of the foregoing, the following specific uses are prohibited, restricted, or reserved as indicated:

A. Recreational Uses. Grantor expressly reserves the right to undeveloped recreational uses, including hiking, bird watching, hunting and fishing, and access to the Conservation Easement Area for the purposes thereof.

B. Motorized Vehicle Use. Motorized vehicle use in the Conservation Easement Area is prohibited except within a Crossing Area(s) or Road or Trail as shown on the recorded survey plat**.**

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including organized educational activities such as site visits and observations. Educational uses of the property shall not alter vegetation, hydrology or topography of the site.

D. **Damage to Vegetation.** Except within Crossing Area(s) as shown on the recorded survey plat and as related to the removal of non-native plants, diseased or damaged trees, or vegetation that destabilizes or renders unsafe the Conservation Easement Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Conservation Easement Area is prohibited.

E. Industrial, Residential and Commercial Uses. All industrial, residential and commercial uses are prohibited in the Conservation Easement Area.

F. Agricultural Use. All agricultural uses are prohibited within the Conservation Easement Area including any use for cropland, waste lagoons, or pastureland.

G. New Construction. There shall be no building, facility, mobile home, antenna, utility pole, tower, or other structure constructed or placed in the Conservation Easement Area.

H. **Roads and Trails.** There shall be no construction or maintenance of new roads, trails, walkways, or paving in the Conservation Easement.

All existing roads, trails and crossings within the Conservation Easement Area shall be shown on the recorded survey plat.

I. Signs. No signs shall be permitted in the Conservation Easement Area except interpretive signs describing restoration activities and the conservation values of the Conservation Easement Area, signs identifying the owner of the Property and the holder of the Conservation Easement, signs giving directions, or signs prescribing rules and regulations for the use of the Conservation Easement Area.

J. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or any other material in the Conservation Easement Area is prohibited.

K. Grading, Mineral Use, Excavation, Dredging. There shall be no grading, filling, excavation, dredging, mining, drilling, hydraulic fracturing; removal of topsoil, sand, gravel, rock, peat, minerals, or other materials.

L. Water Quality and Drainage Patterns. There shall be no diking, draining, dredging, channeling, filling, leveling, pumping, impounding or diverting, causing, allowing or permitting the diversion of surface or underground water in the Conservation Easement Area. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns is allowed. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides in the Conservation Easement Area is prohibited. In the event of an emergency interruption or shortage of all other water sources, water from within the Conservation Easement Area may temporarily be withdrawn for good cause shown as needed for the survival of livestock on the Property.

M. Subdivision and Conveyance. Grantor voluntarily agrees that no further subdivision, partitioning, or dividing of the Conservation Easement Area portion of the Property owned by the Grantor in fee simple ("fee") that is subject to this Conservation Easement is allowed. Any future transfer of the Property shall be subject to this Conservation Easement and Right of Access and to the Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Conservation Easement Area for the purposes set forth herein.

N. Development Rights. All development rights are permanently removed from the Conservation Easement Area and are non-transferrable.

O. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural features of the Conservation Easement Area or any intentional introduction of non-native plants, trees and/or animal species by Grantor is prohibited.

The Grantor may request permission to vary from the above restrictions for good cause shown, provided that any such request is not inconsistent with the purposes of this Conservation Easement, and the Grantor obtains advance written approval from the Division of Mitigation Services, 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, receive a perpetual Right of Access to the Conservation Easement Area over the Property at reasonable times to undertake any activities to restore, construct, manage, maintain, enhance, protect, and monitor the stream, wetland and any other riparian resources in the Conservation Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

B. Restoration Activities. These activities include planting of trees, shrubs and herbaceous vegetation, installation of monitoring wells, utilization of heavy equipment to grade, fill, and prepare the soil, modification of the hydrology of the site, and installation of natural and manmade materials as needed to direct in-stream, above ground, and subterraneous water flow.

C. Signs. The Grantee, its employees and agents, successors or assigns, shall be permitted to place signs and witness posts on the Property to include any or all of the following: describe the project, prohibited activities within the Conservation Easement, or identify the project boundaries and the holder of the Conservation Easement.

D. Fences. Conservation Easements are purchased to protect the investments by the State (Grantee) in natural resources. Livestock within conservations easements damages the investment and can result in reductions in natural resource value and mitigation credits which would cause financial harm to the State. Therefore, Landowners (Grantor) with livestock are required to restrict livestock access to the Conservation Easement area. Repeated failure to do so may result in the State (Grantee) repairing or installing livestock exclusion devices (fences) within the conservation area for the purpose of restricting livestock access. In such cases, the landowner (Grantor) must provide access to the State (Grantee) to make repairs.

E. Crossing Area(s). The Grantee is not responsible for maintenance of crossing area(s), however, the Grantee, its employees and agents, successors or assigns, reserve the right to repair crossing area(s), at its sole discretion and to recover the cost of such repairs from the Grantor if such repairs are needed as a result of activities of the Grantor, his successors or assigns.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the

power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

B. Inspection. The Grantee, its employees and agents, successors and assigns, have the right, with reasonable notice, to enter the Conservation Easement Area over the Property at reasonable times for the purpose of inspection to determine whether the Grantor is complying with the terms, conditions and restrictions of this Conservation Easement.

C. Acts Beyond Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury or change in the Conservation Easement Area caused by third parties, resulting from causes beyond the Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life or damage to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

E. No Waiver. Enforcement of this Easement shall be at the discretion of the Grantee and any forbearance, delay or omission by Grantee to exercise its rights hereunder in the event of any breach of any term set forth herein shall not be construed to be a waiver by Grantee.

V. MISCELLANEOUS

A. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of the Conservation Easement, and the application of such provision to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the

obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

C. Any notices shall be sent by registered or certified mail, return receipt requested to the parties at their addresses shown herein or to other addresses as either party establishes in writing upon notification to the other.

D. Grantor shall notify Grantee in writing of the name and address and any party to whom the Property or any part thereof is to be transferred at or prior to the time said transfer is made. Grantor further agrees that any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed is subject to the Conservation Easement herein created.

E. The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the State Property Office and the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property or of any request to void or modify this Conservation Easement. Such notifications and modification requests shall be addressed to:

Division of Mitigation Services Program Manager
NC State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

and

General Counsel
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

G. The parties recognize and agree that the benefits of this Conservation Easement are in gross and assignable provided, however, that the Grantee hereby covenants and agrees, that in the event it transfers or assigns this Conservation Easement, the organization receiving the interest will be a qualified holder under N.C. Gen. Stat. § 121-34 et seq. and § 170(h) of the Internal Revenue Code, and the Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue in perpetuity the conservation purposes described in this document.

VI. QUIET ENJOYMENT

Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Conservation Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes of this Conservation Easement. Without limiting the generality of the foregoing, the Grantor expressly reserves to the Grantor, and the Grantor's invitees and licensees, the right of access to the Conservation Easement Area, and the right of quiet enjoyment of the Conservation Easement Area,

TO HAVE AND TO HOLD, the said rights and easements perpetually unto the State of North Carolina for the aforesaid purposes,

AND Grantor covenants that Grantor is seized of said premises in fee and has the right to convey the permanent Conservation Easement herein granted; that the same is free from encumbrances and that Grantor will warrant and defend title to the same against the claims of all persons whomsoever.

IN TESTIMONY WHEREOF, the Grantor has hereunto set his hand and seal, the day and year first above written.

_____ (SEAL)

NORTH CAROLINA
COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the _____ day of _____, 20__.

_____
Notary Public

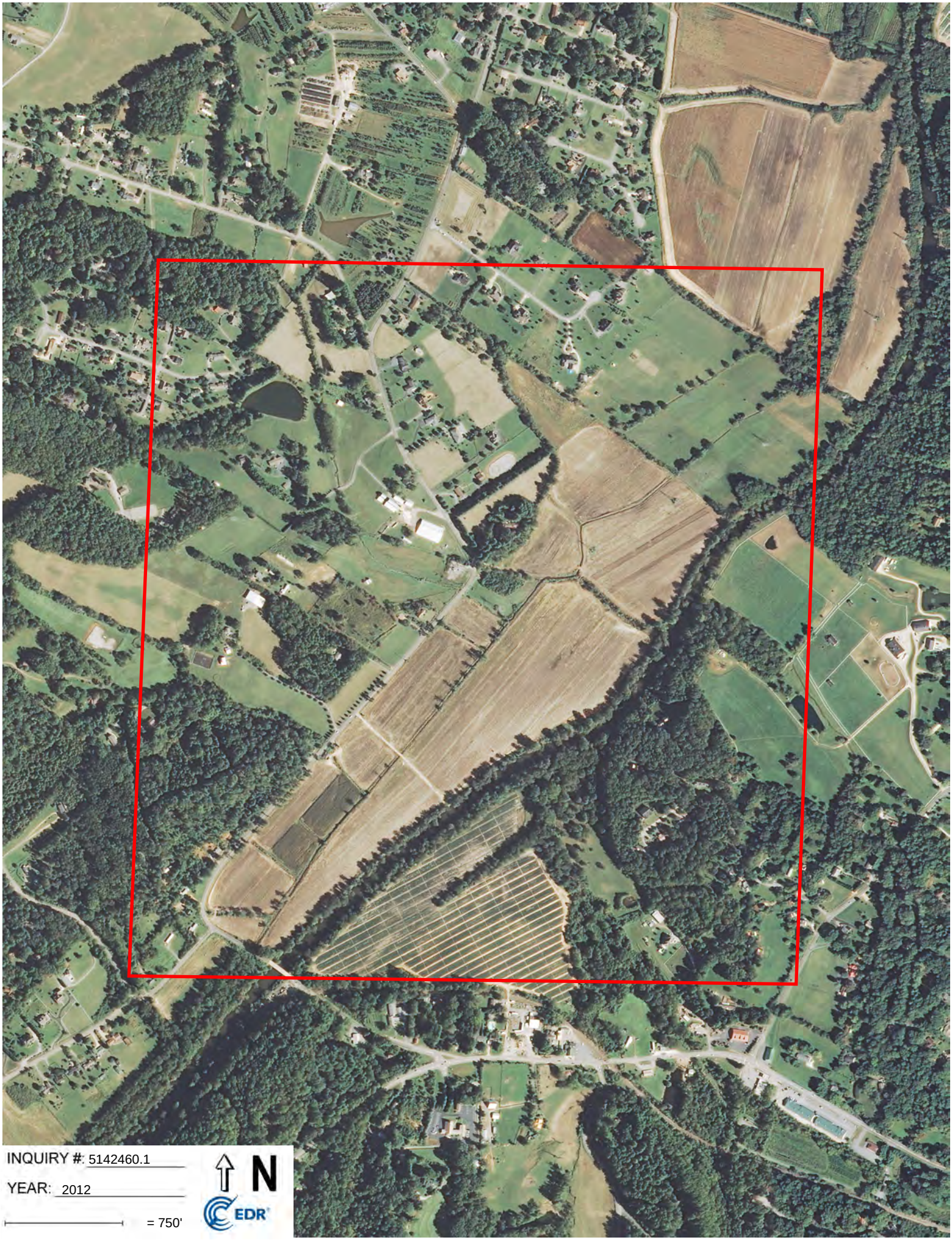
My commission expires:

_____

Exhibit A

[INSERT LEGAL DESCRIPTION]

APPENDIX 2
Historic Aerial Photos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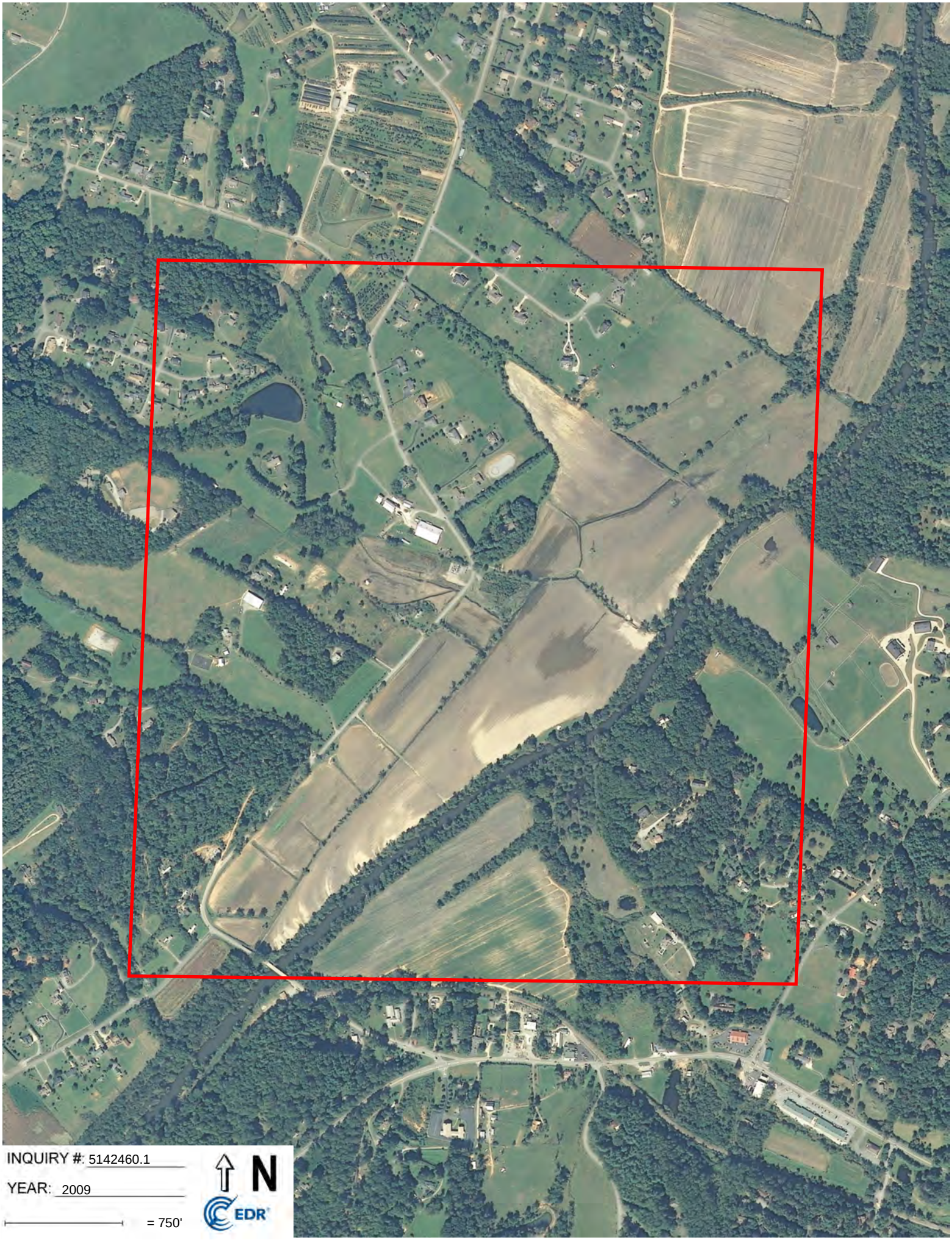
N
EDR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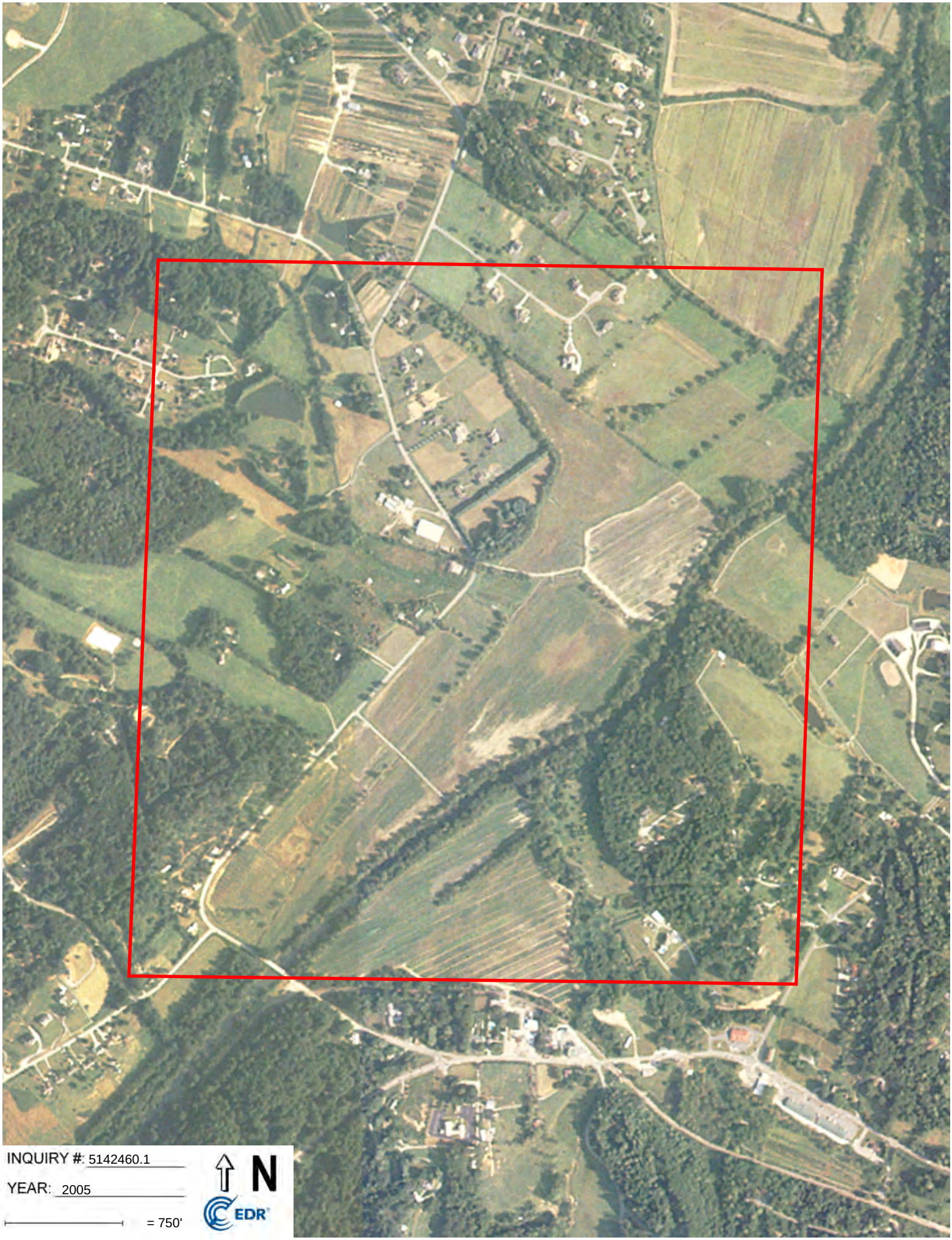
INQUIRY #: 5142460.1
YEAR: 2005
= 750'
N
EDR


INQUIRY #: 5142460.1
YEAR: 1994
= 750'
N
EDR
Subject boundary not shown because it exceeds image extent or image is not georeferenced.


INQUIRY #: 5142460.1
YEAR: 1964
= 750'
N
EDR

APPENDIX 3
Jurisdictional Determination and Wetland Assessment Forms

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action ID: **SAW-2018-01153** County: **Henderson** U.S.G.S. Quad: **Horse Shoe**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner: **Wildlands Engineering, Inc. / Attn.: Jordan Hessler**
Address: **167-B Haywood Road**
Asheville, NC 28806
Telephone Number: **704-332-7754**

Size (acres): **61.1**
Nearest Waterway: **UTs French Broad River**
River Basin/ HUC: **Upper French Broad (06010105)**

Nearest Town: **Mills River**
Coordinates: **35.35088 N, 82.55689 W**

Location description: **The project site is located on a tract of land (PINs 9630-82-6726, 9630-92-4395, 9630-91-2884, 9640-02-8341, 9630-91-9204, 9630-90-0480, and 9539-89-5929) which are generally portions of parcels east of Banner Farm Road and west of the French Broad River, including unassigned addressed parcels and parcels at 52, 56, and 60 Banner Farm Road in Mills River, Henderson County, North Carolina.**

Indicate Which of the Following Apply:

A. Preliminary Determination

X There are waters, including wetlands, on the above described project area, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). The waters, including wetlands, have been delineated, and the delineation has been verified by the Corps to be sufficiently accurate and reliable. Therefore this preliminary jurisdiction determination may be used in the permit evaluation process, including determining compensatory mitigation. For purposes of computation of impacts, compensatory mitigation requirements, and other resource protection measures, a permit decision made on the basis of a preliminary JD will treat all waters and wetlands that would be affected in any way by the permitted activity on the site as if they are jurisdictional waters of the U.S. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). However, you may request an approved JD, which is an appealable action, by contacting the Corps district for further instruction.

_ There are wetlands on the above described property, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). However, since the waters, including wetlands, have not been properly delineated, this preliminary jurisdiction determination may not be used in the permit evaluation process. Without a verified wetland delineation, this preliminary determination is merely an effective presumption of CWA/RHA jurisdiction over all of the waters, including wetlands, at the project area, which is not sufficiently accurate and reliable to support an enforceable permit decision. We recommend that you have the waters of the U.S. on your property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403) and Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are waters of the U.S. including wetlands on the above described property subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We recommend you have the waters of the U.S. on your property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

_ The waters of the U.S. including wetlands on your project area have been delineated and the delineation has been verified by the Corps. If you wish to have the delineation surveyed, the Corps can review and verify the survey upon

completion. Once verified, this survey will provide an accurate depiction of all areas subject to CWA and/or RHA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on_____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described project area which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management to determine their requirements.

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). Placement of dredged or fill material, construction or placement of structures, or work within navigable waters of the United States without a Department of the Army permit may constitute a violation of Sections 9 and/or 10 of the Rivers and Harbors Act (33 USC § 401 and/or 403). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **David Brown** at **828-271-7980, ext. 4232** or **david.w.brown@usace.army.mil**.

C. Basis for Determination:

See attached preliminary jurisdictional determination form.

D. Remarks:

The potential waters of the U.S., at this site, were verified on-site by the Corps on October 9, 2019, and are as approximately depicted on the attached *Delineation Map-Banner Farm Mitigation Site* (Figures 3.0-3.3), dated October 9, 2019, and submitted by Wildlands Engineering, Inc.

E. Attention USDA Program Participants

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

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

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

US Army Corps of Engineers
South Atlantic Division
Attn: Philip Shannin, Review Officer
60 Forsyth Street SW, Room 10M15
Atlanta, Georgia 30303-8801

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by, N/A (Preliminary-JD).

It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: _____

David Brown

Issue Date of JD: **November 19, 2019** Expiration Date: N/A Preliminary JD

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

Copy furnished:
Mitchell and Wendy Gaither, 60 Banner Farm Road, Mills River, NC 28759

Mountain Bean Holdings, Inc., P.O. Box 637, Horse Shoe, NC 28742

Vine Ripe Investments, Inc., P.O. Box 609, Horse Shoe, NC 28742

Preston and Judy Johnson, P.O. Box 901177, Homestead, FL 33090

Kirby and Sherri Johnson, 207 E. Price Street, Hendersonville, NC 28739

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NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL		
Applicant: **Wildlands Engineering, Inc. / Attn.: Jordan Hessler**	File Number: **SAW-2018-01153**	Date: **November 19, 2019**

Attached is:	See Section below
☐ INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
☐ PROFFERED PERMIT (Standard Permit or Letter of permission)	B
☐ PERMIT DENIAL	C
☐ APPROVED JURISDICTIONAL DETERMINATION	D
☒ PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx or Corps regulations at 33 CFR Part 331.

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

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

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

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

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

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

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

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division,** **Attn: David Brown** **151 Patton Avenue, Room 208** **Asheville, North Carolina 28801-5006** **828-271-7980, ext. 4232**	If you only have questions regarding the appeal process you may also contact: Mr. Philip Shannin, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, Attn.: David Brown, 69 Darlington Avenue, Wilmington, North Carolina 28403

For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:

Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Phillip Shannin, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

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

BACKGROUND INFORMATION

A. **REPORT COMPLETION DATE FOR PRELIMINARY JD:** November 19, 2019

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

C. **DISTRICT OFFICE, FILE NAME, AND NUMBER:**
CESAW-RG-A, SAW-2018-01153, NCDMS ILF Banner Farm Mitigation Site

D. **PROJECT LOCATION(S) AND BACKGROUND INFORMATION:**
The project site is located on a tract of land (PINs 9630-82-6726, 9630-92-4395, 9630-91-2884, 9640-02-8341, 9630-91-9204, 9630-90-0480, and 9539-89-5929) which are generally portions of parcels east of Banner Farm Road and west of the French Broad River, including unassigned addressed parcels and parcels at 52, 56, and 60 Banner Farm Road in Mills River, Henderson County, North Carolina.

State: **NC** County/parish/borough: **Henderson** City: **Mills River**
Center coordinates of site (lat/long in degree decimal format): **35.35088 N, 82.55689 W**
Universal Transverse Mercator: **N/A**
Name of nearest waterbody: **UTs French Broad River**

E. **REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):**
☒ Office (Desk) Determination. Date: **November 19, 2019**
☒ Field Determination. Date(s): **October 9, 2019**

Use the table below to document aquatic resources and/or aquatic resources at different sites

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION

Site Number	Centered Coordinates (decimal degrees) Latitude	Longitude	Estimated Amount of Aquatic Resource in Review Area (linear feet or acre)	Type of Aquatic Resources	Geographic Authority to Which Aquatic Resource "May Be" Subject
Banner Creek (UT French Broad River)	35.35539	-82.55942	3,272 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT1 (UT French Broad River	35.35356	-82.55421	878 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
UT2 (UT French Broad River)	35.34857	-82.55913	1,930 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland A	35.353209	-82.552293	0.54 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland B	35.351927	-82.554840	0.09 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404

Wetland C	35.351520	-82.556267	0.004 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland D	35.350908	-82.556404	0.17 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland E	35.350698	-82.556398	0.003 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland F	35.349546	-82.557627	0.03 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland G	35.348435	-82.559495	0.01 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland H	35.347386	-82.559793	0.13 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland I	35.346085	-82.561050	0.02 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland J	35.346677	-82.560354	0.11 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland K	35.345746	-82.561251	0.16 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland L	35.345256	-82.560874	0.04 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland M	35.353680	-82.559013	0.003 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland N	35.353641	-82.559056	0.003 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland O	35.353030	-82.558640	0.01 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland P	35.352911	-82.558349	0.01 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland Q	35.352746	-82.558248	0.14 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland R	35.352391	-82.558560	0.15 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland S	35.352292	-82.557848	1.62 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland T	35.352990	-82.558923	0.04 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland U	35.353294	-82.558995	0.04 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland V	35.355278	-82.559389	0.004 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Wetland W	35.353934	-82.552684	0.28 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
Open Water 1	35.34724	-82.559173	0.40 ac	☐ Wetland ☒ Non-wetland Water	☒ Section 404 ☐ Section 10/404

i. The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an

approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre- construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA

Data reviewed for preliminary JD (check all that apply) - Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

☒ Maps, plans, plots or plat submitted by or on behalf of preliminary JD requester: **Wildlands Engineering, Inc.**
☒ Data sheets prepared/submitted by or on behalf of preliminary JD requester. **Wildlands Engineering, Inc.**
  ☒ Office concurs with data sheets/delineation report.
  ☐ Office does not concur with data sheets/delineation report. Rational:
☐ Data sheets prepared by the Corps:
☐ Corps navigable waters' study:
☐ U.S. Geological Survey (USGS) Hydrologic Atlas:
  ☐ USGS NHD data.
  ☐ USGS 8 and 12 digit HUC maps.
☒ USGS map(s). Cite scale & quad name: **Horse Shoe.**
☒ Natural Resources Conservation Service (NRCS) Soil Survey.
  Citation: **Henderson County, NC**
☐ National wetlands inventory (NWI) map(s). Cite name:
☐ State/Local wetland inventory map(s):
☒ Federal Emergency Management Agency (FEMA) / Flood Insurance Rate Map (FIRM) maps: **Map nos. 3700963000J and 3700964000J, effective date Oct. 2, 2008**
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): **Google Earth Pro, Oct. 2015, Nov. 2013, Oct. 2010, May 2009, Jun. 2008, Apr. 2007, May 2006, Apr. 2004, Mar. 1998, and Mar. 1994**

or ☐ Other (Name & Date):

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

☐ Applicable/supporting scientific literature:

☒ Other information (please specify): **The site contains wetlands as determined by the *1987 Corps of Engineers Wetland Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Eastern Mountain and Piedmont Region (Version 2.0)*. These wetlands are abutting to stream channels located at the site and flow into the channels. Wetland hydrology is enhanced with the abutting stream channels via normal down gradient flows and periods of high water.**

The site also contains open water (impoundment) that abuts wetlands and a stream channel at the site. The impoundment receives waters and/or flow directly into associated abutting wetlands and stream.

The streams on the property are UTs of the French Broad River, which all exhibit physical ordinary high water mark (OHWM) indicators including, break in slope; developed bed and bank; changes in sediment texture and soil character; natural line impressed on the bank; shelving; absence of vegetation; leaf litter washed away; sediment deposition and sorting; presence of aquatic life; water staining; presence of debris; and scour. Some of the streams are depicted as solid blue lines on the USGS 7.5 minute quadrangle map Horse Shoe and the most current Natural Resource Conservation Service Soil Survey for Henderson County. Solid blue line features on these mapping conventions typically represent perennial streams.

The UTs of the French Broad River flow into the French Broad River, a traditional navigable water. The French Broad River merges with the Holston River to form the Tennessee River. The Tennessee River flows into the Ohio River then to the Mississippi River before entering the Gulf of Mexico.

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

David Brown, November 19, 2019
Signature and date of Regulatory staff member completing preliminary JD

Wildlands Engineering, Inc.
(per Agent Authorization)
Signature and date of person requesting preliminary JD (REQUIRED, unless obtaining the signature is impracticable)

Please sign this Preliminary JD Form. Keep a signed copy for your record and return a signed form to the Asheville Regulatory Field Office by mail or e-mail.

US Army Corps of Engineers-Wilmington District
Asheville Regulatory Field Office
151 Patton Avenue, Room 208
Asheville, NC 28801-5006

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

Preliminary ORM Data Entry Fields for New Actions

ACTION ID #: SAW- Begin Date (Date Received):

Prepare file folder ☐ Assign Action ID Number in ORM ☐

1. Project Name [PCN Form A2a]: Banner Farm Mitigation Site

2. Work Type: ☐ Private ☐ Institutional ☑ Government ☐ Commercial

3. Project Description / Purpose [PCN Form B3d and B3e]:

The Banner Farm Mitigation Site is being developed to generate stream and wetland mitigation units for the North Carolina Department of Environmental Quality Division of Mitigation Services. The project proposes to restore approximately 6,080 Linear feet of stream and 33 acres of wetland.

4. Property Owner / Applicant [PCN Form A3 or A4]: Wildlands Engineering, Inc.

5. Agent / Consultant [PNC Form A5 – or ORM Consultant ID Number]:
Jordan Hessler

6. Related Action ID Number(s) [PCN Form B5b]:

7. Project Location – Coordinates, Street Address, and/or Location Description [PCN Form B1b]:

Coordinates: 35.350886, -82.556899
Site Address: 52 Banner Farm Road, Mills River, NC 28759

8. Project Location – Tax Parcel ID [PCN Form B1a]: Multiple (Information Attached)

9. Project Location – County [PCN Form A2b]: Henderson

10. Project Location – Nearest Municipality or Town [PCN Form A2c]: Mills River

11. Project Information – Nearest Waterbody [PCN Form B2a]: French Broad River

12. Watershed / 8-Digit Hydrologic Unit Code [PCN Form B2c]: 06010105

Authorization: Section 10 ☐ Section 404 ☑ Section 10 and 404 ☐

Regulatory Action Type:

- ☐ Standard Permit
- ☐ Nationwide Permit #
- ☐ Regional General Permit #
- ☑ Jurisdictional Determination Request
- ☑ Pre-Application Request
- ☐ Unauthorized Activity
- ☐ Compliance
- ☐ No Permit Required

Revised 20150602

August 12, 2019

Mr. David Brown
Asheville Regulatory Field Office
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006

Subject: **Preliminary Jurisdictional Delineation and Request for Verification**
Banner Farm Mitigation Site
Henderson County, North Carolina

Dear Mr. Brown:

Wildlands Engineering, Inc. (Wildlands) is requesting written verification from the U.S. Army Corps of Engineers (USACE) regarding the extent of potential features within the project area. The Banner Farms Mitigation Site is in Henderson County approximately 3 miles south of Mills River and 6 miles northwest of Hendersonville (Figures 1 & 2). The Banner Farms Mitigation Site is being developed to provide mitigation for unavoidable stream and wetland impacts. Wildlands is currently in the design process of developing a draft mitigation plan.

Methodology

Wildlands delineated potential waters of the U.S. within the proposed project area using the USACE Routine On-Site Determination Method defined by the 1987 Corps of Engineers Wetlands Delineation Manual and subsequent Eastern Mountain and Piedmont Regional Supplement Version 2.0 (2012). Wetland Determination Data Forms representative of on-site wetland areas as well as upland areas are enclosed (DP1-DP6). Non-wetland waters (streams) were reviewed using USACE Ordinary High-Water Marks guidance (2005) and classified using the North Carolina Department of Water Resources (NCDWR) Methodology for Identification of Intermittent and Perennial Streams and Their Origins (Version 4.11, 2010). NCDWR Stream Classification Forms representative of on-site stream channels are enclosed (SCP1-SCP3).

Field Investigation Results

The results of the on-site field investigation indicate there are three streams and 23 wetlands located within the assessment area (Figures 3 – 3.3). The streams are unnamed tributaries (UTs) to the French Broad River (NCDWR Index No. 6-(47.5)), which is classified as a WS-IV, B water. On-site stream channels are located within NCDWR Subbasin 04-03-03 of the French Broad River Basin (HUC# 06010105). Approximate linear footage and acreage of potential on-site waters, within the project area are summarized in Table 1.

Table 1. Summary of Potential On-Site Waters

Feature	Classification	Length (LF)	Acreage (AC)
Banner Creek	Perennial	3,272	-
UT1	Perennial	878	-
UT2	Perennial	1,930	-
Wetland A	Headwater Forest	-	0.54
Wetland B	Headwater Forest	-	0.09
Wetland C	Headwater Forest	-	<0.01
Wetland D	Headwater Forest	-	0.17
Wetland E	Headwater Forest	-	<0.01
Wetland F	Headwater Forest	-	0.03
Wetland G	Headwater Forest	-	0.01
Wetland H	Headwater Forest	-	0.13
Wetland I	Headwater Forest	-	0.02
Wetland J	Headwater Forest	-	0.11
Wetland K	Headwater Forest	-	0.16
Wetland L	Headwater Forest	-	0.04
Wetland M	Headwater Forest	-	<0.01
Wetland N	Headwater Forest	-	<0.01
Wetland O	Headwater Forest	-	0.01
Wetland P	Headwater Forest	-	0.01
Wetland Q	Headwater Forest	-	0.14
Wetland R	Headwater Forest	-	0.15
Wetland S	Headwater Forest	-	1.62
Wetland T	Headwater Forest	-	0.04
Wetland U	Headwater Forest	-	0.04
Wetland V	Headwater Forest	-	<0.01
Wetland W	Headwater Forest	-	0.28
Open Water 1	Canal	-	0.40
Spring Head	Spring	-	-
	Total:	**6,080**	**4.04**

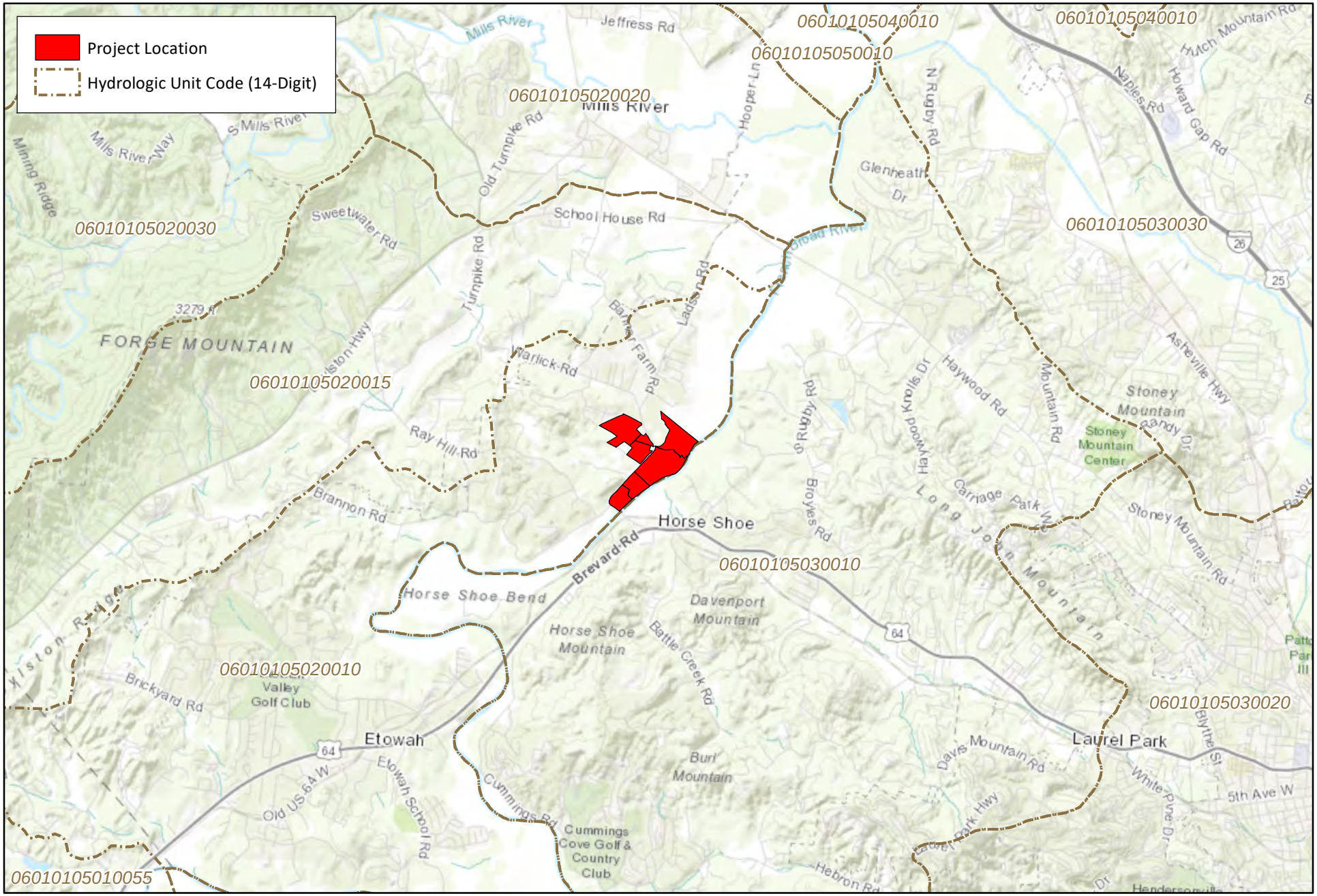
Soils

Soil types within the assessment area shown in figure 4 include Bradson gravelly loam (BaB & BaC). Codorus loam (Co), Delanco loam (DeB), Evard soils (EwF), Hayesville loam (HyE), Rosman loam (Ro), Suncook loamy sand (Su), Tate fine sandy loam (TeC), and Toxaway silt loam (To). Bradson gravelly loam is well drained and found in stream terraces and fans. Codorus loam is a somewhat poorly drained soil that experiences occasional flooding and is typically found in floodplains. Delanco loam experiences occasional flooding, is moderately well drained, and is typically found in depressions on stream terraces. Evard soils are well drained and found on mountain slopes and ridges. Hayesville loam soils are well drained and found on ridges on hillslopes. Rosman loam are well drained, frequently flooded and found in floodplains. Suncook loamy sand are well drained, frequently flooded and found on natural levees on floodplains. Tate fine sandy loam are well drained and found on fans, coves, and drainageways. Toxaway silt loam is frequently flooded, very poorly drained, and found in depressions on floodplains. Soil mapping units are from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm).

Please do not hesitate to contact me at 828-551-8582 or at jhessler@wildlandseng.com should you have any questions regarding this request for jurisdictional verification.

Sincerely,

Jordan Hessler
Environmental Scientist

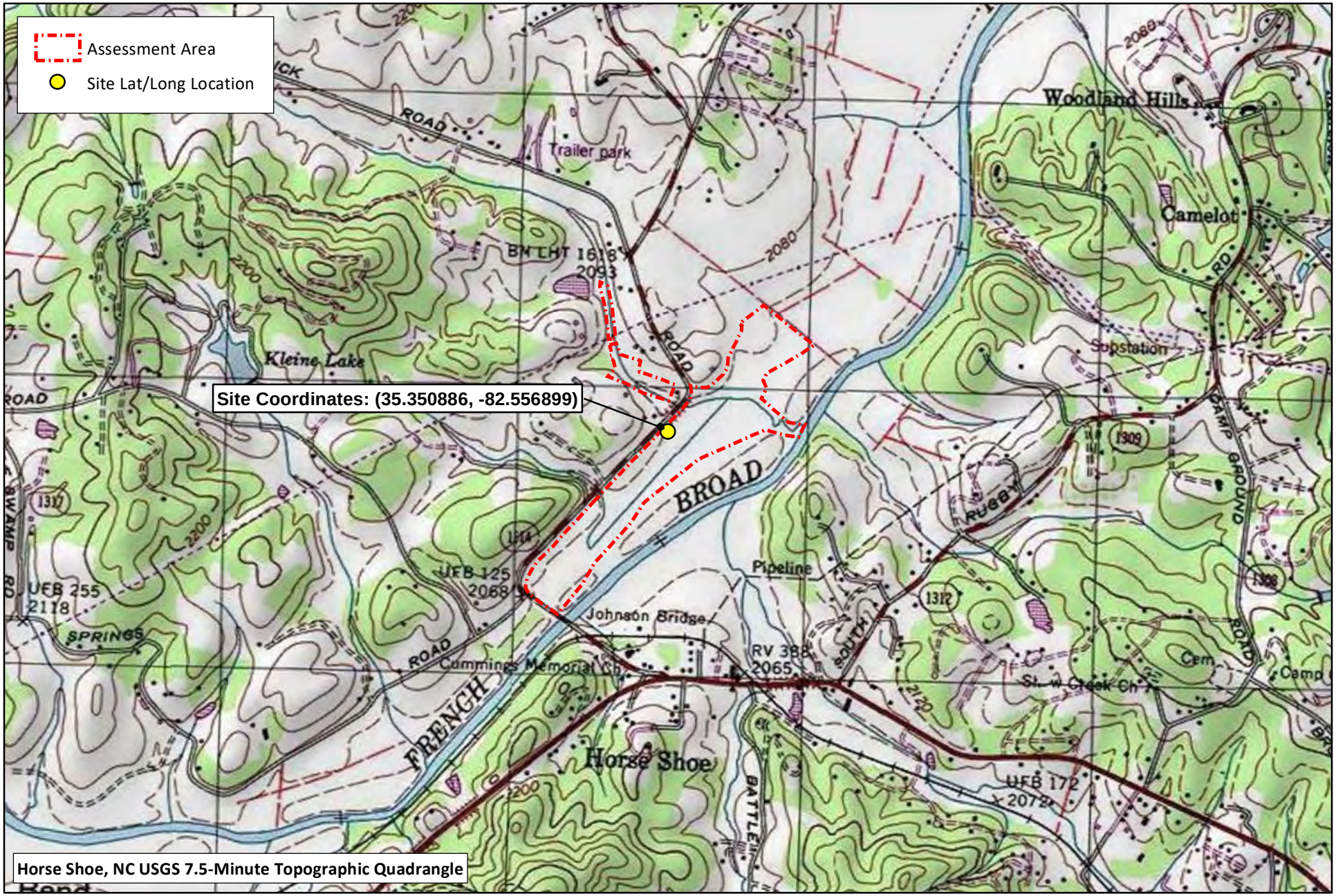


WILDLANDS ENGINEERING

0 1 2 Miles

N

Figure 1 Vicinity Map
Banner Farm Mitigation Site
French Broad 06010105
Henderson County, NC
8/21/2019



WILDLANDS ENGINEERING

0 1,500 3,000 Feet

N

Figure 2 USGS Topographic Map
Banner Farm Mitigation Site
French Broad 06010105
Henderson County, NC
8/21/2019

Assessment Area
Project Parcels
Potential Wetland Waters
Potential Open Waters
Potential Non-Wetland Waters (Perennial)
Non-project Streams

Figure 3.2
Figure 3.3
Figure 3.1

Benton Farms Ln
Banner Creek
UT1
Banner Creek
UT2
Banner Farm Rd
UT2
French Broad River
Cane Path
Bobbie Memorial Dr
Gregory Woods Ln
Banner Farm Rd
Open Water 1
Byron Forest Ln
Ray Hill Rd
Grannon Rd
TR

A
B
C
D
E
F
G
H
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Q
R
S
T
U
V
W

2015 Aerial Imagery

WILDLANDS ENGINEERING

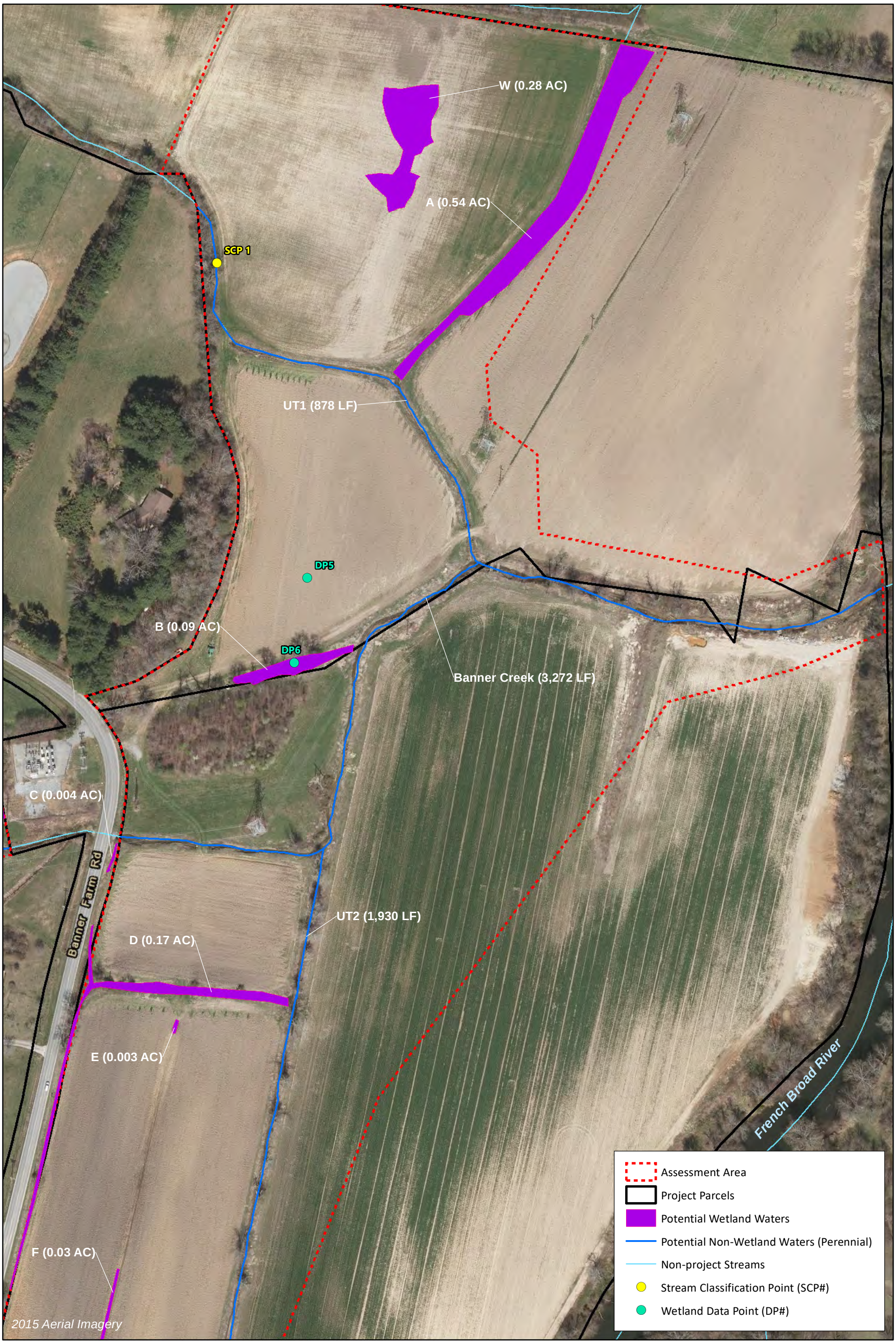
0 350 700 Feet

Figure 3.0 Delineation Map (Overview)
Banner Farm Mitigation Site
French Broad 06010105
Henderson County, NC
10/09/2019

WILDLANDS ENGINEERING

0 150 300 Feet

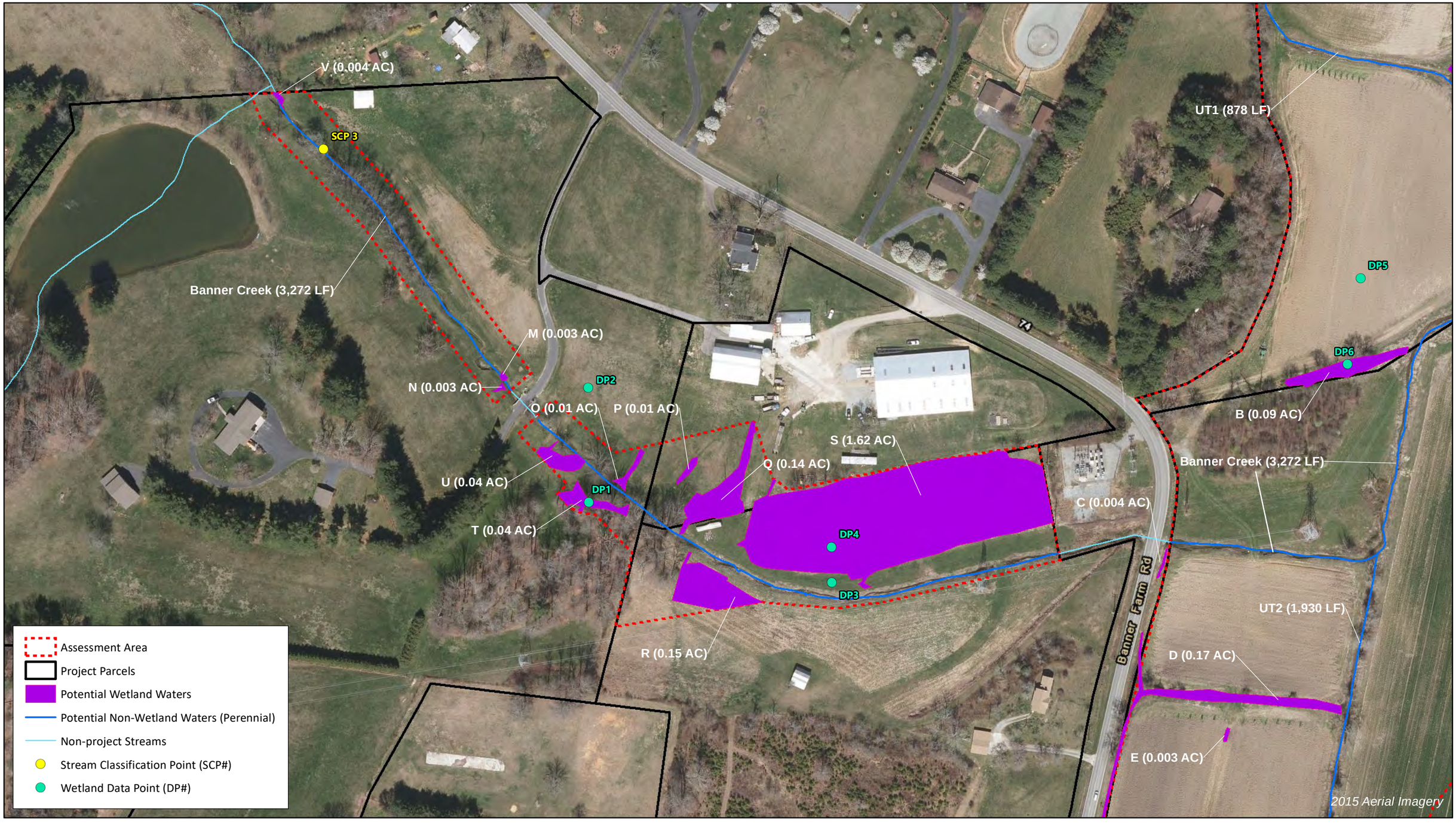
Figure 3.1 Delineation Map
Banner Farm Mitigation Site
French Broad 06010105
Henderson County, NC
10/09/2019



WILDLANDS ENGINEERING

0 150 300 Feet

Figure 3.2 Delineation Map
Banner Farm Mitigation Site
French Broad 06010105
Henderson County, NC
10/09/2019

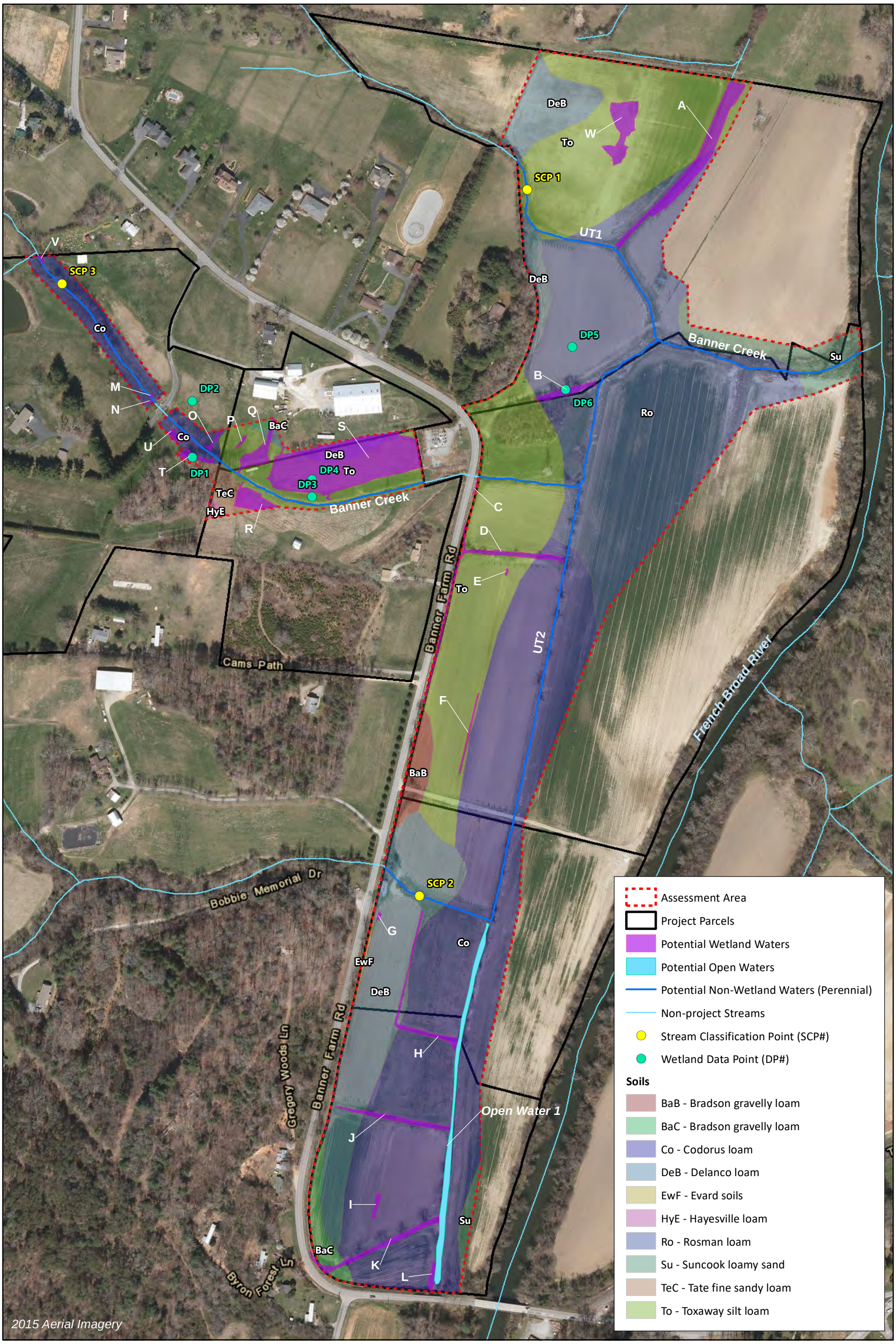


WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3.3 Delineation Map
Banner Farm Mitigation Site
French Broad 06010105
Henderson County, NC
10/09/2019



WILDLANDS ENGINEERING

0 300 600 Feet

Figure 4 Soils Map
Banner Farm Mitigation Site
French Broad 06010105
Henderson County, NC
10/09/2019

Jurisdictional Determination Request

US Army Corps of Engineers
Wilmington District

This form is intended for use by anyone requesting a jurisdictional determination (JD) from the U.S. Army Corps of Engineers, Wilmington District (Corps). Please include all supporting information, as described within each category, with your request. You may submit your request via mail, electronic mail, or facsimile. Requests should be sent to the appropriate project manager of the county in which the property is located. A current list of project managers by assigned counties can be found on-line at: http://www.saw.usace.army.mil/Missions/RegulatoryPermitProgram/Contact/CountyLocator.aspx, by calling 910-251-4633, or by contacting any of the field offices listed below. Once your request is received you will be contacted by a Corps project manager.

ASHEVILLE & CHARLOTTE REGULATORY FIELD OFFICES
US Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006
General Number: (828) 271-7980
Fax Number: (828) 281-8120

RALEIGH REGULATORY FIELD OFFICE
US Army Corps of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587
General Number: (919) 554-4884
Fax Number: (919) 562-0421

WASHINGTON REGULATORY FIELD OFFICE
US Army Corps of Engineers
2407 West Fifth Street
Washington, North Carolina 27889
General Number: (910) 251-4610
Fax Number: (252) 975-1399

WILMINGTON REGULATORY FIELD OFFICE
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, North Carolina 28403
General Number: 910-251-4633
Fax Number: (910) 251-4025

INSTRUCTIONS:

All requestors must complete Parts A, B, C, D, E, F and G.

NOTE TO CONSULTANTS AND AGENCIES: If you are requesting a JD on behalf of a paying client or your agency, please note the specific submittal requirements in **Part H**.

NOTE ON PART D – PROPERTY OWNER AUTHORIZATION: Please be aware that all JD requests must include the current property owner authorization for the Corps to proceed with the determination, which may include inspection of the property when necessary. This form must be signed by the current property owner(s) or the owner(s) authorized agent to be considered a complete request.

NOTE ON PART D - NCDOT REQUESTS: Property owner authorization/notification for JD requests associated with North Carolina Department of Transportation (NCDOT) projects will be conducted according to the current NCDOT/USACE protocols.

NOTE TO USDA PROGRAM PARTICIPANTS: A Corps approved or preliminary JD 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 also request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

A. PARCEL INFORMATION

Street Address: 52 Banner Farm Road

City, State: Mills River, NC

County: Henderson

Parcel Index Number(s) (PIN): Multiple (Information Attached)

B. REQUESTOR INFORMATION

Name: Jordan Hessler

Mailing Address: 167-B Haywood Road

Asheville, NC 28806

Telephone Number: 828-551-8582

Electronic Mail Address: jhessler@wildlandseng.com

Select one:

- ☐ I am the current property owner.
- ☑ I am an Authorized Agent or Environmental Consultant[1]
- ☐ Interested Buyer or Under Contract to Purchase
- ☐ Other, please explain. _____

C. PROPERTY OWNER INFORMATION[2]

Name: Multiple (Information Attached)

Mailing Address: _____

Telephone Number: _____

Electronic Mail Address: _____

[1] Must provide completed Agent Authorization Form/Letter.

[2] Documentation of ownership also needs to be provided with request (copy of Deed, County GIS/Parcel/Tax Record).

D. PROPERTY ACCESS CERTIFICATION[3,4]

By signing below, I authorize representatives of the Wilmington District, U.S. Army Corps of Engineers (Corps) to enter upon the property herein described for the purpose of conducting on-site investigations, if necessary, and issuing a jurisdictional determination pursuant to Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899. I, the undersigned, am either a duly authorized owner of record of the property identified herein, or acting as the duly authorized agent of the owner of record of the property.

Jordan Hessler
Print Name

Capacity: ☐ Owner ☑ Authorized Agent[5]

8-12-19
Date

Jordan Hessler
Signature

E. REASON FOR JD REQUEST: (Check as many as applicable)

☐ I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all aquatic resources.

☐ I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all jurisdictional aquatic resources under Corps authority.

☑ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps, and the JD would be used to avoid and minimize impacts to jurisdictional aquatic resources and as an initial step in a future permitting process.

☐ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps; this request is accompanied by my permit application and the JD is to be used in the permitting process.

☐ I intend to construct/develop a project or perform activities in a navigable water of the U.S. which is included on the district Section 10 list and/or is subject to the ebb and flow of the tide.

☐ A Corps JD is required in order obtain my local/state authorization.

☐ I intend to contest jurisdiction over a particular aquatic resource and request the Corps confirm that jurisdiction does/does not exist over the aquatic resource on the parcel.

☐ I believe that the site may be comprised entirely of dry land.

☑ Other: This is an initial step for future permitting of a stream and wetland restoration project that will involve impacts to aquatic resources.

[3] For NCDOT requests following the current NCDOT/USACE protocols, skip to Part E.

[4] If there are multiple parcels owned by different parties, please provide the following for each additional parcel on a continuation sheet.

[5] Must provide agent authorization form/letter signed by owner(s).

F. JURISDICTIONAL DETERMINATION (JD) TYPE (Select One)

☑ I am requesting that the Corps provide a preliminary JD for the property identified herein.

A Preliminary Jurisdictional Determination (PJD) provides an indication that there may be "waters of the United States" or "navigable waters of the United States"on a property. PJDs are sufficient as the basis for permit decisions. For the purposes of permitting, all waters and wetlands on the property will be treated as if they are jurisdictional "waters of the United States". PJDs cannot be appealed (33 C.F.R. 331.2); however, a PJD is "preliminary" in the sense that an approved JD can be requested at any time. PJDs do not expire.

☐ I am requesting that the Corps provide an approved JD for the property identified herein.

An Approved Jurisdictional Determination (AJD) is a determination that jurisdictional "waters of the United States" or "navigable waters of the United States" are either present or absent on a site. An approved JD identifies the limits of waters on a site determined to be jurisdictional under the Clean Water Act and/or Rivers and Harbors Act. Approved JDs are sufficient as the basis for permit decisions. AJDs are appealable (33 C.F.R. 331.2). The results of the AJD will be posted on the Corps website. A landowner, permit applicant, or other "affected party" (33 C.F.R. 331.2) who receives an AJD may rely upon the AJD for five years (subject to certain limited exceptions explained in Regulatory Guidance Letter 05-02).

☐ I am unclear as to which JD I would like to request and require additional information to inform my decision.

G. ALL REQUESTS

☑ Map of Property or Project Area. This Map must clearly depict the boundaries of the review area.

☑ Size of Property or Review Area 61.1 acres.

☐ The property boundary (or review area boundary) is clearly physically marked on the site.

H. REQUESTS FROM CONSULTANTS

☑ Project Coordinates (Decimal Degrees): Latitude: 35.350886
Longitude: -82.556899

☑ A legible delineation map depicting the aquatic resources and the property/review area. Delineation maps must be no larger than 11x17 and should contain the following: (Corps signature of submitted survey plats will occur after the submitted delineation map has been reviewed and approved).[6]

- North Arrow
- Graphical Scale
- Boundary of Review Area
- Date
- Location of data points for each Wetland Determination Data Form or tributary assessment reach.

For Approved Jurisdictional Determinations:

- Jurisdictional wetland features should be labeled as Wetland Waters of the US, 404 wetlands, etc. Please include the acreage of these features.
- Jurisdictional non-wetland features (i.e. tidal/navigable waters, tributaries, impoundments) should be labeled as Non-Wetland Waters of the US, stream, tributary, open water, relatively permanent water, pond, etc. Please include the acreage or linear length of each of these features as appropriate.
- Isolated waters, waters that lack a significant nexus to navigable waters, or non-jurisdictional upland features should be identified as Non-Jurisdictional. Please include a justification in the label regarding why the feature is non-jurisdictional (i.e. "Isolated", "No Significant Nexus", or "Upland Feature"). Please include the acreage or linear length of these features as appropriate.

For Preliminary Jurisdictional Determinations:

- Wetland and non-wetland features should not be identified as Jurisdictional, 404, Waters of the United States, or anything that implies jurisdiction. These features can be identified as Potential Waters of the United States, Potential Non-wetland Waters of the United States, wetland, stream, open water, etc. Please include the acreage and linear length of these features as appropriate.

☑ Completed Wetland Determination Data Forms for appropriate region
(at least one wetland and one upland form needs to be completed for each wetland type)

[6] Please refer to the guidance document titled "Survey Standards for Jurisdictional Determinations" to ensure that the supplied map meets the necessary mapping standards. http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Jurisdiction/

- [x] Completed appropriate Jurisdictional Determination form
  - **PJDs,** please complete a Preliminary Jurisdictional Determination Form[7] and include the Aquatic Resource Table
  - **AJDs**, please complete an Approved Jurisdictional Determination Form[8]
- [x] Vicinity Map
- [x] Aerial Photograph
- [x] USGS Topographic Map
- [x] Soil Survey Map
- [ ] Other Maps, as appropriate (e.g. National Wetland Inventory Map, Proposed Site Plan, previous delineation maps, LIDAR maps, FEMA floodplain maps)
- [x] Landscape Photos (if taken)
- [ ] NCSAM and/or NCWAM Assessment Forms and Rating Sheets
- [x] NC Division of Water Resources Stream Identification Forms
- [ ] Other Assessment Forms

[7] www.saw.usace.army.mil/Portals/59/docs/regulatory/regdocs/JD/RGL_08-02_App_A_Prelim_JD_Form_fillable.pdf
[8] Please see http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Jurisdiction/

Principal Purpose: The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the project area subject to federal jurisdiction under the regulatory authorities referenced above.
Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in the approved jurisdictional determination (AJD), which will be made available to the public on the District's website and on the Headquarters USAGE website.
Disclosure: Submission of requested information is voluntary; however, if information is not provided, the request for an AJD cannot be evaluated nor can an AJD be issued.

Banner Farms Mitigation Site – Parcel Information

Parcel Information:

PIN: 9630826726

Street Address:
60 Banner Farm Road
Mills River, NC 28759

Property Owner Information:
Mitchell W. & Wendy L. Gaither
60 Banner Farm Road
Mills River, NC 28759

Parcel Information:

PIN: 9630924395

Street Address:
56 Banner Farm Road
Mills River, NC 28759

Property Owner Information:
Mountain Bean Holdings, Inc.
PO Box 637
Horse Shoe, NC 28742

Parcel Information:

PIN: 9630912884

Street Address:
52 Banner Farms Road
Mills River, NC 28759

Property Owner Information:
Vine Ripe Investments, Inc.
PO Box 609
Horse Shoe, NC 28742

Parcel Information:

PIN: 9640028341

Street Address:
SR1314 on Banner Farm Road (No Address Assigned)
Mills River, NC 28759

Property Owner Information:
Mountain Bean Holdings, Inc.
PO Box 637
Horse Shoe, NC 28742

Parcel Information:

PIN: 9630919204

Street Address:
SR1314 on Banner Farm Road (No Address Assigned)
Mills River, NC 28759

Property Owner Information:
Kirby E. & Sherri L. Johnson
207 E Price Street
Hendersonville, NC 28739

Parcel Information:

PIN: 9630900480

Street Address:
SR1314 on Banner Farm Road (No Address Assigned)
Mills River, NC 28759

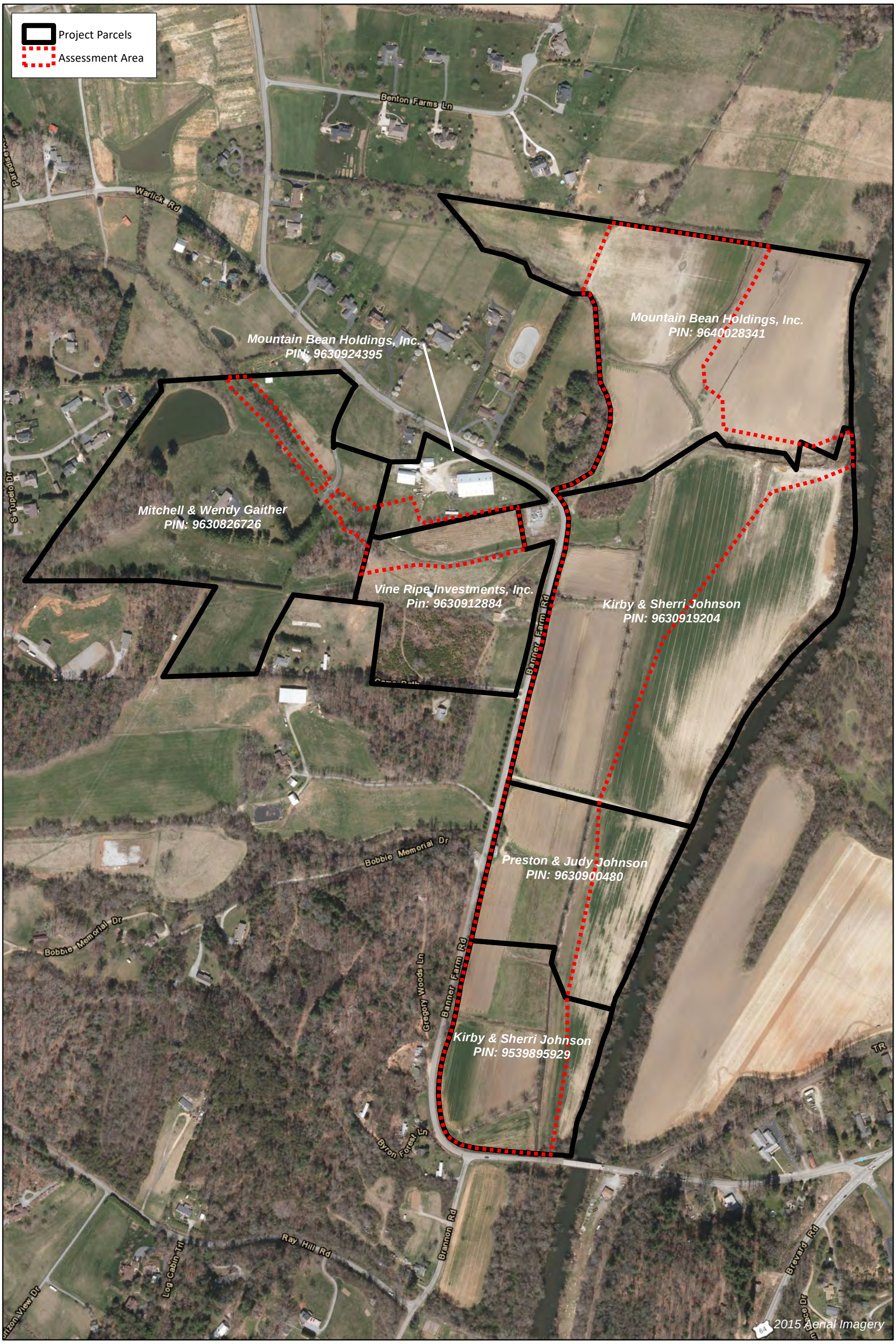
Property Owner Information:
Preston P. & Judy K. Johnson
PO Box 901177
Homestead, FL 33090

Parcel Information:

PIN: 9539895929

Street Address:
SR1314 on Banner Farm Road (No Address Assigned)
Mills River, NC 28754

Property Owner Information:
Kirby E. & Sherri L. Johnson
207 E Price Street
Hendersonville, NC 28739



WILDLANDS ENGINEERING

0 175 350 525 700 Feet

Parcel Map
Banner Farm Mitigation Site
French Broad 06010105
Henderson County, NC
8/21/2019

WARNING: THIS IS NOT A SURVEY

Parcel Information

REID:	1017536	**Pin:**	9630826726
Listed to:	GAITHER, MITCHELL W;GAITHER, WENDY L	**Neighborhood:**	ETOWAH/ HORSESHOE (C)
Mailing Address:	60 BANNER FARM RD	**Township:**	Mills River
Mailing City, State, Zip:	MILLS RIVER, NC 28759	**Municipality:**	
Physical Address:	60 BANNER FARM RD	**Tax District:**	ETOWAH - HORSE SHOE FIRE
Deed:	001598/00219	**Plat:**	SLD 9217
Date Recorded:	2014-11-25 00:01:00.0	**Elementary School District:**	MILLS RIVER
Revenue Stamps:	0	**Middle School District:**	RUGBY MIDDLE
County Zoning:	R2,R2R	**High School District:**	WEST HIGH
Property Description:	SR1314 ON BANNER FARM RD| BMSLD-9217	**Soil:**	
Map Sheet:	9630.00	**Voting Precinct:**	Mills River South
Assessed Acreage:	29.55000000	**Commissioner District**	3
Building Value:	$437,400.00	**Agricultural District**	None Found
Land Value:	$296,600.00	**North Carolina House District**	117
Value To Be Billed:	$734,000.00	**U.S. House District**	11
North Carolina Senate District	48	**Flood Zone:**	Zone X, Not Shaded (Areas outside of the floodplain),Zone AE, 1% (100 Year Floodplain),Zone X, Shaded, 0.2% (500 Year Floodplain)

Henderson County
Geographic Information Systems (GIS)
200 North Grove Street
Hendersonville, NC 28792
P: (828) 698-5124
F: (828) 698-5122

THIS IS NOT A SURVEY.

WARNING: THIS IS NOT A SURVEY

Parcel Information

REID:	1017435	**Pin:**	9630924395
Listed to:	MOUNTAIN BEAN HOLDINGS, INC.	**Neighborhood:**	ETOWAH/ HORSESHOE (C)
Mailing Address:	PO BOX 637	**Township:**	Mills River
Mailing City, State, Zip:	HORSE SHOE, NC 28742	**Municipality:**	
Physical Address:	56 BANNER FARM RD	**Tax District:**	ETOWAH - HORSE SHOE FIRE
Deed:	003150/00641	**Plat:**	SLD 9217
Date Recorded:	2018-01-05 16:30:00.0	**Elementary School District:**	MILLS RIVER
Revenue Stamps:	0	**Middle School District:**	RUGBY MIDDLE
County Zoning:	R2	**High School District:**	WEST HIGH
Property Description:	SR1314 ON BANNER FARM RD BMSLD-9217	**Soil:**	
Map Sheet:	9630.00	**Voting Precinct:**	Mills River South
Assessed Acreage:	4.25000000	**Commissioner District**	3
Building Value:	$29,200.00	**Agricultural District**	French Broad
Land Value:	$40,500.00	**North Carolina House District**	117
Value To Be Billed:	$69,700.00	**U.S. House District**	11
North Carolina Senate District	48	**Flood Zone:**	Zone X, Not Shaded (Areas outside of the floodplain),Zone AE, 1% (100 Year Floodplain),Zone X, Shaded, 0.2% (500 Year Floodplain)

Henderson County
Geographic Information Systems (GIS)
200 North Grove Street
Hendersonville, NC 28792
P: (828) 698-5124
F: (828) 698-5122

THIS IS NOT A SURVEY.

WARNING: THIS IS NOT A SURVEY

Parcel Information

REID:	9934020	**Pin:**	9630912884
Listed to:	VINE RIPE INVESTMENTS, INC.	**Neighborhood:**	ETOWAH/ HORSESHOE (C)
Mailing Address:	PO BOX 609	**Township:**	Mills River
Mailing City, State, Zip:	HORSE SHOE, NC 28742	**Municipality:**	
Physical Address:	52 BANNER FARM RD	**Tax District:**	ETOWAH - HORSE SHOE FIRE
Deed:	003150/00631	**Plat:**	Not Available
Date Recorded:	2018-01-05 16:27:00.0	**Elementary School District:**	MILLS RIVER
Revenue Stamps:	0	**Middle School District:**	RUGBY MIDDLE
County Zoning:	R2R	**High School District:**	WEST HIGH
Property Description:	SR1314 ON BANNER FARM RD	**Soil:**	
Map Sheet:	9630.00	**Voting Precinct:**	Mills River South
Assessed Acreage:	12.52000000	**Commissioner District**	3
Building Value:	$94,100.00	**Agricultural District**	French Broad
Land Value:	$87,600.00	**North Carolina House District**	117
Value To Be Billed:	$181,700.00	**U.S. House District**	11
North Carolina Senate District	48	**Flood Zone:**	Zone X, Not Shaded (Areas outside of the floodplain),Zone AE, 1% (100 Year Floodplain),Zone X, Shaded, 0.2% (500 Year Floodplain)

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Hendersonville, NC 28792
P: (828) 698-5124
F: (828) 698-5122

WARNING: THIS IS NOT A SURVEY

Parcel Information

REID:	802562	**Pin:**	9640028341
Listed to:	MOUNTAIN BEAN HOLDINGS, INC.	**Neighborhood:**	MILLS RIVER R/30
Mailing Address:	PO BOX 637	**Township:**	Mills River
Mailing City, State, Zip:	HORSE SHOE, NC 28742	**Municipality:**	
Physical Address:	0 NO ADDRESS ASSIGNED	**Tax District:**	ETOWAH - HORSE SHOE FIRE
Deed:	003150/00641	**Plat:**	Not Available
Date Recorded:	2018-01-05 16:30:00.0	**Elementary School District:**	MILLS RIVER
Revenue Stamps:	0	**Middle School District:**	RUGBY MIDDLE
County Zoning:	R2	**High School District:**	WEST HIGH
Property Description:	SR1314 ON LADSON RD	**Soil:**	
Map Sheet:	9640.00	**Voting Precinct:**	Mills River South
Assessed Acreage:	30.68000000	**Commissioner District**	3
Building Value:	$0.00	**Agricultural District**	French Broad
Land Value:	$232,000.00	**North Carolina House District**	117
Value To Be Billed:	$232,000.00	**U.S. House District**	11
North Carolina Senate District	48	**Flood Zone:**	Zone X, Not Shaded (Areas outside of the floodplain),Zone AE, 1% (100 Year Floodplain),Floodway Areas in Zone AE,Zone X, Shaded, 0.2% (500 Year Floodplain)

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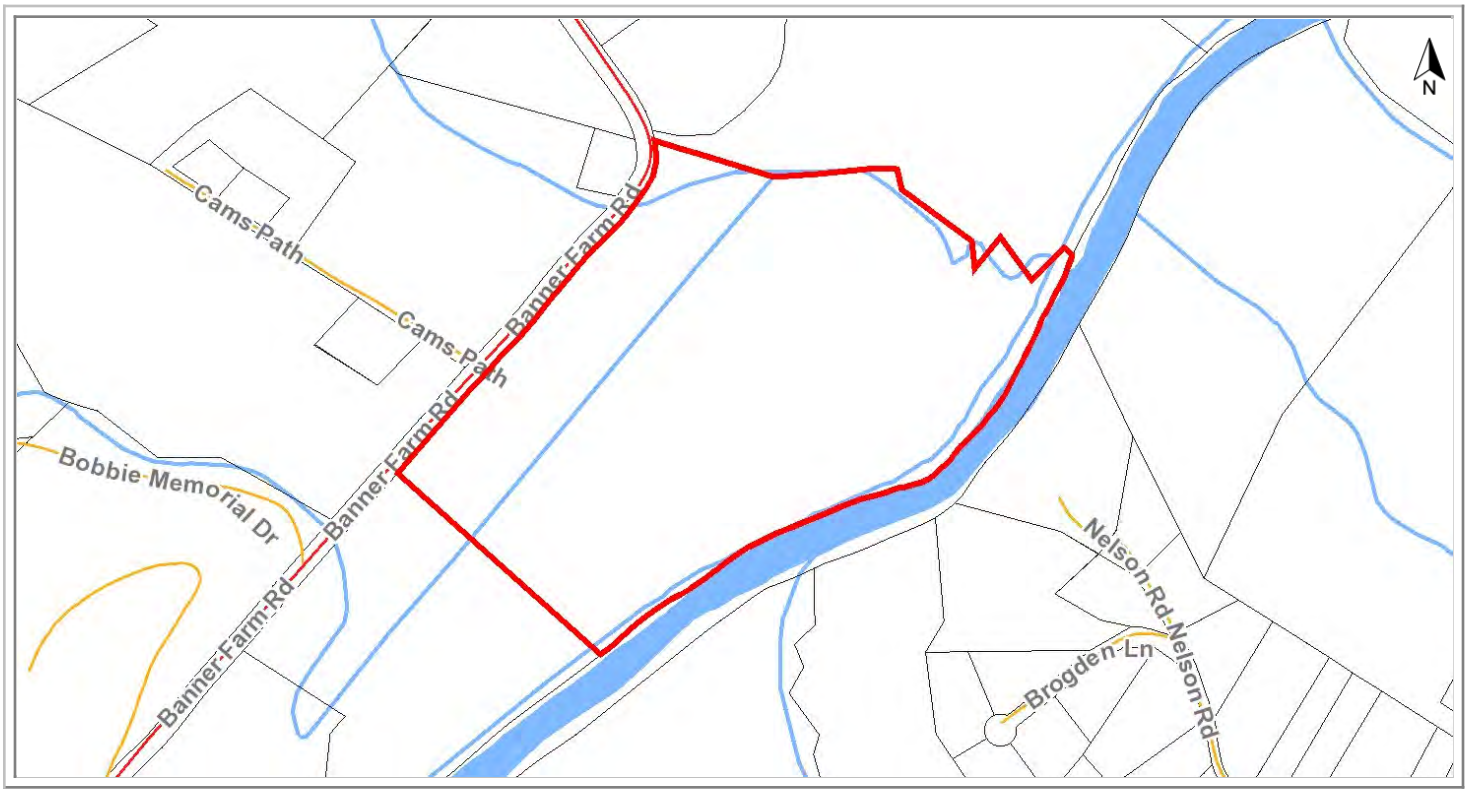

WARNING: THIS IS NOT A SURVEY

Parcel Information

REID:	9901818	**Pin:**	9630919204
Listed to:	JOHNSON, KIRBY E;JOHNSON, SHERRI L	**Neighborhood:**	ETOWAH/ HORSESHOE (C)
Mailing Address:	207 E PRICE ST	**Township:**	Mills River
Mailing City, State, Zip:	HENDERSONVLLE, NC 28739	**Municipality:**	
Physical Address:	0 NO ADDRESS ASSIGNED	**Tax District:**	ETOWAH - HORSE SHOE FIRE
Deed:	000831/00023	**Plat:**	Not Available
Date Recorded:	1993-10-15 00:02:00.0	**Elementary School District:**	MILLS RIVER
Revenue Stamps:	123	**Middle School District:**	RUGBY MIDDLE
County Zoning:	R2,R2R	**High School District:**	WEST HIGH
Property Description:	SR1314 BANNER FARM RD ON	**Soil:**	
Map Sheet:	9630.00	**Voting Precinct:**	Mills River South
Assessed Acreage:	40.97000000	**Commissioner District**	3
Building Value:	$0.00	**Agricultural District**	French Broad
Land Value:	$229,300.00	**North Carolina House District**	117
Value To Be Billed:	$229,300.00	**U.S. House District**	11
North Carolina Senate District	48	**Flood Zone:**	Zone AE, 1% (100 Year Floodplain),Floodway Areas in Zone AE,Zone X, Shaded, 0.2% (500 Year Floodplain)

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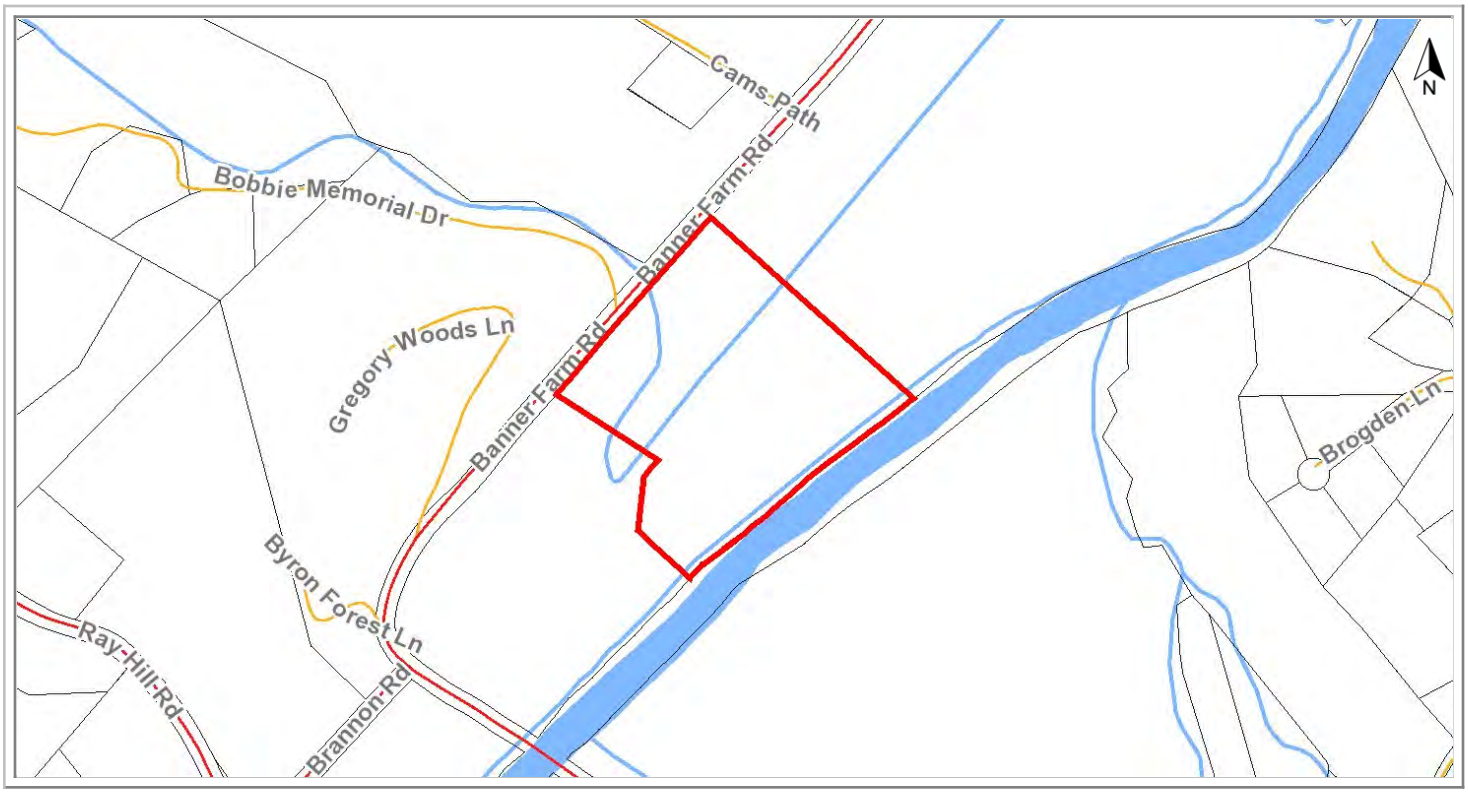

WARNING: THIS IS NOT A SURVEY

Parcel Information

REID:	9901591	**Pin:**	9630900480
Listed to:	JOHNSON, PRESTON P;JOHNSON, JUDY K	**Neighborhood:**	ETOWAH/ HORSESHOE (C)
Mailing Address:	PO BOX 901177	**Township:**	Mills River
Mailing City, State, Zip:	HOMESTEAD, FL 33090	**Municipality:**	
Physical Address:	0 NO ADDRESS ASSIGNED	**Tax District:**	ETOWAH - HORSE SHOE FIRE
Deed:	000849/00853	**Plat:**	Not Available
Date Recorded:	1994-08-03 00:02:00.0	**Elementary School District:**	MILLS RIVER
Revenue Stamps:	44	**Middle School District:**	RUGBY MIDDLE
County Zoning:	R2R	**High School District:**	WEST HIGH
Property Description:	SR1314 ON BANNER FM RD	**Soil:**	
Map Sheet:	9630.00	**Voting Precinct:**	Mills River South
Assessed Acreage:	13.74000000	**Commissioner District**	3
Building Value:	$0.00	**Agricultural District**	None Found
Land Value:	$77,800.00	**North Carolina House District**	117
Value To Be Billed:	$77,800.00	**U.S. House District**	11
North Carolina Senate District	48	**Flood Zone:**	Zone AE, 1% (100 Year Floodplain),Floodway Areas in Zone AE

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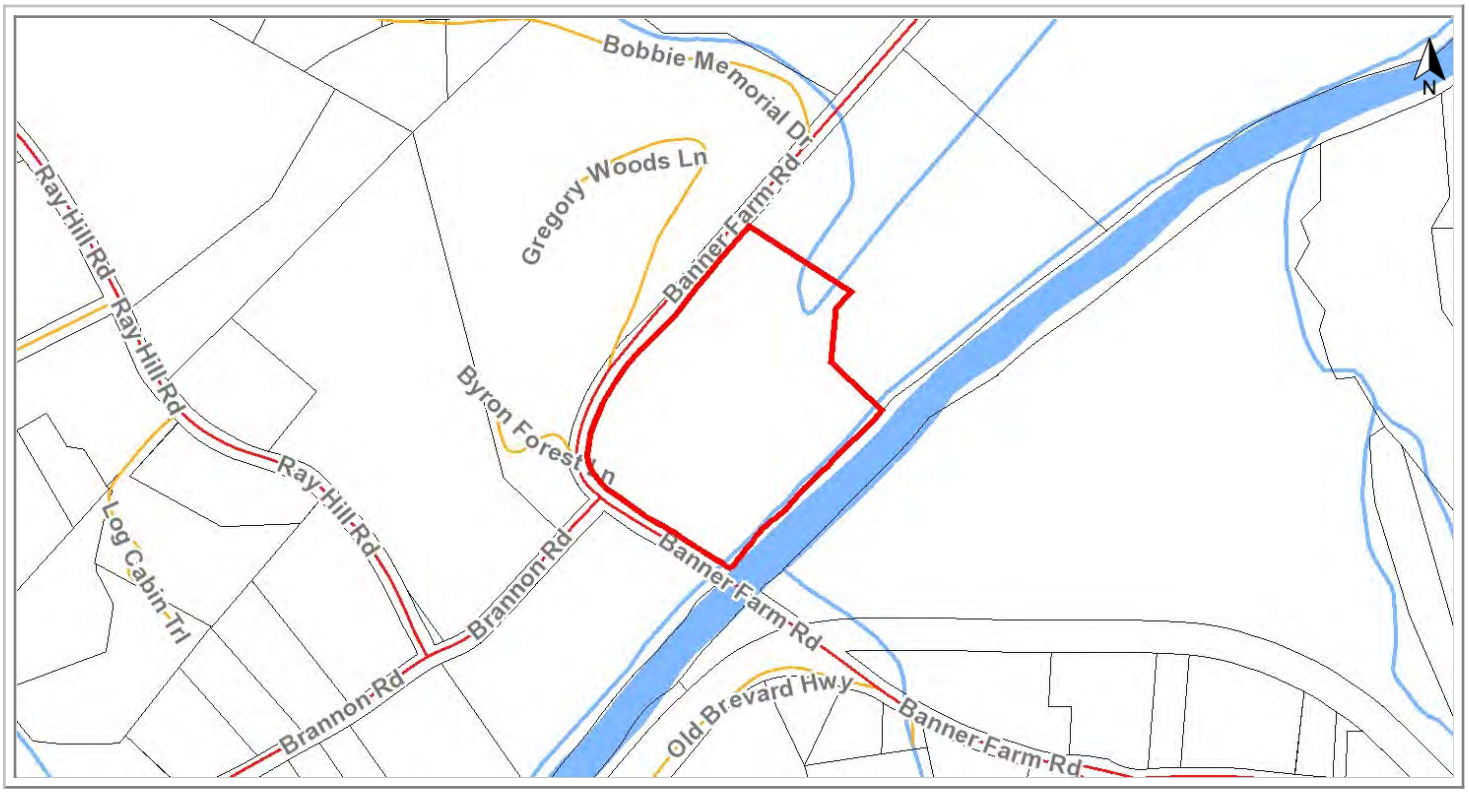

WARNING: THIS IS NOT A SURVEY

Parcel Information

REID:	1013093	**Pin:**	9539895929
Listed to:	JOHNSON, KIRBY E;JOHNSON, SHERRI L	**Neighborhood:**	ETOWAH/ HORSESHOE (C)
Mailing Address:	207 PRICE STREET	**Township:**	Mills River
Mailing City, State, Zip:	HENDERSONVLLE, NC 28739	**Municipality:**	
Physical Address:	0 NO ADDRESS ASSIGNED	**Tax District:**	ETOWAH - HORSE SHOE FIRE
Deed:	001426/00625	**Plat:**	SLD 8040
Date Recorded:	2010-04-21 00:02:00.0	**Elementary School District:**	MILLS RIVER
Revenue Stamps:	0	**Middle School District:**	RUGBY MIDDLE
County Zoning:	R2R	**High School District:**	WEST HIGH
Property Description:	SR1331 ON BANNER FARM RD BMSLD-8040	**Soil:**	
Map Sheet:	9539.00	**Voting Precinct:**	Mills River South
Assessed Acreage:	12.61000000	**Commissioner District**	3
Building Value:	$0.00	**Agricultural District**	French Broad
Land Value:	$107,200.00	**North Carolina House District**	117
Value To Be Billed:	$107,200.00	**U.S. House District**	11
North Carolina Senate District	48	**Flood Zone:**	Zone AE, 1% (100 Year Floodplain),Floodway Areas in Zone AE,Zone X, Shaded, 0.2% (500 Year Floodplain)

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PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: 8/9/2019

B. NAME AND ADDRESS OF PERSON REQUESTING PJD: Wildlands Engineering, Inc., Jordan Hessler, 167-B Haywood Road, Asheville, NC 28806

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: Wilmington District, Banner Farm Mitigation Site, N/A

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION: 52 Banner Farms Road**,** Mills River, NC 28759

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

State: North Carolina County: Henderson City: Mills River
Center coordinates of site (lat/long in degree decimal format): Latitude: 35.350886 Longitude: -82.556899

Universal Transverse Mercator: UTM 17

Name of nearest waterbody: French Broad River

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

☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s):6/4/19 – 6/7/19

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)
1.) Banner Creek	35.35539	-82.55942	3,272 LF	Non-wetland waters	Section 404
2.) UT1	35.35356	-82.55421	878 LF	Non-wetland waters	Section 404
3.) UT2	35.34857	-82.55913	1,930 LF	Non-wetland waters	Section 404
4.) Wetland A	35.353209	-82.552293	0.54	Wetland waters	Section 404
5.) Wetland B	35.351927	-82.554840	0.09	Wetland waters	Section 404
6.) Wetland C	35.351520	-82.556267	0.004	Wetland waters	Section 404
7.) Wetland D	35.350908	-82.556404	0.17	wetland waters	Section 404
8.) Wetland E	35.350698	-82.556398	0.003	Wetland waters	Section 404
9.) Wetland F	35.349546	-82.557627	0.03	Wetland waters	Section 404
10.) Wetland G	35.348435	-82.559495	0.01	Wetland waters	Section 404
11.) Wetland H	35.347386	-82.559793	0.13	Wetland waters	Section 404

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resources in review area (acreage and linear feet, if applicable	Type of aquatic resources (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
12.) Wetland I	35.346085	-82.561050	0.02	Wetland waters	Section 404
13.) Wetland J	35.346677	-82.560354	0.11	Wetland waters	Section 404
14.) Wetland K	35.345746	-82.561251	0.16	Wetland waters	Section 404
15.) Wetland L	35.345256	-82.560874	0.04	Wetland waters	Section 404
16.) Wetland M	35.353680	-82.559013	0.003	Wetland waters	Section 404
17.) Wetland N	35.353641	-82.559056	0.003	Wetland waters	Section 404
18.) Wetland O	35.353030	-82.558640	0.01	Wetland waters	Section 404
19.) Wetland P	35.352911	-82.558349	0.01	Wetland waters	Section 404
20.) Wetland Q	35.352746	-82.558248	0.14	Wetland waters	Section 404
21.) Wetland R	35.352391	-82.558560	0.15	Wetland waters	Section 404
22.) Wetland S	35.352292	-82.557848	1.62	Wetland waters	Section 404
23.) Wetland T	35.352990	-82.558923	0.04	Wetland waters	Section 404
24.) Wetland U	35.353294	-82.558995	0.04	Wetland waters	Section 404
25.) Wetland V	35.355278	-82.559389	0.004	Wetland waters	Section 404
25.) Wetland W	35.353934	-82.552684	0.28	Wetland waters	Section 404
26.) Open Water 1	35.34724	-82.559173	0.40	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 should be included in subject file. Appropriately reference sources below where indicated for all checked items:

☒ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
Map: GIS figures including Vicinity, USGS Topographic, Delineation, & Soils

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

☐ 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: 1:24,000 Scale Horse Shoe quadrangle

☒ Natural Resources Conservation Service Soil Survey. Citation: NRCS Web Soil Survey Website

☐ 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): 2015 aerial on GIS figures with submittal.

or ☒Other (Name & Date): Representative site photos with submittal.

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

☐ Other information (please specify):_____

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.

_____
Signature and date of Regulatory staff member completing PJD
DATE

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.

Banner Creek

UT1

UT2

Wetland A

Wetland B

Wetland C

Wetland D

Wetland E

Wetland F

Wetland H

Wetland J

Wetland K

Wetland L

Wetland M

Wetland N

Wetland O

Wetland P

Wetland Q

Wetland S

Wetland U

Wetland V

Wetland W

U.S. Army Corps of Engineers

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Banner Farm Mitigation Site City/County: Henderson Sampling Date: 6-5-19

Applicant/Owner: Wildlands Engineering, Inc. State: NC Sampling Point: DP1

Investigator(s): Jordan Hessler Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Hilllside Local relief (concave, convex, none): concave Slope (%): 0%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.342990 Long: -82.558923 Datum: NAD 83

Soil Map Unit Name: Codorus Loam (Co) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation x , Soil x , or Hydrology x significantly disturbed? Are "Normal Circumstances" present? Yes x No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area**		
Hydric Soil Present?	Yes X	No ____	**within a Wetland?**	**Yes** X	**No** ____
Wetland Hydrology Present?	Yes X	No ____			

Remarks:
Sampling point is in a seep next to an intermittent stream. The data point is for wetlands M, N, O, P, T, U, and V. Data point was taken in wetland T. The sampling point is in a manipulated area where the floodplain was filled, and the vegetation is continuously maintained. These factors attribute to the disturbance of vegetation, soils, and hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- X High Water Table (A2)
- x Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- x Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- x True Aquatic Plants (B14)
- ____ Hydrogen Sulfide Odor (C1)
- x Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- x Sparsely Vegetated Concave Surface (B8)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- x Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No x	Depth (inches): ____
Water Table Present?	Yes x	No ____	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes x	No ____	Depth (inches): 1

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP1

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Clethra acuminata*	30	Yes	
2. *Acer spicatum*	20	Yes	FACU
3. *Betula nigra*	10	No	FACW
4. *Oxydendrum arboreum*	5	No	UPL
5.			
6.			
7.			
	65	=Total Cover	
50% of total cover: 33		20% of total cover: 13	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Oxydendrum arboreum*	5	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	5	=Total Cover	
50% of total cover: 3		20% of total cover: 1	
Herb Stratum (Plot size: 5)			
1. *Microstegium vimineum*	15	Yes	FAC
2. *Sparganium*	5	Yes	OBL
3. *Thelypteris novboracensis*	5	Yes	FAC
4. *Sagittaria latifolia*	5	Yes	OBL
5. *Impatiens capensis*	5	Yes	FACW
6. *Fescue*	5	Yes	
7.			
8.			
9.			
10.			
11.			
	40	=Total Cover	
50% of total cover: 20		20% of total cover: 8	
Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 55.6% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	15	x 2 =	30
FAC species	20	x 3 =	60
FACU species	20	x 4 =	80
UPL species	10	x 5 =	50
Column Totals:	75 (A)		230 (B)

Prevalence Index = B/A = 3.07

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: DP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/1	95	7.5YR 4/6	5	D	PL	Loamy/Clayey	
10-15	10YR 5/1	95	7.5YR 5/8	5	D	M	Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

U.S. Army Corps of Engineers

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Banner Farm Mitigation Site City/County: Henderson Sampling Date: 6-5-19

Applicant/Owner: Wildlands Engineering, Inc. State: NC Sampling Point: DP2

Investigator(s): Jordan Hessler Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Hillside Local relief (concave, convex, none): None Slope (%): 2%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.353452 Long: -82.558627 Datum: NAD 83

Soil Map Unit Name: Codorus loam (Co) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No x	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No x	

Remarks:
The sampling point is in a large mowed lawn. The sampling point is in a manipulated area where the floodplain was filled, and the vegetation is continuously maintained. These factors attribute to the disturbance of vegetation, soils, and hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No x	Depth (inches): ____
Water Table Present?	Yes ____	No x	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No x	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No x

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No hydrologic Indicators present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP2

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5)			
1. *Fescue*	90	Yes	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 =Total Cover		
50% of total cover: 45	20% of total cover: 18		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	0 (A)		0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** x

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/6	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Gravel

Depth (inches): 10

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

U.S. Army Corps of Engineers

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Banner Farm Mitigation Site City/County: Henderson Sampling Date: 6-5-19

Applicant/Owner: Wildlands Engineering, Inc. State: NC Sampling Point: DP3

Investigator(s): Jordan Hessler Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): <1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.352149 Long: -82.557940 Datum: NAD 83

Soil Map Unit Name: Toxaway silt loam (To) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No x	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No x	
Wetland Hydrology Present?	Yes ____	No x	

Remarks:
Sampling point is in banner creek's floodplain. The sampling point is in an area that has been manipulated by mowing, filling of the flood plain, and movement of heavy farm equipment. These factors attribute to the vegetation, soils, and hydrology being significantly disturbed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No x	Depth (inches): ____
Water Table Present?	Yes ____	No x	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No x	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No x

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No hydrological indicators present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP3

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		

50% of total cover: 20% of total cover:

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		

50% of total cover: 20% of total cover:

Herb Stratum (Plot size: 5)			
1. *Fescue*	90	Yes	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 =Total Cover		

50% of total cover: 45 20% of total cover: 18

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	0 (A)		0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** x

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 4/4	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

U.S. Army Corps of Engineers

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Banner Farm Mitigation Site City/County: Henderson Sampling Date: 6-5-19

Applicant/Owner: Wildlands Engineering, Inc. State: NC Sampling Point: DP4

Investigator(s): Jordan Hessler Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): <1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.352292 Long: -82.557848 Datum: NAD 83

Soil Map Unit Name: Toxaway silt loam (To) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sampling point is within banner creek's floodplain. The sampling point is in an area that has been manipulated by mowing, filling of the flood plain, and movement of heavy farm equipment. These factors attribute to the vegetation, soils, and hydrology being significantly disturbed.The Data point is for wetlands R ,Q, and S. The data point was taken inside wetland S.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- x Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water-Stained Leaves (B9)
- x Aquatic Fauna (B13)
- x True Aquatic Plants (B14)
- ____ Hydrogen Sulfide Odor (C1)
- x Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes x	No ____	Depth (inches): 1
Water Table Present?	Yes x	No ____	Depth (inches): 1
Saturation Present? (includes capillary fringe)	Yes x	No ____	Depth (inches): 1

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP4

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5)			
1. *Sagittaria latifolia*	20	Yes	OBL
2. *Juncus effusus*	20	Yes	FACW
3. *Carex lupuliformis*	20	Yes	FACW
4. *Perssicaria sagittata*	5	No	FACW
5. *Impatiens capensis*	5	No	FACW
6. *Fescue*	10	No	
7.			
8.			
9.			
10.			
11.			
	80 =Total Cover		
50% of total cover: 40	20% of total cover: 16		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	50	x 2 =	100
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	70 (A)		120 (B)

Prevalence Index = B/A = 1.71

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** x

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: DP4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	2.5Y 3/1	100					Loamy/Clayey	
10-15	5Y 6/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

U.S. Army Corps of Engineers

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Banner Farm Mitigation Site City/County: Henderson Sampling Date: 6-5-19

Applicant/Owner: Wildlands Engineering, Inc. State: NC Sampling Point: DP5

Investigator(s): Jordan Hessler Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): <1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.352245 Long: -82.554550 Datum: NAD 83

Soil Map Unit Name: Rosman loam (Ro) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No x	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No x	
Wetland Hydrology Present?	Yes ____	No x	

Remarks:
Sampling point is in an agricultural field with row crops. The sampling point is significantly disturbed by agricultural practices. Which include, tilling, spraying, ditching, etc. These practices significantly disturbed the vegetation, soils, and hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No x	Depth (inches): ____
Water Table Present?	Yes ____	No x	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No x	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No x

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No hydrologic indicators present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP5

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5)			
1. *Corn*	40	Yes	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	40 =Total Cover		
50% of total cover: 20	20% of total cover: 8		
Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	0 (A)		0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** x

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 4/3	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

U.S. Army Corps of Engineers

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Banner Farm Mitigation Site City/County: Henderson Sampling Date: 6-5-19

Applicant/Owner: Wildlands Engineering, Inc. State: NC Sampling Point: DP6

Investigator(s): Jordan Hessler Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Ditch Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 35.351927 Long: -82.55484 Datum: NAD 83

Soil Map Unit Name: Rosman loam (Ro) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sampling point in agricultural field ditch. Data point is for wetlands A, B, C, D, E, F, G, H, I, J, K, L, and W. Data point was taken in wetland B. The sampling point is significantly disturbed by agricultural practices. Which include, tilling, spraying, ditching, etc. These practices significantly disturbed the vegetation, soils, and hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- x Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- x Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ True Aquatic Plants (B14)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes x	No ____	Depth (inches): 1
Water Table Present?	Yes x	No ____	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes x	No ____	Depth (inches): 1

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP6

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	20	Yes	FAC
2. *Cornus florida*	5	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	25	=Total Cover	
50% of total cover: 13		20% of total cover:	5

Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 5)			
1. *Fescue*	15	Yes	
2. *Impatiens capensis*	10	Yes	FACW
3. *Saururus cernuus*	5	No	OBL
4. *Boehmeria cylindrica*	5	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	35	=Total Cover	
50% of total cover: 18		20% of total cover:	7

Woody Vine Stratum (Plot size: 5)			
1. *Toxicodendron radicans*	5	Yes	FAC
2.			
3.			
4.			
5.			
	5	=Total Cover	
50% of total cover: 3		20% of total cover:	1

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	15	x 2 =	30
FAC species	25	x 3 =	75
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	50 (A)		130 (B)

Prevalence Index = B/A = 2.60

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 4/1	100					Mucky Sand	
9-15	10YR 4/1	100					Mucky Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- X Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

NC DWQ Stream Identification Form Version 4.11 Stream Classification Point 1

Date: 12/11/2018	Project/Site: Banner Farms	Latitude: 35.35356
Evaluator: M. Caddell	County: Henderson	Longitude: -82.55421
Total Points: 35.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other UT 1 *e.g. Quad Name:*

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

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

B. Hydrology (Subtotal = 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 = 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: Damsel fly ~10 Crayfish - 2

Sketch:

NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 2

Date: 12/18/2018	Project/Site: Banner Farm	Latitude: 35.34857
Evaluator: M. Caddell	County: Henderson	Longitude: -82.55913
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 34.5	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other UT2 *e.g. Quad Name:*

A. Geomorphology (Subtotal = 13.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	(0)	0.5	1	1.5
☆ 11. Second or greater order channel	No = 0		(Yes = 3)	

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

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

C. Biology (Subtotal = 11.5)				
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: 3 salamander, 3 damselflies, 1 dragonfly, 1 scud, 1 beetle

Sketch:

NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 3

Date: 12/18/2018	**Project/Site:** Banner Farm	**Latitude:** 35.35539
Evaluator: M. Caddell	**County:** Henderson	**Longitude:** -82.55942
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 38.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** Banner Creek *e.g. Quad Name:* Reach 1

A. Geomorphology (Subtotal = 20.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	(0)	1	2	3
9. Grade control	(0)	0.5	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		(Yes = 3)	

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

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

C. Biology (Subtotal = 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: 3 mayfly, 1 damselfly, 1 stonefly, 5 caddisfly, 1 cranefly

Sketch:

LANDOWNER AUTHORIZATION FORM

PROPERTY LEGAL DESCRITION:

Deed Book: 831 **Page: 23** **County: Henderson**

Parcel ID Number: PIN 9630919204

Street Address: Off Banner Farm Road, Mills River, NC

Property Owner (please print): Kirby and Sherri Johnson

The undersigned, registered property owner(s) of the above property, do hereby authorize Wildlands Engineering, Inc. to take all actions necessary for the evaluation of the property as a potential stream, wetland and/or riparian buffer mitigation project, including conducting stream and/or wetland determinations and delineations, as well as issuance and acceptance of any required permit(s) or certification(s). I agree to allow regulatory agencies, including the US Army Corps of Engineers, to visit the property as part of these environmental reviews.

Property Owners(s) Address: 207 E. Price Street, Hendersonville, NC 28739
(if different from above)

Property Owner Telephone Number: 828-329-8622

We hereby certify the above information to be true and accurate to the best of our knowledge.

(Property Owner Authorized Signature) **(Date)**

(Property Owner Authorized Signature) **(Date)**

LANDOWNER AUTHORIZATION FORM

PROPERTY LEGAL DESCRITION:

Deed Book: 1598 **Page: 219** **County: Henderson**

Parcel ID Number: PIN 9630826726

Street Address: Off Banner Farm Road, Mills River, NC

Property Owner (please print): Mitchell and Wendy Gaither

The undersigned, registered property owner(s) of the above property, do hereby authorize Wildlands Engineering, Inc. to take all actions necessary for the evaluation of the property as a potential stream, wetland and/or riparian buffer mitigation project, including conducting stream and/or wetland determinations and delineations, as well as issuance and acceptance of any required permit(s) or certification(s). I agree to allow regulatory agencies, including the US Army Corps of Engineers, to visit the property as part of these environmental reviews.

Property Owners(s) Address: 60 Banner Farm Road, Mills River, NC 28759
(if different from above)

Property Owner Telephone Number: _____

We hereby certify the above information to be true and accurate to the best of our knowledge.

_____
(Property Owner Authorized Signature) **(Date)**

_____
(Property Owner Authorized Signature) **(Date)**

LANDOWNER AUTHORIZATION FORM

PROPERTY LEGAL DESCRITION:

Deed Book: 1087, 1005 **Page: 194, 65** **County: Henderson**

Parcel ID Number: PIN 9640028341, 9630924395

Street Address: Off Banner Farm Road, Mills River, NC

Property Owner (please print): Mountain Bean Holdings, Inc.

The undersigned, registered property owner(s) of the above property, do hereby authorize Wildlands Engineering, Inc. to take all actions necessary for the evaluation of the property as a potential stream, wetland and/or riparian buffer mitigation project, including conducting stream and/or wetland determinations and delineations, as well as issuance and acceptance of any required permit(s) or certification(s). I agree to allow regulatory agencies, including the US Army Corps of Engineers, to visit the property as part of these environmental reviews.

Property Owners(s) Address: P.O. Box 637, Horse Shoe, NC 28742
(if different from above)

Property Owner Telephone Number: 828 329-8623

We hereby certify the above information to be true and accurate to the best of our knowledge.

(Property Owner Authorized Signature) **(Date)**

LANDOWNER AUTHORIZATION FORM

PROPERTY LEGAL DESCRITION:

Deed Book: 849 **Page: 853** **County: Henderson**

Parcel ID Number: PIN 9630900480

Street Address: Off Banner Farm Road, Mills River, NC

Property Owner (please print): Preston and Judy Johnson

The undersigned, registered property owner(s) of the above property, do hereby authorize Wildlands Engineering, Inc. to take all actions necessary for the evaluation of the property as a potential stream, wetland and/or riparian buffer mitigation project, including conducting stream and/or wetland determinations and delineations, as well as issuance and acceptance of any required permit(s) or certification(s). I agree to allow regulatory agencies, including the US Army Corps of Engineers, to visit the property as part of these environmental reviews.

Property Owners(s) Address: P.O. Box 901177, Homestead, FL 33090
(if different from above)

Property Owner Telephone Number: _____

We hereby certify the above information to be true and accurate to the best of our knowledge.

Preston P. Johnson, Jr.
_____
(Property Owner Authorized Signature) **(Date)**

Judy K. Johnson
_____
(Property Owner Authorized Signature) **(Date)**

LANDOWNER AUTHORIZATION FORM

PROPERTY LEGAL DESCRITION:

Deed Book: 1465 Page: 126 County: Henderson

Parcel ID Number: PIN 9630912884

Street Address: Off Banner Farm Road, Mills River, NC

Property Owner (please print): Vine Ripe Investments, Inc.

The undersigned, registered property owner(s) of the above property, do hereby authorize Wildlands Engineering, Inc. to take all actions necessary for the evaluation of the property as a potential stream, wetland and/or riparian buffer mitigation project, including conducting stream and/or wetland determinations and delineations, as well as issuance and acceptance of any required permit(s) or certification(s). I agree to allow regulatory agencies, including the US Army Corps of Engineers, to visit the property as part of these environmental reviews.

Property Owners(s) Address: P.O. Box 609, Horse Shoe, NC 28742
(if different from above)

Property Owner Telephone Number: _____

We hereby certify the above information to be true and accurate to the best of our knowledge.

_____

(Property Owner Authorized Signature) **(Date)**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Banner Farm Mitigation Site	Date of Evaluation	6/5/19
Applicant/Owner Name	Wildlands Engineering Inc. (WEI)	Wetland Site Name	Wetlands M,N,O,P,T,U,V
Wetland Type	Headwater Forest	Assessor Name/Organization	J. Hessler/WEI
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	06010105
County	Henderson	NCDWR Region	Asheville
(•) Yes ( ) No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.342990/-82.558923

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

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

Is the assessment area intensively managed? (•) Yes ( ) No

Regulatory Considerations - Were regulatory considerations evaluated? (•) Yes ( ) No If Yes, check all that apply to the assessment area

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

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

- ( ) Blackwater
- (•) Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) ( ) Lunar ( ) Wind ( ) Both

Is the assessment area on a coastal island? ( ) Yes (•) No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ( ) Yes (•) No

Does the assessment area experience overbank flooding during normal rainfall conditions? (•) Yes ( ) No

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

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

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

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

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

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

3b. ( ) A Evidence that maximum depth of inundation is greater than 2 feet

- B Evidence that maximum depth of inundation is between 1 and 2 feet
- C Evidence that maximum depth of inundation is less than 1 foot

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

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

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

4b.
- ◉ A Soil ribbon < 1 inch
- ○ B Soil ribbon ≥ 1 inch

4c.
- ◉ A No peat or muck presence
- ○ B A peat or muck presence

5. Discharge into Wetland – opportunity metric

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

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

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

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

7a. Is assessment area within 50 feet of a tributary or other open water?
◉ Yes ○ No If Yes, continue to 7b. If No, skip to Metric 8.

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

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

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

7e. Is tributary or other open water sheltered or exposed?
- ◉ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ○ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

- ◉ A Sediment deposition is not excessive, but at approximately natural levels.
- ○ B Sediment deposition is excessive, but not overwhelming the wetland.
- ○ C Sediment deposition is excessive and is overwhelming the wetland.

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

- ○ A 0
- ◉ B 1 to 4
- ○ C 5 to 8

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

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

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

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

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

17a. Is vegetation present?

(•) Yes ( ) No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

( ) A ≥ 25% coverage of vegetation
( ) B < 25% coverage of vegetation

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

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

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

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

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

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

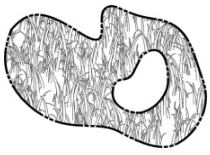
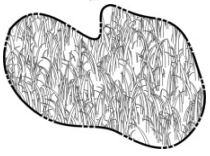
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.

( ) A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
(•) B Not A

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

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

( ) A 
( ) B 
( ) C 
( ) D 

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

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

( ) A Overbank and overland flow are not severely altered in the assessment area.
(•) B Overbank flow is severely altered in the assessment area.
( ) C Overland flow is severely altered in the assessment area.
( ) D Both overbank and overland flow are severely altered in the assessment area.

Notes

Wetland Classification is based on the reference wetland type that on-site wetlands would become if not maintained.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetlands M,N,O,P,T,U,V	Date	6/5/19
Wetland Type	Headwater Forest	Assessor Name/Organization	J. Hessler/WEI

Notes on Field Assessment Form (Y/N)	YES
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	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

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

Overall Wetland Rating **MEDIUM**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#: NCDWR #:

Project Name	Banner Farm Mitigation Site	Date of Evaluation	6/5/19
Applicant/Owner Name	Wildlands Engineering Inc. (WEI)	Wetland Site Name	Wetlands R,Q,S
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J. Hessler/WEI
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	06010105
County	Henderson	NCDWR Region	Asheville
(●) Yes ( ) No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.352292/-82.557848

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

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

Is the assessment area intensively managed? (●) Yes ( ) No

Regulatory Considerations - Were regulatory considerations evaluated? (●) Yes ( ) No If Yes, check all that apply to the assessment area

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

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

- ( ) Blackwater
- (●) Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) ( ) Lunar ( ) Wind ( ) Both

Is the assessment area on a coastal island? ( ) Yes (●) No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ( ) Yes (●) No

Does the assessment area experience overbank flooding during normal rainfall conditions? (●) Yes ( ) No

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

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

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

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

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

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

3b. ( ) A Evidence that maximum depth of inundation is greater than 2 feet

- B Evidence that maximum depth of inundation is between 1 and 2 feet
- C Evidence that maximum depth of inundation is less than 1 foot

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

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

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

4b.
- ◉ A Soil ribbon < 1 inch
- ○ B Soil ribbon ≥ 1 inch

4c.
- ◉ A No peat or muck presence
- ○ B A peat or muck presence

5. Discharge into Wetland – opportunity metric

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

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

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

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

7a. Is assessment area within 50 feet of a tributary or other open water?
◉ Yes ○ No If Yes, continue to 7b. If No, skip to Metric 8.

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

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

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

7e. Is tributary or other open water sheltered or exposed?
- ◉ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ○ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

- ○ A Sediment deposition is not excessive, but at approximately natural levels.
- ◉ B Sediment deposition is excessive, but not overwhelming the wetland.
- ○ C Sediment deposition is excessive and is overwhelming the wetland.

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

- ○ A 0
- ◉ B 1 to 4
- ○ C 5 to 8

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

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

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

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

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

17a. Is vegetation present?

(•) Yes ( ) No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

(•) A ≥ 25% coverage of vegetation
( ) B < 25% coverage of vegetation

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

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

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

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

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

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

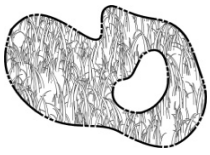
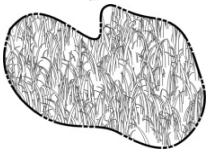
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.

( ) A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
(•) B Not A

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

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

( ) A 
( ) B 
( ) C 
( ) D 

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

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

( ) A Overbank and overland flow are not severely altered in the assessment area.
(•) B Overbank flow is severely altered in the assessment area.
( ) C Overland flow is severely altered in the assessment area.
( ) D Both overbank and overland flow are severely altered in the assessment area.

Notes

Wetland Classification is based on the reference wetland type that on-site wetlands would become if not maintained.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetlands R,Q,S	Date	6/5/19
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J. Hessler/WEI

Notes on Field Assessment Form (Y/N)	YES
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	**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	**MEDIUM**

Function Rating Summary

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

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#: NCDWR #:

Project Name	Banner Farm Mitigation Site	Date of Evaluation	6/5/19
Applicant/Owner Name	Wildlands Engineering Inc. (WEI)	Wetland Site Name	Wetlands A,B,C,D,E,F,G,H,I,J,K,L,W
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J. Hessler/WEI
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	French Broad River
River Basin	French Broad	USGS 8-Digit Catalogue Unit	06010105
County	Henderson	NCDWR Region	Asheville
(●) Yes ( ) No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.351927/-82.55484

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

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

Is the assessment area intensively managed? (●) Yes ( ) No

Regulatory Considerations - Were regulatory considerations evaluated? (●) Yes ( ) No If Yes, check all that apply to the assessment area

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

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

- ( ) Blackwater
- (●) Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) ( ) Lunar ( ) Wind ( ) Both

Is the assessment area on a coastal island? ( ) Yes (●) No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ( ) Yes (●) No

Does the assessment area experience overbank flooding during normal rainfall conditions? (●) Yes ( ) No

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

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

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

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

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

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

3b. (●) A Evidence that maximum depth of inundation is greater than 2 feet

- B Evidence that maximum depth of inundation is between 1 and 2 feet
- C Evidence that maximum depth of inundation is less than 1 foot

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

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

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

4b.
- ( ) A Soil ribbon < 1 inch
- (•) B Soil ribbon ≥ 1 inch

4c.
- ( ) A No peat or muck presence
- (•) B A peat or muck presence

5. Discharge into Wetland – opportunity metric

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

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

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

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

7a. Is assessment area within 50 feet of a tributary or other open water?
(•) Yes ( ) No If Yes, continue to 7b. If No, skip to Metric 8.

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

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

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

7e. Is tributary or other open water sheltered or exposed?
- (•) Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ( ) Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

- ○ A Sediment deposition is not excessive, but at approximately natural levels.
- ○ B Sediment deposition is excessive, but not overwhelming the wetland.
- ◉ C Sediment deposition is excessive and is overwhelming the wetland.

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

- ○ A 0
- ◉ B 1 to 4
- ○ C 5 to 8

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

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

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

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

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

17a. Is vegetation present?

(•) Yes ( ) No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

( ) A ≥ 25% coverage of vegetation
( ) B < 25% coverage of vegetation

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

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

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

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

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

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

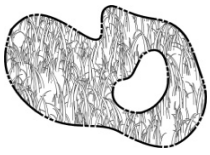
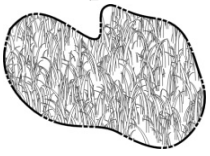
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.

( ) A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
(•) B Not A

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

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

( ) A 
( ) B 
( ) C 
( ) D 

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

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

( ) A Overbank and overland flow are not severely altered in the assessment area.
( ) B Overbank flow is severely altered in the assessment area.
( ) C Overland flow is severely altered in the assessment area.
(•) D Both overbank and overland flow are severely altered in the assessment area.

Notes

Wetland Classification is based on the reference wetland type that on-site wetlands would become if not maintained.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetlands A,B,C,D,E,F,G,H,I,J,K,L,W	Date	6/5/19
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J. Hessler/WEI

Notes on Field Assessment Form (Y/N)	YES
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	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

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

Overall Wetland Rating **LOW**

APPENDIX 4
Categorical Exclusion Documentation and Agency Correspondence

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Banner Farm Mitigation Site
County Name:	Henderson County
DMS Number:	100062
Project Sponsor:	Wildlands Engineering, Inc
Project Contact Name:	Andrea Eckardt
Project Contact Address:	1430 South Mint Street, Suite 104, Charlotte, NC, 28203
Project Contact E-mail:	aeckardt@wildlandseng.com
DMS Project Manager:	Matthew Reid

Project Description

The Banner Farm Mitigation Site (Site) is located in Henderson County, NC approximately 6 miles northwest of Hendersonville and 6 miles southwest of Fletcher. The project limits include Banner Creek and two associated tributaries which drain to the French Broad River for a total of 6,194 stream mitigation credits and 16.0 wetlands mitigation credits. The Site will protect 26 acres of land and is being submitted for mitigation credit in the French Broad Catalog Unit 06010105.

For Official Use Only

Reviewed By:

1-11-2019
Date

DMS Project Manager

Conditional Approved By:

Date

For Division Administrator FHWA

☐ **Check this box if there are outstanding issues**

Final Approval By:

1-11-19
Date

For Division Administrator FHWA

WILDLANDS
ENGINEERING

July 24, 2018

Renee Gledhill-Earley
State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617

Subject: Banner Farm Mitigation Site
Henderson, North Carolina

Dear Ms. Gledhill-Earley,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the Banner Farm Mitigation Site, a stream and wetland mitigation site located in Henderson County, NC. A Concept Map and USGS Topographic Map with approximate project areas are enclosed. The topographic figure was prepared from the Horse Shoe, NC (2016) USGS 7.5 Topographic Quadrangle, and the site is located at latitude 35.351469, longitude -82.556080.

The Banner Farm Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel and riparian wetland impacts. Several sections of channel have been identified as significantly degraded. This project will include wetland restoration along with stream restoration and enhancement of Banner Creek and two associated tributaries which drain to the French Broad River. Furthermore, no archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the project.

Sincerely,

Greg Pierce
Environmental Scientist

Attachment:
Figure 1 Concept Map
Figure 2 USGS Topographic Map

North Carolina Department of Natural and Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary Susi H. Hamilton

Office of Archives and History
Deputy Secretary Kevin Cherry

August 21, 2018

Greg Pierce
Wildlands Engineering
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Re: Banner Farm Mitigation Site, Henderson County, ER 18-1785

Dear Mr. Pierce:

Thank you for your letter of July 24, 2018, concerning the above project.

There are no known recorded archaeological sites within the project boundaries. There are two previously recorded sites in close proximity to project area. However, the project area has never been systematically surveyed to determine the location or significance of archaeological resources. Based on the topographic and hydrological situation and the density of archaeological sites in the area, there is a high probability for the presence of prehistoric or historic archaeological sites.

We recommend that a comprehensive survey be conducted by an experienced archaeologist to identify and evaluate the significance of archaeological remains that may be damaged or destroyed by the proposed project. Potential effects on unknown resources must be assessed prior to the initiation of construction activities.

Two paper copies and one digital copy of the resulting archaeological survey report, as well as one paper and one digital copy of the appropriate site forms, should be forwarded to us for review and comment as soon as they are available and well in advance of any construction activities.

A list of archaeological consultants who have conducted or expressed an interest in contract work in North Carolina is available at www.archaeology.ncdcr.gov/ncarch/resource/consultants.htm. The archaeologists listed, or any other experienced archaeologist, may be contacted to conduct the recommended survey.

We have determined that the project as proposed will not have an effect on any historic structures.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

North Carolina Department of Natural and Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary Susi H. Hamilton

Office of Archives and History
Deputy Secretary Kevin Cherry

November 27, 2018

Andrea S. Eckardt
Wildlands Engineering, Inc.
1430 Mint Street, Suite 104
Charlotte, NC 28203

Re: Banner Farm Mitigation Site, Henderson County, ER 18-1785

Dear Ms. Eckardt:

Thank you for your letter of November 1, 2018, transmitting the archaeological survey report by Archaeological Consultants of the Carolinas, Inc. (ACC) for the above project.

During the course of the survey, no sites were located within the project area. ACC has recommended that no further archaeological investigation be conducted in connection with this project. We concur with this recommendation since the project will not involve significant archaeological resources.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

cc: Luan Cao, Archaeological Consultants of the Carolinas

WILDLANDS
ENGINEERING

July 24, 2018

Mr. Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
PO Box 455
Henderson, NC 28719

Subject: Banner Farms Mitigation Site
Henderson County, North Carolina

Dear Mr. Townsend,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the Banner Farm Mitigation Site, a stream and wetland mitigation site located in Henderson County, NC. A Concept Map and USGS Topographic Map with approximate project areas are enclosed. The topographic figure was prepared from the Horse Shoe, NC (2016) USGS 7.5 Topographic Quadrangle, and the site is located at latitude 35.351469, longitude -82.556080.

The Banner Farms Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel and riparian wetland impacts. This project will include wetland restoration along with stream restoration and enhancement of Banner Creek and two associated tributaries which drain to the French Broad River. Several sections of channel have been identified as significantly degraded. Furthermore, no archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the project.

Sincerely,

Greg Pierce
Environmental Scientist

Attachment:
Figure 1 Concept Map
Figure 2 USGS Topographic Map

cc: via email
Ms. Holly Austin, Federal Cultural Resource Law Liaison, EBCI Tribal Historic Preservation Office
Mr. Donnie Brew, Federal Highway Administration
Mr. Matthew Reid, Division of Mitigation Services

Andrea Eckardt

From: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Sent: Friday, November 30, 2018 2:55 PM
To: sbird@ukb-nsn.gov
Cc: Donnie.Brew@dot.gov; Reid, Matthew; Andrea Eckardt; Eric Neuhaus
Subject: Banner Farm Mitigation Site - NCDEQ: DMS - Henderson County, North Carolina
Attachments: Banner Farm_100062_Keetoowah_11-30-18.pdf

Good afternoon Ms. Bird,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed Banner Farms Mitigation Site.

Project information, a Phase I Identification Survey performed by Archaeological Consultants of the Carolinas, Inc (ACC), and SHPO documentation are attached for your review.

Please let us know if you have any questions or need any additional information.

Thanks

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

Andrea Eckardt

From: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Sent: Friday, November 30, 2018 2:49 PM
To: Elizabeth Toombs
Cc: Donnie.Brew@dot.gov; Reid, Matthew; Andrea Eckardt; Eric Neuhaus
Subject: Banner Farm Mitigation Site - NCDEQ: DMS - Henderson County, North Carolina
Attachments: Banner Farm_100062_Cherokee Nation_11-30-18.pdf

Good afternoon Ms. Toombs,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed Banner Farms Mitigation Site.

Project information, a Phase I Identification Survey performed by Archaeological Consultants of the Carolinas, Inc (ACC), and SHPO documentation are attached for your review.

Please let us know if you have any questions or need any additional information.

Thanks

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

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CHEROKEE NATION®
P.O. Box 948 • Tahlequah, OK 74465-0948 • 918-453-5000 • cherokee.org

Office of the Chief

Bill John Baker
Principal Chief
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S. Joe Crittenden
Deputy Principal Chief
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December 21, 2018

Paul Wiesner
North Carolina Department of Environmental Quality
Western DMS Field Office
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

Re: Banner Farms Mitigation Site

Mr. Paul Wiesner:

The Cherokee Nation (Nation) is in receipt of your correspondence about and report for the **Banner Farms Mitigation Site**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation’s interest in acting as a consulting party to this proposed undertaking.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office reviewed this project, cross referenced the project’s legal description against our information, and found no instances where this project intersects or adjoins such resources. Thus, the Nation does not foresee this project imparting impacts to Cherokee cultural resources at this time.

However, the Nation requests that the North Carolina Department of Environmental Quality (NCDEQ) halt all project activities immediately and re-contact our Offices for further consultation if items of cultural significance are discovered during the course of this project.

Additionally, the Nation requests that NCDEQ conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation’s databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

July 24, 2018

Marella Buncick
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801

Subject: Banner Farm Mitigation Site
Henderson County, North Carolina

Dear Ms. Buncick,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources associated with the proposed Banner Farm Mitigation Site, a stream and wetland mitigation site located in Henderson County, NC. A USGS Topographic Map and a Concept Map showing the approximate project area are enclosed. The topographic figure was prepared from the Horse Shoe, NC (2016) USGS 7.5 Topographic Quadrangle and the site is located at latitude 35.351469, longitude -82.556080.

The Banner Farm Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel and riparian wetland impacts. This project will include wetland restoration along with stream restoration and enhancement of Banner Creek and two associated tributaries which drain to the French Broad River. Several sections of channel have been identified as significantly degraded.

According to your website (https://www.fws.gov/raleigh/species/cntylist/henderson.html) the threatened or endangered species for Lincoln County are: The Bald eagle (*Haliaeetus leucocephalus*), the Bog turtle (*Glyptemys muhlenbergii*), the Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*), the Gray bat (*Myotis grisescens*), the Northern long-eared bat (*Myotis septentrionalis*), the Appalachian elktoe (*Alasmidonta raveneliana*), the Rusty-patched bumble bee (*Bombus affinis*), the Bunched arrowhead (*Sagittaria fasciculata*), the Mountain sweet pitcher plant (*Sarracenia rubra* ssp. *Jonesii*), the Small whorled pogonia (*Isotria medeoloides*), the Swamp pink (*Helonias bullata*), the White fringeless orchid (*Platanthera integrilabia*), and the White irisette (*Sisyrinchium dichotomum*). If we have not heard from you in 30 days, we will assume that you do not have any comments regarding associated laws and that you do not have any information relevant to this project at the current time.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

Greg Pierce
Environmental Scientist

Attachment:
Figure 1 Concept Map
Figure 2 USGS Topographic Map

Andrea Eckardt

From: Brew, Donnie (FHWA) <Donnie.Brew@dot.gov>
Sent: Wednesday, November 28, 2018 12:41 PM
To: Marella_Buncick@fws.gov
Cc: Reid, Matthew; Wiesner, Paul; Andrea Eckardt
Subject: Banner Farm site DMS_mitigation project_Henderson County_NLEB 4(d) rule consultation
Attachments: Banner Farm site Figure 1 Concept Map.pdf; Banner Farm site Figure 2 USGS Topo Map.pdf; Banner Farm site NLEB 4(d) rule Consultation form 11-28-18.pdf

Good afternoon Marella,

The purpose of this message is to notify your office that FHWA will use the NLEB streamlined consultation framework for the Banner Farm Mitigation Site in Henderson County, NC.

Attached is a completed NLEB 4(d) Rule Streamlined Consultation form and site maps/figures.

Thank you,

Donnie

Notifying the Service Under the Framework

Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form

Federal agencies (or designated non-federal representatives) should use the Northern Long-Eared Bat 4(d) Rule Streamlined Consultation form to notify the Service of their project and meet the requirements of the framework.

Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form (Word document)

Information requested in the Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form serves to

(1) notify the field office that an action agency will use the streamlined framework;

(2) describe the project with sufficient detail to support the required determination; and

(3) enable the USFWS to track effects and determine if reinitiation of consultation for the 4(d) rule is required. This form requests the minimum amount of information required for the Service to be able to track this information.

Providing information in the Streamlined Consultation Form does not address section 7(a)(2) compliance for any other listed species.

Donnie Brew
Preconstruction & Environment Engineer
Federal Highway Administration

310 New Bern Ave, Suite 410
Raleigh, NC 27601
donnie.brew@dot.gov
919-747-7017

Please consider the environment before printing this email.

Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form

Federal agencies should use this form for the optional streamlined consultation framework for the northern long-eared bat (NLEB). This framework allows federal agencies to rely upon the U.S. Fish and Wildlife Service's (USFWS) January 5, 2016, intra-Service Programmatic Biological Opinion (BO) on the final 4(d) rule for the NLEB for section 7(a)(2) compliance by: (1) notifying the USFWS that an action agency will use the streamlined framework; (2) describing the project with sufficient detail to support the required determination; and (3) enabling the USFWS to track effects and determine if reinitiation of consultation is required per 50 CFR 402.16.

This form is not necessary if an agency determines that a proposed action will have no effect to the NLEB or if the USFWS has concurred in writing with an agency's determination that a proposed action may affect, but is not likely to adversely affect the NLEB (i.e., the standard informal consultation process). Actions that may cause prohibited incidental take require separate formal consultation. Providing this information does not address section 7(a)(2) compliance for any other listed species.

Information to Determine 4(d) Rule Compliance:	**YES**	**NO**
1. Does the project occur wholly outside of the WNS Zone[1]?	☐	☒
2. Have you contacted the appropriate agency[2] to determine if your project is near known hibernacula or maternity roost trees?	☒	☐
3. Could the project disturb hibernating NLEBs in a known hibernaculum?	☐	☒
4. Could the project alter the entrance or interior environment of a known hibernaculum?	☐	☒
5. Does the project remove any trees within 0.25 miles of a known hibernaculum at any time of year?	☐	☒
6. Would the project cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot radius from the maternity roost tree from June 1 through July 31.	☐	☒

You are eligible to use this form if you have answered yes to question #1 **or** yes to question #2 **and** no to questions 3, 4, 5 and 6. The remainder of the form will be used by the USFWS to track our assumptions in the BO.

Agency and Applicant[3] (Name, Email, Phone No.): FHWA, Donnie Brew, Donnie.brew@dot.gov, 919-747-7017

Project Name: Banner Farm Mitigation Site

Project Location (include coordinates if known): 35.351469 (N), -82.556080 (W)

Basic Project Description (provide narrative below or attach additional information):

The Banner Farm Mitigation Site (Site) is located in Henderson County, NC approximately 6 miles northwest of Hendersonville and 6 miles southwest of Fletcher. The project limits include Banner Creek and two associated tributaries which drain to the French Broad River for a total of 6,194 linear feet of stream. Additionally, the site features two wetlands totaling 16 acres. The Site is being submitted for mitigation credit in the French Broad Catalog Unit 06010105. Construction of the stream and wetland mitigation project will include some tree removal (>3" DBH) – approximately 0.25 acres

[1] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf
[2] See http://www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html
[3] If applicable - only needed for federal actions with applicants (e.g., for a permit, etc.) who are party to the consultation.

General Project Information	YES	NO
Does the project occur within 0.25 miles of a known hibernaculum?	☐	☒
Does the project occur within 150 feet of a known maternity roost tree?	☐	☒
Does the project include forest conversion[4]? (if yes, report acreage below)	☒	☐
Estimated total acres of forest conversion	0.25 ac	
If known, estimated acres[5] of forest conversion from April 1 to October 31		
If known, estimated acres of forest conversion from June 1 to July 31[6]		
Does the project include timber harvest? (if yes, report acreage below)	☐	☒
Estimated total acres of timber harvest		
If known, estimated acres of timber harvest from April 1 to October 31		
If known, estimated acres of timber harvest from June 1 to July 31		
Does the project include prescribed fire? (if yes, report acreage below)	☐	☒
Estimated total acres of prescribed fire		
If known, estimated acres of prescribed fire from April 1 to October 31		
If known, estimated acres of prescribed fire from June 1 to July 31		
Does the project install new wind turbines? (if yes, report capacity in MW below)	☐	☒
Estimated wind capacity (MW)		

Agency Determination:

By signing this form, the action agency determines that this project may affect the NLEB, but that any resulting incidental take of the NLEB is not prohibited by the final 4(d) rule.

If the USFWS does not respond within 30 days from submittal of this form, the action agency may presume that its determination is informed by the best available information and that its project responsibilities under 7(a)(2) with respect to the NLEB are fulfilled through the USFWS January 5, 2016, Programmatic BO. The action agency will update this determination annually for multi-year activities.

The action agency understands that the USFWS presumes that all activities are implemented as described herein. The action agency will promptly report any departures from the described activities to the appropriate USFWS Field Office. The action agency will provide the appropriate USFWS Field Office with the results of any surveys conducted for the NLEB. Involved parties will promptly notify the appropriate USFWS Field Office upon finding a dead, injured, or sick NLEB.

Signature: _____ Date Submitted: 11-28-18

[4] Any activity that temporarily or permanently removes suitable forested habitat, including, but not limited to, tree removal from development, energy production and transmission, mining, agriculture, etc. (see page 48 of the BO).
[5] If the project removes less than 10 trees and the acreage is unknown, report the acreage as less than 0.1 acre.
[6] If the activity includes tree clearing in June and July, also include those acreage in April to October.

Andrea Eckardt

From: Andrea Eckardt
Sent: Tuesday, November 27, 2018 3:46 PM
To: Cortes, Milton - NRCS, Raleigh, NC
Subject: Banner Farm Mitigation Site - Completed Ad1006 Form - Henderson County
Attachments: Appendix 9 Banner- AD1006 Final Completed.pdf

Milton-
Attached is the completed AD1006 for the Banner Farms Mitigation Site for your files.

Thank you for your time

Andrea

Andrea S. Eckardt | *Senior Environmental Planner*
704.332.7754 x101

Wildlands Engineering, Inc.
1430 S. Mint St, Suite 104
Charlotte, NC 28203

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 7/23/17
Name Of Project Banner Farms Mitigation Site	Federal Agency Involved Federal Highway Administration
Proposed Land Use Stream Restoration	County And State Henderson County, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).* Yes ☑ No ☐		Acres Irrigated -none-	Average Farm Size 76 acres
Major Crop(s) CORN	Farmable Land In Govt. Jurisdiction Acres: 132,945 acres % 56	Amount Of Farmland As Defined in FPPA Acres: 132,945 acres % 56	
Name Of Land Evaluation System Used Henderson Co. NC LESA	Name Of Local Site Assessment System N/A	Date Land Evaluation Returned By NRCS July 25, 2018 By eMail	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	25.70			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	25.70	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	29.97			
B. Total Acres Statewide And Local Important Farmland	0.48			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.0229			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	5.0			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	79	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	20			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	15			
6. Distance To Urban Support Services	15	15			
7. Size Of Present Farm Unit Compared To Average	10	10			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	5			
10. On-Farm Investments	20	20			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	130	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	79	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	130	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	209	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side)

This form was electronically produced by National Production Services Staff

Clear Form

Form AD-1006 (10-83)

July 24, 2018

Shannon Deaton
North Carolina Wildlife Resource Commission
Division of Inland Fisheries
1721 Mail Service Center
Raleigh, NC 27699

Subject: Banner Farm Mitigation Site
Henderson County, North Carolina

Dear Ms. Deaton,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with the proposed Banner Farms Mitigation Site, a stream and wetland mitigation site located in Henderson County, NC. A USGS Topographic Map and a Concept Map showing the approximate project area are enclosed. The topographic figure was prepared from the Horse Shoe, NC (2016) USGS 7.5 Topographic Quadrangle, and the site is located at latitude 35.351469, longitude -82.556080.

The Banner Farm Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel and riparian wetland impacts. This project will include wetland restoration along with stream restoration and enhancement of Banner Creek and two associated tributaries which drain to the French Broad River. Several sections of channel have been identified as significantly degraded.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

Greg Pierce
Environmental Scientist

Attachment:
Figure 1 Concept Map
Figure 2 USGS Topographic Map

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

August 8, 2018

Greg Pierce
Wildlands Engineering
1430 S. Mint Street, Suite 104
Charlotte, NC 28203

SUBJECT: Banner Farm Mitigation Site

Dear Mr. Pierce:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) received your July 24, 2018 letter regarding plans for a wetland and stream restoration project on unnamed tributaries to the French Broad River in Henderson County. You requested review and comment on any possible issues that might emerge with respect to fish and wildlife associated with the project. Our comments on this project are offered for your consideration under provisions of the Clean Water Act of 1977 (33 U.S.C. 466 et. seq.) and Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

Details were not provided in the letter on design nor the size of the project. The project is proposed as a mitigation project and will involve stream enhancement and restoration.

This project should not impact wild trout resources. We recommend that riparian buffers that are to be reestablished be as wide as possible, given site constraints and landowner needs. NCWRC generally recommends a woody buffer of 100 feet on perennial streams to maximize the benefits of buffers, including bank stability, stream shading, treatment of overland runoff, and wildlife habitat.

Thank you for the opportunity to review and comment on this project. Please contact me at (828) 803-6054 if you have any questions about these comments.

Sincerely,

Andrea Leslie
Mountain Region Coordinator
Habitat Conservation Program

Mailing Address: Habitat Conservation • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

APPENDIX 5
Stream Identification Forms

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" 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): Banner Farms
2. Date of evaluation: 12/18/2018
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Henderson
6. Nearest named water body on USGS 7.5-minute quad: French Broad River
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.35329, -82.55893

STREAM INFORMATION: (depth and width can be approximations)
9. Site number (show on attached map): Banner Creek R1
10. Length of assessment reach evaluated (feet): 900
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 stream? ☐ 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] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

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

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

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream 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 (including 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.** 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?

Banner Creek R1

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 (including water pennies)
☐	☒	Caddisfly larvae (Trichoptera [T])
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☒	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans (true flies)
☐	☒	Mayfly larvae (Ephemeroptera [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 (Plecoptera [P])
☒	☐	Tipulid larvae (Cranefly)
☐	☐	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 that passes some flow during low-flow periods affecting assessment reach (ex: beaver dam, bottom-release dam)
☒D	Evidence of bank seepage or sweating (iron oxidizing bacteria 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 the 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 – First 100 feet of 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?

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:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Banner Farm - Banner Creek Reach 1
Date of Evaluation: 12/18/2018
Stream Category: Ma3
Assessor Name/Organization: M. Caddell

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**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	**HIGH**	
(4) Stream Geomorphology	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	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" 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): Banner Farms
2. Date of evaluation: 12/18/2018
3. Applicant/owner name: Wildlands
4. Assessor name/organization: A. Caddell
5. County: Henderson
6. Nearest named water body on USGS 7.5-minute quad: French Broad River
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.35168, -82.55635

STREAM INFORMATION: (depth and width can be approximations)
9. Site number (show on attached map): Banner Creek - R2
10. Length of assessment reach evaluated (feet): 1000'
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 stream? ☐ 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] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

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

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

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream 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 (including 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.** 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?

Banner Creek R2

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 (including water pennies)
☐	☐	Caddisfly larvae (Trichoptera [T])
☐	☐	Asian clam (*Corbicula*)
☒	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☒	Damselfly and dragonfly larvae
☐	☐	Dipterans (true flies)
☐	☒	Mayfly larvae (Ephemeroptera [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 (Plecoptera [P])
☐	☐	Tipulid larvae (Cranefly)
☐	☐	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 that passes some flow during low-flow periods affecting assessment reach (ex: beaver dam, bottom-release dam)
☒D	Evidence of bank seepage or sweating (iron oxidizing bacteria 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 the 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 – First 100 feet of 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?

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:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Banner Farms - Banner Creek Reach 2
Date of Evaluation: 12/18/2018
Stream Category: Ma3
Assessor Name/Organization: M. Caddell

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**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	**MEDIUM**	
(4) Stream Geomorphology	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**HIGH**	
(3) Thermoregulation	**LOW**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**HIGH**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

Banner R3 & R4a

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" 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): Banner Farms
2. Date of evaluation: 12/18/2018
3. Applicant/owner name: Williams
4. Assessor name/organization: M. Caddell
5. County: Henderson
6. Nearest named water body on USGS 7.5-minute quad: French Broad River
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.35194, -82.55373

STREAM INFORMATION: (depth and width can be approximations)
9. Site number (show on attached map): Banner Creek R3
10. Length of assessment reach evaluated (feet): 900'
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 9 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 20'
13. Is assessment reach a swamp stream? ☐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] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

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

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

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream 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 (including 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.** 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?

Banner Creek R38124a

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 (including water pennies)
☐	☐	Caddisfly larvae (Trichoptera [T])
☐	☐	Asian clam (*Corbicula*)
☒	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans (true flies)
☐	☐	Mayfly larvae (Ephemeroptera [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 (Plecoptera [P])
☐	☐	Tipulid larvae (Cranefly)
☐	☐	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 that passes some flow during low-flow periods affecting assessment reach (ex: beaver dam, bottom-release dam)
☒D	Evidence of bank seepage or sweating (iron oxidizing bacteria 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 the 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 – First 100 feet of 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?

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:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Banner Farms - Banner Creek Reach 3 & 4a
Date of Evaluation: 12/18/2018
Stream Category: Ma3
Assessor Name/Organization: M. Caddell

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

Banner Creek R4B

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" 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): Banner Farms
2. Date of evaluation: 12/18/2018
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Henderson
6. Nearest named water body on USGS 7.5-minute quad: French Broad River
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.35091, -82.55187

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Banner Reach 4B
10. Length of assessment reach evaluated (feet): 650'
11. Channel depth from bed (in riffle, if present) to top of bank (feet): X 15' ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 20-40
13. Is assessment reach a swamp stream? ☐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" 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 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 (including 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.** 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?

Reach 4-B

Banner Farm R.4B

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: Too Deep

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 (including water pennies)
☐	☐	Caddisfly larvae (Trichoptera [T])
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans (true flies)
☐	☐	Mayfly larvae (Ephemeroptera [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 (Plecoptera [P])
☐	☐	Tipulid larvae (Cranefly)
☐	☐	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 that passes some flow during low-flow periods affecting assessment reach (ex: beaver dam, bottom-release dam)
☒D	Evidence of bank seepage or sweating (iron oxidizing bacteria 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 the 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 – First 100 feet of 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?

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:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Banner Farms - Banner Creek Reach 4b
Date of Evaluation: 12/18/2018
Stream Category: Ma3
Assessor Name/Organization: M. Caddell

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**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	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

UTI Upper

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" 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): Banner Farms
2. Date of evaluation: 12/18/2018
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Cobleen
5. County: Henderson
6. Nearest named water body on USGS 7.5-minute quad: French Broad River
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.35346, -82.55433

STREAM INFORMATION: (depth and width can be approximations)
9. Site number (show on attached map): UTI - Upper
10. Length of assessment reach evaluated (feet): 200'
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 3-4' ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 12'
13. Is assessment reach a swamp stream? ☐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] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

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

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

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream 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 (including 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.** 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?

UTI Upper

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 (including water pennies)
☐	☐	Caddisfly larvae (Trichoptera [T])
☐	☐	Asian clam (*Corbicula*)
☐	☒	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☒	Damselfly and dragonfly larvae
☐	☐	Dipterans (true flies)
☐	☐	Mayfly larvae (Ephemeroptera [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 (Plecoptera [P])
☐	☐	Tipulid larvae (Cranefly)
☐	☐	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 that passes some flow during low-flow periods affecting assessment reach (ex: beaver dam, bottom-release dam)
☒D	Evidence of bank seepage or sweating (iron oxidizing bacteria 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 the stream category (may include gaps associated with natural processes)
☒B	Degraded (example: scattered trees)
☐C	Stream shading is gone or largely absent

UT1 upper

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 – First 100 feet of 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?

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:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Banner Farms - UT1 Upper
Stream Category: Ma2
Date of Evaluation: 12/18/2018
Assessor Name/Organization: M. Caddell

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

UTI lower

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" 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): Banner Farms
2. Date of evaluation: 12/18/2018
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Henderson
6. Nearest named water body on USGS 7.5-minute quad: French Broad River
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.35220, -82.55358

STREAM INFORMATION: (depth and width can be approximations)
9. Site number (show on attached map): UT1 lower
10. Length of assessment reach evaluated (feet): 550'
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): 15'
13. Is assessment reach a swamp stream? ☐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" 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 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**
☒No ☐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 (including 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.** 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?

UT11ower

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 (including water pennies)
☐	☐	Caddisfly larvae (Trichoptera [T])
☐	☐	Asian clam (*Corbicula*)
☐	☒	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☒	Damselfly and dragonfly larvae
☐	☐	Dipterans (true flies)
☐	☐	Mayfly larvae (Ephemeroptera [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 (Plecoptera [P])
☐	☐	Tipulid larvae (Cranefly)
☒	☐	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 that passes some flow during low-flow periods affecting assessment reach (ex: beaver dam, bottom-release dam)
☒D	Evidence of bank seepage or sweating (iron oxidizing bacteria 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 the stream category (may include gaps associated with natural processes)
☐B	Degraded (example: scattered trees)
☒C	Stream shading is gone or largely absent

UT1 lower

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 – First 100 feet of 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?

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:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Banner Farms - UT1 Lower
Stream Category: Ma2
Date of Evaluation: 12/18/2018
Assessor Name/Organization: M. Caddell

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

UT2

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" 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): Banner Farms
2. Date of evaluation: 12/18/2018
3. Applicant/owner name: Wildlands
4. Assessor name/organization: M. Caddell
5. County: Henderson
6. Nearest named water body on USGS 7.5-minute quad: French Broad River
7. River basin: French Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.35098, -82.55527

STREAM INFORMATION: (depth and width can be approximations)
9. Site number (show on attached map): UT2
10. Length of assessment reach evaluated (feet): 1500'
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 stream? ☐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
[X] B	[X] 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" 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)
- [X] 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
- [X] C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
[ ] Yes [X] No Is stream 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)**
- [X] A Multiple aquatic macrophytes and aquatic mosses (including liverworts, lichens, and algal mats)
- [X] B Multiple sticks and/or leaf packs and/or emergent vegetation
- [ ] C Multiple snags and logs (including lap trees)
- [X] 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. [X] Yes [X] No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
- [X] 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.** 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	
[X]	[ ]	[ ]	[ ]	[ ]	Bedrock/saprolite
[X]	[ ]	[ ]	[ ]	[ ]	Boulder (256 – 4096 mm)
[X]	[ ]	[ ]	[ ]	[ ]	Cobble (64 – 256 mm)
[ ]	[X]	[ ]	[ ]	[ ]	Gravel (2 – 64 mm)
[ ]	[ ]	[ ]	[X]	[ ]	Sand (.062 – 2 mm)
[ ]	[ ]	[X]	[ ]	[ ]	Silt/clay (< 0.062 mm)
[ ]	[X]	[ ]	[ ]	[ ]	Detritus
[ ]	[X]	[ ]	[ ]	[ ]	Artificial (rip-rap, concrete, etc.)

11d. [ ] Yes [X] No Are pools filled with sediment?

UT2

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 (including water pennies)
☐	☐	Caddisfly larvae (Trichoptera [T])
☐	☐	Asian clam (*Corbicula*)
☒	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☑	☒	Damselfly and dragonfly larvae
☐	☐	Dipterans (true flies)
☐	☐	Mayfly larvae (Ephemeroptera [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 (Plecoptera [P])
☐	☐	Tipulid larvae (Cranefly)
☐	☐	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 that passes some flow during low-flow periods affecting assessment reach (ex: beaver dam, bottom-release dam)
☒D Evidence of bank seepage or sweating (iron oxidizing bacteria 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 the 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 – First 100 feet of 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?

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:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Banner Farms - UT2
Date of Evaluation: 12/18/2018
Stream Category: Ma2
Assessor Name/Organization: M. Caddell

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

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**LOW**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 3

Date: 12/18/2018	**Project/Site:** Banner Farm	**Latitude:** 35.35539
Evaluator: M. Caddell	**County:** Henderson	**Longitude:** -82.55942
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 38.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** Banner Creek *e.g. Quad Name:* Reach 1

A. Geomorphology (Subtotal = 20.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	(0)	1	2	3
9. Grade control	(0)	0.5	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		(Yes = 3)	

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

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

C. Biology (Subtotal = 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: 3 mayfly, 1 damselfly, 1 stonefly, 5 caddisfly, 1 cranefly

Sketch:

NC DWQ Stream Identification Form Version 4.11 Stream Classification Point 1

Date: 12/11/2018	Project/Site: Banner Farms	Latitude: 35.35356
Evaluator: M. Caddell	County: Henderson	Longitude: -82.55421
Total Points: 35.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other UT 1 *e.g. Quad Name:*

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

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

B. Hydrology (Subtotal = 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 = 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: Damsel fly ~10 Crayfish - 2

Sketch:

NC DWQ Stream Identification Form Version 4.11

Stream Classification Point 2

Date: 12/18/2018	Project/Site: Banner Farm	Latitude: 35.34857
Evaluator: M. Caddell	County: Henderson	Longitude: -82.55913
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 34.5	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other UT2 *e.g. Quad Name:*

A. Geomorphology (Subtotal = 13.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	(0)	0.5	1	1.5
☆ 11. Second or greater order channel	No = 0		(Yes = 3)	

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

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

C. Biology (Subtotal = 11.5)				
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: 3 salamander, 3 damselflies, 1 dragonfly, 1 scud, 1 beetle

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 12/18/2018	Project/Site: Banner Farm	Latitude: 35.35532
Evaluator: M. Caddell	County: Henderson	Longitude: -82.55964
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 21.5	Stream Determination (circle one) Ephemeral (Intermittent) Perennial	Other e.g. Quad Name: Small drainage coming into Banner Creek 2.1 from pond

A. Geomorphology (Subtotal = 7)

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

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

B. Hydrology (Subtotal = 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)	

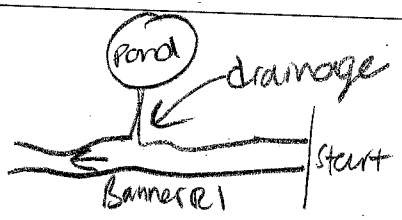
C. Biology (Subtotal = 3)

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: 2 Scud

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 12/18/2018	Project/Site: Banner Farm	Latitude: 35.35311
Evaluator: M. Cobbell	County: Henderson	Longitude: -82.55999
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 22.5	Stream Determination (circle one) Ephemeral (Intermittent) Perennial	Other Trib coming into Banner Creek at end of reach 2 *e.g. Quad Name:*

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

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

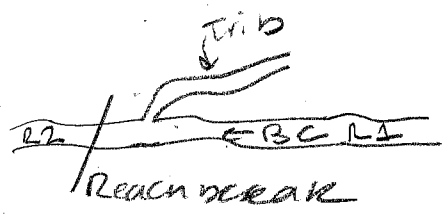
B. Hydrology (Subtotal = 8)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6.5)				
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: No life found

Sketch:



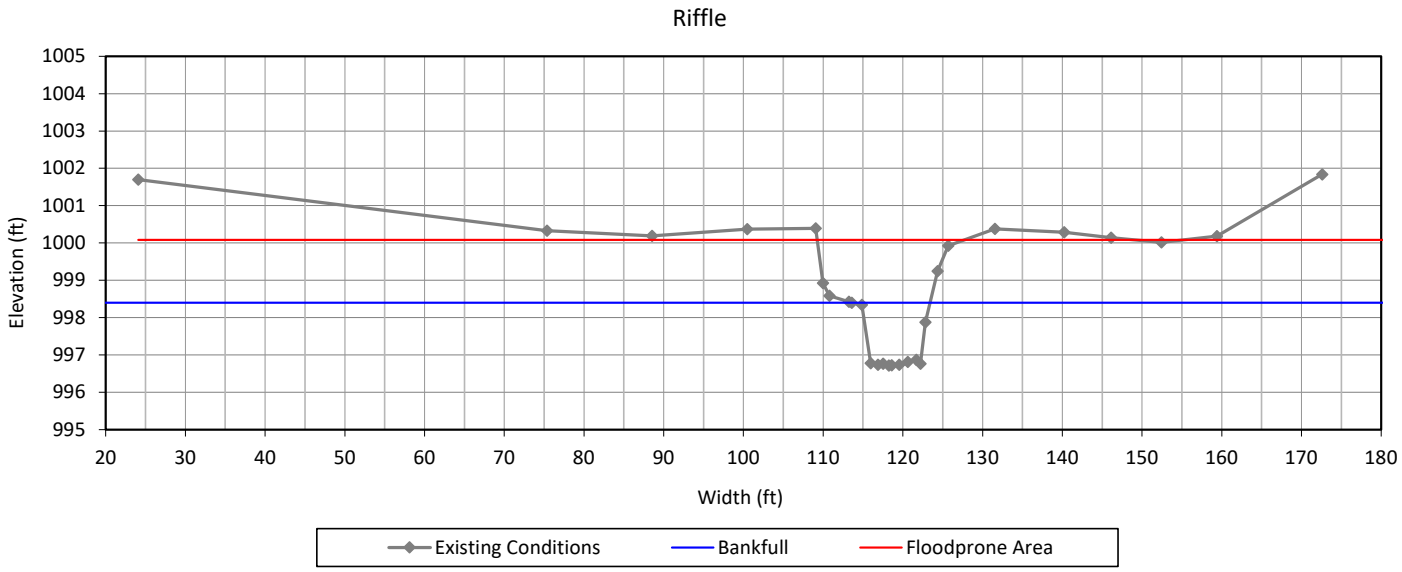
APPENDIX 6
Data, Analysis, and Supplementary Design Information

Existing Conditions Geomorphic Parameters

Parameter			Banner R1		Banner R2		Banner R3		Banner R4		UT1		UT2	
			min	max	min	max	min	max	min	max	min	max	min	max
stream type			C4		C5/4		C4		C4		E/C5		E/C5	
drainage area	DA	sq mi	0.61		0.66		0.67		1.13		0.13		0.30	
bankfull cross-sectional area	A_{bkf}	SF	12.0		11.6		11.9		32.4		3.6	7.8	4.1	
avg velocity during bankfull event	v_{bkf}	fps	3.4		4.0		3.6		1.8		0.6	2.3	2.3	
width at bankfull	w_{bkf}	feet	9.8		10.4		7.4		19.4		5.2	11.7	4.6	
maximum depth at bankfull	d_{max}	feet	1.7		2.30		2.10		2.60		1.4	1.7	1.2	
mean depth at bankfull	d_{bkf}	feet	1.2		1.1		1.6		1.7		0.7	0.8	0.9	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		8.2		9.3		4.6		11.4		7.5	12.9	5.1	
low bank height		feet	3.7		3.2		3.6		5.5		2.8	3.4	1.7	
bank height ratio	BHR		2.2		1.4		1.7		2.1		2.0	2.1	1.4	
floodprone area width	w_{fpa}	feet	25		58		31		23		15	24	16	
entrenchment ratio	ER		2.5		5.6		4.2		1.2		2.4	2.9	3.5	
max pool depth at bankfull	d_{pool}	feet	2.4		2.3		3.1		3.3		1.9		2.5	
pool depth ratio	d_{pool}/d_{bkf}		2.0		2.1		1.9		1.9		2.7		2.8	
pool width at bankfull	w_{pool}	feet	14.3		6.8		11.8		17		4.5		5.7	
pool width ratio	w_{pool}/w_{bkf}		1.5		0.7		1.6		0.9		0.9		1.2	
Bkf pool cross-sectional area	A_{pool}	SF	14.2		9.4		16.4		35.9		4.6		6.2	
pool area ratio	A_{pool}/A_{bkf}		1.2		0.8		1.4		1.1		1.3		1.5	
pool-pool spacing	p-p	feet	34	52	7	30	N/A[1]	N/A[1]	N/A[1]	N/A[1]	15	36	7	38
pool-pool spacing ratio	$p\text{-}p/W_{bkf}$		3.4	5	0.7	2.9	N/A[1]	N/A[1]	N/A[1]	N/A[1]	1.5	7	1.5	8
valley slope	S_{valley}	feet/ foot	0.006		0.005		0.009		0.004		0.0024		0.004	
channel slope	$S_{channel}$	feet/ foot	0.0057		0.007		0.001		0.001		0.003		0.0047	
sinuosity	K		1.08		1.01		1.00		1.02		1.10		1.28	
belt width	w_{blt}	feet	14	30	3	18	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
meander width ratio	w_{blt}/w_{bkf}		1.4	3.0	0.3	1.7	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
meander length	L_m	feet	54	130	63	106	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
meander length ratio	L_m/w_{bkf}		5.5	13.3	6.1	10.2	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Linear Wavelength	LW		50	111	58	100	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Linear Wavelength Ratio	LW/w_{bkf}		5.1	11.3	5.6	9.6	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
radius of curvature	R_c	feet	30	47	20	50	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
radius of curvature ratio	R_c/ w_{bkf}		3.1	4.8	1.9	4.8	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]

1) Banner Creek Reach 3 and 4 are inundated with fine sediments and no pool habitiat was observed along the reaches.
2) Banner Creek R3, 4, UT1, and UT2 are channelized with no pattern. Channel slope is based on abbreviated and representative geomorphic survey in vicinity of cross sections.

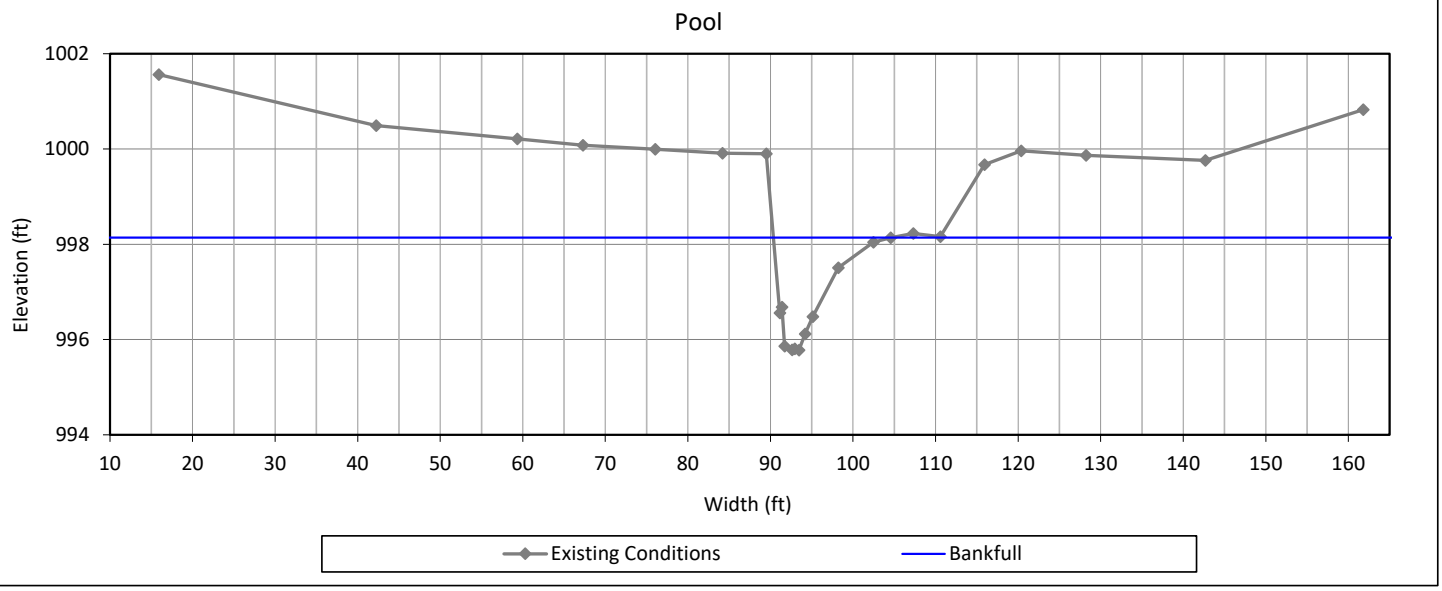
Cross Section 1, Banner Creek Reach 1



Bankfull Dimensions	
12.0	x-section area (ft.sq.)
9.8	width (ft)
1.2	mean depth (ft)
1.7	max depth (ft)
11.5	wetted perimeter (ft)
1.0	hyd radi (ft)
8.1	width-depth ratio
2.5	entrenchment ratio
2.2	low bank height ratio

View Downstream

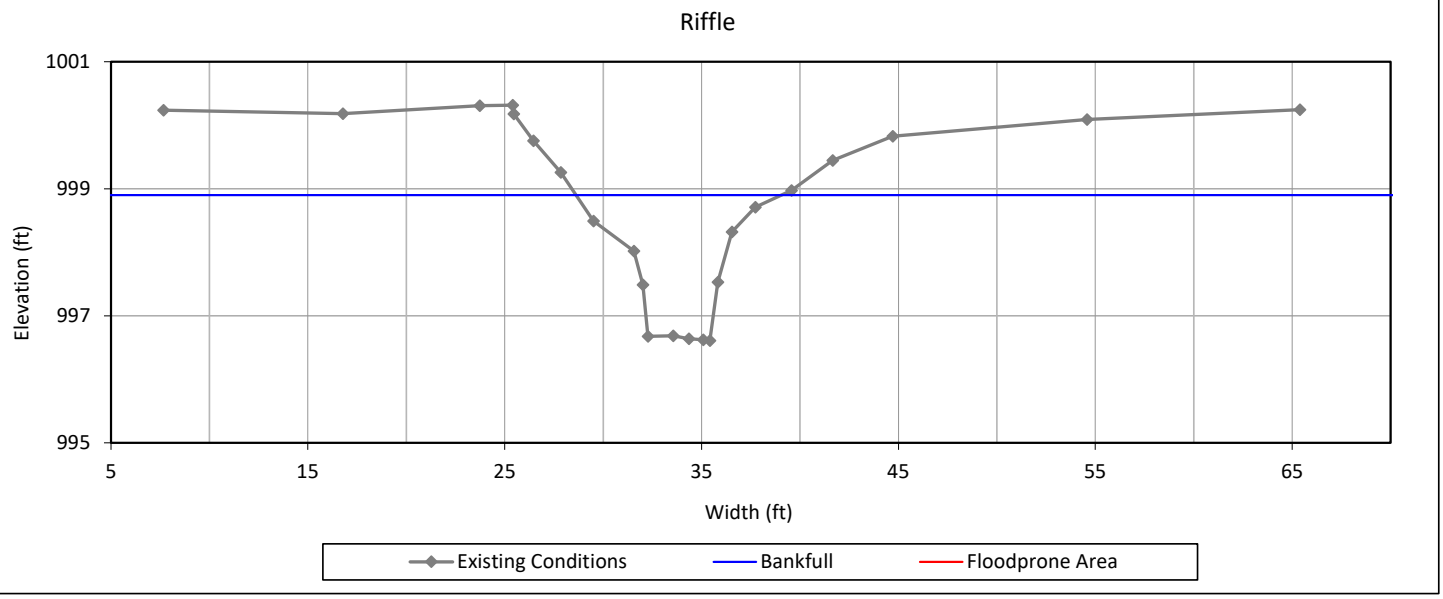
Cross Section 2, Banner Creek Reach 1



Bankfull Dimensions	
14.2	x-section area (ft.sq.)
14.3	width (ft)
1.0	mean depth (ft)
2.4	max depth (ft)
16.2	wetted perimeter (ft)
0.9	hyd radi (ft)
14.3	width-depth ratio
38.3	W flood prone area (ft)
2.7	entrenchment ratio
1.7	low bank height ratio

View Downstream

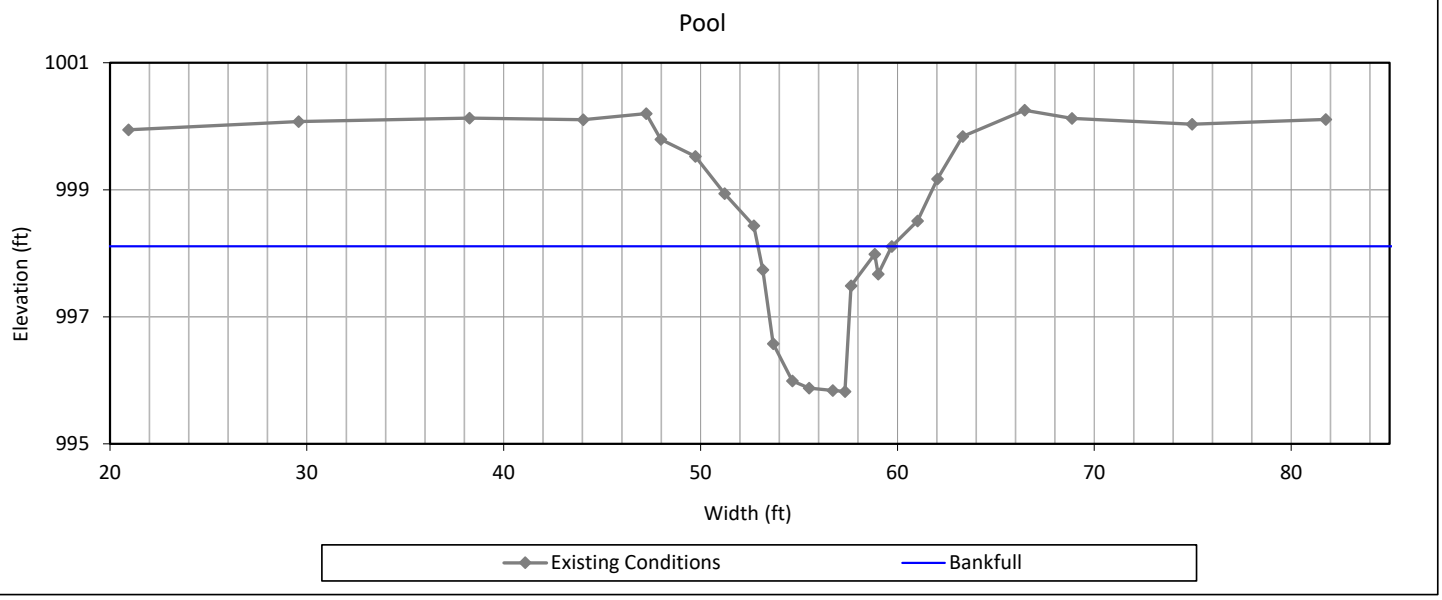
Cross Section 3, Banner Creek Reach 2



Bankfull Dimensions	
11.6	x-section area (ft.sq.)
10.4	width (ft)
1.1	mean depth (ft)
2.3	max depth (ft)
12.4	wetted perimeter (ft)
0.9	hyd radi (ft)
9.4	width-depth ratio
57.7	W flood prone area (ft)
5.5	entrenchment ratio
1.4	low bank height ratio

View Downstream

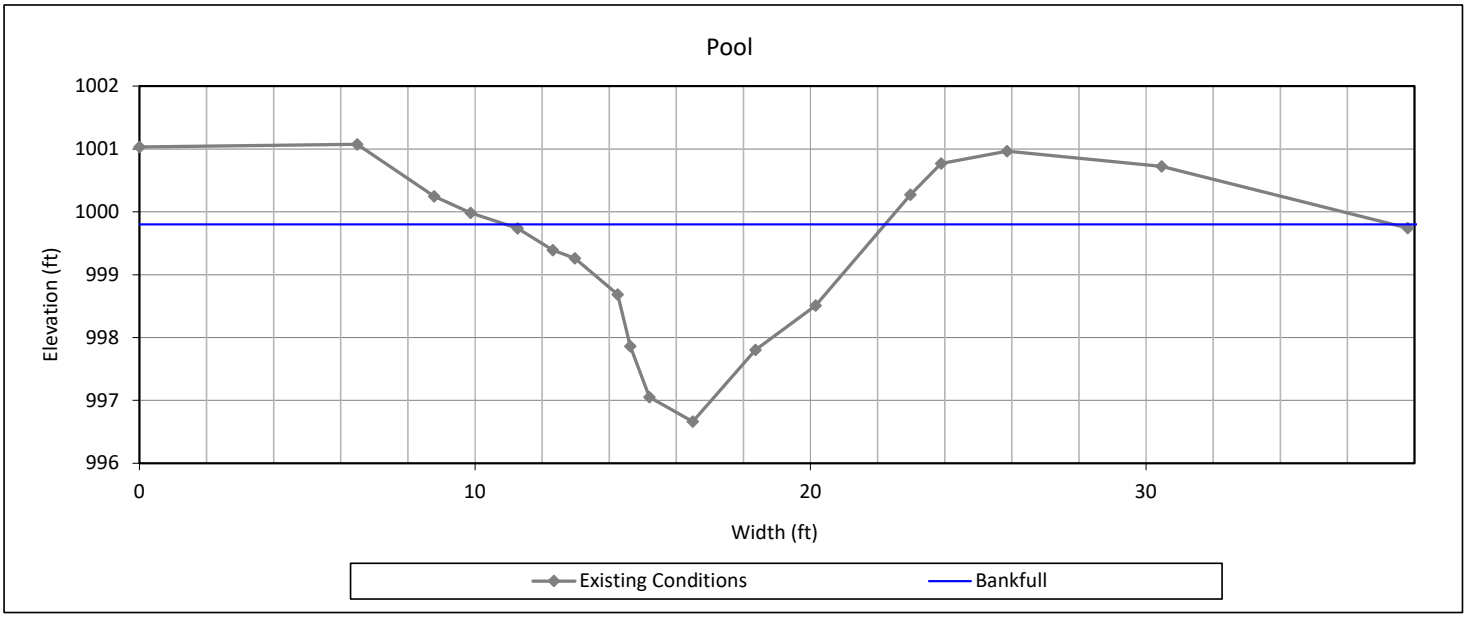
Cross Section 4, Banner Creek Reach 2



Bankfull Dimensions	
9.4	x-section area (ft.sq.)
6.8	width (ft)
1.4	mean depth (ft)
2.3	max depth (ft)
9.7	wetted perimeter (ft)
1.0	hyd radi (ft)
4.9	width-depth ratio
8.9	entrenchment ratio
1.9	low bank height ratio

View Downstream

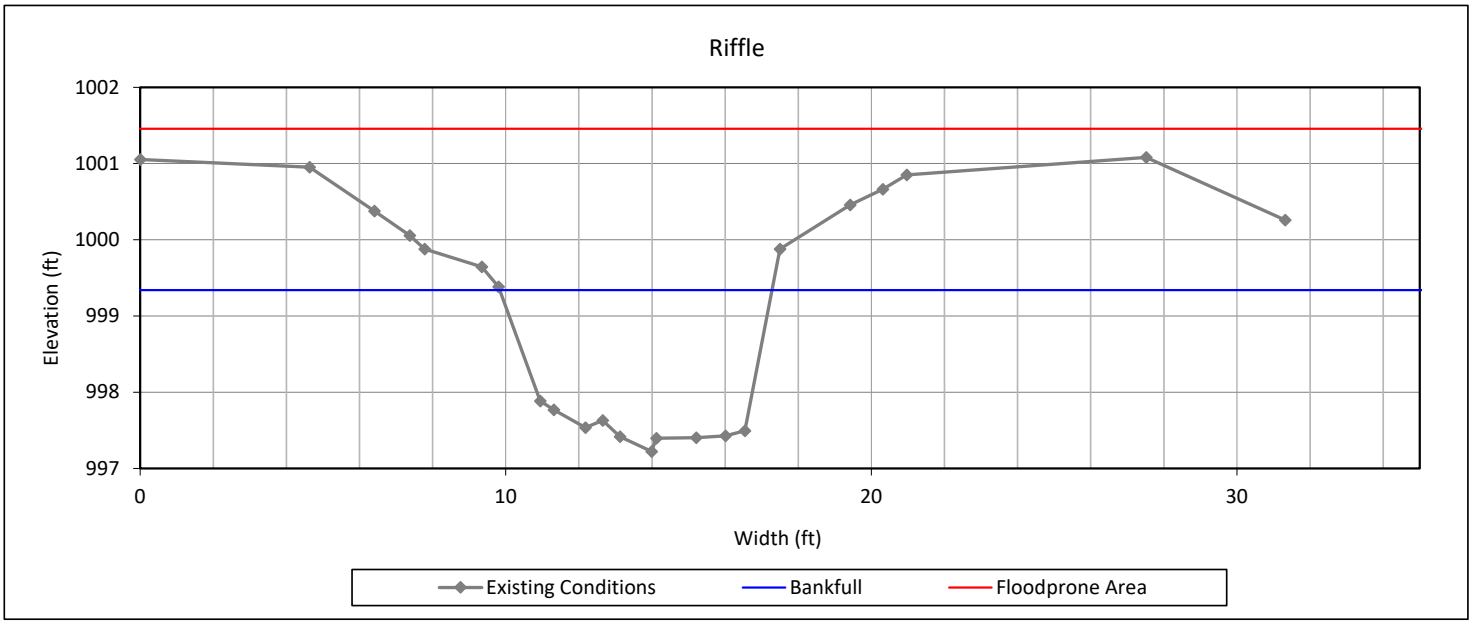
Cross Section 5, Banner Creek R3



Bankfull Dimensions	
16.4	x-section area (ft.sq.)
11.8	width (ft)
1.4	mean depth (ft)
3.1	max depth (ft)
13.8	wetted perimeter (ft)
1.2	hyd radi (ft)
8.4	width-depth ratio
3.2	entrenchment ratio
1.3	low bank height ratio

View Downstream

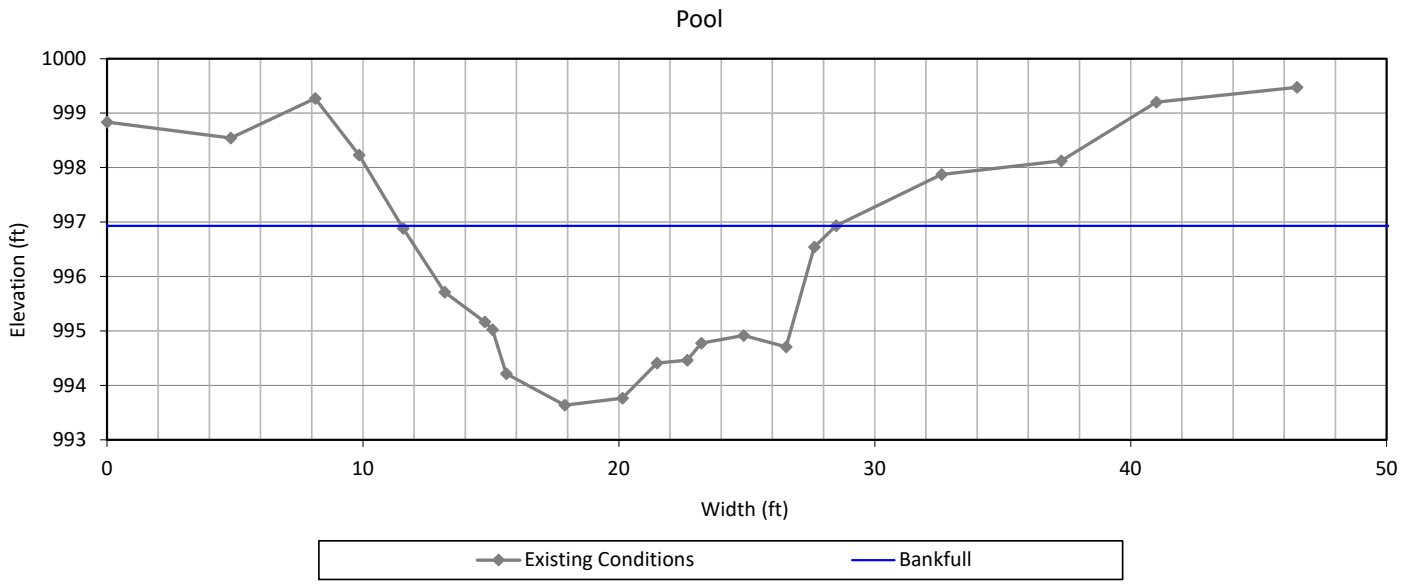
Cross Section 6, Banner Creek R3



Bankfull Dimensions	
11.9	x-section area (ft.sq.)
7.4	width (ft)
1.6	mean depth (ft)
2.1	max depth (ft)
9.6	wetted perimeter (ft)
1.2	hyd radi (ft)
4.7	width-depth ratio
31.3	W flood prone area (ft)
4.2	entrenchment ratio
1.7	low bank height ratio

View Downstream

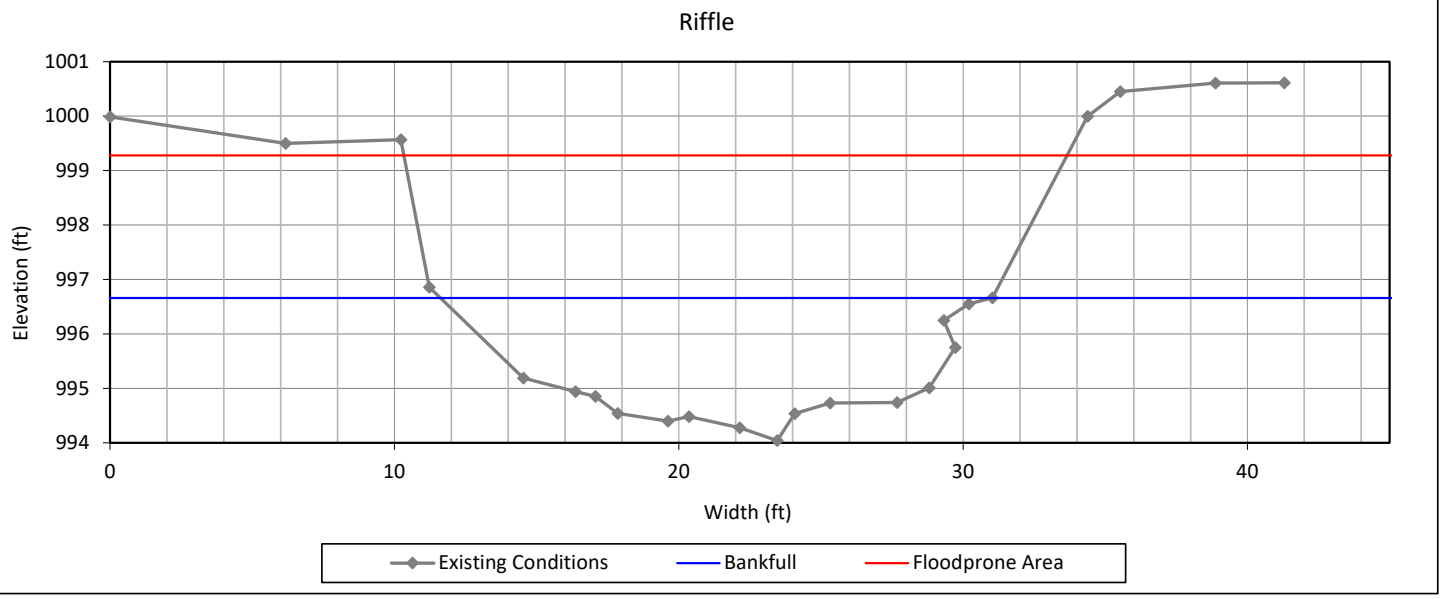
Cross Section 7, Banner Creek Reach 4 A



Bankfull Dimensions	
35.9	x-section area (ft.sq.)
17.0	width (ft)
2.1	mean depth (ft)
3.3	max depth (ft)
19.4	wetted perimeter (ft)
1.9	hyd radi (ft)
8.0	width-depth ratio
2.7	entrenchment ratio
1.4	low bank height ratio

View Downstream

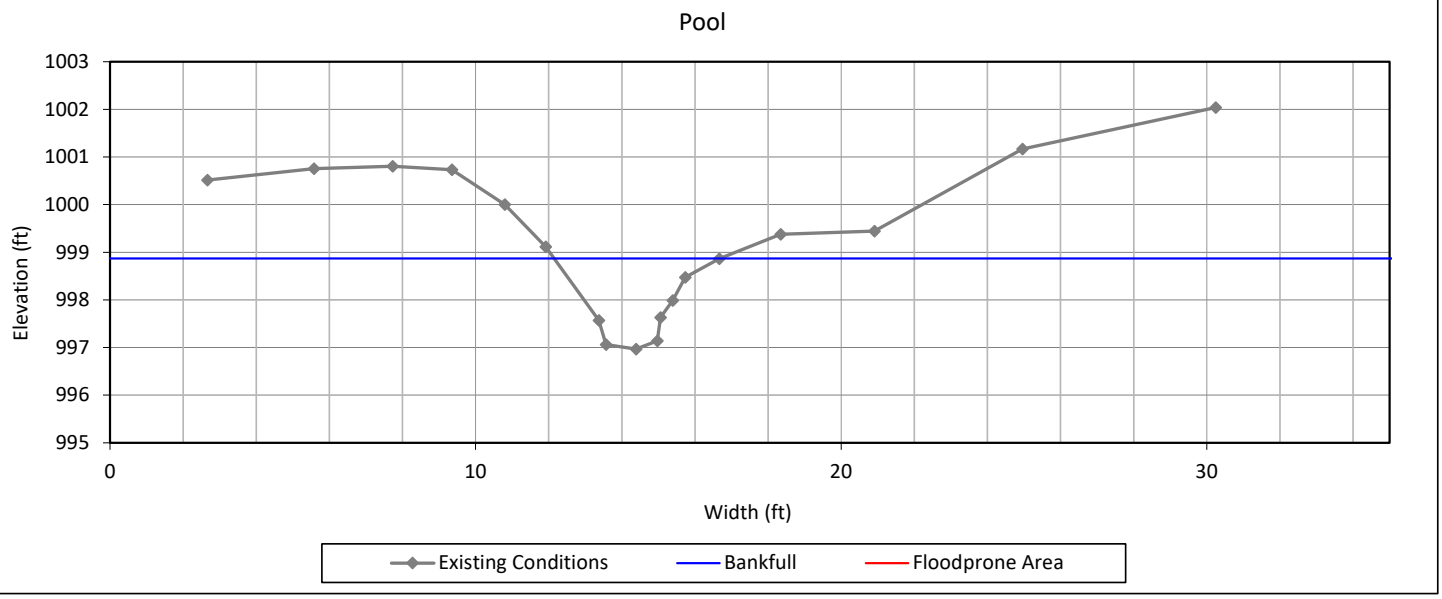
Cross Section 8, Banner Creek Reach 4 B



Bankfull Dimensions	
32.4	x-section area (ft.sq.)
19.4	width (ft)
1.7	mean depth (ft)
2.6	max depth (ft)
21.4	wetted perimeter (ft)
1.5	hyd radi (ft)
11.6	width-depth ratio
23.3	W flood prone area (ft)
1.2	entrenchment ratio
2.1	low bank height ratio

View Downstream

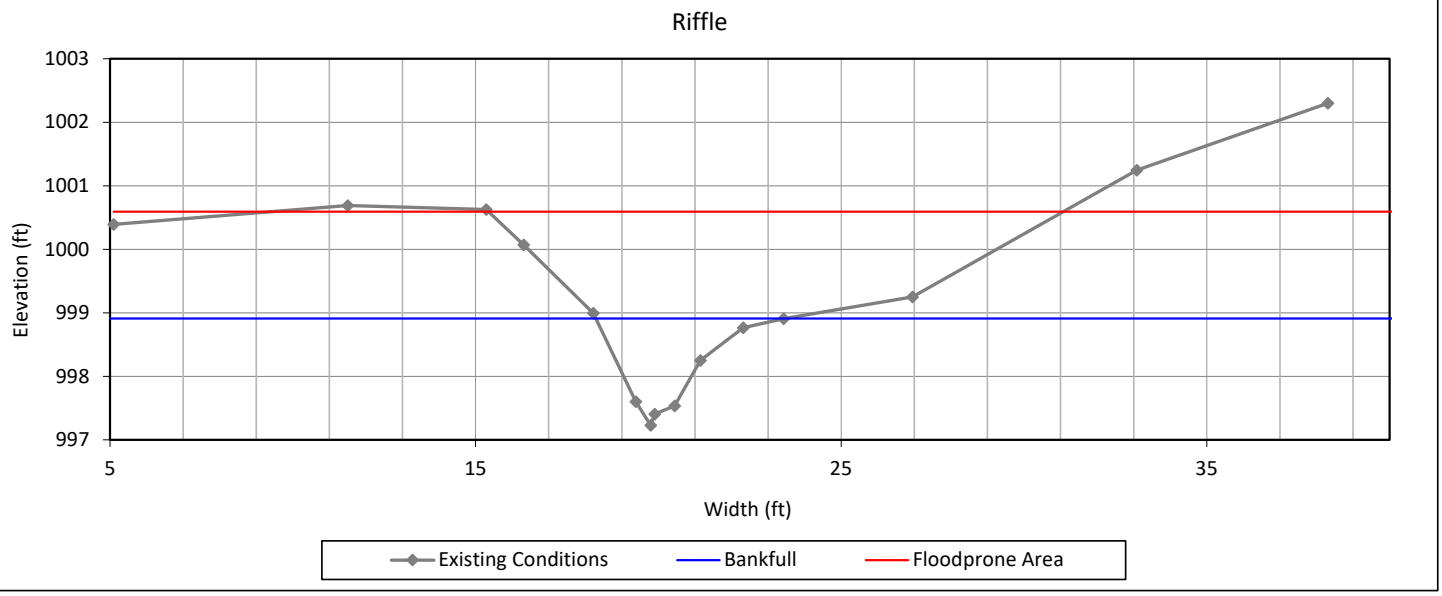
Cross Section 9, UT1 R1 A



Bankfull Dimensions	
4.6	x-section area (ft.sq.)
4.5	width (ft)
1.0	mean depth (ft)
1.9	max depth (ft)
6.4	wetted perimeter (ft)
0.7	hyd radi (ft)
4.5	width-depth ratio
14.3	W flood prone area (ft)
3.2	entrenchment ratio
2.0	low bank height ratio

View Downstream

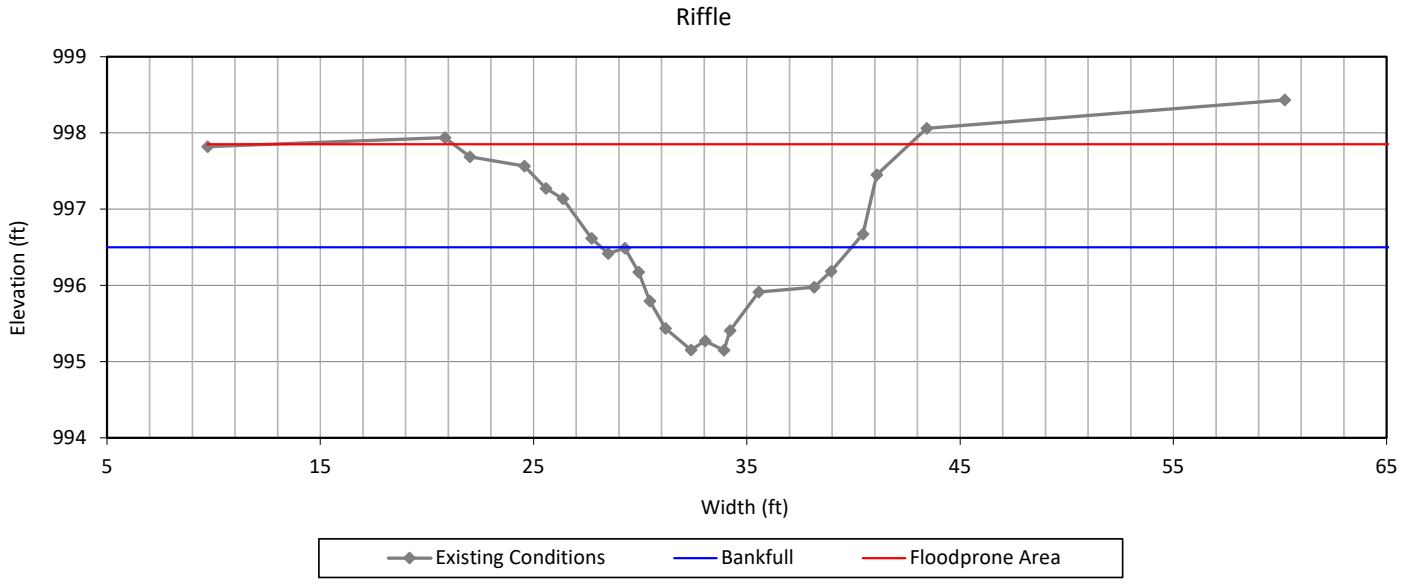
Cross Section 10, UT1 R1A Pool



Bankfull Dimensions	
3.6	x-section area (ft.sq.)
5.2	width (ft)
0.7	mean depth (ft)
1.7	max depth (ft)
6.5	wetted perimeter (ft)
0.6	hyd radi (ft)
7.5	width-depth ratio
2.9	entrenchment ratio
2.0	low bank height ratio

View Downstream

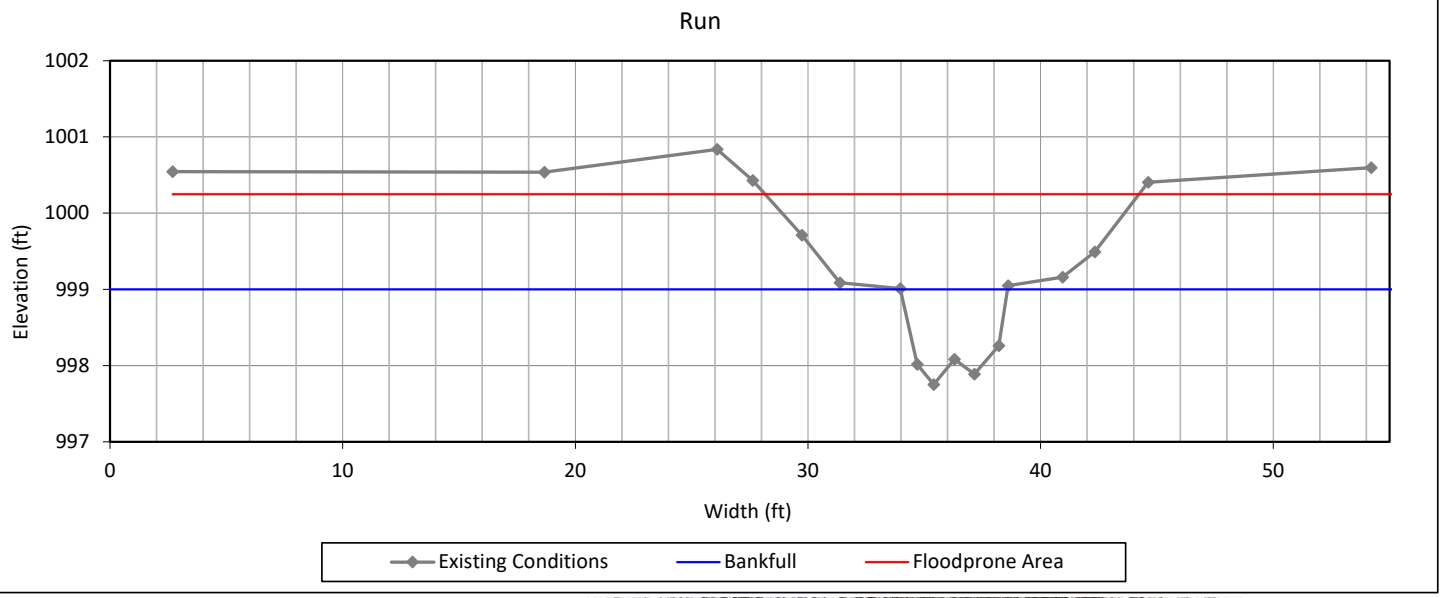
Cross Section 10, UT1 R1B Riffle



Bankfull Dimensions	
7.9	x-section area (ft.sq.)
11.7	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
12.4	wetted perimeter (ft)
0.6	hyd radi (ft)
17.4	width-depth ratio
2.0	entrenchment ratio
2.1	low bank height ratio

View Downstream

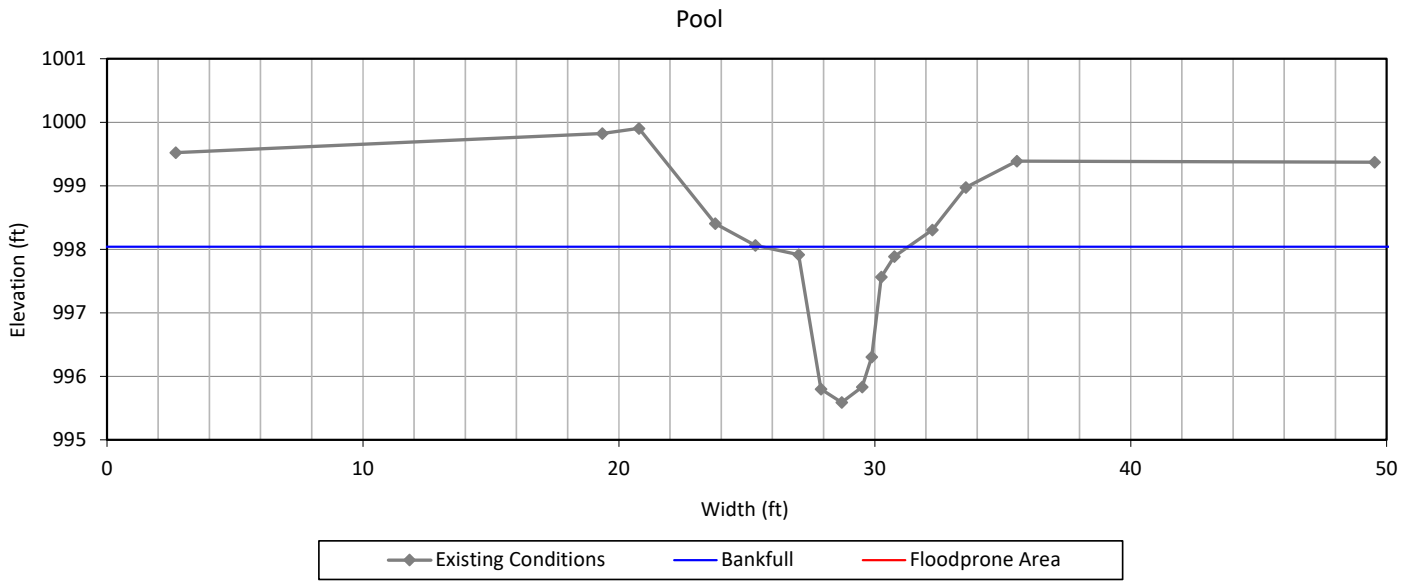
Cross Section 12, UT2 R2A Run



Bankfull Dimensions	
4.1	x-section area (ft.sq.)
4.6	width (ft)
0.9	mean depth (ft)
1.2	max depth (ft)
5.7	wetted perimeter (ft)
0.7	hyd radi (ft)
5.2	width-depth ratio
3.5	entrenchment ratio
1.4	low bank height ratio

View Downstream

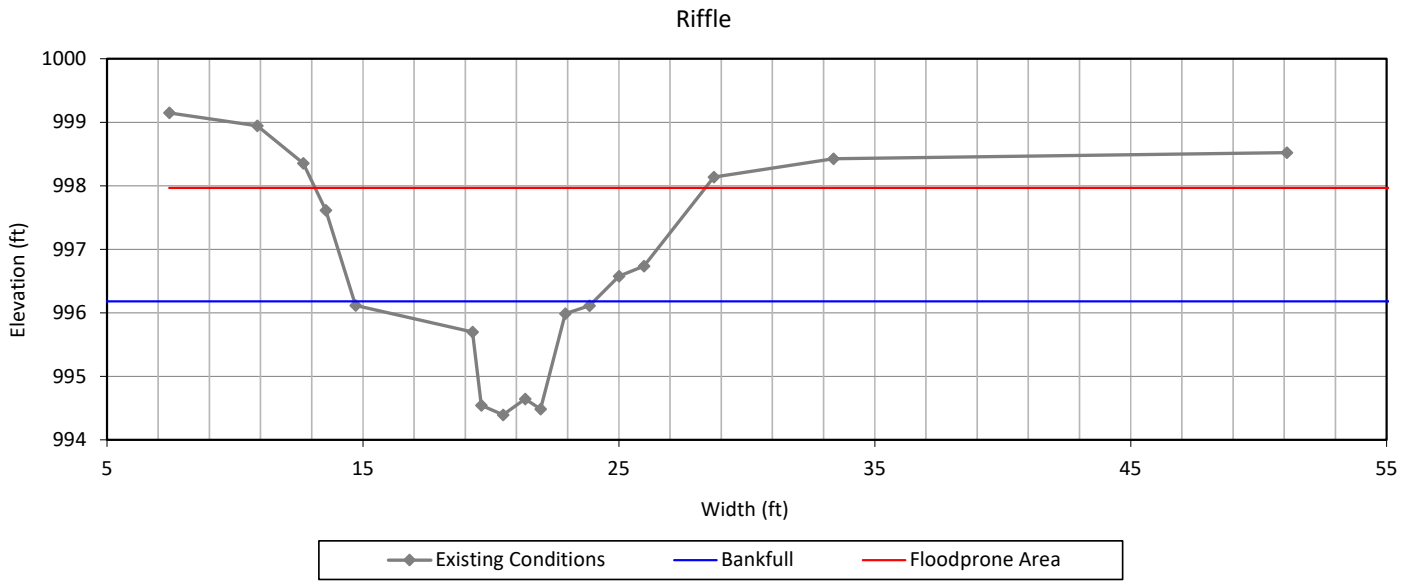
Cross Section 13, UT2 R2A Pool



Bankfull Dimensions	
6.2	x-section area (ft.sq.)
5.7	width (ft)
1.1	mean depth (ft)
2.5	max depth (ft)
8.5	wetted perimeter (ft)
0.7	hyd radi (ft)
5.3	width-depth ratio
2.3	entrenchment ratio
1.1	low bank height ratio

View Downstream

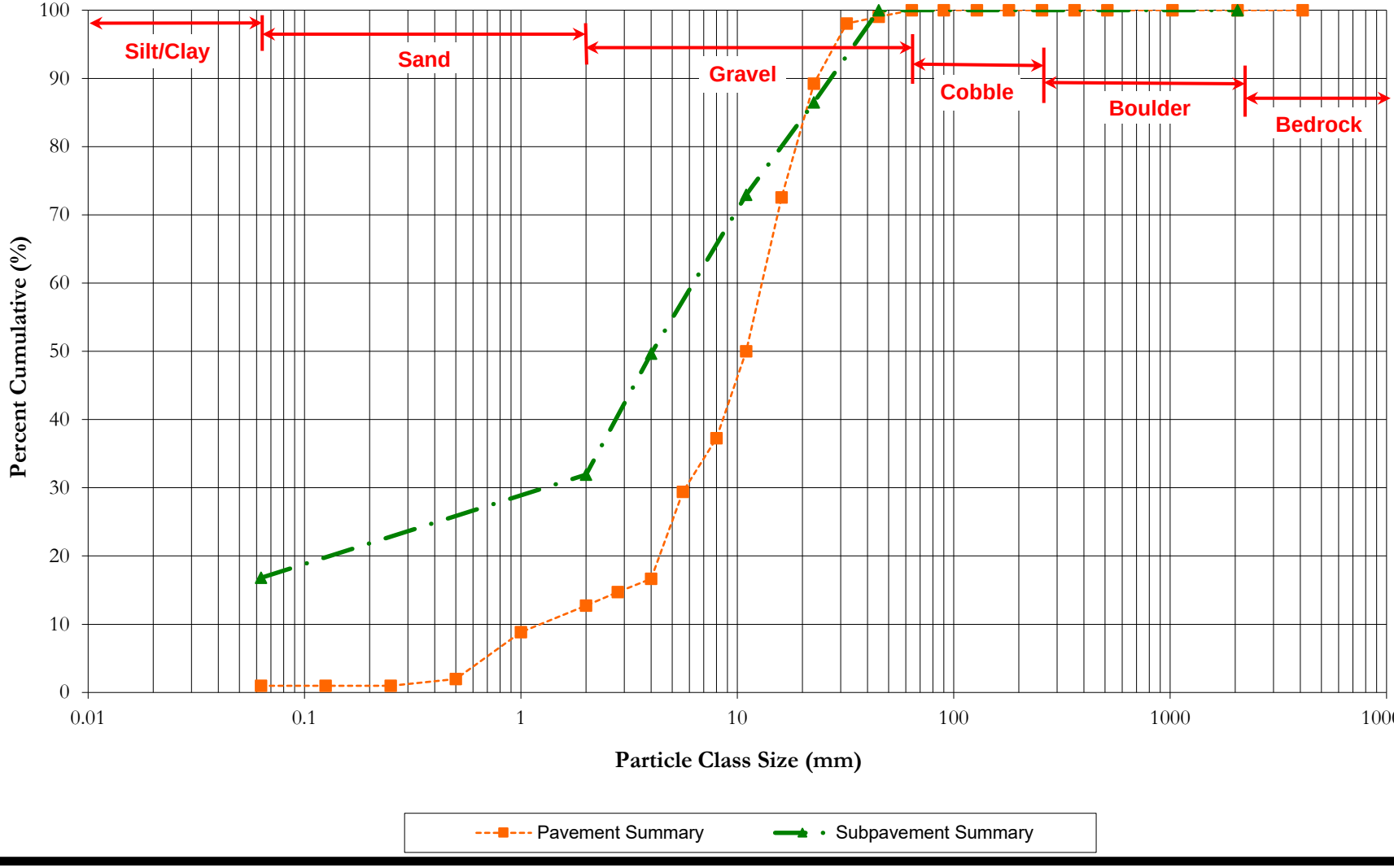
Cross Section 14, UT2 R2B Riffle



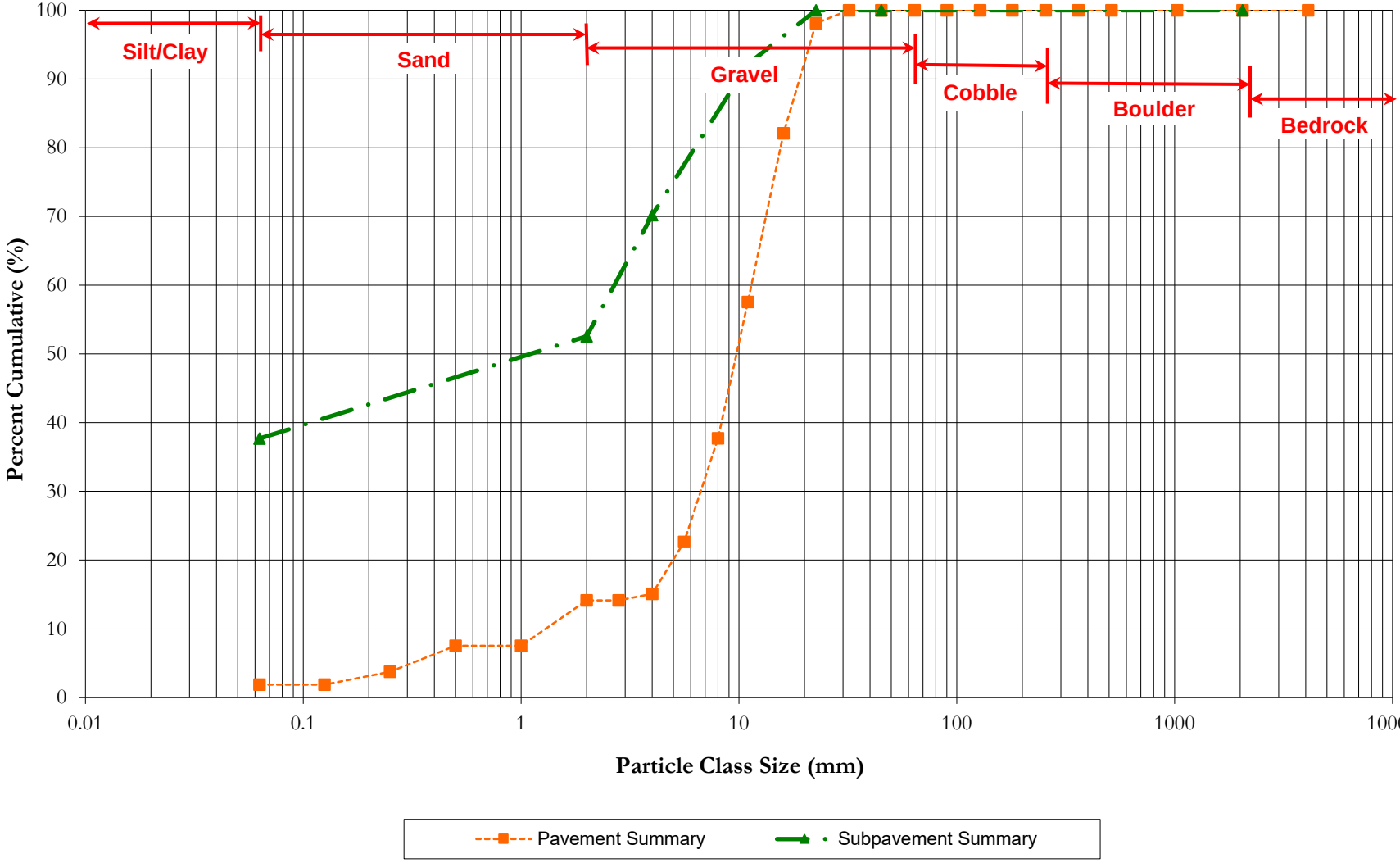
Bankfull Dimensions	
6.5	x-section area (ft.sq.)
9.4	width (ft)
0.7	mean depth (ft)
1.8	max depth (ft)
11.2	wetted perimeter (ft)
0.6	hyd radi (ft)
13.5	width-depth ratio
1.6	entrenchment ratio
1.3	low bank height ratio

View Downstream

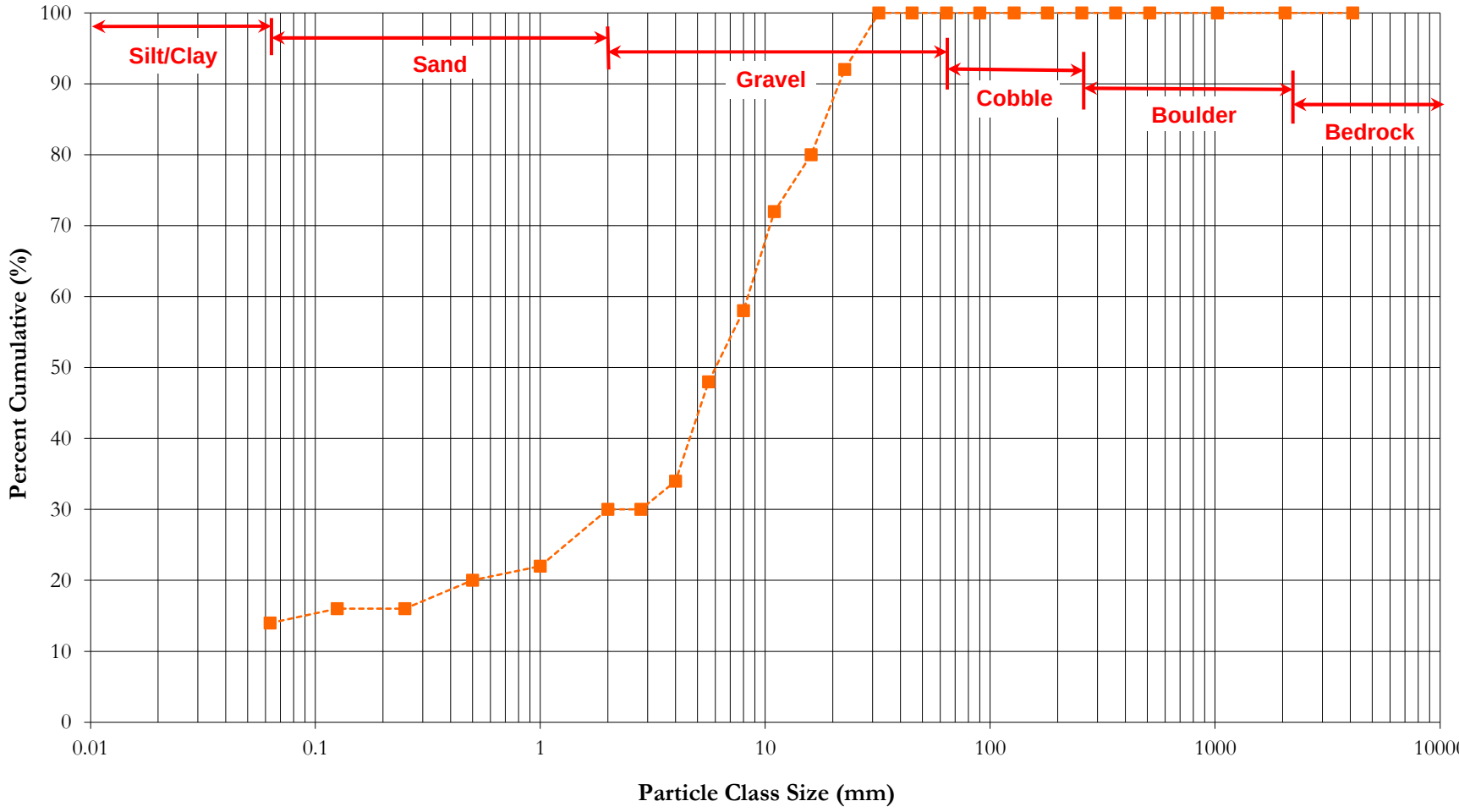
Banner Creek Reach 1 - XS1
Pavement-Subpavement Particle Distribution



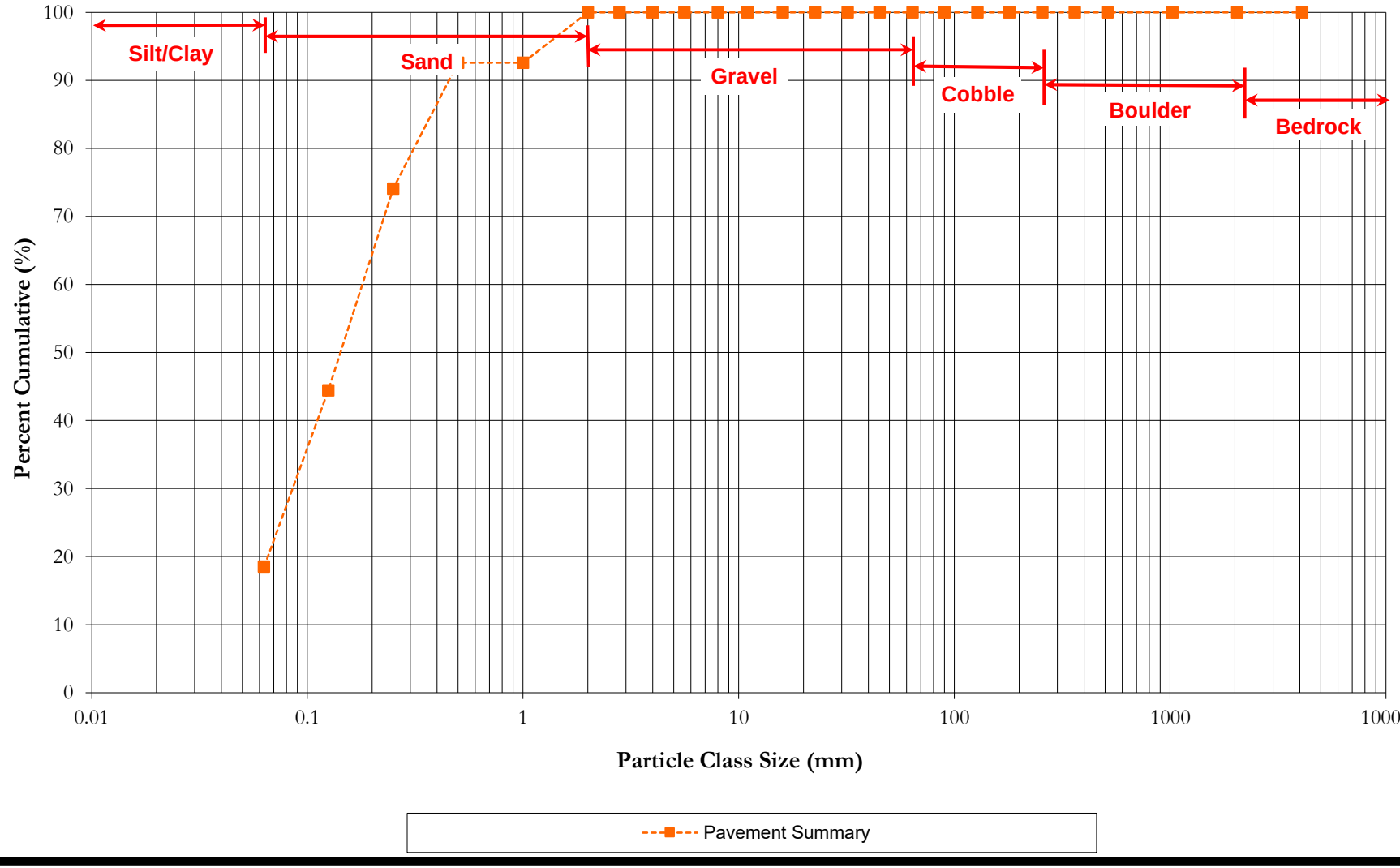
Banner Farms Reach 2 - XS3
Pavement-Subpavement Particle Distribution



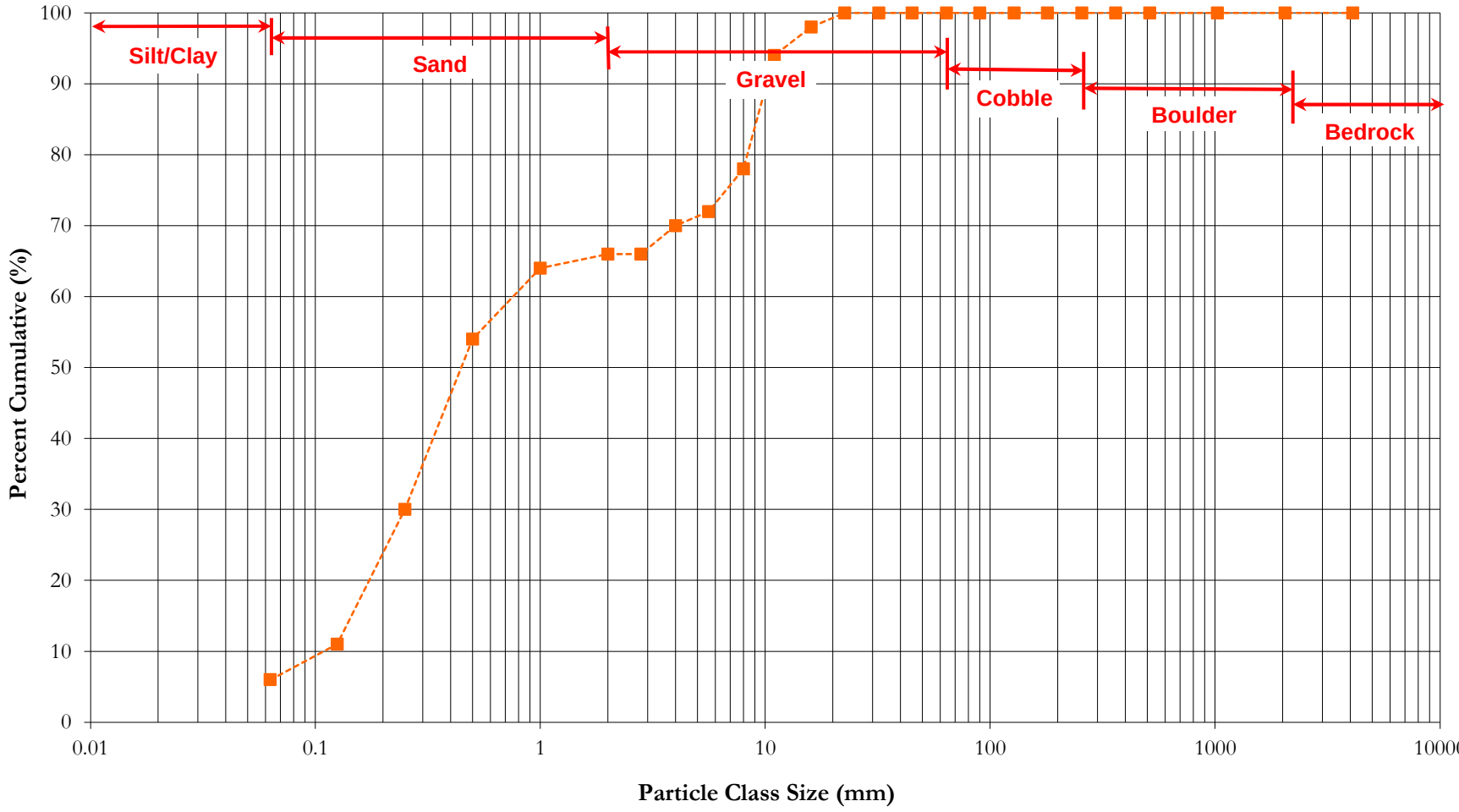
Banner Creek Reach 3 - XS 5
Pavement Particle Distribution



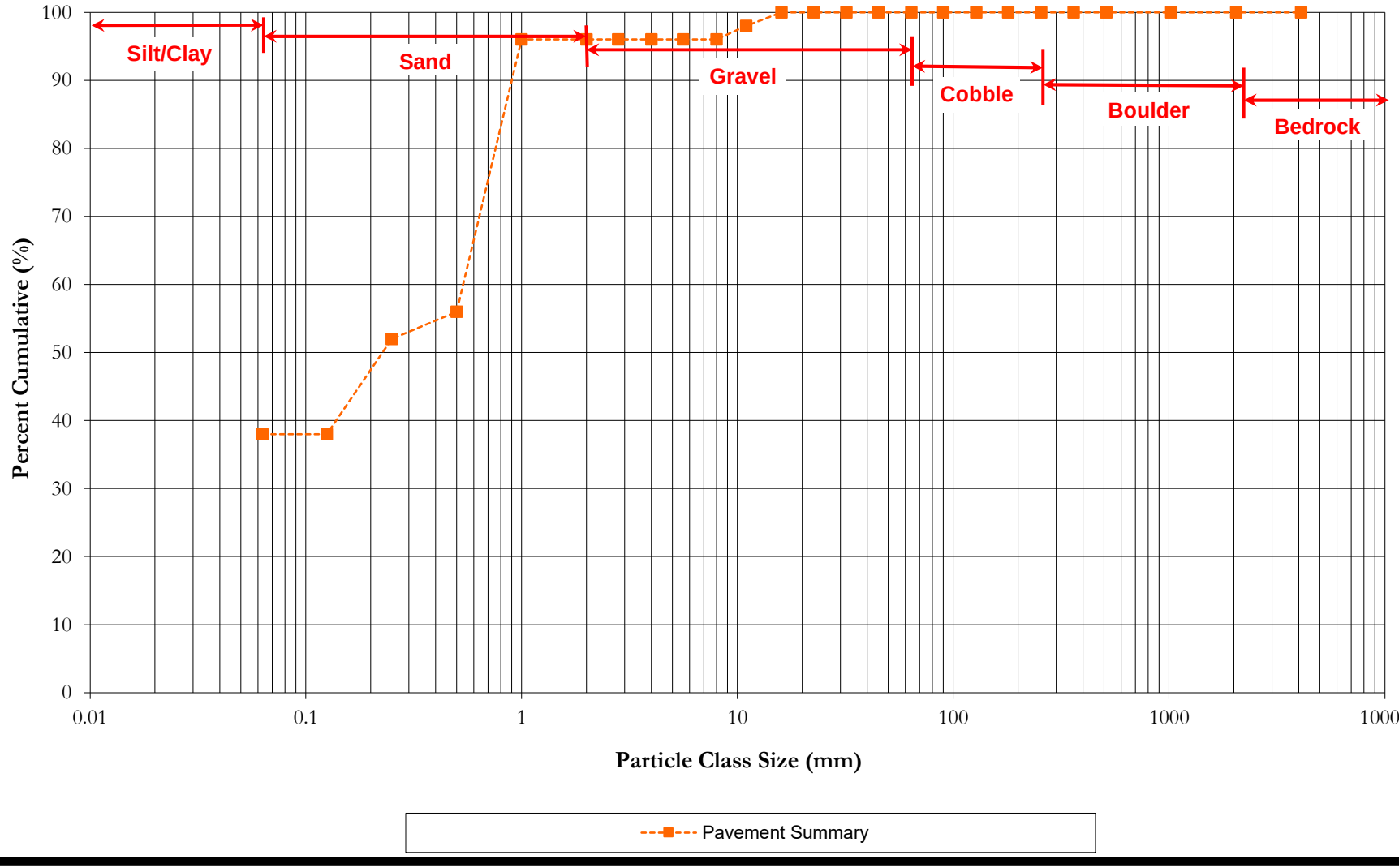
Banner Farms Reach 4 - Pavement Particle Distribution



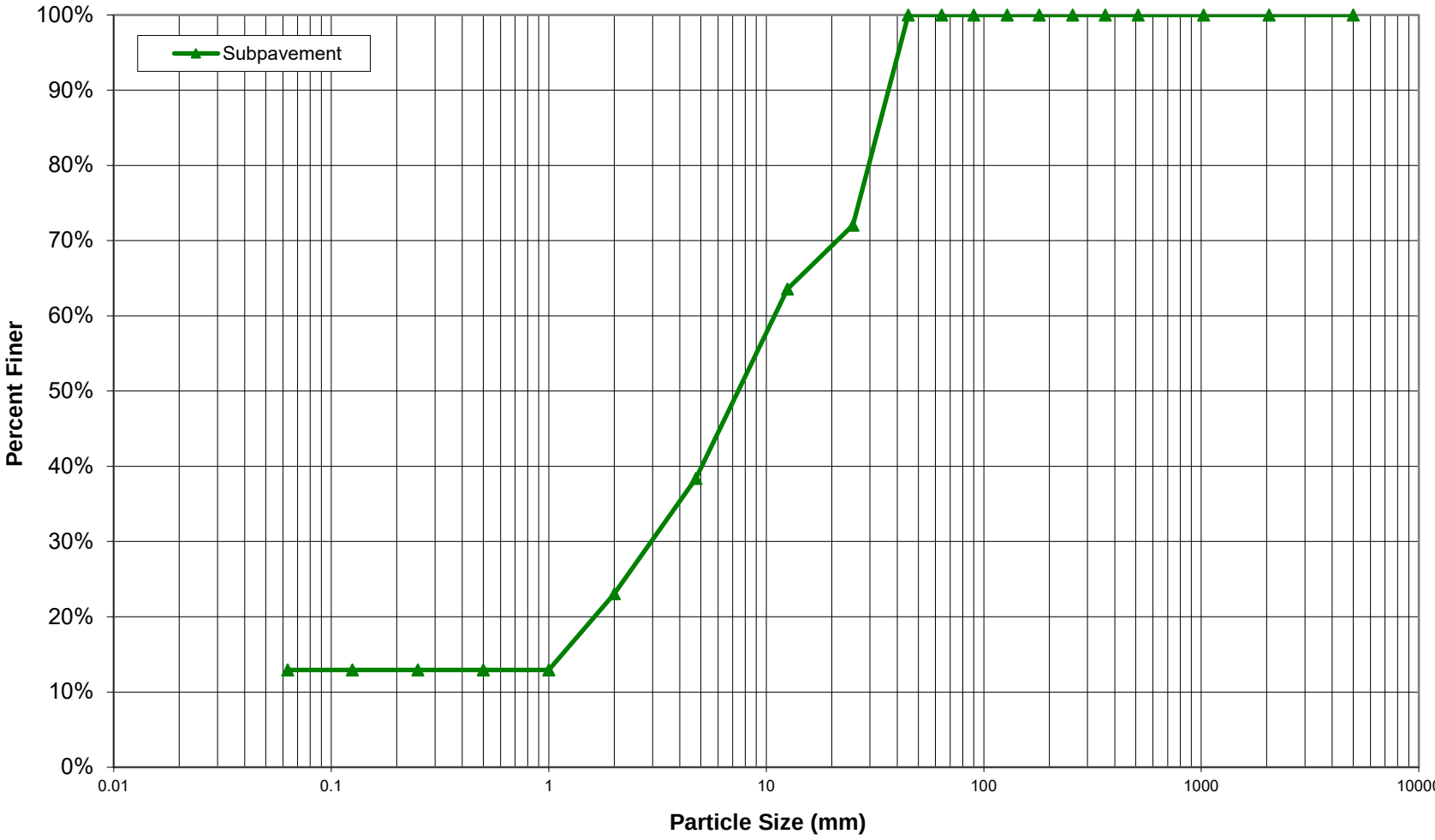
UT1 - XS 9
Pavement Particle Distribution



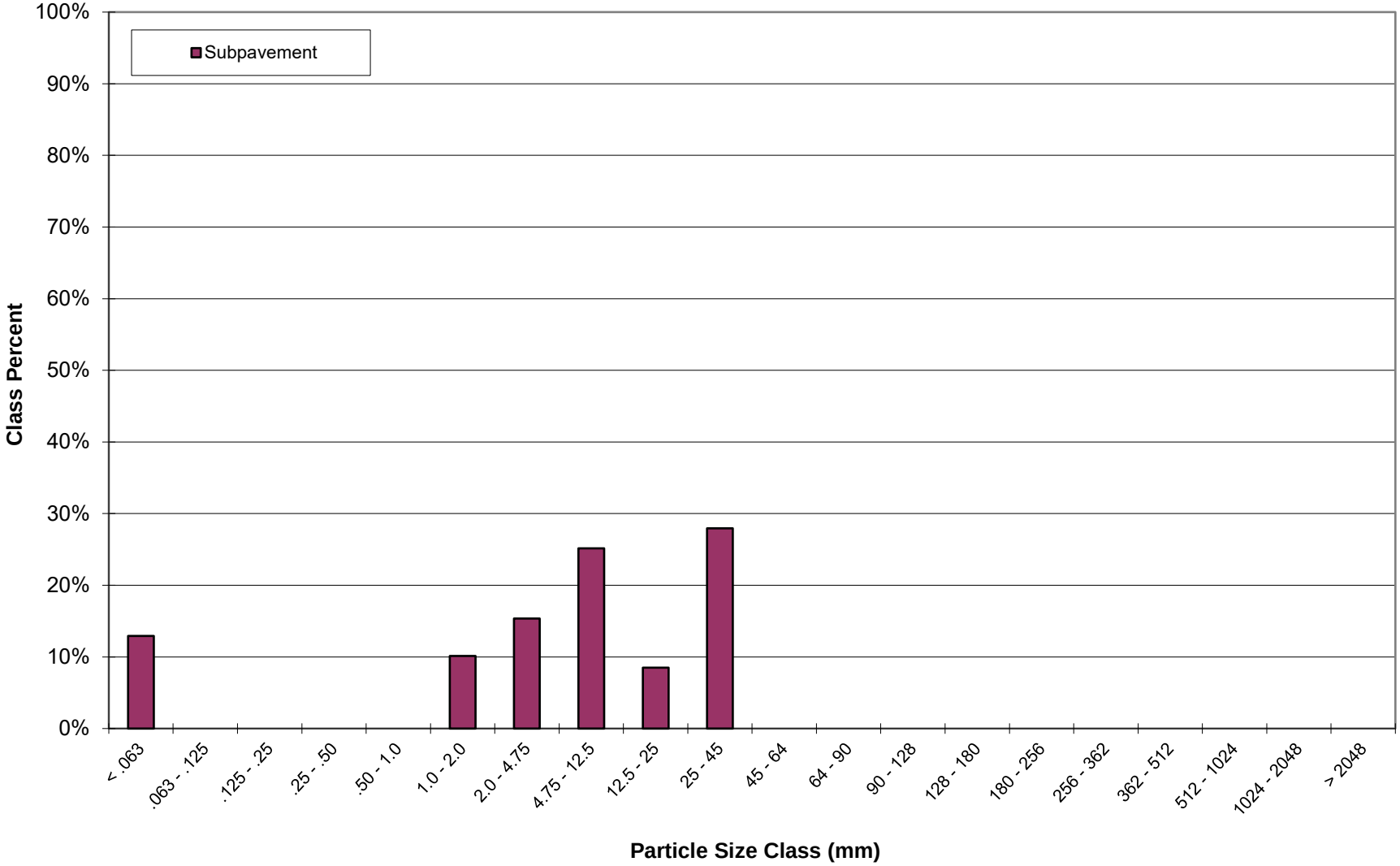
UT2 - XS-12
Pavement Particle Distribution



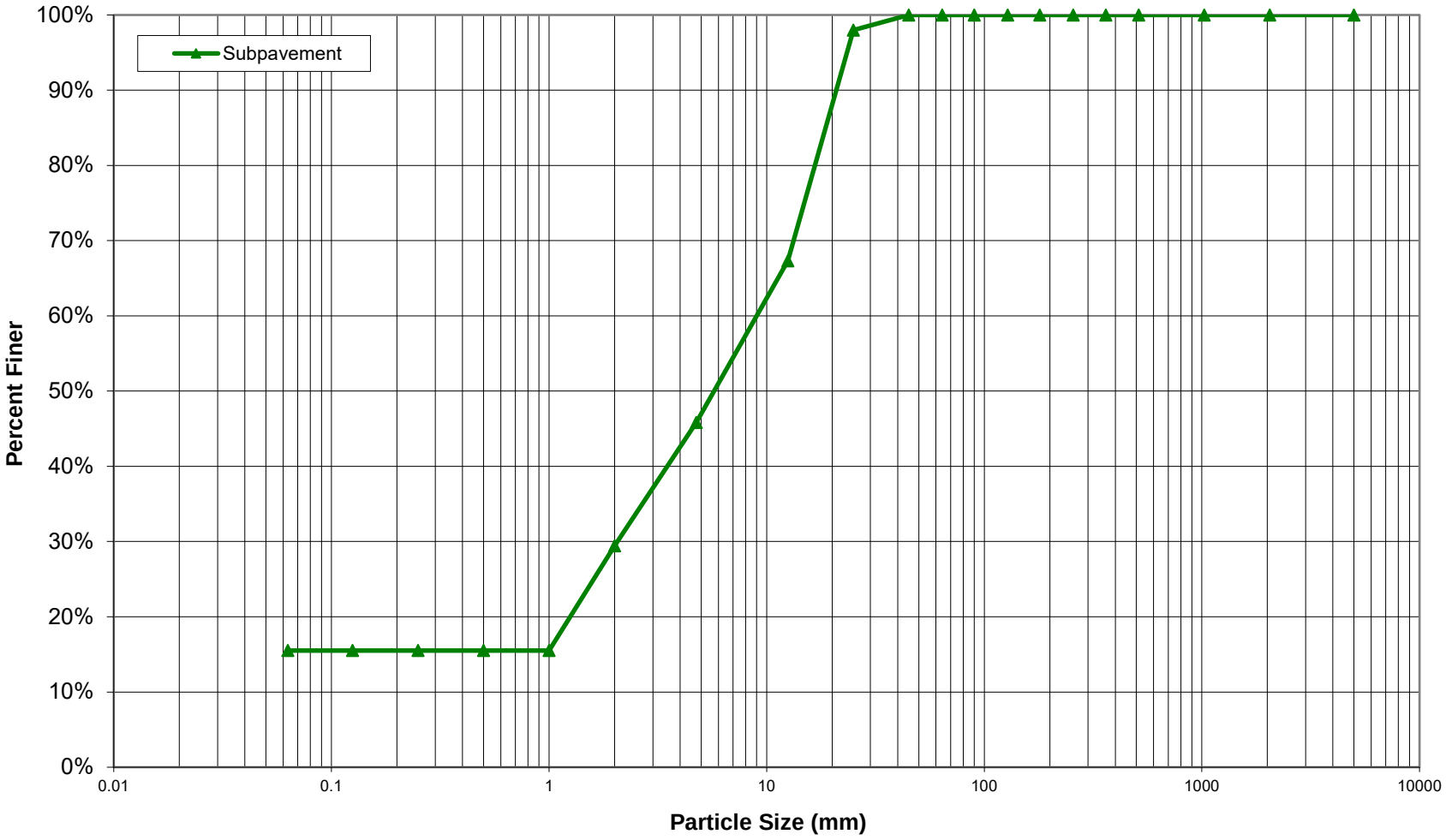
Banner Farm Mitigation Site
Banner Creek Reach 1 (Bar)
Subpavement Particle Size Distribution



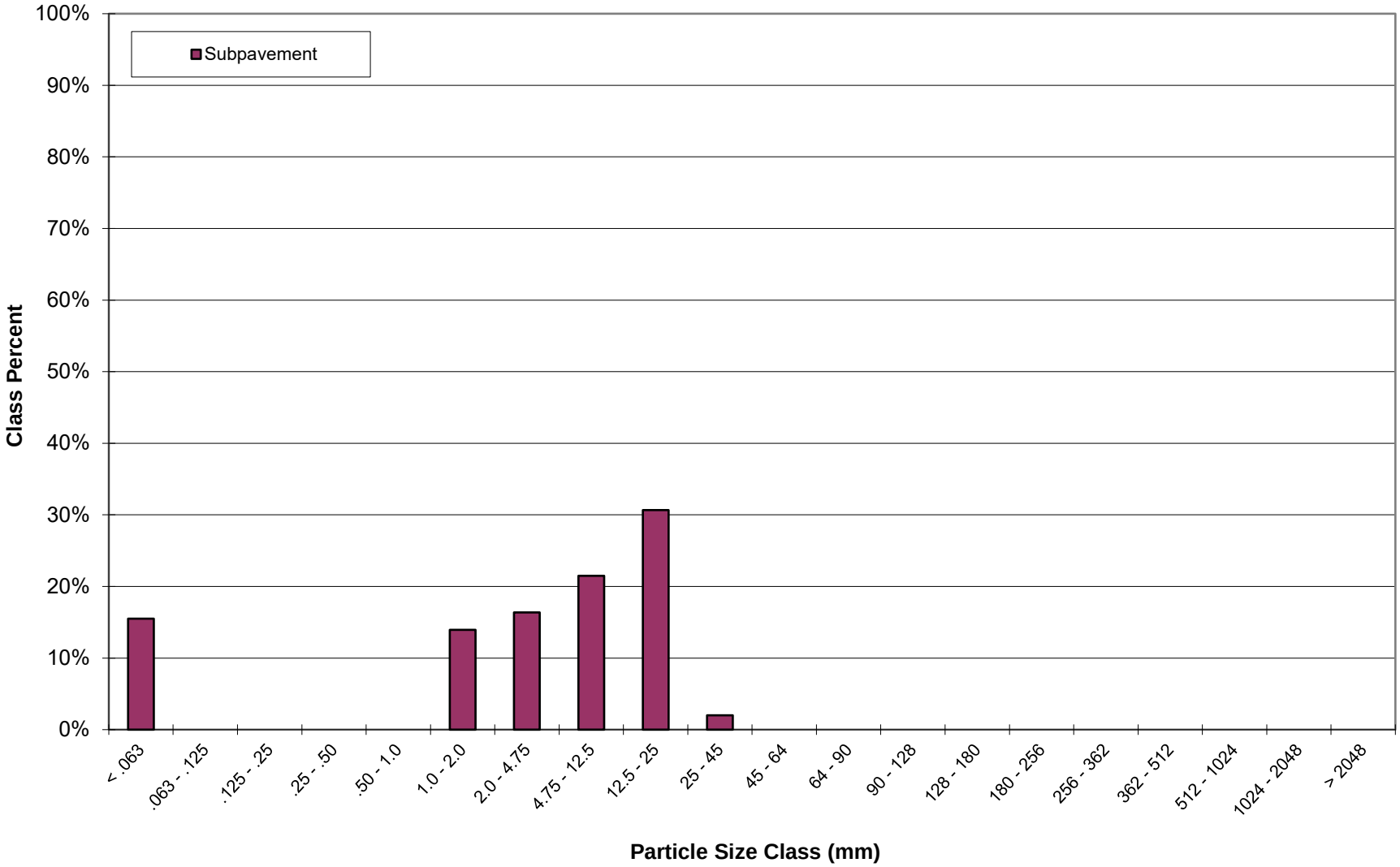
Banner Creek
Reach 1 (Bar)
Sieve Analysis Class Distribution



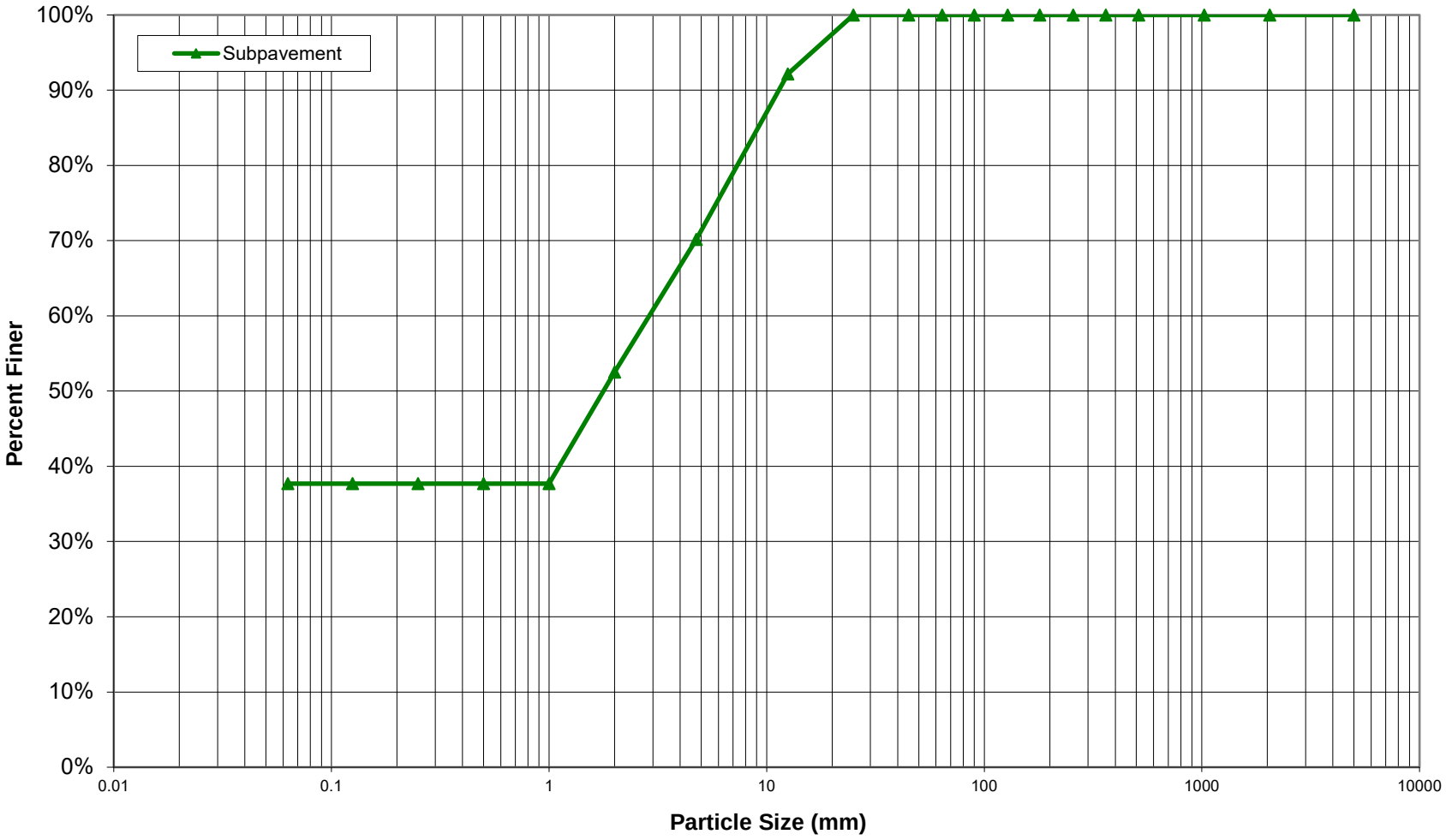
Banner Farms Mitigation Site
Banner Creek Reach 1
Subpavement Particle Size Distribution



Banner Creek
Reach 1
Sieve Analysis Class Distribution



Banner Farm Mitigation Site
Banner Creek Reach 2
Subpavement Particle Size Distribution



Banner Creek
Reach 2
Sieve Analysis Class Distribution

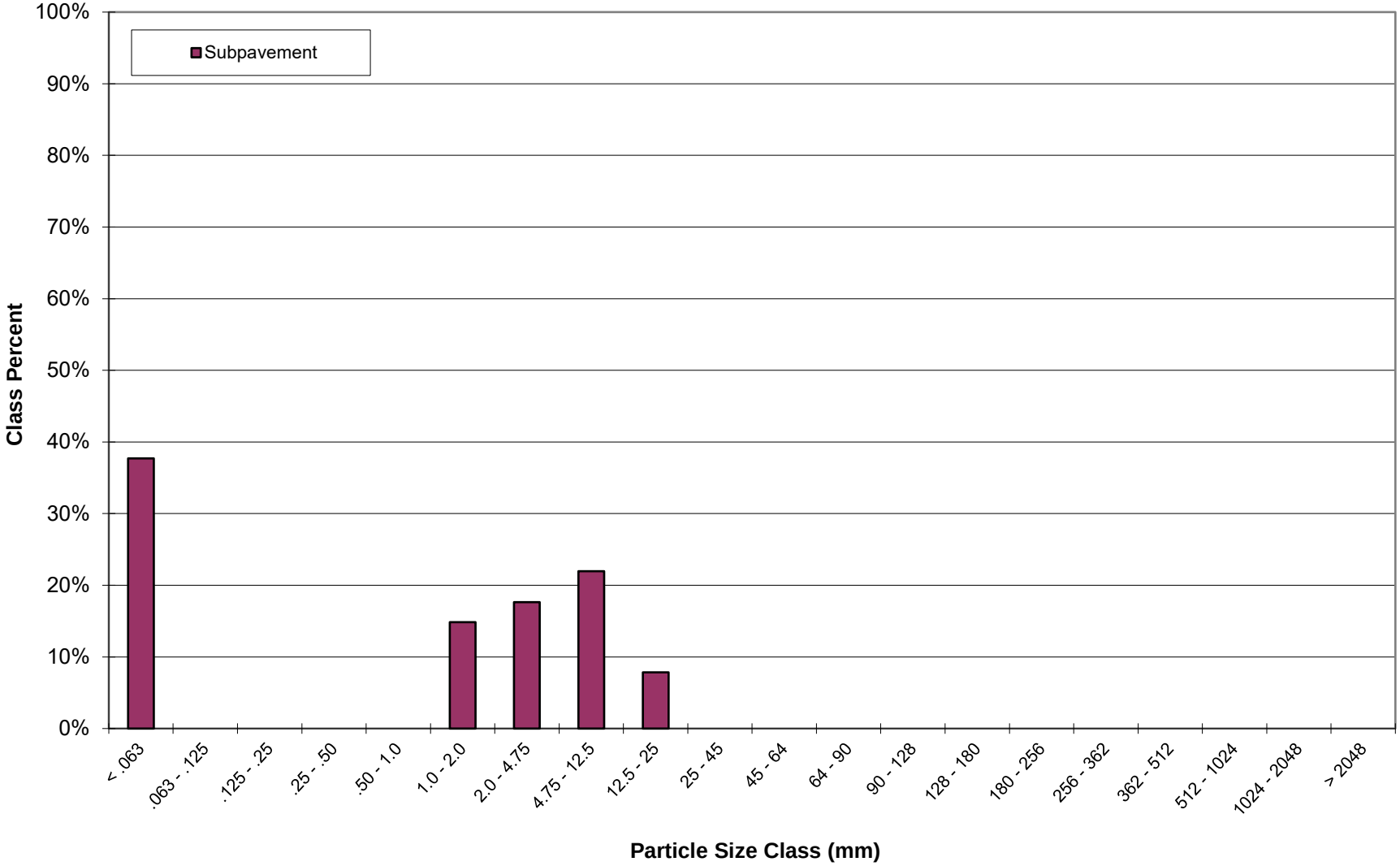


Table 1: Banner Reach 1 & Reach 2

	Notation	Units	Designed Conditions			Notes
			min	max	design	
stream type			C4			
drainage area	DA	sq mi	0.61 - 0.66			
bankfull design discharge	Q_{bkf}	cfs	40 - 43			
Cross-Section Features						
bankfull cross-sectional area	A_{bkf}	SF	14.0			
side slopes	*H:V*	*ft/ft*	*3.0*			
channel bottom width	b_{bkf}	*feet*	*4.5*			
bankfull wetted perimeter	WP_{bkf}	*feet*	*14.0*			
bankfull hydraulic radius	r_{bkf}	*feet*	*1.0*			
mannings 'n'			*0.035*			
average velocity during bankfull event	v_{bkf}	fps	2.8			
width at bankfull	w_{bkf}	feet	13.5			
mean depth at bankfull	d_{bkf}	feet	1.0			
bankfull width to depth ratio	w_{bkf}/d_{bkf}		13			Design Parameters
maximum depth at bankfull	d_{max}	feet	1.2	1.8		
max depth ratio	d_{max}/d_{bkf}		1.2	1.7	1.70	Design Parameters
bank height ratio	BHR		1.0	1.0		Design Parameters
floodprone area width	w_{fpa}	feet	30	68		
entrenchment ratio	ER		2.2	5.0		
Slope						
valley slope	S_{valley}	feet/ foot	0.0056			
channel slope	$S_{channel}$	feet/ foot	0.0043	0.0051	0.0044	
Riffle Features						
riffle slope	S_{riffle}	feet/ foot	0.0052	0.0173		
riffle slope ratio	$S_{riffle}/S_{channel}$		1.2	3.4		Reference Range
Pool Features						
pool slope	S_{pool}	feet/ foot	0.0000	0.0015		
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.30		Reference Range
pool-to-pool spacing	L_{p-p}	feet	22	88		
pool spacing ratio	L_{p-p}/w_{bkf}		1.6	6.5		Reference Range
maximum pool depth at bankfull	d_{pool}	feet	1.6	3.6		
pool depth ratio	d_{pool}/d_{bkf}		1.5	3.5		Reference Range
pool width at bankfull	w_{pool}	feet	13.5	21.6		
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6		Reference Range
pool cross-sectional area at bankfull	A_{pool}	SF	15.3	34.9		
pool area ratio	A_{pool}/A_{bkf}		1.1	2.5		Design Parameters
Pattern Features						
sinuosity	K		1.10	1.30	1.20	Design Parameters
belt width	w_{blt}	feet	34	89		
meander width ratio	w_{blt}/w_{bkf}		2.5	6.6		Design Parameters
linear wavelength	LW	feet	81	162		
linear wavelength ratio	LW/w_{bkf}		6.0	12.0		Design Parameters
meander length	L_m	feet	101	203		
meander length ratio	L_m/w_{bkf}		7.5	15.0		Reference Range
radius of curvature	R_c	feet	27	41		
radius of curvature ratio	R_c/ w_{bkf}		2.0	3.0		Design Parameters

Table 1: Banner Reach 3

	Notation	Units	Designed Conditions			Notes
			min	max	design	
stream type			C4			
drainage area	DA	sq mi	0.67			
bankfull design discharge	Q_{bkf}	cfs	44.0			
Cross-Section Features						
bankfull cross-sectional area	A_{bkf}	SF	17.3			
side slopes	*H:V*	*ft/ft*	*3.0*			
channel bottom width	b_{bkf}	*feet*	*4.0*			
bankfull wetted perimeter	WP_{bkf}	*feet*	*15.4*			
bankfull hydraulic radius	r_{bkf}	*feet*	*1.1*			
mannings 'n'			*0.035*			
average velocity during bankfull event	v_{bkf}	fps	2.3			
width at bankfull	w_{bkf}	feet	14.8			
mean depth at bankfull	d_{bkf}	feet	1.2			
bankfull width to depth ratio	w_{bkf}/d_{bkf}		13			Design Parameters
maximum depth at bankfull	d_{max}	feet	1.4	2.1		
max depth ratio	d_{max}/d_{bkf}		1.2	1.8	1.70	Design Parameters
bank height ratio	BHR		1.0	1.0		Design Parameters
floodprone area width	w_{fpa}	feet	33	74		
entrenchment ratio	ER		2.2	5.0		
Slope						
valley slope	S_{valley}	feet/ foot	0.0029			
channel slope	$S_{channel}$	feet/ foot	0.0021	0.0026	0.0025	
Riffle Features						
riffle slope	S_{riffle}	feet/ foot	0.0025	0.0090		
riffle slope ratio	$S_{riffle}/S_{channel}$		1.2	3.4		Reference Range
Pool Features						
pool slope	S_{pool}	feet/ foot	0.0000	0.0008		
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.30		Reference Range
pool-to-pool spacing	L_{p-p}	feet	24	96		
pool spacing ratio	L_{p-p}/w_{bkf}		1.6	6.5		Reference Range
maximum pool depth at bankfull	d_{pool}	feet	2.5	3.7		
pool depth ratio	d_{pool}/d_{bkf}		2.1	3.2		Reference Range
pool width at bankfull	w_{pool}	feet	14.8	23.7		
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6		Reference Range
pool cross-sectional area at bankfull	A_{pool}	SF	19.1	43.3		
pool area ratio	A_{pool}/A_{bkf}		1.1	2.5		Design Parameters
Pattern Features						
sinuosity	K		1.10	1.40	1.30	Design Parameters
belt width	w_{blt}	feet	37	98		
meander width ratio	w_{blt}/w_{bkf}		2.5	6.6		Design Parameters
linear wavelength	LW	feet	89	178		
linear wavelength ratio	LW/w_{bkf}		6.0	12.0		Design Parameters
meander length	L_m	feet	111	222		
meander length ratio	L_m/w_{bkf}		7.5	15.0		Reference Range
radius of curvature	R_c	feet	30	44		
radius of curvature ratio	R_c/ w_{bkf}		2.0	3.0		Design Parameters

Table 1: Banner Reach 4a

	Notation	Units	Designed Conditions			Notes
			min	max	design	
stream type			C5/4			
drainage area	DA	sq mi	0.99			
bankfull design discharge	Q_{bkf}	cfs	60.0			
Cross-Section Features						
bankfull cross-sectional area	A_{bkf}	SF	30.3			
side slopes	*H:V*	*ft/ft*	*3.0*			
channel bottom width	b_{bkf}	*feet*	*6.0*			
bankfull wetted perimeter	WP_{bkf}	*feet*	*20.6*			
bankfull hydraulic radius	r_{bkf}	*feet*	*1.5*			
mannings 'n'			*0.035*			
average velocity during bankfull event	v_{bkf}	fps	2.0			
width at bankfull	w_{bkf}	feet	19.8			
mean depth at bankfull	d_{bkf}	feet	1.5			
bankfull width to depth ratio	w_{bkf}/d_{bkf}		13			Design Parameters
maximum depth at bankfull	d_{max}	feet	1.8	2.6		
max depth ratio	d_{max}/d_{bkf}		1.2	1.7	1.67	Design Parameters
bank height ratio	BHR		1.0	1.0		Design Parameters
floodprone area width	w_{fpa}	feet	44	99		
entrenchment ratio	ER		2.2	5.0		
Slope						
valley slope	S_{valley}	feet/ foot	0.0015			
channel slope	$S_{channel}$	feet/ foot	0.0012	0.0013	0.0013	
Riffle Features						
riffle slope	S_{riffle}	feet/ foot	0.0014	0.0043		
riffle slope ratio	$S_{riffle}/S_{channel}$		1.2	3.4		Reference Range
Pool Features						
pool slope	S_{pool}	feet/ foot	0.0000	0.0004		
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.30		Reference Range
pool-to-pool spacing	L_{p-p}	feet	32	129		
pool spacing ratio	L_{p-p}/w_{bkf}		1.6	6.5		Reference Range
maximum pool depth at bankfull	d_{pool}	feet	2.3	5.4		
pool depth ratio	d_{pool}/d_{bkf}		1.5	3.5		Reference Range
pool width at bankfull	w_{pool}	feet	19.8	31.7		
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6		Reference Range
pool cross-sectional area at bankfull	A_{pool}	SF	33.3	75.7		
pool area ratio	A_{pool}/A_{bkf}		1.1	2.5		Design Parameters
Pattern Features						
sinuosity	K		1.20	1.30	1.20	Design Parameters
belt width	w_{blt}	feet	50	131		
meander width ratio	w_{blt}/w_{bkf}		2.5	6.6		Design Parameters
linear wavelength	LW	feet	119	238		
linear wavelength ratio	LW/w_{bkf}		6.0	12.0		Design Parameters
meander length	L_m	feet	149	297		
meander length ratio	L_m/w_{bkf}		7.5	15.0		Reference Range
radius of curvature	R_c	feet	40	59		
radius of curvature ratio	R_c/w_{bkf}		2.0	3.0		Design Parameters

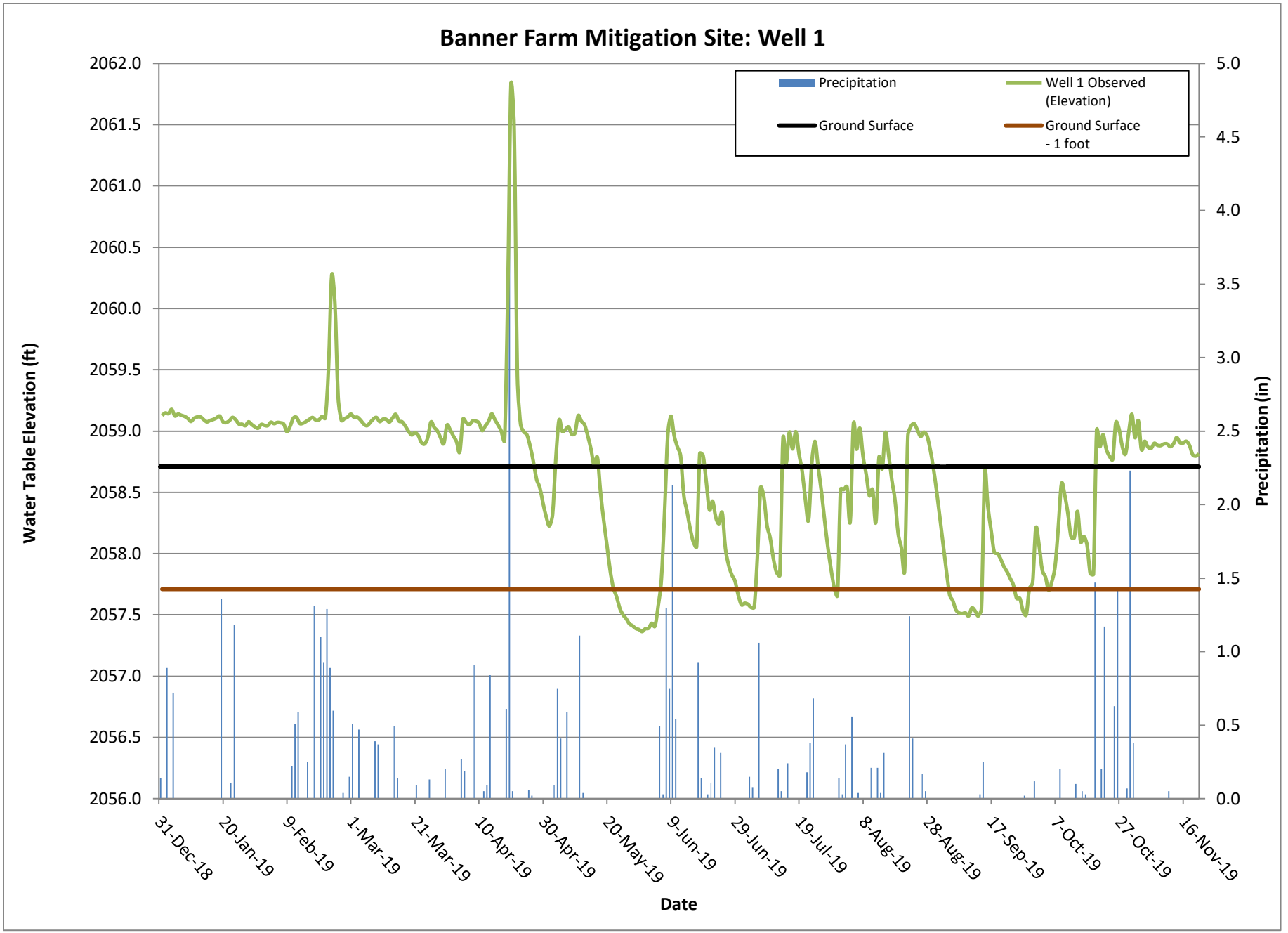
Table 1: Banner Reach 4b

	Notation	Units	Designed Conditions			Notes
			min	max	design	
stream type			C5/4			
drainage area	DA	sq mi	1.13			
bankfull design discharge	Q_{bkf}	cfs	70.0			
Cross-Section Features						
bankfull cross-sectional area	A_{bkf}	SF	32.7			
side slopes	*H:V*	*ft/ft*	*3.0*			
channel bottom width	b_{bkf}	*feet*	*7.0*			
bankfull wetted perimeter	WP_{bkf}	*feet*	*21.6*			
bankfull hydraulic radius	r_{bkf}	*feet*	*1.5*			
mannings 'n'			*0.035*			
average velocity during bankfull event	v_{bkf}	fps	2.3			
width at bankfull	w_{bkf}	feet	20.8			
mean depth at bankfull	d_{bkf}	feet	1.6			
bankfull width to depth ratio	w_{bkf}/d_{bkf}		13			Design Parameters
maximum depth at bankfull	d_{max}	feet	1.9	2.7		
max depth ratio	d_{max}/d_{bkf}		1.2	1.7	1.6	Design Parameters
bank height ratio	BHR		1.0	1.0		Design Parameters
floodprone area width	w_{fpa}	feet	46	104		
entrenchment ratio	ER		2.2	5.0		
Slope						
valley slope	S_{valley}	feet/ foot	0.0020			
channel slope	$S_{channel}$	feet/ foot	0.0015	0.0019	0.0017	
Riffle Features						
riffle slope	S_{riffle}	feet/ foot	0.0018	0.0065		
riffle slope ratio	$S_{riffle}/S_{channel}$		1.2	3.4		Reference Range
Pool Features						
pool slope	S_{pool}	feet/ foot	0.0000	0.0006		
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.30		Reference Range
pool-to-pool spacing	L_{p-p}	feet	33	135		
pool spacing ratio	L_{p-p}/w_{bkf}		1.6	6.5		Reference Range
maximum pool depth at bankfull	d_{pool}	feet	2.4	5.5		
pool depth ratio	d_{pool}/d_{bkf}		1.5	3.5		Reference Range
pool width at bankfull	w_{pool}	feet	20.8	33.3		
pool width ratio	w_{pool}/w_{bkf}		1.0	1.6		Reference Range
pool cross-sectional area at bankfull	A_{pool}	SF	35.9	81.7		
pool area ratio	A_{pool}/A_{bkf}		1.1	2.5		Design Parameters
Pattern Features						
sinuosity	K		1.05	1.30	1.20	Design Parameters
belt width	w_{blt}	feet	42	137		
meander width ratio	w_{blt}/w_{bkf}		2.0	6.6		Design Parameters
linear wavelength	LW	feet	125	250		
linear wavelength ratio	LW/w_{bkf}		6.0	12.0		Design Parameters
meander length	L_m	feet	156	312		
meander length ratio	L_m/w_{bkf}		7.5	15.0		Reference Range
radius of curvature	R_c	feet	42	62		
radius of curvature ratio	R_c/w_{bkf}		2.0	3.0		Design Parameters

Table 1: UT1

	Notation	Units	Designed Conditions			Notes
			min	max	design	
stream type			E5			
drainage area	DA	sq mi	0.13			
bankfull design discharge	Q_{bkf}	cfs	14.0			
Cross-Section Features						
bankfull cross-sectional area	A_{bkf}	SF	8.4			
side slopes	*H:V*	*ft/ft*	*2.0*			
channel bottom width	b_{bkf}	*feet*	*4.2*			
bankfull wetted perimeter	WP_{bkf}	*feet*	*9.6*			
bankfull hydraulic radius	r_{bkf}	*feet*	*0.9*			
mannings 'n'			*0.035*			
average velocity during bankfull event	v_{bkf}	fps	1.7			
width at bankfull	w_{bkf}	feet	9.0			
mean depth at bankfull	d_{bkf}	feet	0.9			
bankfull width to depth ratio	w_{bkf}/d_{bkf}		10			Design Parameters
maximum depth at bankfull	d_{max}	feet	0.9	1.4		
max depth ratio	d_{max}/d_{bkf}		1.0	1.5	1.5	Design Parameters
bank height ratio	BHR		1.0	1.0		Design Parameters
floodprone area width	w_{fpa}	feet	20	72		
entrenchment ratio	ER		2.2	8.0		
Slope						
valley slope	S_{valley}	feet/ foot	0.0026			
channel slope	$S_{channel}$	feet/ foot	0.0016	0.0022	0.0020	
Riffle Features						
riffle slope	S_{riffle}	feet/ foot	0.0020	0.0043		
riffle slope ratio	$S_{riffle}/S_{channel}$		1.2	2.0		
Pool Features						
pool slope	S_{pool}	feet/ foot	0.0000	0.0007		
pool slope ratio	$S_{pool}/S_{channel}$		0.00	0.30		Reference Reaches
pool-to-pool spacing	L_{p-p}	feet	36	90		
pool spacing ratio	L_{p-p}/w_{bkf}		4.0	10.0		Reference Reach/Construction Experience
maximum pool depth at bankfull	d_{pool}	feet	1.9	3.8		
pool depth ratio	d_{pool}/d_{bkf}		2.0	4.0		Reference Reach
pool width at bankfull	w_{pool}	feet	10.8	13.5		
pool width ratio	w_{pool}/w_{bkf}		1.2	1.5		Reference Reach/Construction Experience
pool cross-sectional area at bankfull	A_{pool}	SF	11.0	25.3		
pool area ratio	A_{pool}/A_{bkf}		1.3	3.0		Reference Reach/Construction Experience
Pattern Features						
sinuosity	K		1.20	1.60	1.30	Design Parameters
belt width	w_{blt}	feet	32	72		
meander width ratio	w_{blt}/w_{bkf}		3.5	8.0		Reference Reach/Construction Experience
linear wavelength	LW	feet	36	90		
linear wavelength ratio	LW/w_{bkf}		4.0	10.0		Reference Reach/Construction Experience
meander length	L_m	feet	41	108		
meander length ratio	L_m/w_{bkf}		4.5	12.0		Reference Range/Rosgen Litereature
radius of curvature	R_c	feet	16	45		
radius of curvature ratio	R_c/ w_{bkf}		1.8	5.0		Reference Reach/Construction Experience

APPENDIX 7
Wetland Design Documents and Data


Banner Farm Mitigation Site: Well 1
Precipitation
Well 1 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
Water Table Elevation (ft)
Precipitation (in)
Date
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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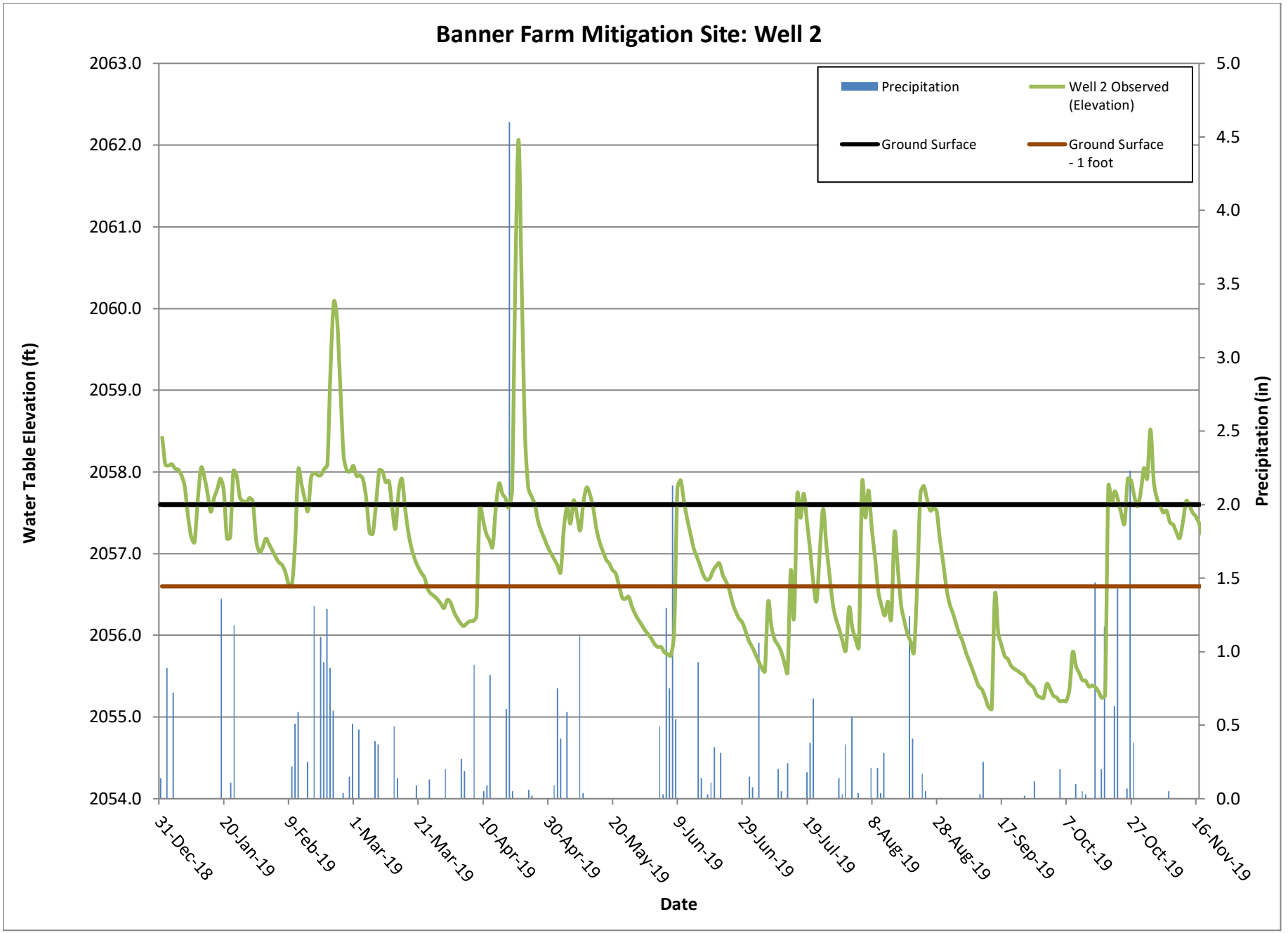
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 2
Precipitation
Well 2 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
Water Table Elevation (ft)
Precipitation (in)
Date
2063.0
2062.0
2061.0
2060.0
2059.0
2058.0
2057.0
2056.0
2055.0
2054.0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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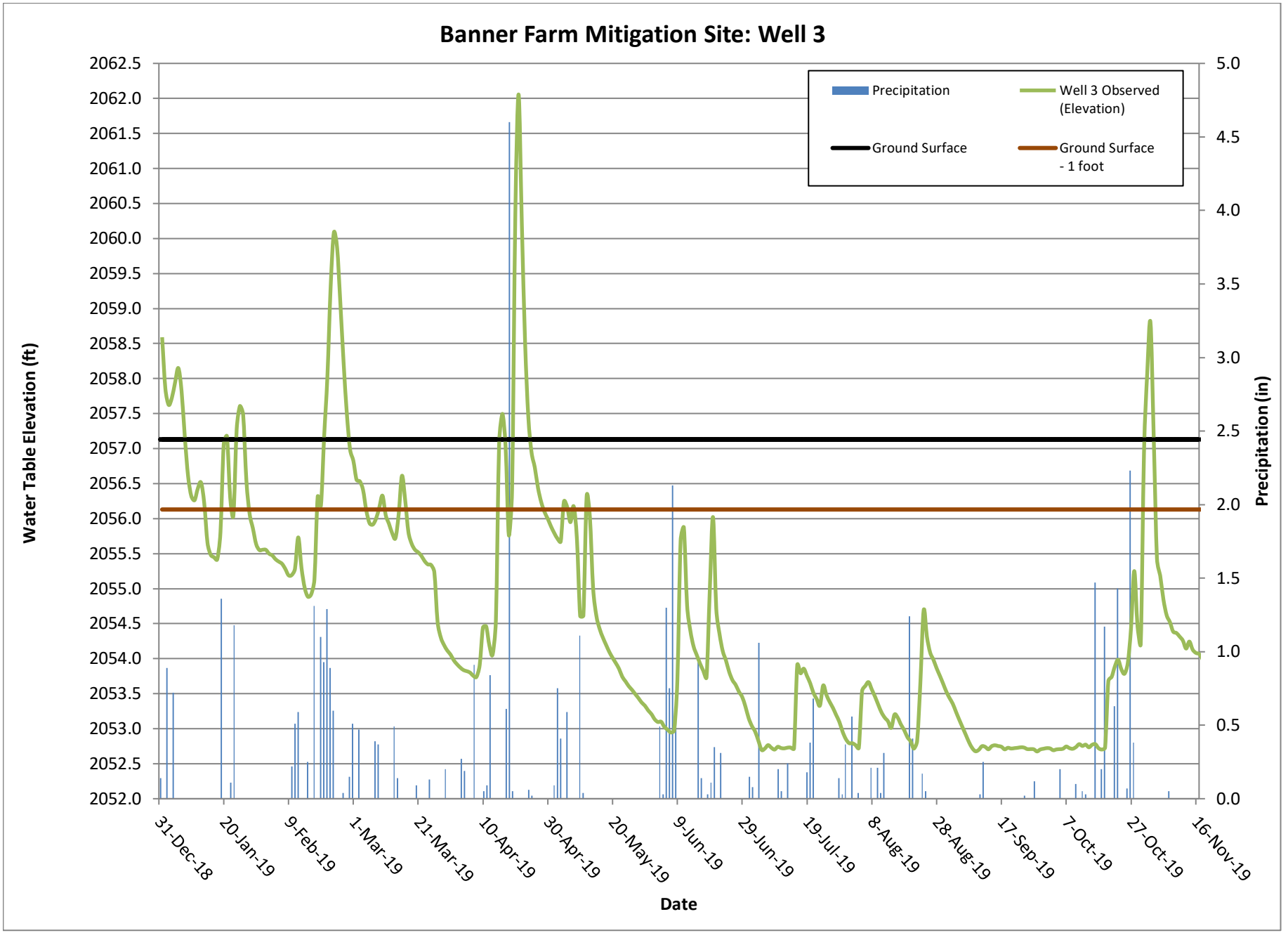
7-Oct-19
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 3
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 3 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2062.5
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
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4.0
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3.0
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2.0
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1.0
0.5
0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
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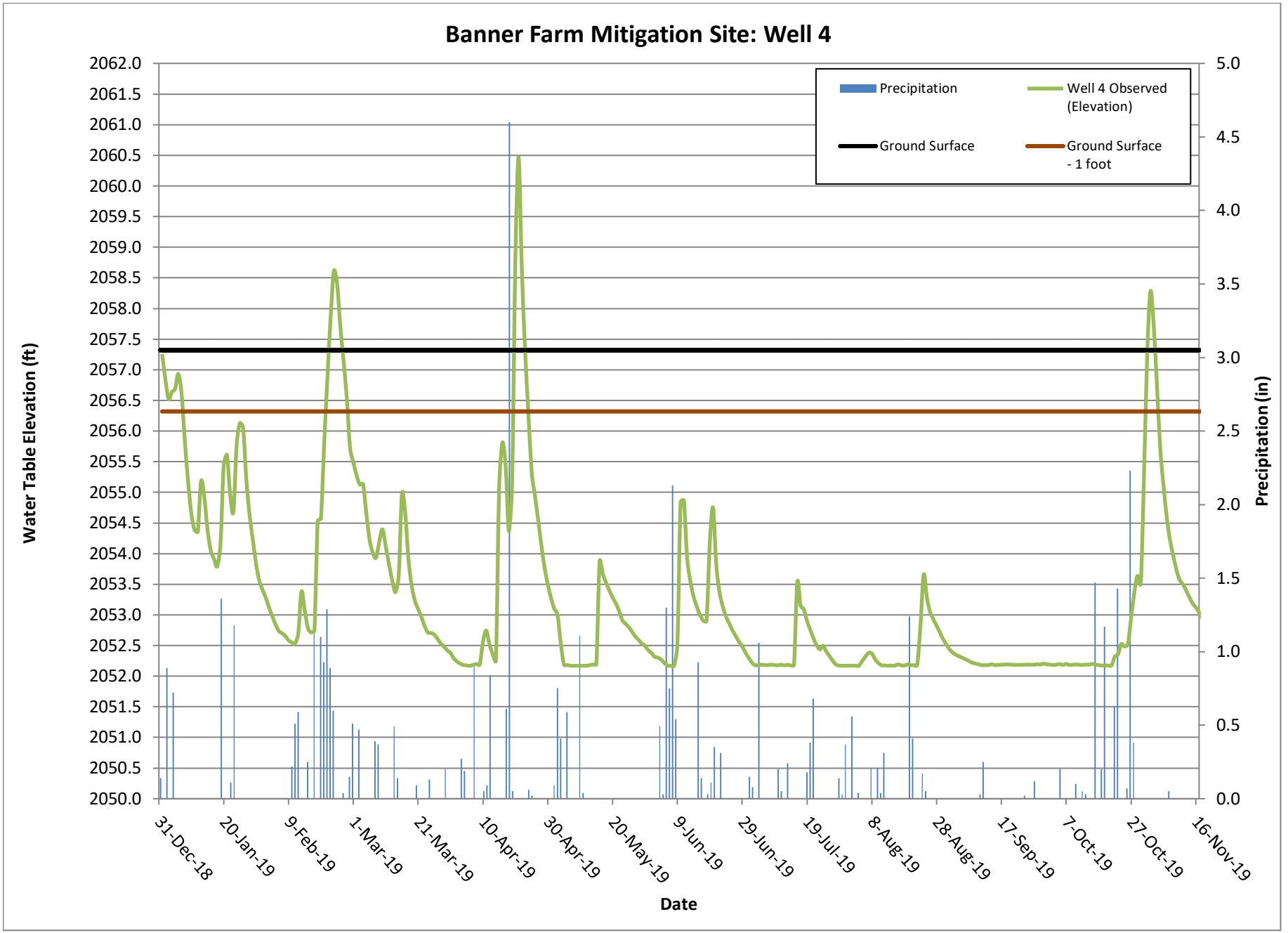
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 4
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 4 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
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31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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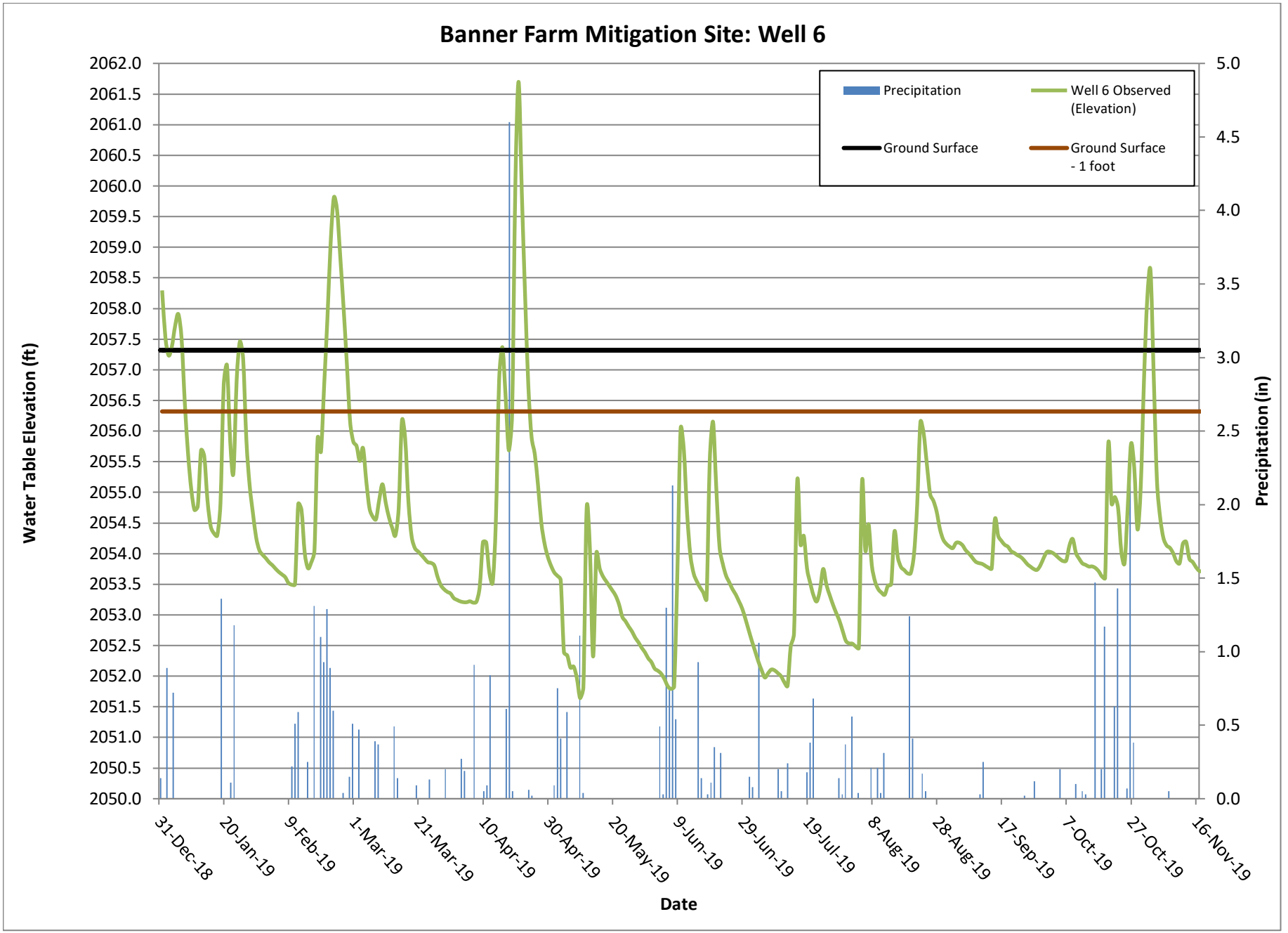
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 6
Precipitation
Well 6 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
Water Table Elevation (ft)
Precipitation (in)
Date
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
2055.5
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2054.5
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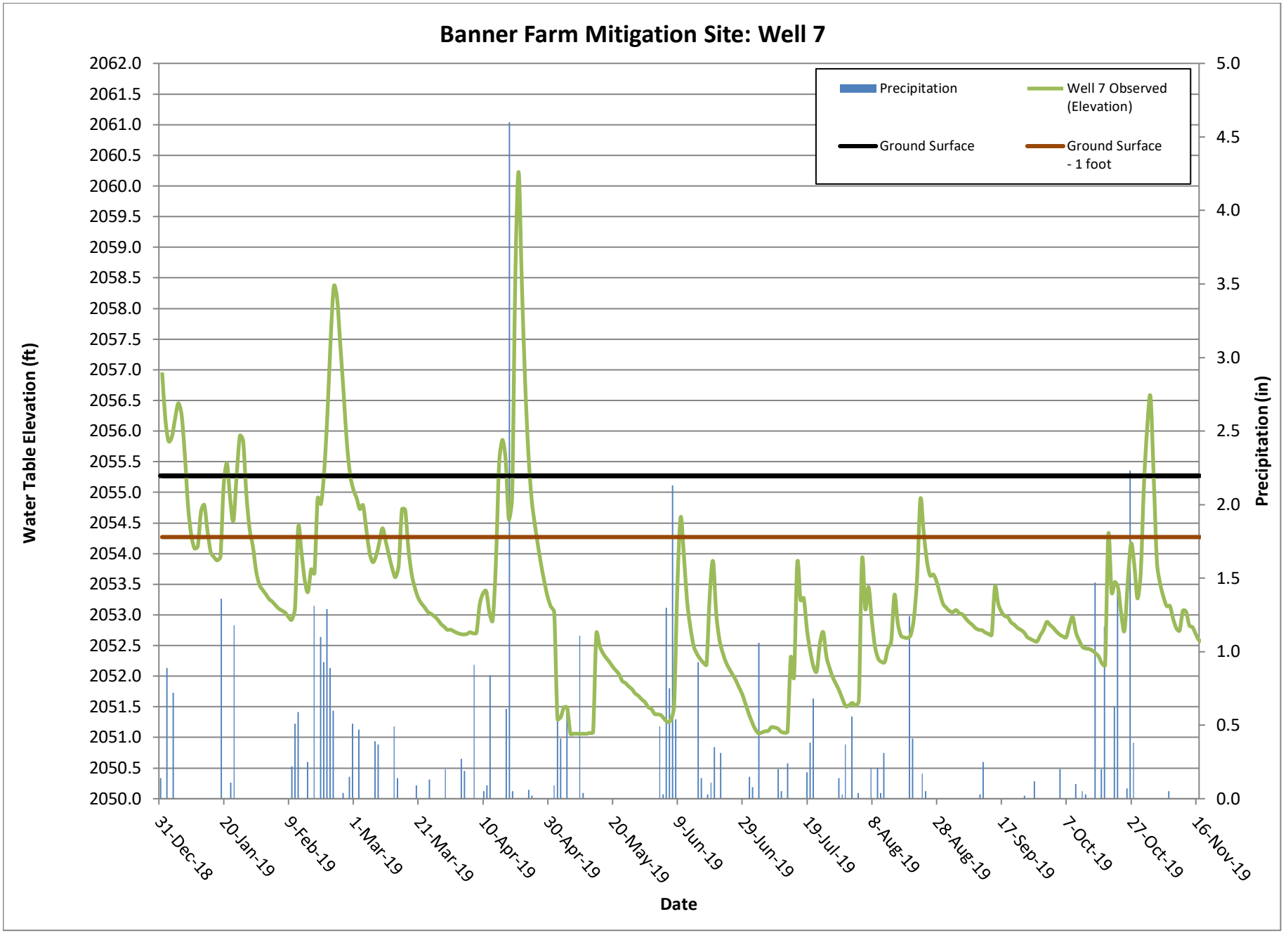
2052.0
2051.5
2051.0
2050.5
2050.0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
29-Jun-19
19-Jul-19
8-Aug-19
28-Aug-19
17-Sep-19
7-Oct-19
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 7
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 7 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
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2056.0
2055.5
2055.0
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2050.0
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4.5
4.0
3.5
3.0
2.5
2.0
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1.0
0.5
0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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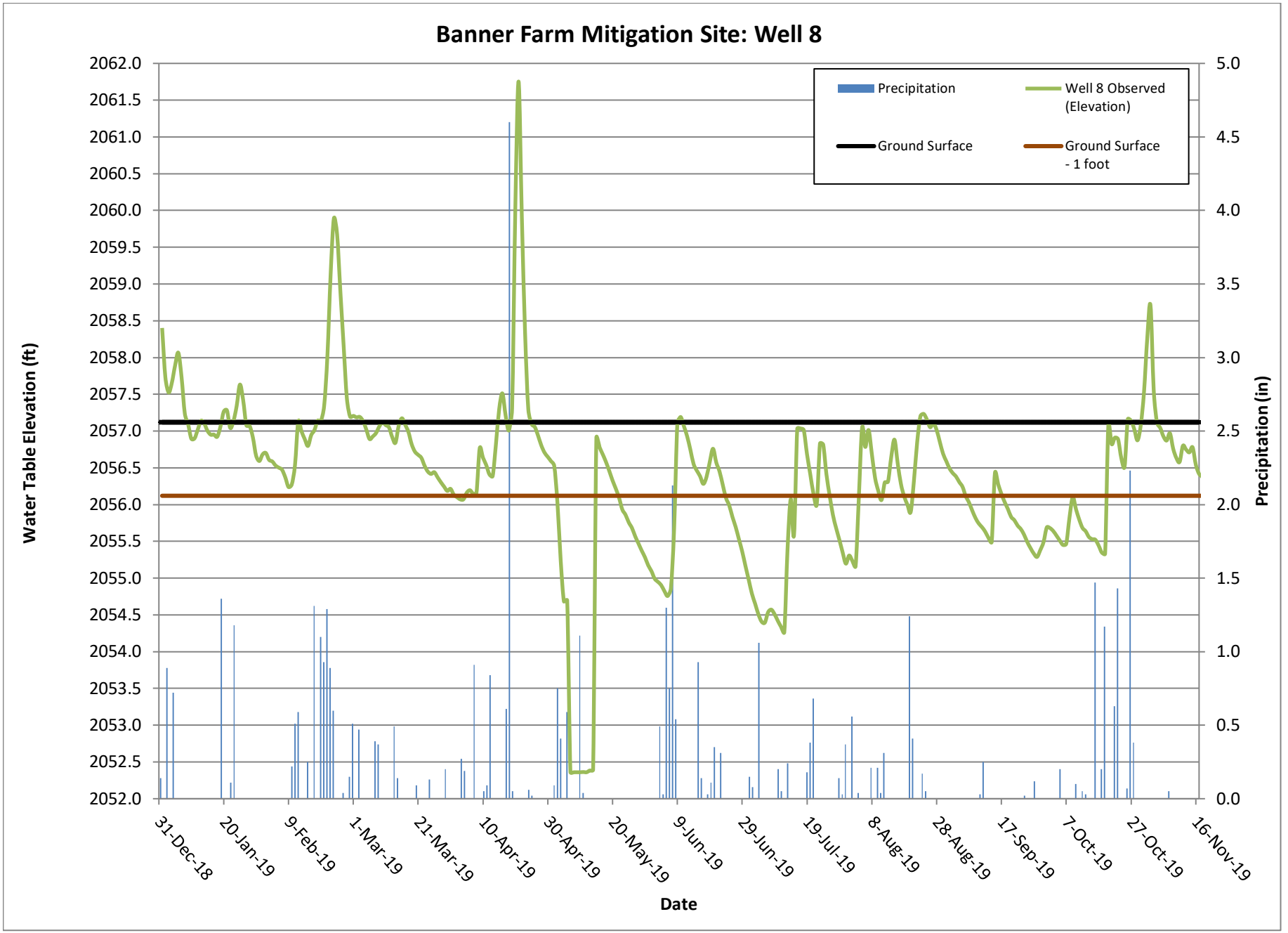
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 8
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 8 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
2055.5
2055.0
2054.5
2054.0
2053.5
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2052.5
2052.0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
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1.0
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0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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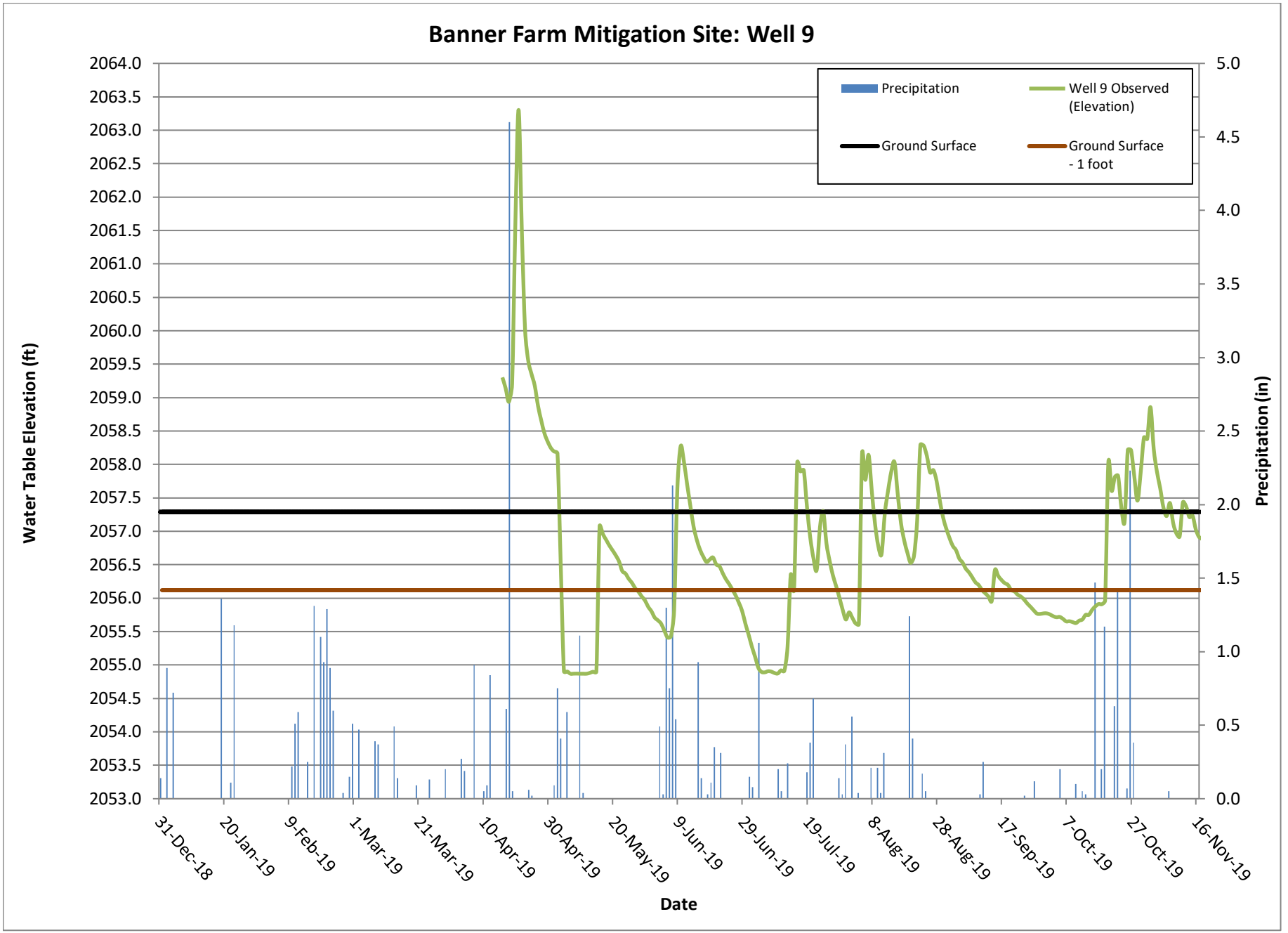
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 9
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 9 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2064.0
2063.5
2063.0
2062.5
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
2055.5
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2053.0
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4.5
4.0
3.5
3.0
2.5
2.0
1.5
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20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
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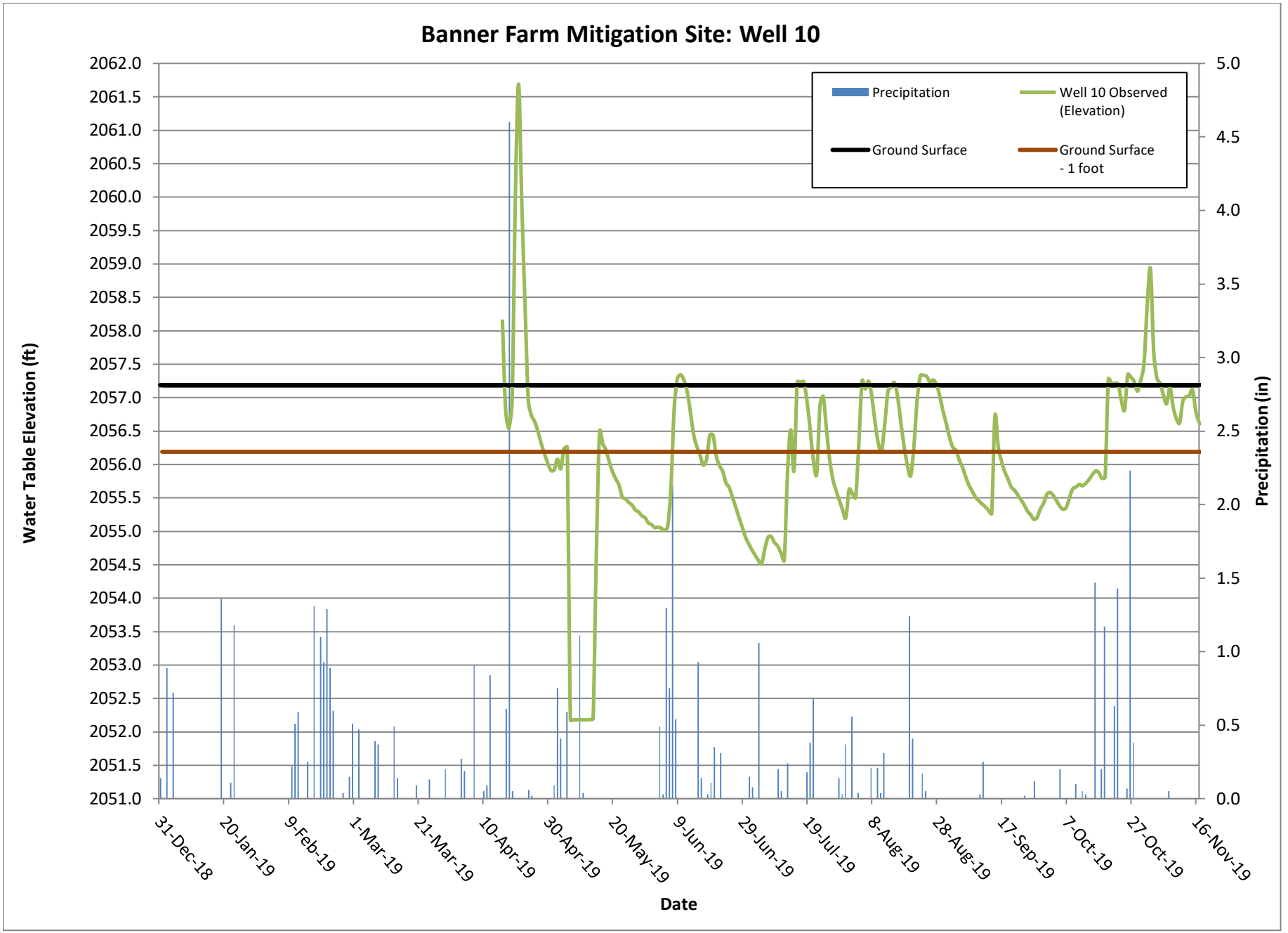
16-Nov-19


Banner Farm Mitigation Site: Well 10
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 10 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
2055.5
2055.0
2054.5
2054.0
2053.5
2053.0
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2051.5
2051.0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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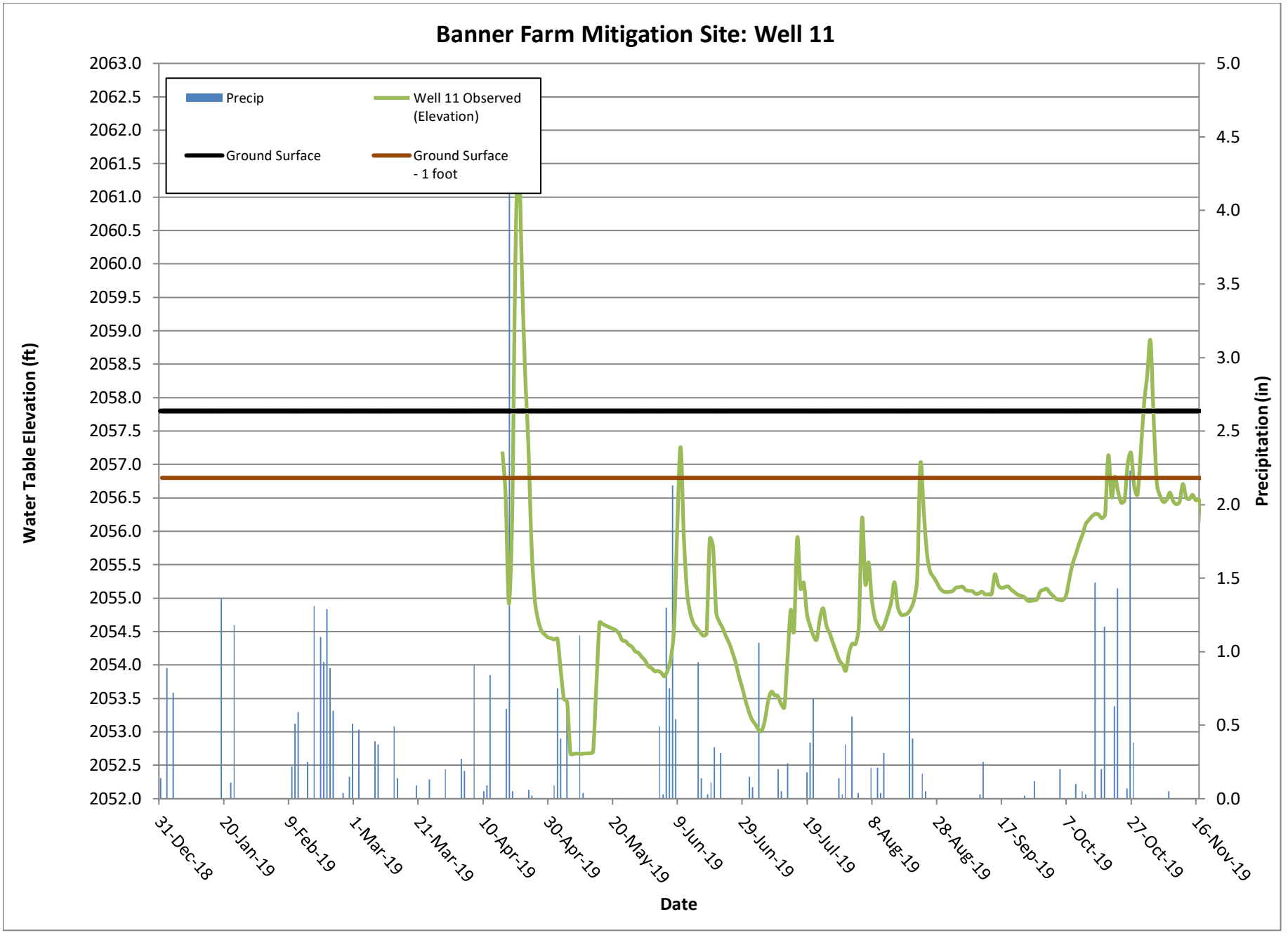
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 11
Precip
Well 11 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
Water Table Elevation (ft)
Precipitation (in)
Date
2063.0
2062.5
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
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2054.5
2054.0
2053.5
2053.0
2052.5
2052.0
5.0
4.5
4.0
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20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
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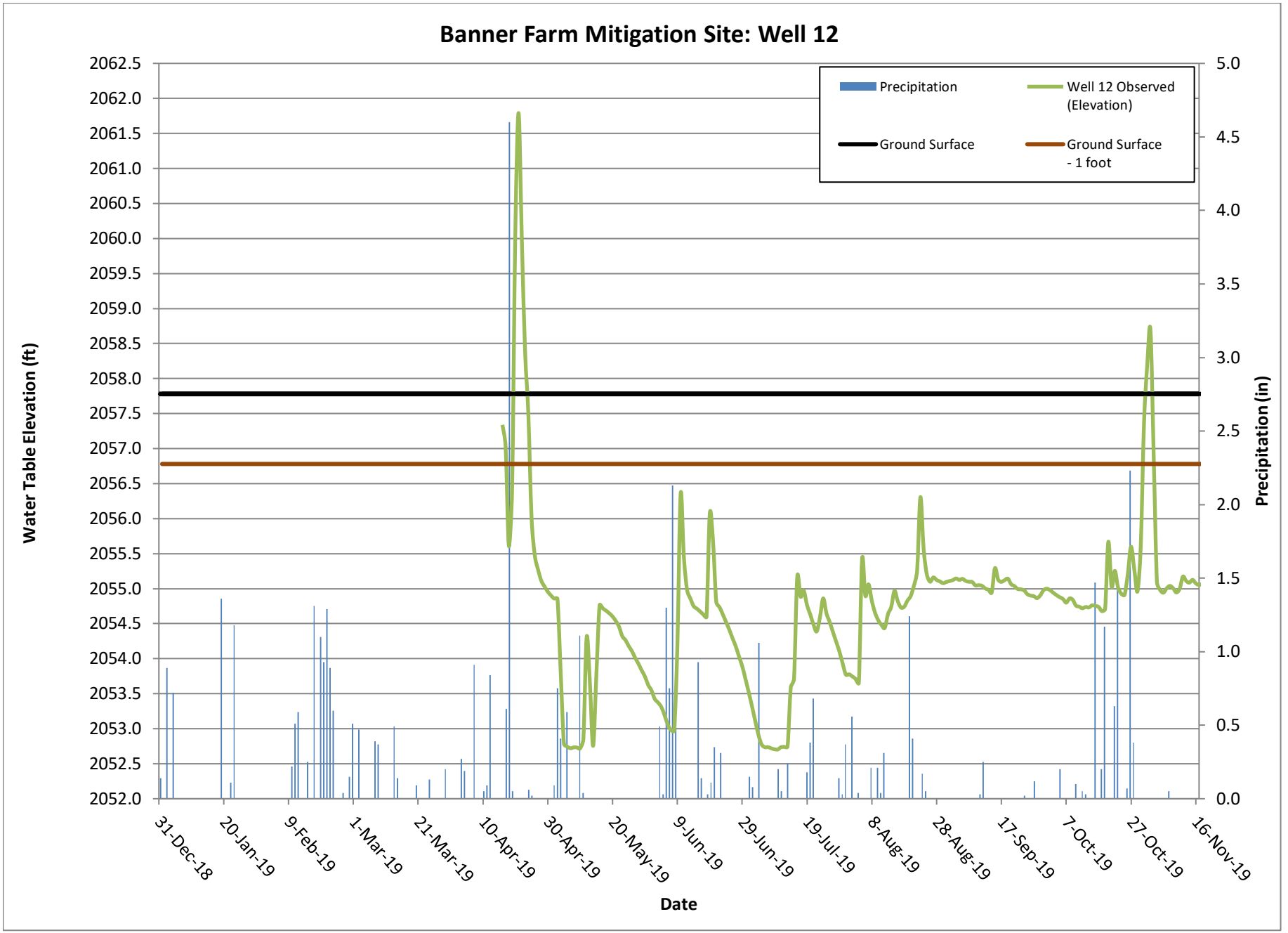
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 12
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 12 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2062.5
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
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2052.0
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4.5
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2.5
2.0
1.5
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31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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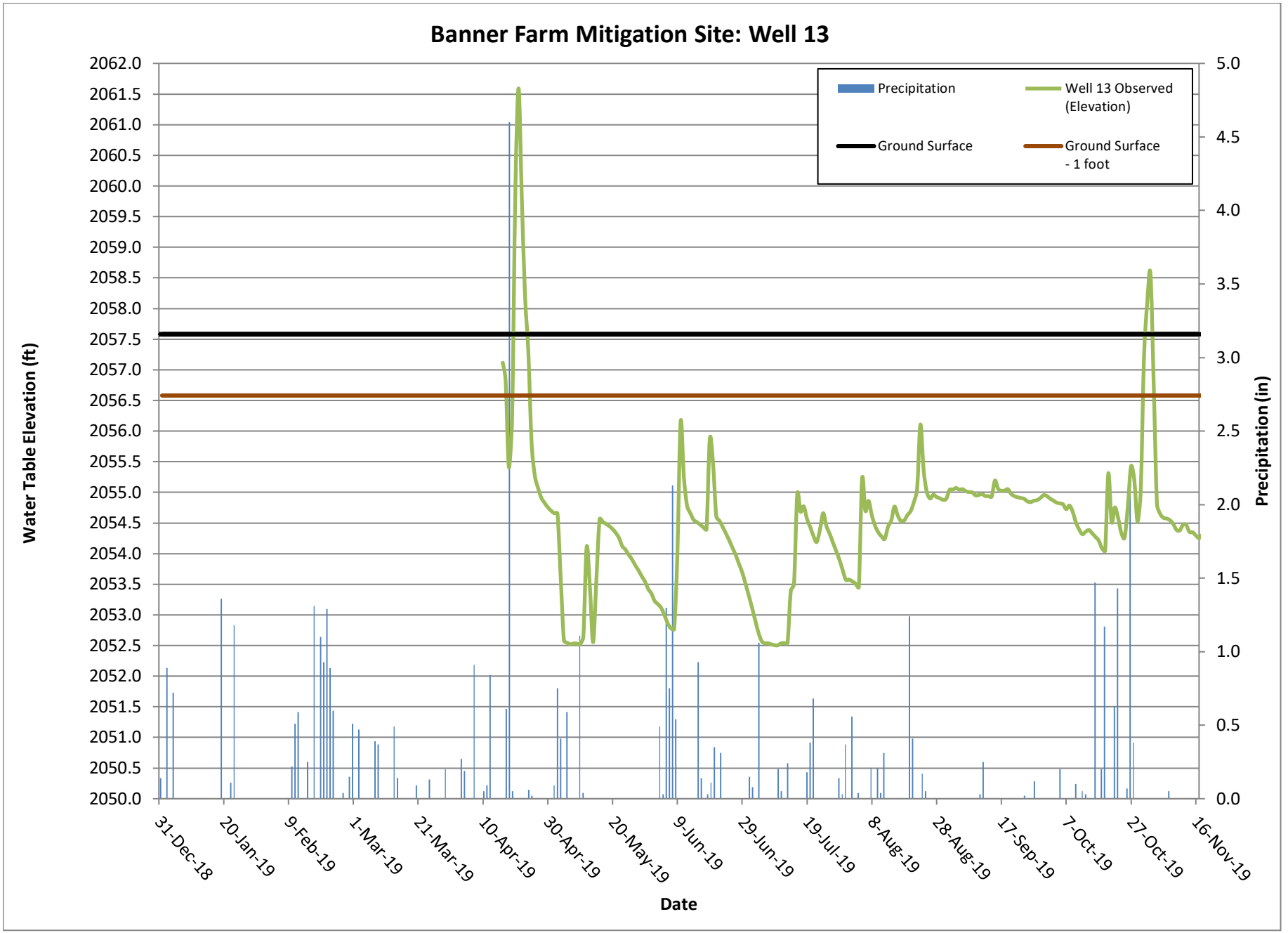
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 13
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 13 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
2055.5
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31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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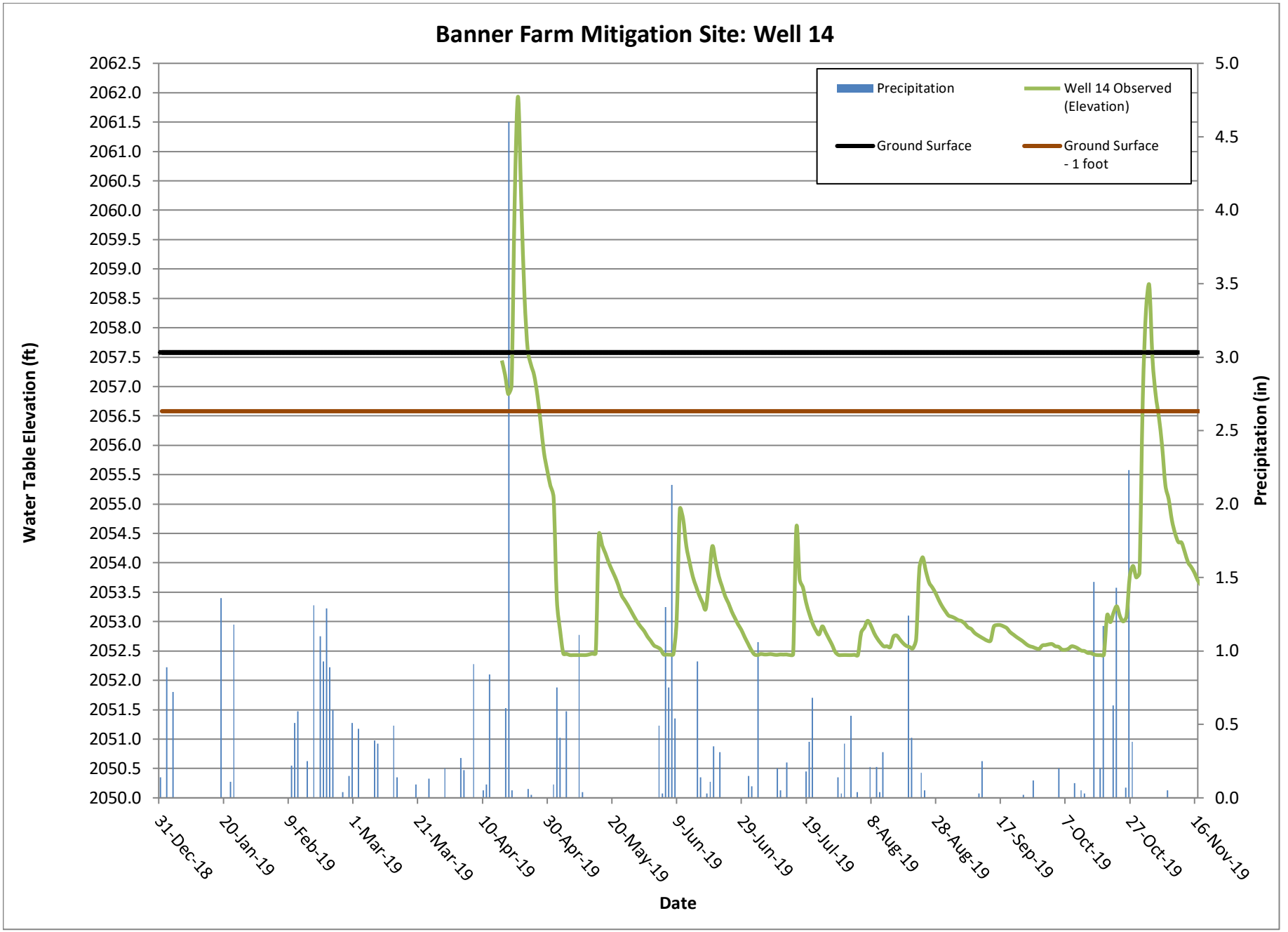
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 14
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 14 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2062.5
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
2055.5
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5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
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0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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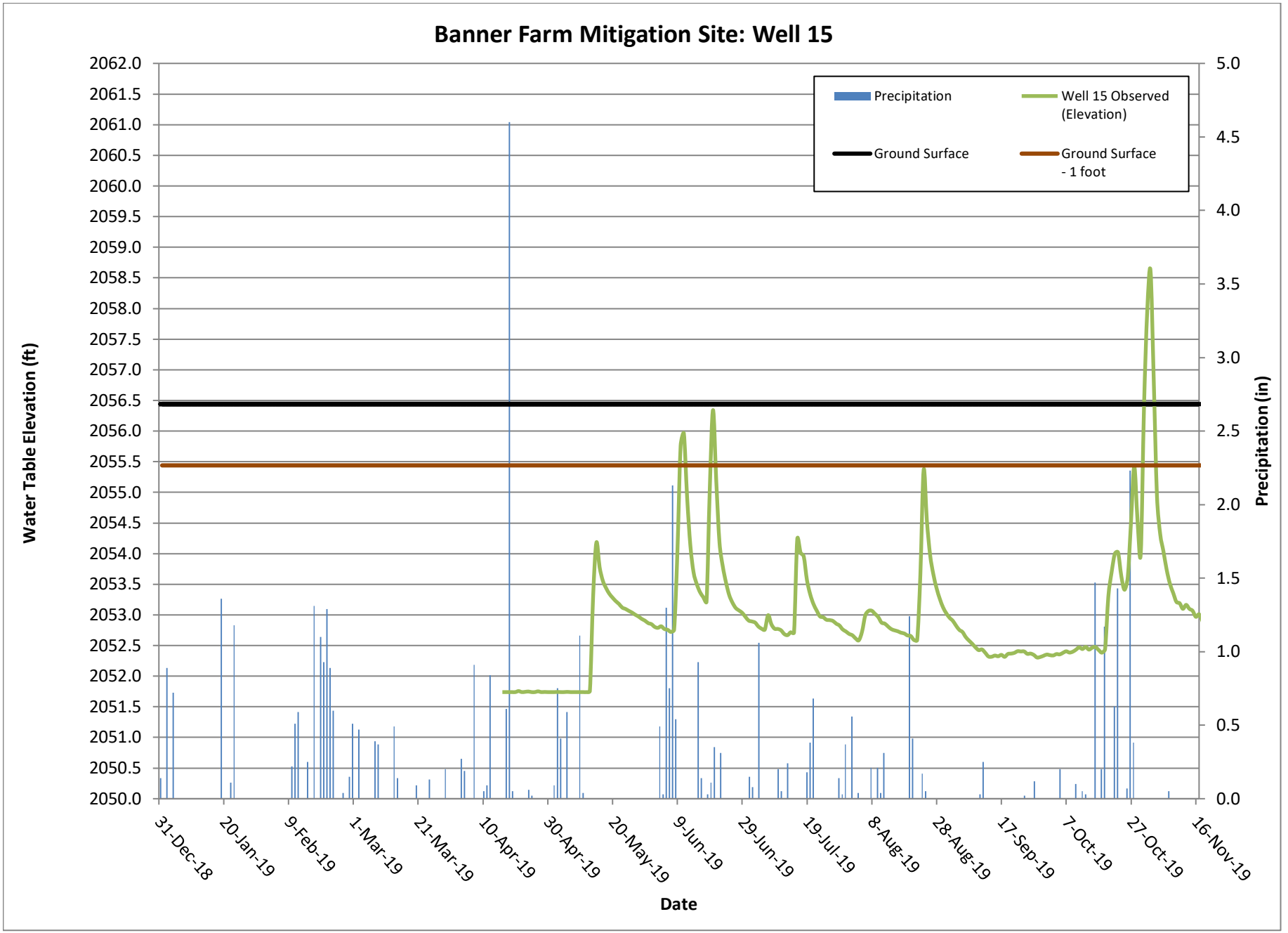
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 15
Water Table Elevation (ft)
Precipitation (in)
Date
Precipitation
Well 15 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
2062.0
2061.5
2061.0
2060.5
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
2055.5
2055.0
2054.5
2054.0
2053.5
2053.0
2052.5
2052.0
2051.5
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2050.5
2050.0
5.0
4.5
4.0
3.5
3.0
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2.0
1.5
1.0
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0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
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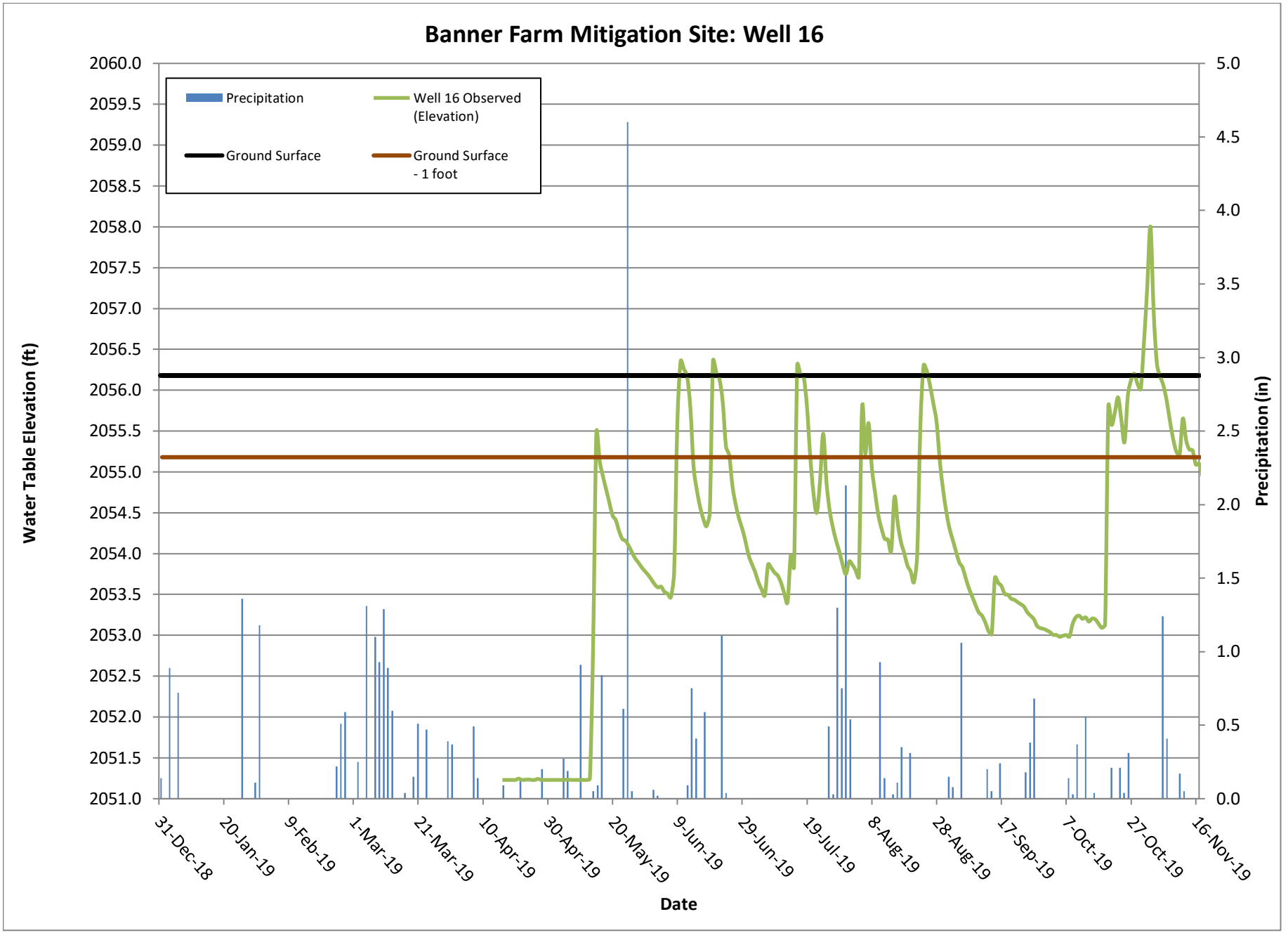
7-Oct-19
27-Oct-19
16-Nov-19


Banner Farm Mitigation Site: Well 16
Precipitation
Well 16 Observed (Elevation)
Ground Surface
Ground Surface - 1 foot
Water Table Elevation (ft)
Precipitation (in)
Date
2060.0
2059.5
2059.0
2058.5
2058.0
2057.5
2057.0
2056.5
2056.0
2055.5
2055.0
2054.5
2054.0
2053.5
2053.0
2052.5
2052.0
2051.5
2051.0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
31-Dec-18
20-Jan-19
9-Feb-19
1-Mar-19
21-Mar-19
10-Apr-19
30-Apr-19
20-May-19
9-Jun-19
29-Jun-19
19-Jul-19
8-Aug-19
28-Aug-19
17-Sep-19
7-Oct-19
27-Oct-19
16-Nov-19

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

Banner Farm Project Site
52 Banner Farm Rd., NC
Mountains
French Broad River Basin
Henderson County, North Carolina

Prepared for:
Mr. Eric Neuhaus
Wildlands
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

November 20th, 2017

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. There are a number of field ditches that dissect the site. The "H" areas evaluated are currently planted in winter wheat or are pasture. The H2 area has been maintained in the past but currently has a year or more growth of mostly herbaceous vegetation with some small saplings inter mixed.

METHODOLOGY

On November 15th, 2017 Kevin Martin (LSS, PWS) of S&EC, PA performed a preliminary 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 Approximate Hydric Soil Locations 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 Unities States - A Guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010).*

All areas evaluated are mapped as the Toxaway (Fine-loamy, mixed, superactive, nonacid, mesic Cumulic Humaquepts), Rosman (Coarse-loamy, mixed, superactive, mesic Fluventic Humudepts) or Codorus (Fine-loamy, mixed, active, mesic Fluvaquentic Dystrudepts) soil series. Most hydric soils observed onsite within the H area have a higher clay content than these soils and are more like the soil series Hemphill soil series (Fine, mixed, active, mesic Umbric Endoaqualfs). Hydric soils n the H2 area are more like the Chatuge soil series (Fine-loamy, mixed, semiactive, mesic Typic Endoaquults) since they are not as clayey as soils in the H areas and the surface colors are not as dark.

RESULTS

Numerous 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. An X" on the map indicates soil boring location and depth to hydric soil indicators.

U- are non hydric soil areas

H- are hydric soils areas containing a depleted matrix but that do not exhibit primary wetland hydrology indicators.

H2- are hydric soils areas containing a depleted matrix that also contain one or more wetland hydrology indicators.

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.

WILDLANDS ENGINEERING

0 150 300 600 Feet

Figure 1 - Hydric Soils Evaluation
Banner Farm
French Broad 06010105

Henderson County, NC

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HYDRIC SOIL INVESTIGATION

Banner Farm Project Site
52 Banner Farm Rd., NC
Mountains
French Broad River Basin
Henderson County, North Carolina

Prepared for:
Mr. Eric Neuhaus
Wildlands
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

November 20th, 2018

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. There are a number of field ditches that dissect the site. The "H" areas evaluated are currently planted in winter wheat, fallow or are pasture. The H3 areas are similar to the H areas but were evaluated on different dates. Two H3 areas contain fill material above the natural soils that have hydric soil indicators. The H2 area has been maintained in the past but currently has a year or more growth of mostly herbaceous vegetation with some small saplings inter mixed. The H4 areas have F3 indicators within 10" but were underlain by a bright clay loam subsoil which likely indicates the saturation is not caused by groundwater but instead is caused by surface water and *therefore it may be difficult to restore* wetland hydrology to those areas.

METHODOLOGY

On November 15th, 2017 and October 24th, 2018 Kevin Martin (LSS, PWS) of S&EC, PA 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 Approximate Hydric Soil Locations 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 Unities States - A Guide for Identifying and Delineating Hydric Soils (Version 8.1, 2017)..

All areas evaluated are mapped as the Toxaway (Fine-loamy, mixed, superactive, nonacid, mesic Cumulic Humaquepts), Rosman (Coarse-loamy, mixed, superactive, mesic Fluventic Humudepts) or Codorus (Fine-loamy, mixed, active, mesic Fluvaquentic Dystrudepts) soil series. Most hydric soils observed onsite within the H & H3 areas have a somewhat higher clay content than these soils and are more like the Hemphill soil series (Fine, mixed, active, mesic Umbric Endoaqualfs) but contain some areas along the fringes of the map unit that resemble the Chatuge soil series. Hydric soils in the H2 area are more like the Chatuge soil series (Fine-loamy, mixed, semiactive, mesic Typic Endoaquults) since they are not as clayey as soils in the H areas and the surface colors are not as dark. The H4 areas have F3 indicators within 10" but were underlain by a strong brown clay loam subsoil (7.5 YR5/6)

RESULTS

Numerous 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. An X" on the map indicates soil boring location and depth to hydric soil indicators.

U- are non hydric soil areas

H & H3- are hydric soils areas containing a depleted matrix but that do not exhibit primary wetland hydrology indicators.

H2- are hydric soils areas containing a depleted matrix that also contain one or more wetland hydrology indicators.

H4- are technically hydric soil areas containing a depleted matrix within 10" but are underlain by a strong brown clay loam subsoil (7.5 YR5/6) that usually began between 14" and 18" below the soil surface.

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.

Typical Soil Profile
Hemphill SERIES

The Hemphill series consists of very deep, very poorly drained soils on low stream terraces in the Southern Blue Ridge

TAXONOMIC CLASS: Fine, mixed, active, mesic Umbric Endoaqualfs

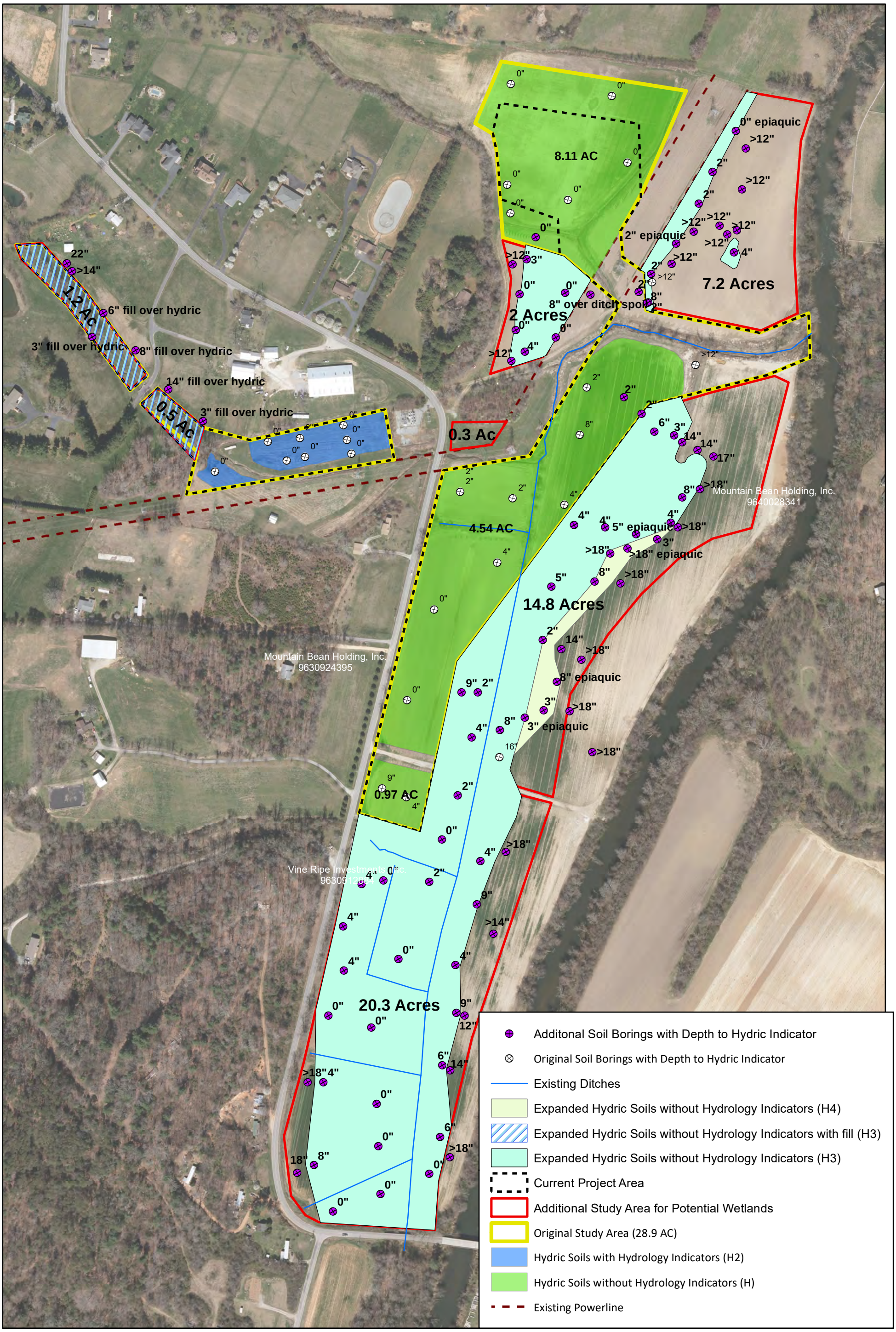
A--0 to 14+ inches; dark grayish brown (2.5Y 4/2) with few brown (7.5YR 5/4) pore linings, clay loam to clay

Chatuge SERIES

The Chatuge series consists of very deep, poorly drained, moderately permeable soils that formed in loamy sediments on low stream terraces.

TAXONOMIC CLASS: Fine-loamy, mixed, semiactive, mesic Typic Endoaquults

A--0 to 6 inches; very dark grayish brown (10YR 3/2) loam; weak granular structure with common 7.5YR 3/4 pore linings.
Btg--6 to 14+ inches; dark grayish brown (10YR 4/2) clay loam; weak subangular blocky structure;



Expanded Hydric Soils Evaluation
Banner Farm
French Broad 06010105

Henderson County, NC

WETS Station: ASHEVILLE AIRPORT, NC

Requested years: 1971 - 2000

Month	Temperature (°F)			Precipitation (inches)				
	Avg daily max	Avg daily min	Avg daily mean	Avg	30% chance will have		Avg number of days with 0.10 inch or more	Average total snowfall
					less than	more than		
Jan	47.3	26.5	36.9	4.06	2.72	4.86	7	4.7
Feb	51.4	28.7	40.1	3.83	2.32	4.64	6	3.2
Mar	59.1	35.6	47.4	4.59	3.14	5.48	8	2.5
Apr	67.8	42.3	55.1	3.50	2.07	4.25	6	0.6
May	74.7	51.1	62.9	4.41	2.97	5.28	8	0.0
Jun	81.1	58.9	70.0	4.38	2.74	5.30	8	0.0
Jul	84.4	63.5	73.9	3.87	2.26	4.70	7	0.0
Aug	82.9	62.5	72.7	4.30	2.70	5.20	7	0.0
Sep	77.3	56.1	66.7	3.72	2.15	4.52	6	0.0
Oct	68.4	43.8	56.1	3.17	1.68	3.83	5	0.0
Nov	58.6	35.8	47.2	3.82	2.85	4.47	6	0.4
Dec	50.6	29.3	39.9	3.39	2.20	4.08	6	1.7
Annual:					41.91	51.37		
Average	67.0	44.5	55.7	-	-	-	-	-
Total	-	-	-	47.06			80	13.2

GROWING SEASON DATES

Requested years of data:	1971 - 2000		
Years with missing data:	24 deg = 0	28 deg = 0	32 deg = 0
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 30	28 deg = 30	32 deg = 30

Probability	Temperature		
	24 F or higher	28 F or higher	32 F or higher
	Beginning and Ending Dates Growing Season Length		
50 percent *	3/16 to 11/15 244 days	4/2 to 11/1 213 days	4/22 to 10/16 177 days
70 percent *	3/12 to 11/20 253 days	3/28 to 11/7 224 days	4/19 to 10/20 184 days

** Percent chance of the growing season occurring between the Beginning and Ending dates.*

STATS TABLE

Total precipitation (inches)

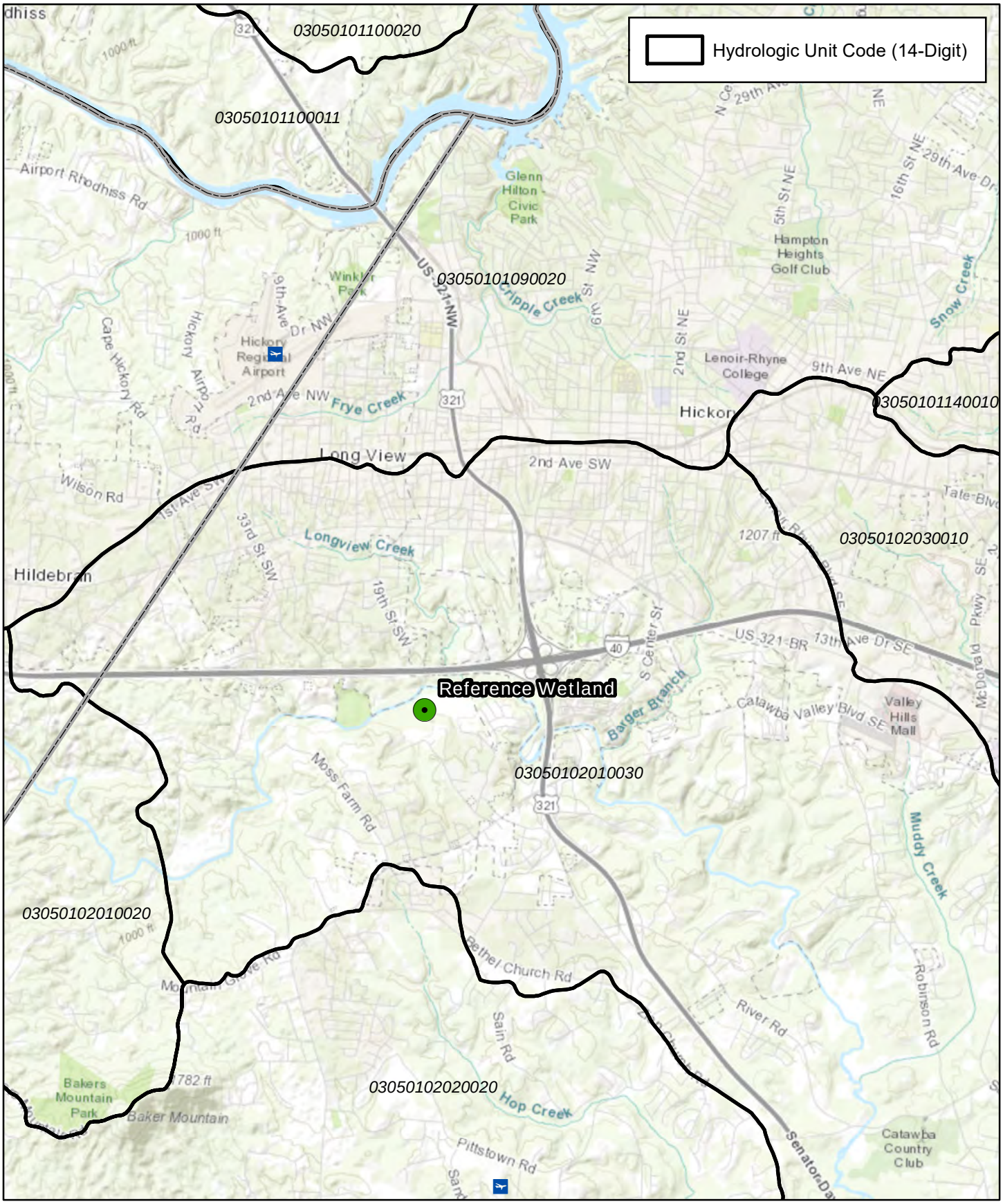
Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1946	3.35	M4.27	M5.93	M4.42	3.81	2.74	M4.44	M3.86	3.11	4.44	3.13	1.84	45.34
1947	8.29	1.17	3.09	M2.16	2.65	M4.47	1.90	3.51	2.07	6.09	4.56	2.01	41.97
1948	3.76	3.47	6.73	1.72	3.46	3.01	5.64	6.84	3.23	M1.16	9.92	3.71	52.65
1949	3.18	M2.98	4.53	5.22	4.64	4.28	10.41	10.26	2.88	6.23	1.56	2.94	59.11
1950	2.17	1.40	5.71	1.03	4.87	2.79	8.87	3.66	3.00	3.03	0.77	5.15	42.45
1951	1.21	2.11	5.37	3.44	0.51	6.17	4.64	1.84	3.54	2.05	2.97	6.51	40.36
1952	4.35	3.61	9.42	4.33	2.52	3.12	1.00	7.34	1.61	1.18	3.23	2.53	44.24
1953	5.25	5.52	2.68	2.25	1.72	4.90	2.21	3.31	3.93	0.39	1.97	5.52	39.65
1954	7.36	4.74	6.03	3.35	2.64	1.83	2.33	3.24	0.41	1.06	4.33	4.10	41.42
1955	1.31	3.86	3.37	4.14	5.03	3.28	6.83	2.97	0.94	1.87	1.70	0.88	36.18
1956	1.01	6.31	3.06	6.25	M4.11	2.27	4.65	1.61					29.27
1957			1.99	6.91	3.40	6.44	1.54	3.30	6.00	2.83	6.44	3.49	42.34
1958	3.36	3.74	3.67	6.79	3.06	2.36	7.58	2.36	1.07	2.01	2.22	4.21	42.43
1959	3.29	1.93	4.19										9.41
1960													
1961													
1962													
1963													
1964									6.82	9.15	2.68	3.71	22.36
1965	2.16	4.60	5.10	2.62	3.33	4.12	4.47	4.03	4.69	2.92	1.30	0.16	39.50
1966	3.37	6.56	2.59	5.47	4.73	2.46	3.24	7.73	4.55	5.37	3.32	2.36	51.75
1967	2.02	2.20	2.86	1.11	6.79	4.45	6.90	11.28	2.53	3.30	2.54	6.13	52.11
1968	2.93	0.62	6.65	2.37	2.92	5.06	7.18	3.31	2.64	5.02	2.98	3.10	44.78
1969	2.64	5.08	4.01	3.53	3.32	3.82	7.53	6.47	3.04	2.63	1.91	4.63	48.61
1970	1.75	2.42	2.62	2.96	1.72	2.72	5.02	2.46	1.17	5.55	1.83	2.72	32.94
1971	2.53	4.93	3.48	2.06	3.54	5.00	5.47	3.03	3.80	7.05	2.84	4.32	48.05
1972	3.57	2.02	3.19	1.49	6.63	6.54	4.66	1.88	5.29	4.44	4.42	3.89	48.02
1973	4.26	4.23	8.91	5.71	8.83	3.87	6.95	4.57	3.12	2.41	3.57	8.48	64.91
1974	3.44	4.24	3.18	4.99	5.58	3.73	3.93	7.34	4.13	1.28	4.22	2.38	48.44
1975	3.86	4.56	9.86	0.61	8.17	2.12	3.31	3.63	7.53	3.94	4.89	4.44	56.92

Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1976	3.51	2.20	4.96	0.25	8.67	5.51	3.18	4.23	3.50	5.59	1.58	4.05	47.23
1977	2.09	1.02	7.29	4.05	3.96	5.11	1.03	3.68	9.12	3.79	6.88	2.43	50.45
1978	7.47	0.44	5.22	2.97	4.65	2.29	0.63	6.91	2.57	0.30	2.49	4.32	40.26
1979	6.81	5.14	5.72	7.26	5.35	2.20	5.52	3.63	5.60	1.40	7.76	1.05	57.44
1980	2.85	0.53	8.26	4.77	4.54	4.68	2.21	2.38	4.36	2.62	3.04	0.59	40.83
1981	0.45	4.80	3.24	2.07	7.50	4.41	2.06	0.52	1.36	2.19	1.19	4.79	34.58
1982	5.41	7.02	1.92	3.62	3.78	3.98	9.92	1.73	1.33	3.48	4.59	4.04	50.82
1983	3.39	5.63	6.27	5.27	3.48	3.71	1.06	0.95	5.66	4.43	4.77	8.30	52.92
1984	2.36	6.43	4.82	4.05	6.62	3.69	5.88	5.02	0.16	2.73	2.61	1.34	45.71
1985	2.95	4.74	0.77	2.74	1.59	1.47	4.37	7.04	1.25	3.41	4.91	0.70	35.94
1986	1.11	1.85	2.75	0.57	3.55	1.28	0.46	6.10	3.15	4.19	5.28	4.28	34.57
1987	3.49	6.17	2.85	3.67	1.87	8.94	1.86	1.79	6.79	0.36	3.09	2.33	43.21
1988	3.71	0.88	1.31	3.46	1.06	0.94	2.65	1.78	2.79	3.12	3.47	1.41	26.58
1989	1.65	4.61	2.91	3.17	5.54	10.73	8.33	4.98	8.17	2.98	4.27	3.29	60.63
1990	3.27	8.07	5.95	1.96	5.09	0.90	6.55	7.78	1.43	8.82	1.55	4.50	55.87
1991	3.25	1.66	6.13	5.38	2.41	5.27	6.07	3.83	1.27	0.19	3.34	4.86	43.66
1992	3.08	3.66	3.52	3.99	6.18	6.62	1.10	7.64	3.15	4.15	7.24	3.71	54.04
1993	3.82	2.03	6.16	3.21	4.59	1.12	2.07	5.29	1.56	1.21	3.32	3.59	37.97
1994	5.35	5.11	7.52	3.30	1.74	5.89	6.76	6.01	5.33	4.27	3.15	3.03	57.46
1995	7.03	2.93	2.42	0.98	6.04	8.89	3.61	9.22	1.95	7.23	3.66	1.43	55.39
1996	7.22	2.71	3.36	2.00	2.55	3.54	4.83	6.68	5.22	0.68	4.45	3.92	47.16
1997	4.44	5.29	5.48	5.26	2.91	8.29	2.97	1.37	4.89	3.90	1.60	2.98	49.38
1998	9.96	6.38	3.71	8.70	2.22	3.64	1.97	2.23	1.62	1.79	2.76	3.04	48.02
1999	6.38	3.29	2.82	2.44	2.53	4.39	3.85	3.37	2.20	3.29	3.31	1.98	39.85
2000	3.10	2.33	3.82	5.11	1.27	2.78	2.84	4.45	3.27	0.00	4.25	2.37	35.59
2001	2.63	2.73	5.00	1.32	2.47	2.91	5.50	3.20	4.37	0.60	1.42	2.34	34.49
2002	3.64	1.30	4.36	1.73	3.42	6.13	1.98	2.09	6.05	3.14	4.23	6.40	44.47
2003	1.19	4.47	4.34	5.25	8.36	6.16	10.88	6.80	3.01	2.33	3.89	2.78	59.46
2004	0.83	4.20	2.02	2.95	3.23	7.39	4.68	3.79	13.71	1.11	5.02	3.43	52.36
2005	2.00	2.57	3.33	2.86	1.65	10.09	10.26	5.71	0.34	1.20	3.74	3.51	47.26
2006	3.58	2.55	0.91	4.58	1.69	5.16	2.81	7.12	7.80	2.93	4.52	4.64	48.29
2007	3.35	1.45	4.29	1.77	0.96	2.91	4.85	2.84	3.40	3.02	1.49	4.06	34.39
2008	2.56	3.79	4.51	2.84	1.33	0.85	4.02	5.84	1.70	1.84	1.61	4.74	35.63
2009	2.40	1.87	4.07	3.54	9.18	6.41	2.88	3.69	8.17	5.50	5.26	9.16	62.13

Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
2010	7.00	3.35	4.18	2.24	4.89	1.75	3.54	3.47	4.15	2.94	5.49	1.26	44.26
2011	2.12	2.97	6.95	4.33	2.95	3.83	3.33	3.00	3.74	2.39	5.32	5.11	46.04
2012	3.85	1.59	2.72	4.66	5.82	1.68	5.78	3.39	5.93	4.01	0.85	4.38	44.66
2013	8.58	3.56	3.32	5.88	7.78	8.97	13.69	6.98	3.05	2.19	3.55	7.67	75.22
2014	2.33	3.02	2.30	5.09	3.77	5.39	4.93	3.95	5.87	4.03	3.83	2.40	46.91
2015	3.06	2.78	2.12	4.94	1.35	6.42	2.66	2.77	4.50	7.17	7.82	8.76	54.35
2016	3.29	5.69	1.56	2.50	1.84	2.53	4.39	6.65	0.58	0.52	1.54	2.31	33.40
2017	3.72	0.70	3.92	7.65	7.03	2.71	4.53	6.35	3.75	9.68	1.59	2.47	54.10
2018	4.04	5.57	3.11	4.64	14.68	2.57	6.58	10.41	4.00	5.85	7.16	10.87	79.48
2019	5.28	6.91	2.63	8.97	3.35	6.90	3.69	3.98	0.90	7.78	2.57	M1.31	54.27

Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.
Data missing for all days in a month or year is blank.

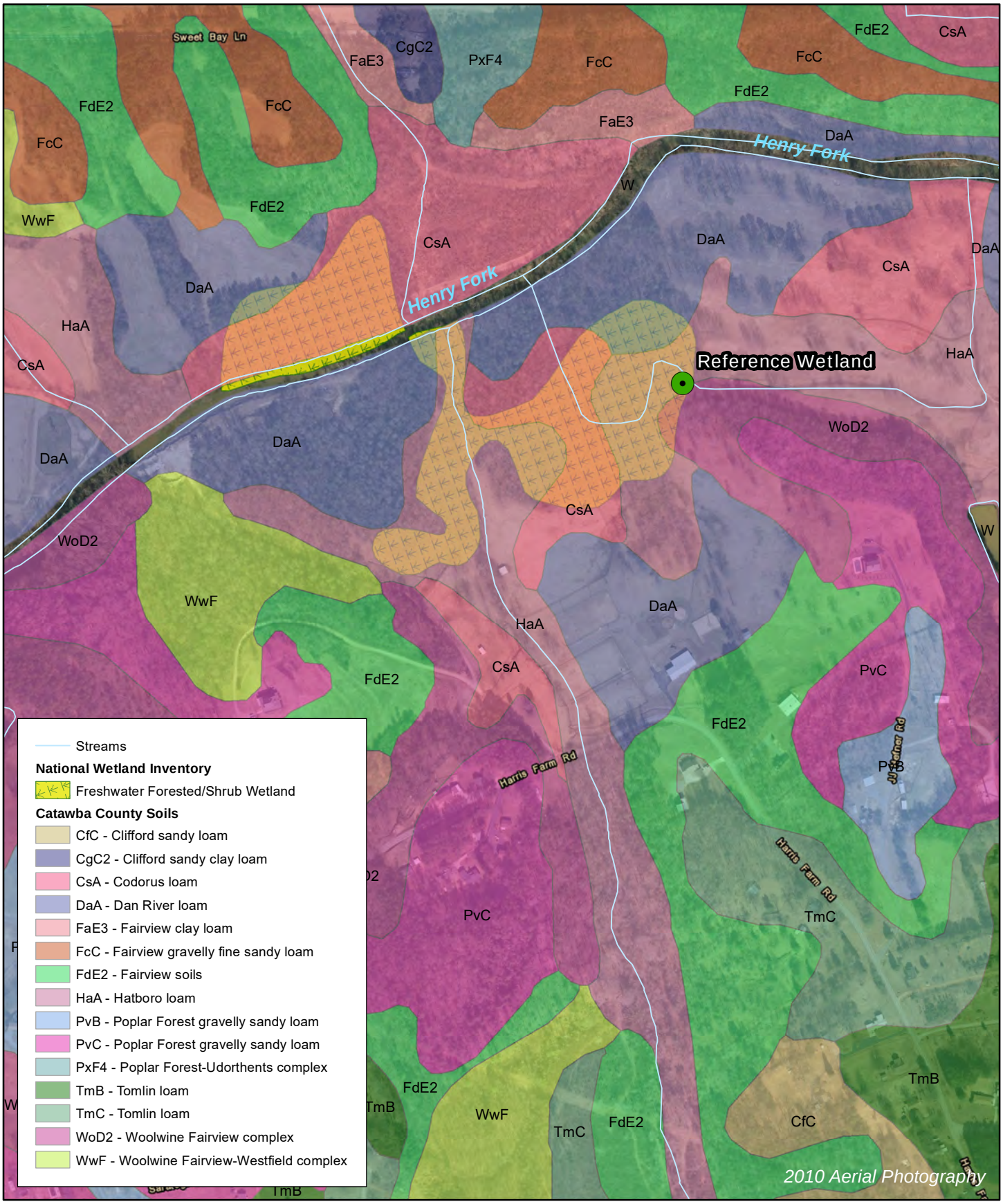
Creation date: 2019-12-13



Appendix - Location Map
Reference Wetland Gauge
Catawba River Basin 03050103

Catawba County, NC

WILDLANDS ENGINEERING



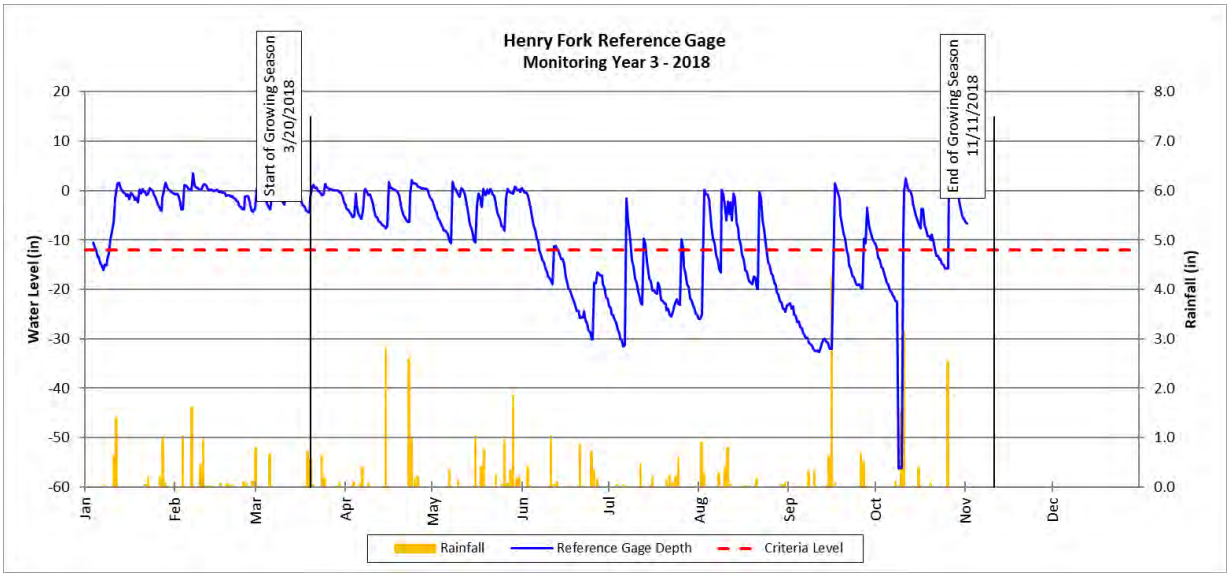
WILDLANDS ENGINEERING

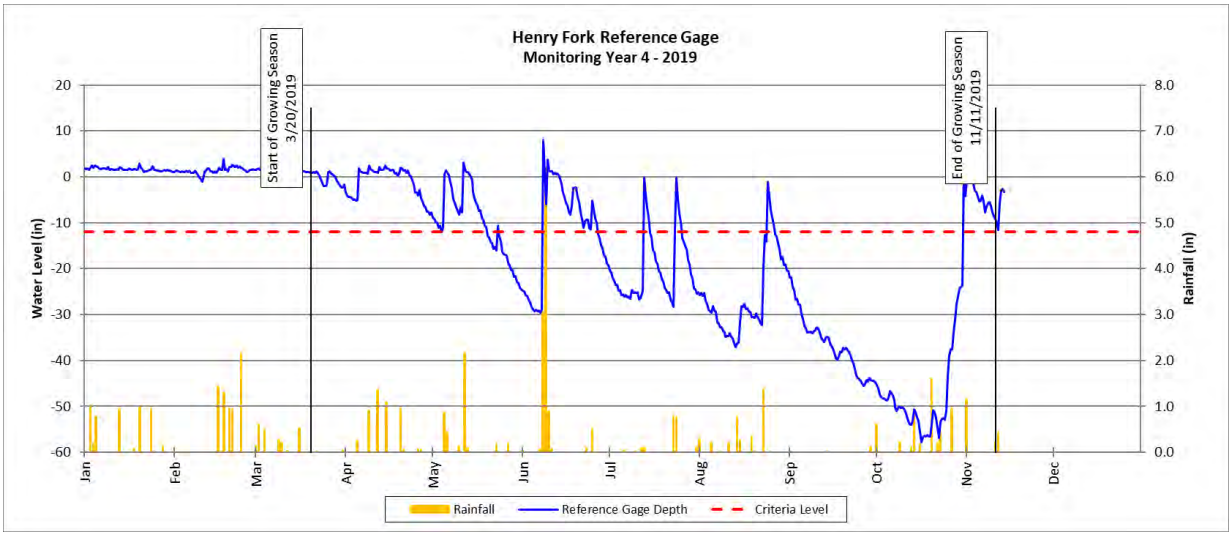
0 150 300 Feet

N

Appendix - Soils Map
Reference Wetland Gauge
Catawba River Basin 03050103

Catawba County, NC


Henry Fork Reference Gage
Monitoring Year 3 - 2018
Start of Growing Season 3/20/2018
End of Growing Season 11/11/2018
Water Level (in)
Rainfall (in)
20
10
0
-10
-20
-30
-40
-50
-60
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Rainfall
Reference Gage Depth
Criteria Level


Henry Fork Reference Gage
Monitoring Year 4 - 2019
Start of Growing Season 3/20/2019
End of Growing Season 11/11/2019
Water Level (in)
Rainfall (in)
20
10
0
-10
-20
-30
-40
-50
-60
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Rainfall
Reference Gage Depth
Criteria Level

Banner Farm Mitigation Site
Sierra Nevada Reference Well

Forest Community:

Tree Stratum:
- Beech Tree – Fragus grandifolia
- Tulip Poplar – Liriodendron Tulipifera
- White Oak – Quercus alba
- Red Maple – Acer rubrum
- Mockernut hickory – Carya tomentosa
- Sycamore – Platanus occidentalis

Under Story:
- American Holly – Ilex opaca
- River Cane – Arundinaria gigantea
- Red Maple – Acer rubrum
- Sycamore – Platanus occidentalis

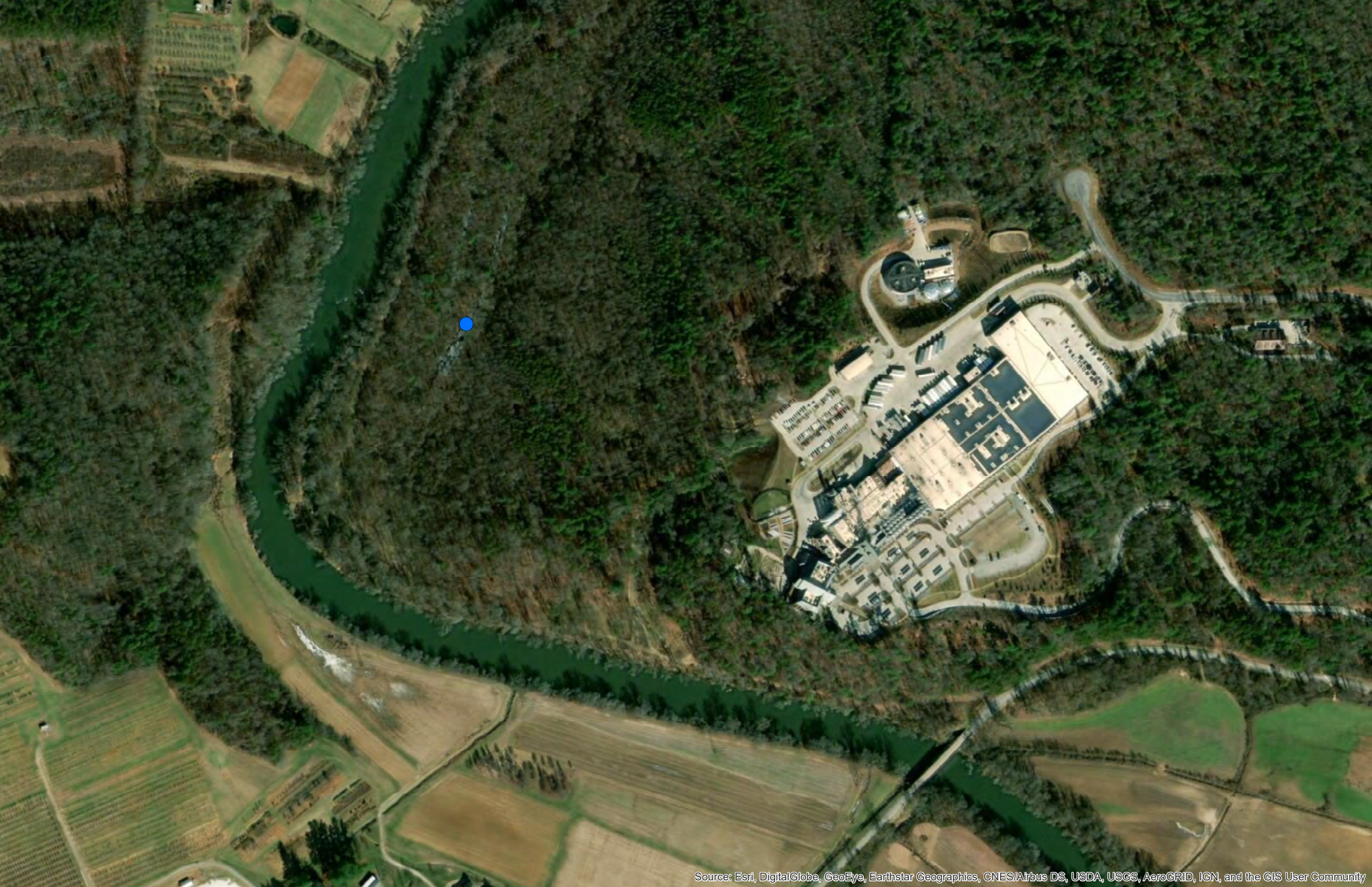
Ground Cover:
- Greenbrier – Smilax spp,
- Sedge – Carex spp.

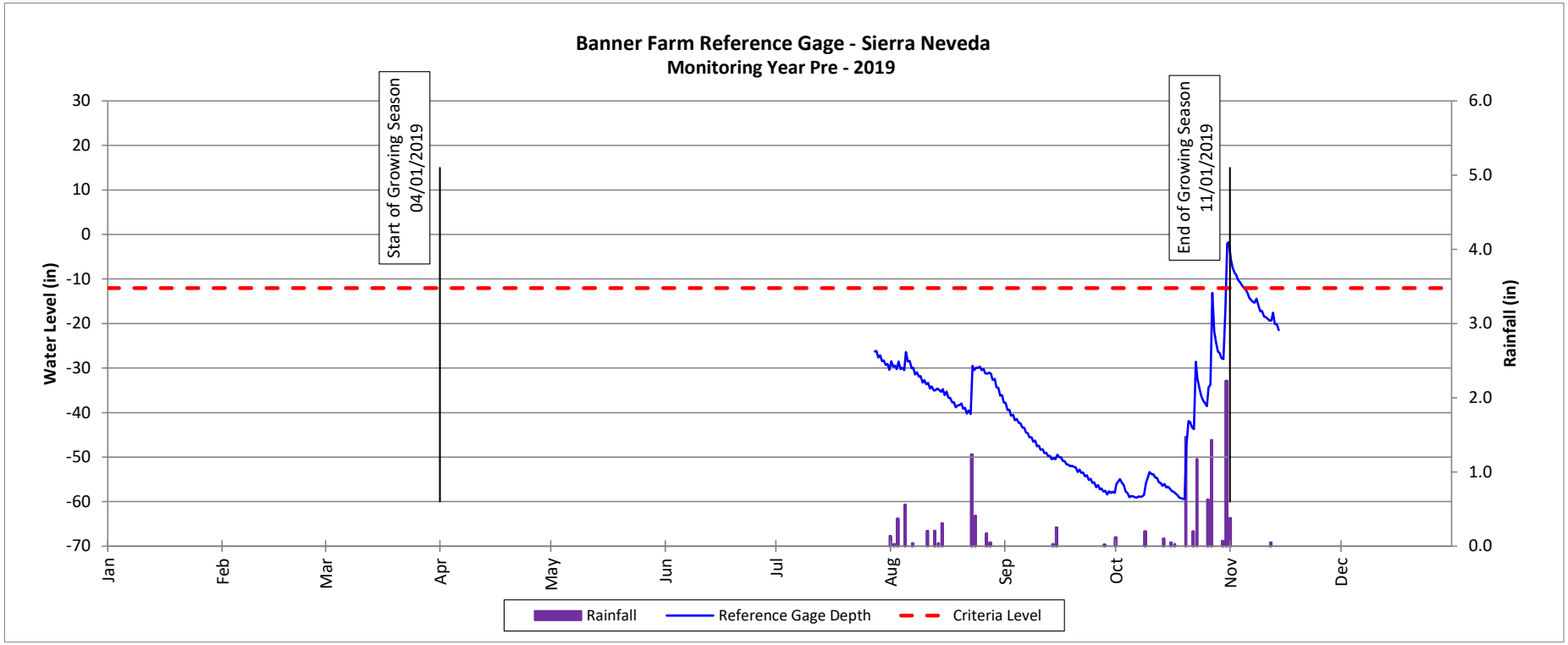
Soils:

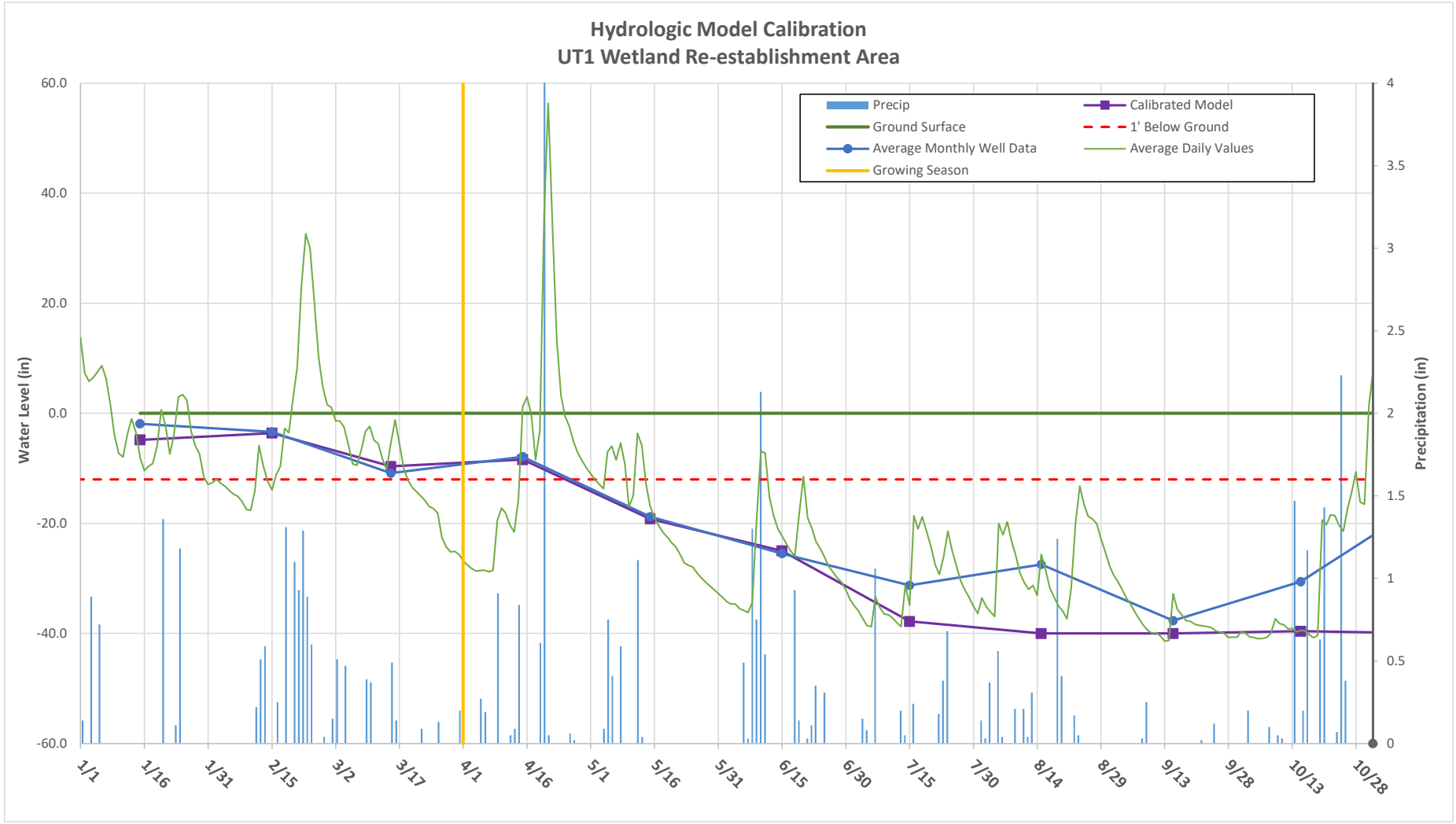
0”-7.2” - 10YR 4/3, Redox 20%, 7.5YR 5/8, Silt Clay loam
7.2”-33.6” - 10YR 3/2, Sandy loam
33.6”-72” – 7.5YR 3/1, Sandy Clay loam

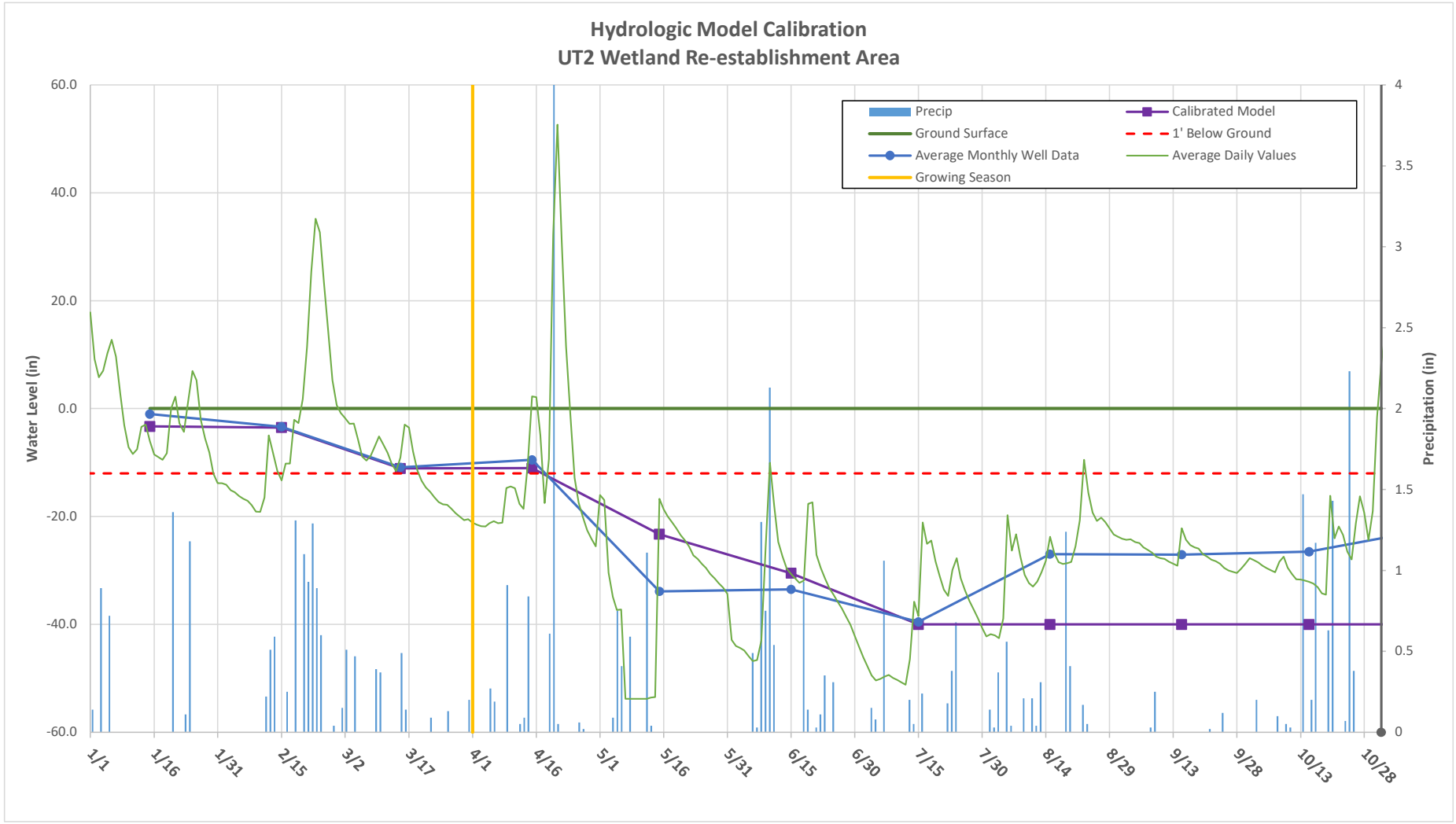
Location (lat/long): 35.4344, -82.5575

Site Photos:


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


Banner Farm Reference Gage - Sierra Neveda
Monitoring Year Pre - 2019
Start of Growing Season 04/01/2019
End of Growing Season 11/01/2019
Water Level (in)
Rainfall (in)
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Rainfall
Reference Gage Depth
Criteria Level

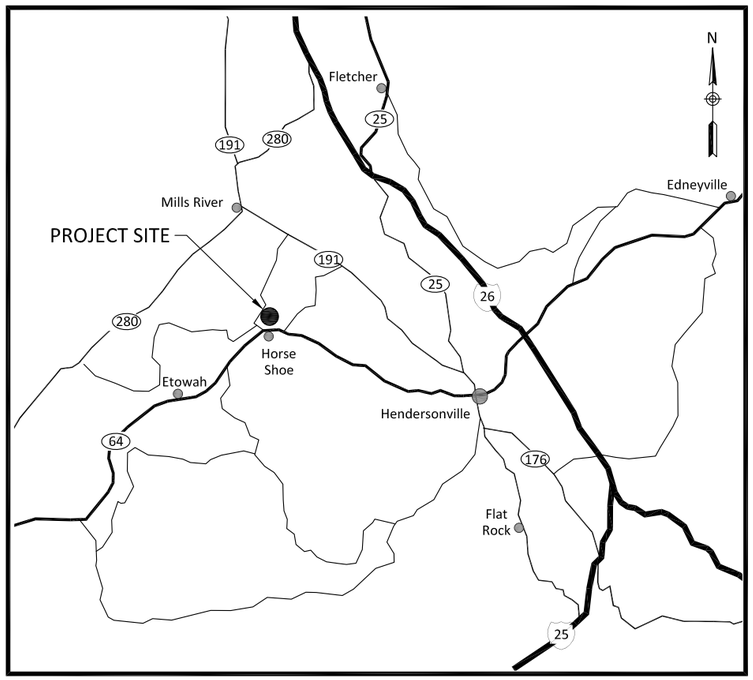

Hydrologic Model Calibration
UT1 Wetland Re-establishment Area
Water Level (in)
Precipitation (in)
Precip
Calibrated Model
Ground Surface
1' Below Ground
Average Monthly Well Data
Average Daily Values
Growing Season
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
4
3.5
3
2.5
2
1.5
1
0.5
0
1/1
1/16
1/31
2/15
3/2
3/17
4/1
4/16
5/1
5/16
5/31
6/15
6/30
7/15
7/30
8/14
8/29
9/13
9/28
10/13
10/28


Hydrologic Model Calibration
UT2 Wetland Re-establishment Area
Water Level (in)
Precipitation (in)
Precip
Calibrated Model
Ground Surface
1' Below Ground
Average Monthly Well Data
Average Daily Values
Growing Season
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
4
3.5
3
2.5
2
1.5
1
0.5
0
1/1
1/16
1/31
2/15
3/2
3/17
4/1
4/16
5/1
5/16
5/31
6/15
6/30
7/15
7/30
8/14
8/29
9/13
9/28
10/13
10/28

APPENDIX 8
Preliminary Design Plans

Banner Farm Mitigation Site

Henderson County, North Carolina
for
NCDEQ
Division of Mitigation Services



Vicinity Map
Not to Scale

BEFORE YOU DIG!
CALL 1-800-632-4949
N.C. ONE-CALL CENTER
IT'S THE LAW!

PRELIMINARY PLANS
ISSUED FOR FINAL MITIGATION PLAN
JULY 1, 2020

Sheet Index

Project Directory

Engineering:
Wildlands Engineering, Inc
License No. F-0831
167-B Haywood Road
Asheville, NC 28806
Eric Neuhaus, PE
865-207-8855

Surveying:
Kee Mapping and Surveying
P.O. Box 2566
Asheville, NC 28802
Brad Kee, PLS
828-575-9021

Owner:
NCDEQ
Division of Mitigation Services
5 Ravenscroft Drive, Ste 102
Asheville, NC 28801
Matthew Reid
828-273-1673

DMS Project No. 100062

French Broad River Basin
HUC 06010105

USACE Action ID:
SAW-2018-01153

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Banner Farm Mitigation Site
Henderson County, NC

Title Sheet

Revisions:

Date: 07.01.2020
Job Number: 005-021752
Project Engineer: EN
Drawn By: JDW
Checked By: JM

Sheet 0.1

June 29, 2020

N

0' 150' 300' 450'
(HORIZONTAL)

EXISTING POND

STA: 0+08
START BANNER CREEK REACH 1 - RESTORATION

Mitchell & Wendy Gaither
PIN: 9630826726
DB: 1598 PG: 219

BANNER CREEK

STA: 9+34
END BANNER CREEK REACH 1 - RESTORATION
START BANNER CREEK REACH 2 - RESTORATION

MOUNTAIN BEAN HOLDINGS, INC.
PIN: 9630924395
DB: 3150 PG: 641
TRACK 1

VINE RIPE INVESTMENTS, INC.
PIN: 9630912884
DB: 3150 PG: 631

STA: 200+18
START UT2 - RESTORATION

STA: 18+00
END BANNER CREEK REACH 2 - RESTORATION

STA: 21+16
START BANNER CREEK REACH 3 - RESTORATION

STA: 100+83
START UT1 - RESTORATION

BANNER FARM ROAD

KIRBY & SHERRI JOHNSON
PIN: 9539895929
DB: 1426 PG: 625

UT 2

UT 1

BANNER CREEK

KIRBY & SHERRI JOHNSON
PIN: 9630900480
DB: 3403 PG: 159

KIRBY & SHERRI JOHNSON
PIN: 9630919204
DB: 831 PG: 23

STA: 218+97
END UT2 - RESTORATION

STA: 25+83
END BANNER CREEK REACH 3 - RESTORATION
START BANNER CREEK REACH 4A - RESTORATION

MOUNTAIN BEAN HOLDINGS, INC.
PIN: 9640028341
DB: 3150 PG: 641
TRACK 2

STA: 112+82
END UT1 - RESTORATION

STA: 33+77
END BANNER CREEK REACH 4A - RESTORATION
START BANNER CREEK REACH 4B - RESTORATION

FRENCH BROAD RIVER

STA: 37+97
END BANNER CREEK REACH 4B - RESTORATION

L:\Active Projects\005-0172 Banner Farm Mitigation Site\Cad\A Archived\CAD Files\MI Plan Submittal 03-2020\Plans\021752-Overview.dgn

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3305
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Banner Farm Mitigation Site
Henderson County, NC

Project Overview

Revisions:

Date: 03.16.2020
Job Number: 005-021752
Project Engineer: DN
Drawn By: JDW
Checked By: JM

Sheet 0.2

June 15, 2020

Existing Features

- Existing Thalweg
- Existing Property Line
- Existing Major Contour (100)
- Existing Minor Contour
- Existing Overhead Wire/Utility (OW)
- Existing Power Pole/Utility Tower/Guy Wire
- Existing Utility Right-of-Way
- Existing Road Right-of-Way
- Existing Top of Bank (TB)
- Existing Fence (X)
- Existing Stormwater Pipe or Culvert
- Existing Road
- Jurisdictionally Delineated Wetland
- Surveyed Tree (> 12" Diameter)
- Existing Culvert or Pipe

Proposed Features

- Proposed Stream Alignment (10+00)
- Proposed Bankfull
- Proposed Major Contour (100)
- Proposed Minor Contour
- Proposed Conservation Easement (CE)
- Proposed Internal Easement Crossing (CE-XS)

Proposed Structures

- Proposed Log Sill
- Proposed Log or Rock J-Hook
- Proposed Rock Sill
- Proposed Cover Log
- Proposed Various Constructed Riffles Per Plans (CR-CR)
  Note: Text Below Riffle in Plan view signifies riffle type (See Sheet 6.1 for Construction Details)
  CR - Constructed Riffle, CH - Chunky Riffle, RR - Rock and Roll Riffle, JR - Jazz Riffle
- Proposed Brush Toe
- Proposed Permanent Culvert Crossing
- Proposed Wetland Ditch Plug
- Proposed Fill in Existing Ditch

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Banner Farm Mitigation Site
Henderson County, NC
General Notes and Symbols

Revisions:

Date: 03.16.2020
Job Number: 005-021752
Project Engineer: EN
Drawn By: JDW
Checked By: JM

Sheet 0.3

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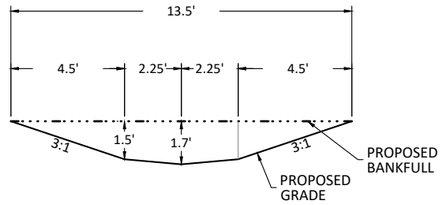
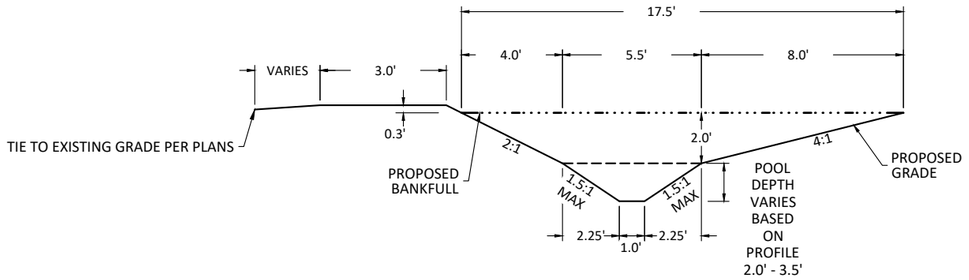


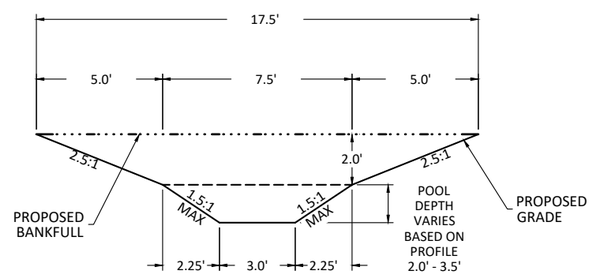
Banner Creek Reach 1 & 2 - Riffle

STA 0+08 to 18+00
Not to Scale



Banner Creek Reach 1 & 2 - Meander Pool

STA 0+08 to 18+00
Not to Scale



Banner Creek Reach 1 & 2 - In-Line Pool

STA 0+08 to 18+00
Not to Scale

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Henderson County, NC

Typical Sections

Banner Creek Reach 1 & 2

Revisions:

Date: 03.16.2020
Job Number: 005-021752
Project Engineer: DN
Drawn By: JDW
Checked By: JM

Sheet 1.1

March 16, 2020

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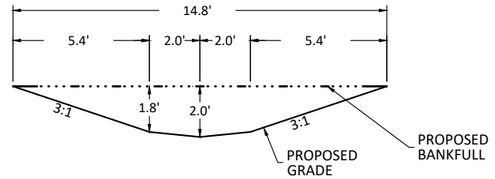
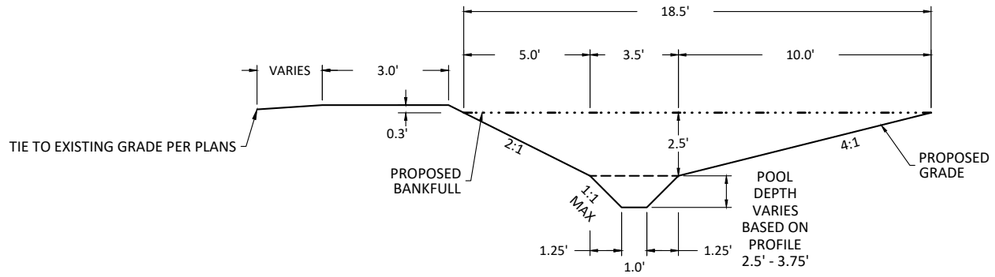


Banner Creek Reach 3 - Riffle

STA 21+16 to 25+83
Not to Scale



Banner Creek Reach 3 - Meander Pool

STA 21+16 to 25+83
Not to Scale

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Typical Sections

Banner Creek Reach 3

Revisions:

Date: 03.16.2020
Job Number: 005-021752
Project Engineer: EN
Drawn By: JDW
Checked By: JM

Sheet 1.2

March 16, 2020

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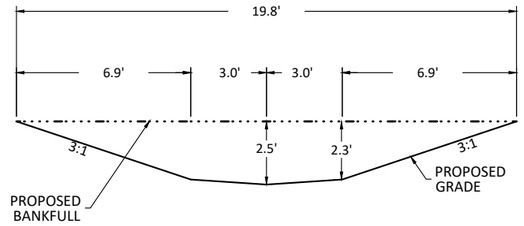

Banner Creek Reach 4a - Riffle

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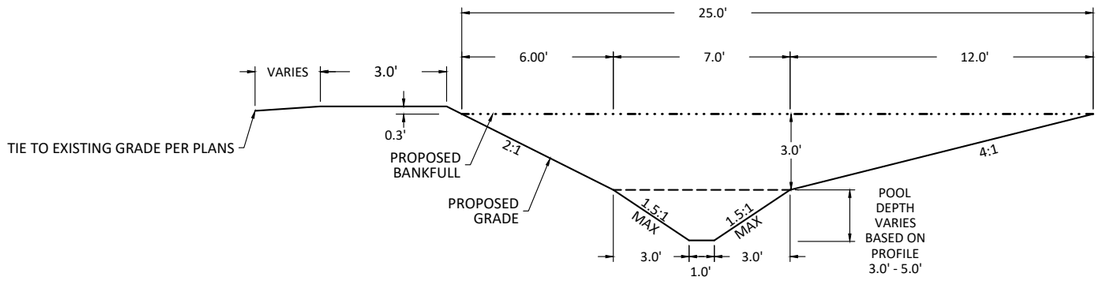
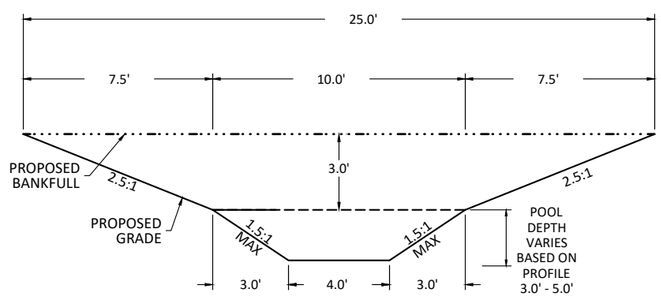
Not to Scale



Banner Creek Reach 4a - Meander Pool

STA 25+83 to 33+77
Not to Scale



Banner Creek Reach 4a - In-Line Pool

STA 25+83 to 33+77
Not to Scale

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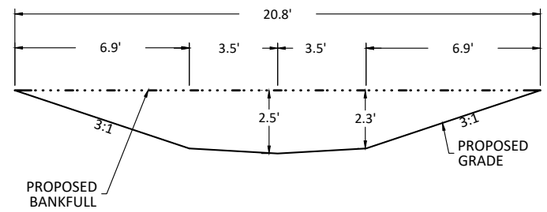
Typical Sections

Banner Creek Reach 4a

Revisions:

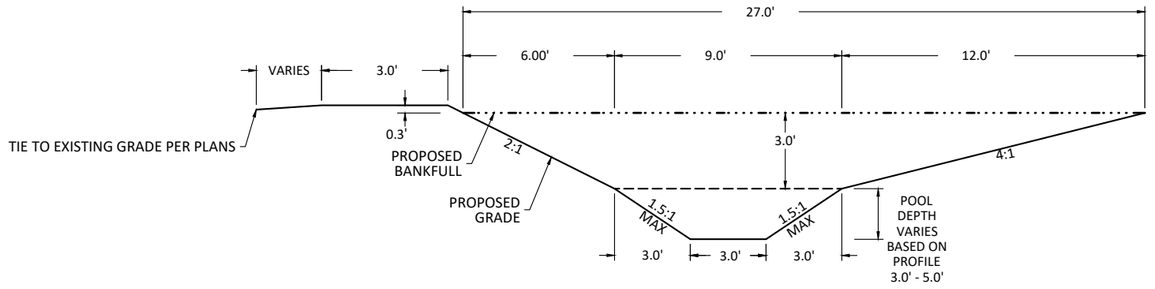
Date: 03.16.2020
Job Number: 005-021752
Project Engineer: EN
Drawn By: JDW
Checked By: JM

Sheet 1.3



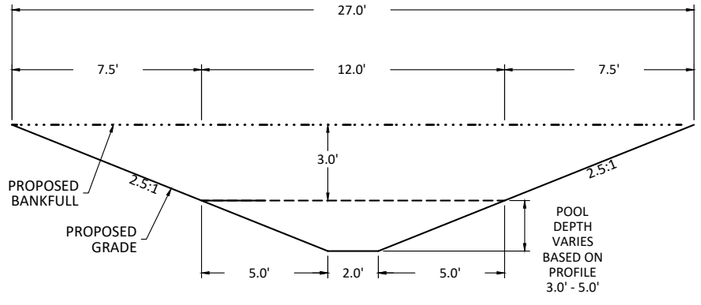
Banner Creek Reach 4b - Riffle

STA 33+77 to 37+97
Not to Scale



Banner Creek Reach 4b - Meander Pool

STA 33+77 to 37+97
Not to Scale



Banner Creek Reach 4b - In-Line Pool

STA 33+77 to 37+97
Not to Scale

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Typical Sections
Banner Creek Reach 4b

Revisions:

Date: 03.16.2020
Job Number: 005-021752
Project Engineer: EN
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1.4
Sheet

March 16, 2020

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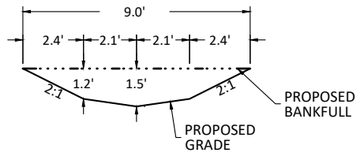
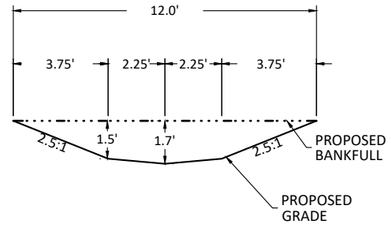


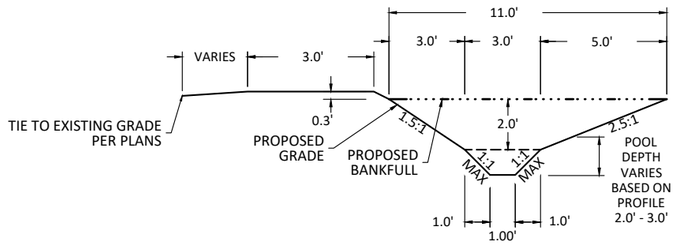
UT1 - Riffle

STA 100+83 to 112+82
Not to Scale



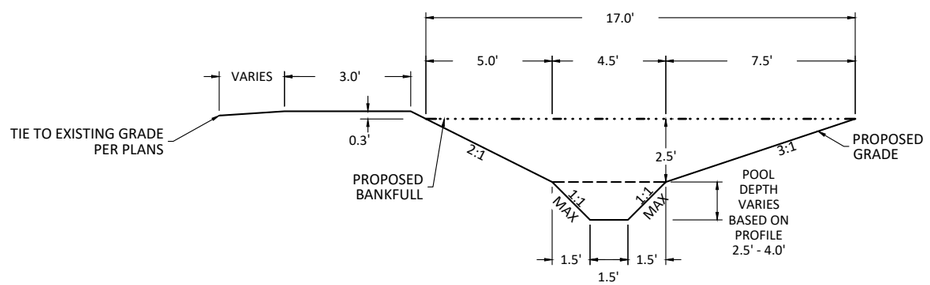
UT2 - Riffle

STA 200+18 to 218+97
Not to Scale



UT1 - Meander Pool

STA 100+83 to 112+82
Not to Scale



UT2 - Meander Pool

STA 200+18 to 218+97
Not to Scale

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Typical Sections
UT1 and UT2

Revisions:

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Job Number: 085-02752
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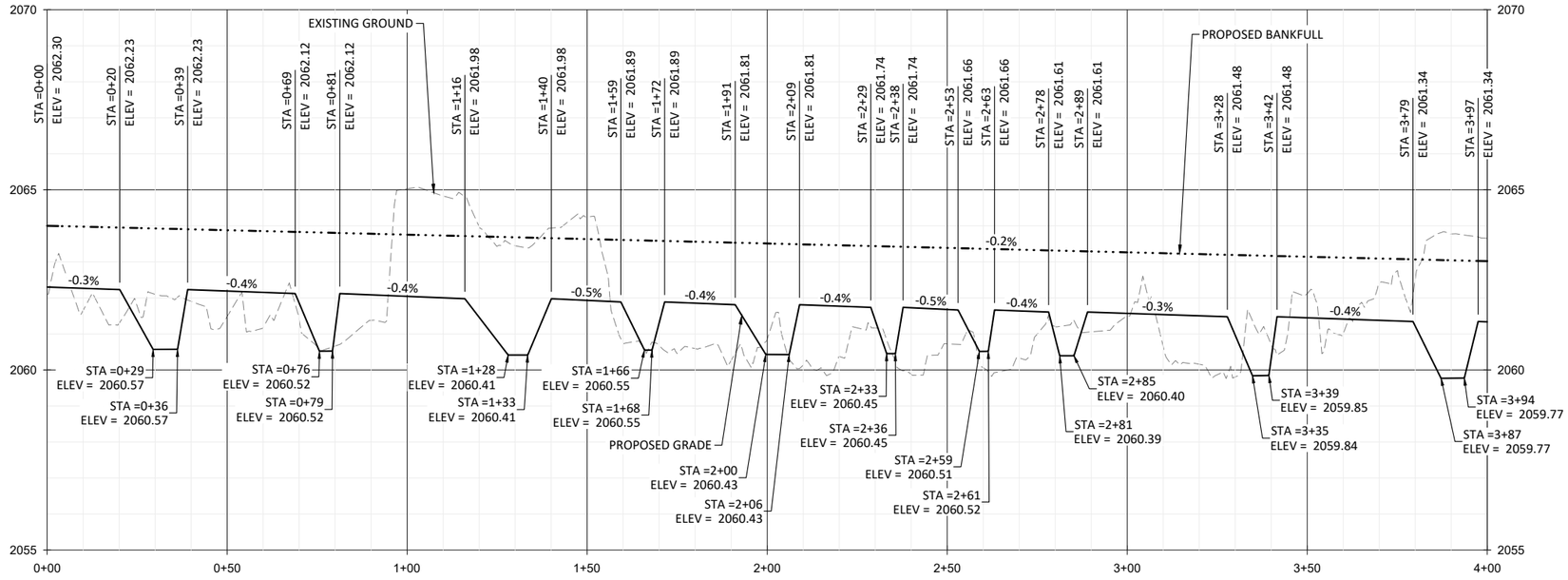
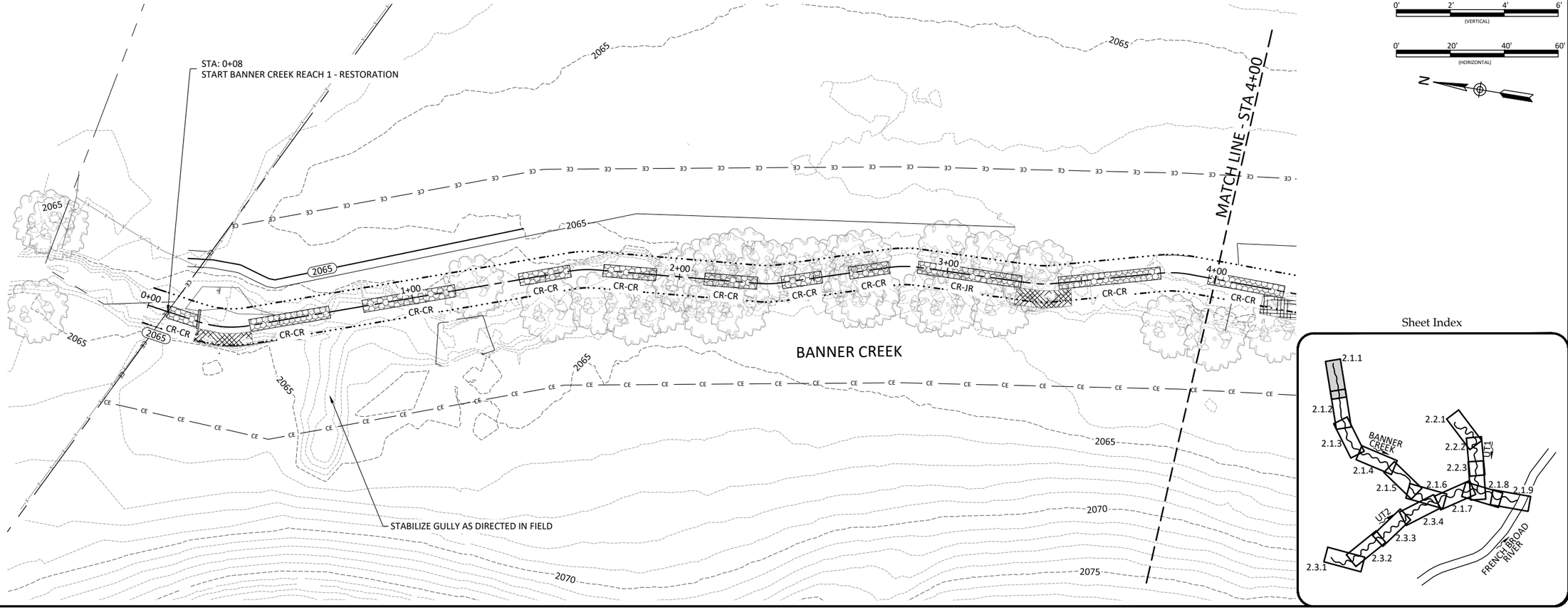
Sheet





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Henderson County, NC

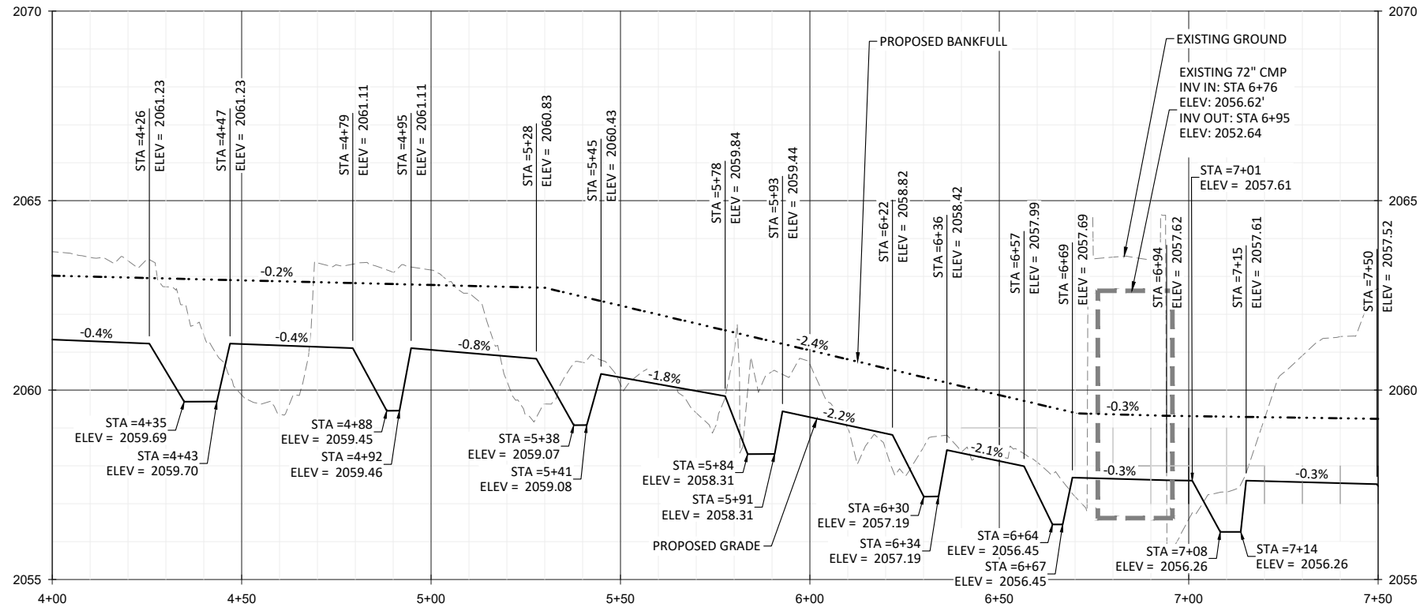
Stream Plan and Profile
Banner Creek

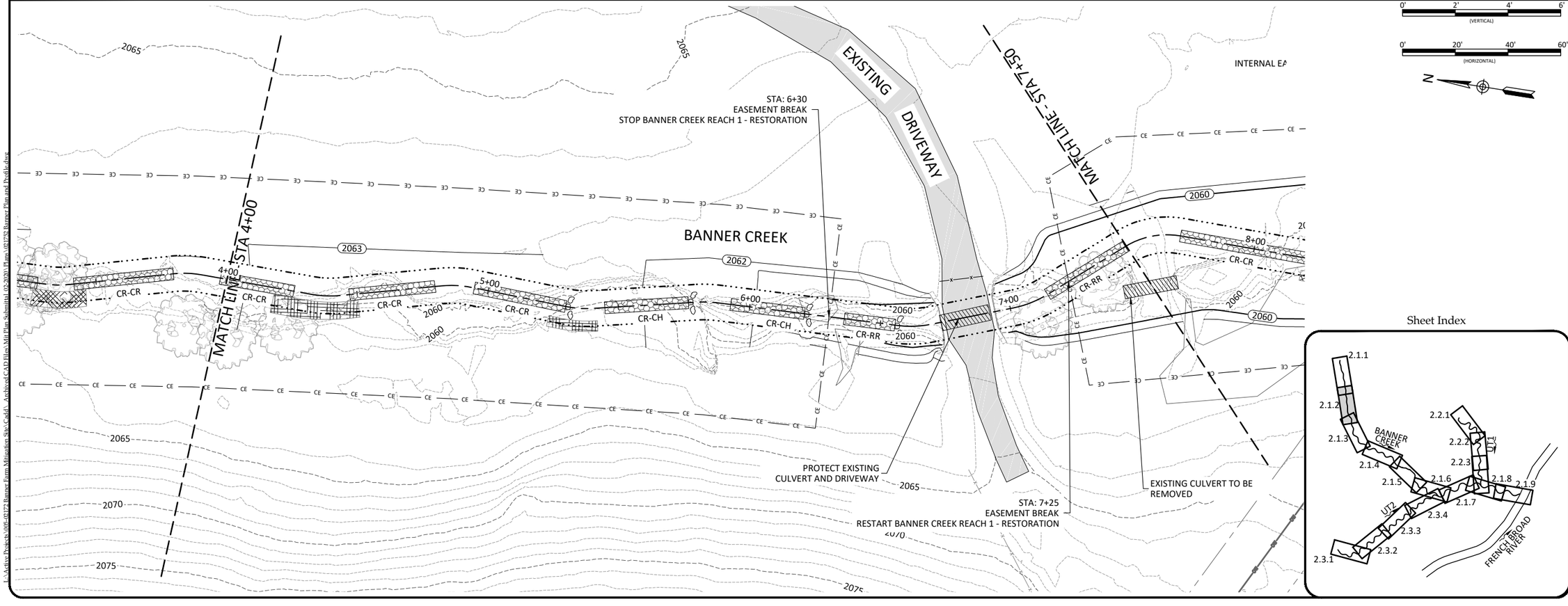
Revisions:

Date:	03.16.2020
Job Number:	005-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

Sheet 2.1.1

March 16, 2020





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Stream Plan and Profile
Banner Creek

Revisions:

Date:	03.16.2020
Job Number:	005-021752
Project Engineer:	JEN
Drawn By:	JDW
Checked By:	JM

Sheet 2.1.2

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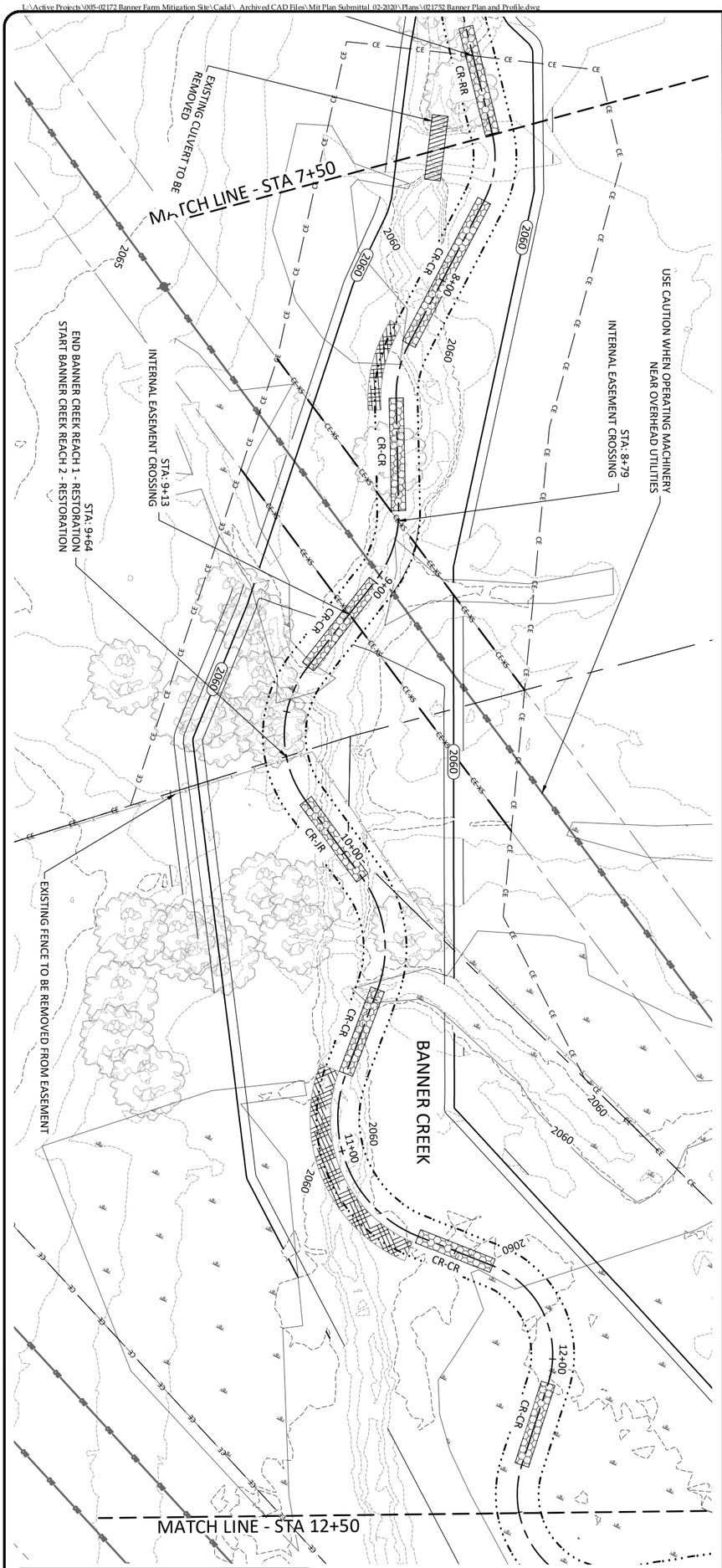

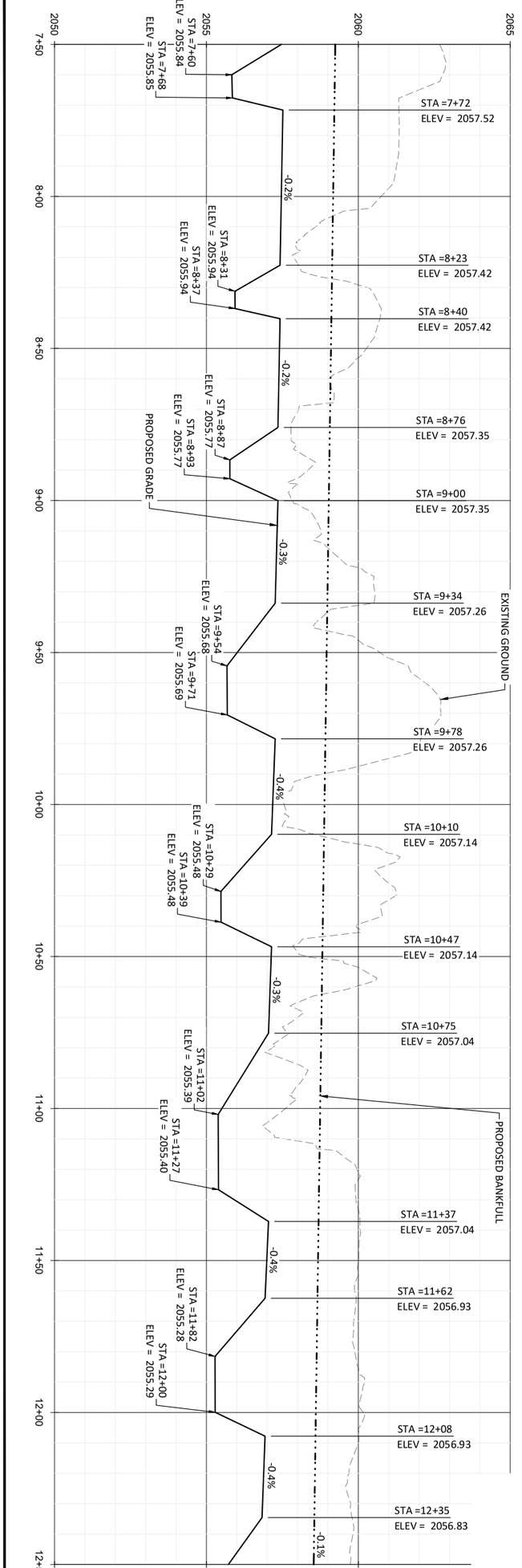

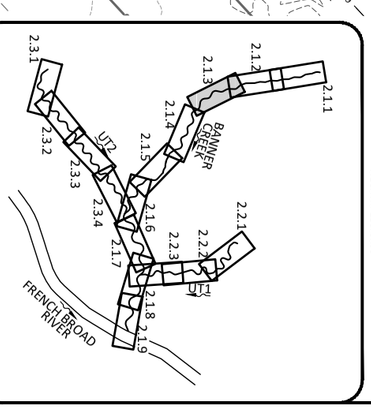

Sheet Index

N

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	03.16.2020
Job Number:	005-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

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2.1.3
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Banner Farm Mitigation Site
Henderson County, NC

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Banner Creek

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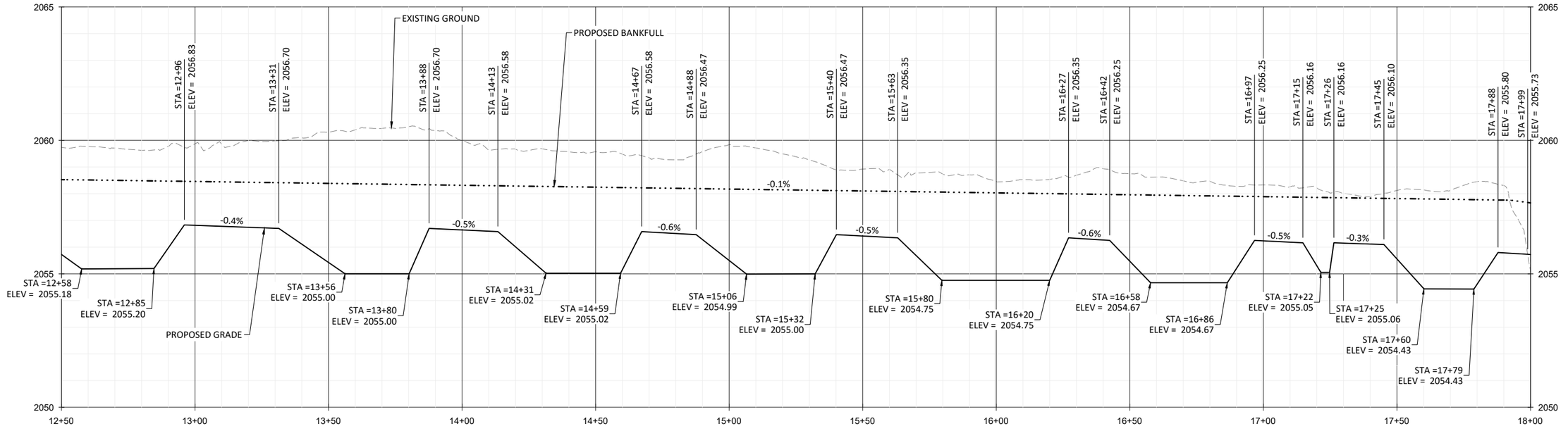

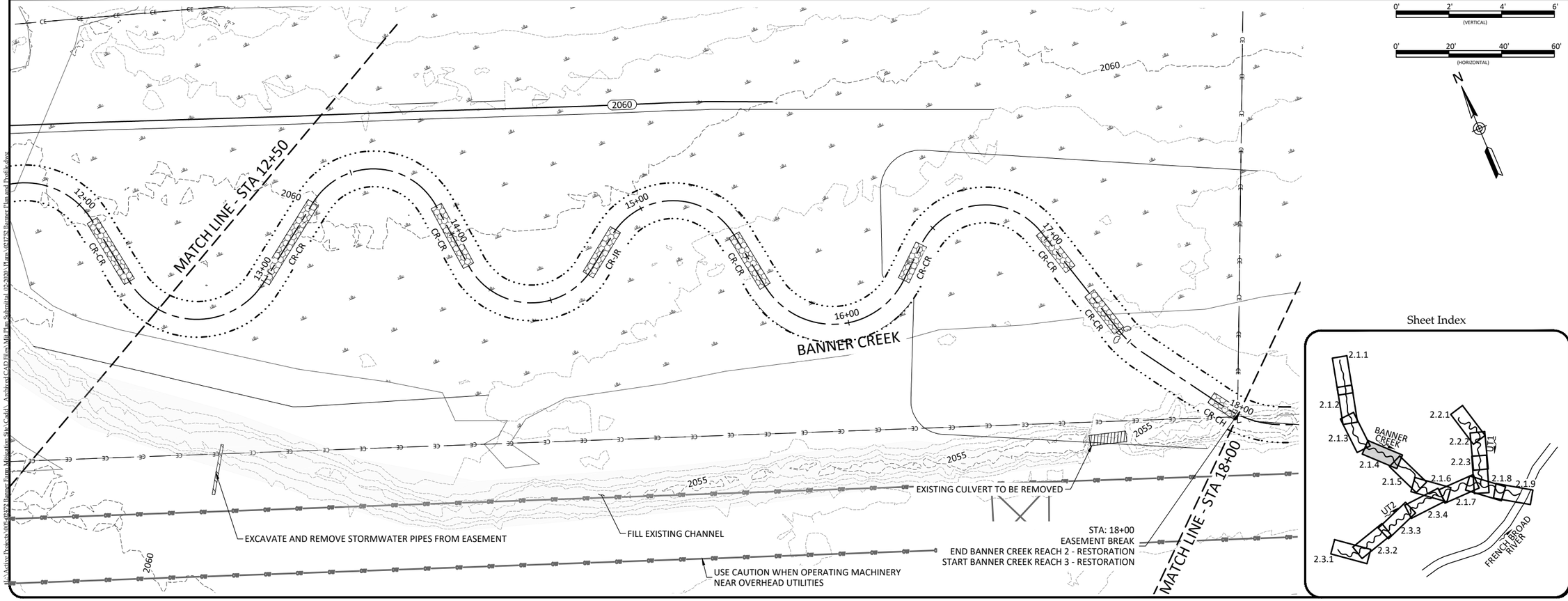

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Banner Farm Mitigation Site
Henderson County, NC

Stream Plan and Profile
Banner Creek

Revisions:

Date: 03.16.2020
Job Number: 005-021752
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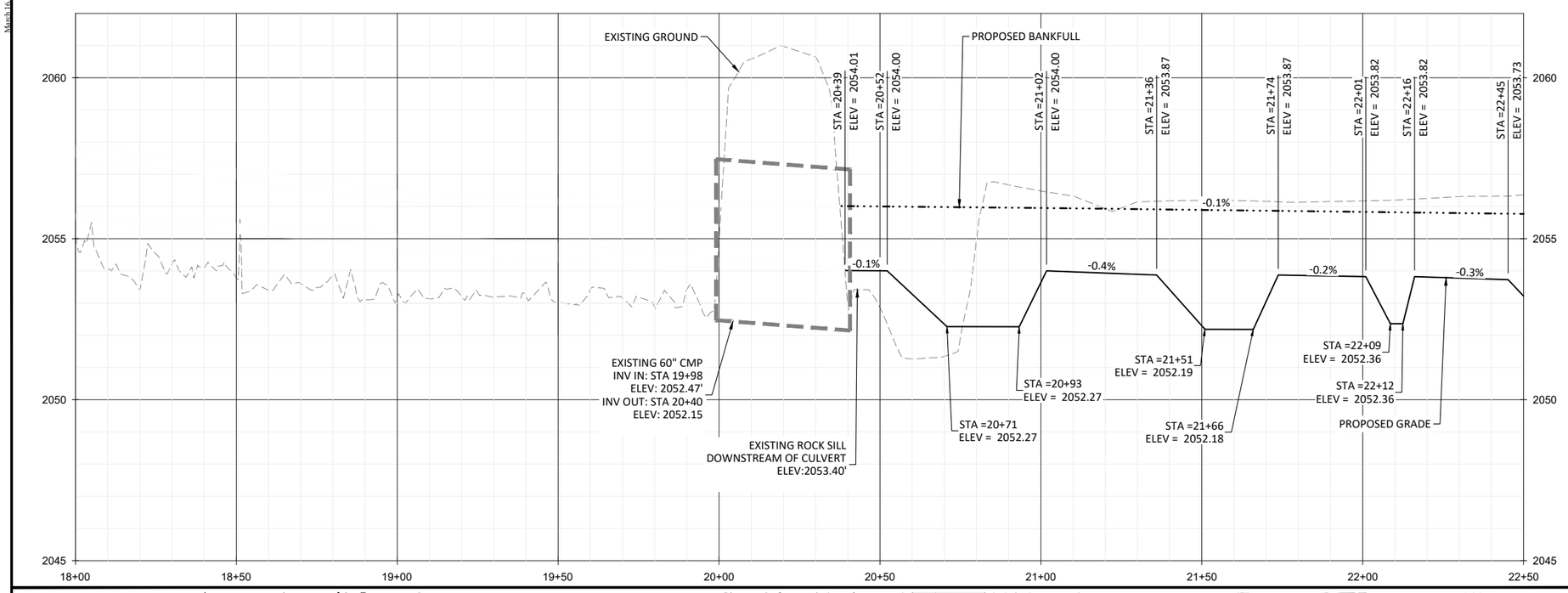
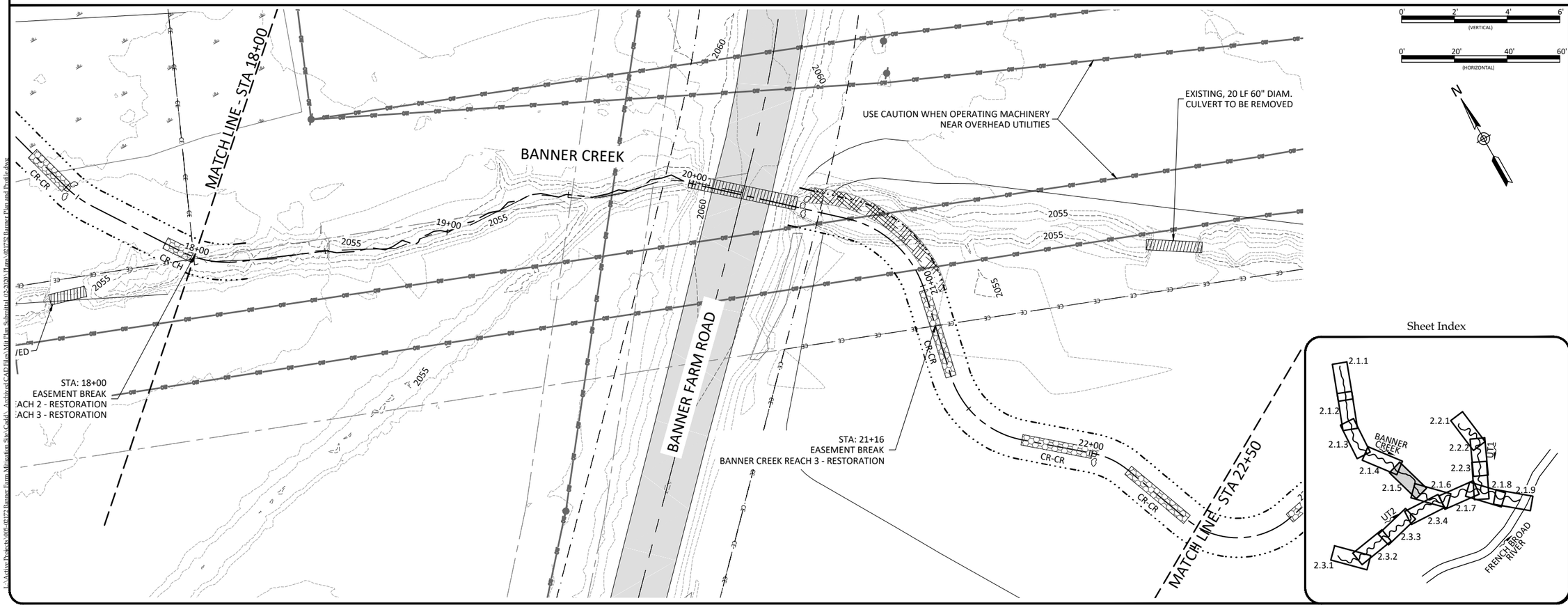
Drawn By: JDW
Checked By: JM

Sheet 2.1.4

March 16, 2020





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Stream Plan and Profile
Banner Creek

Revisions:

Date: 03.16.2020
Job Number: 003-021752
Project Engineer: JEN
Drawn By: JDW
Checked By: JM

Sheet: 2.1.5

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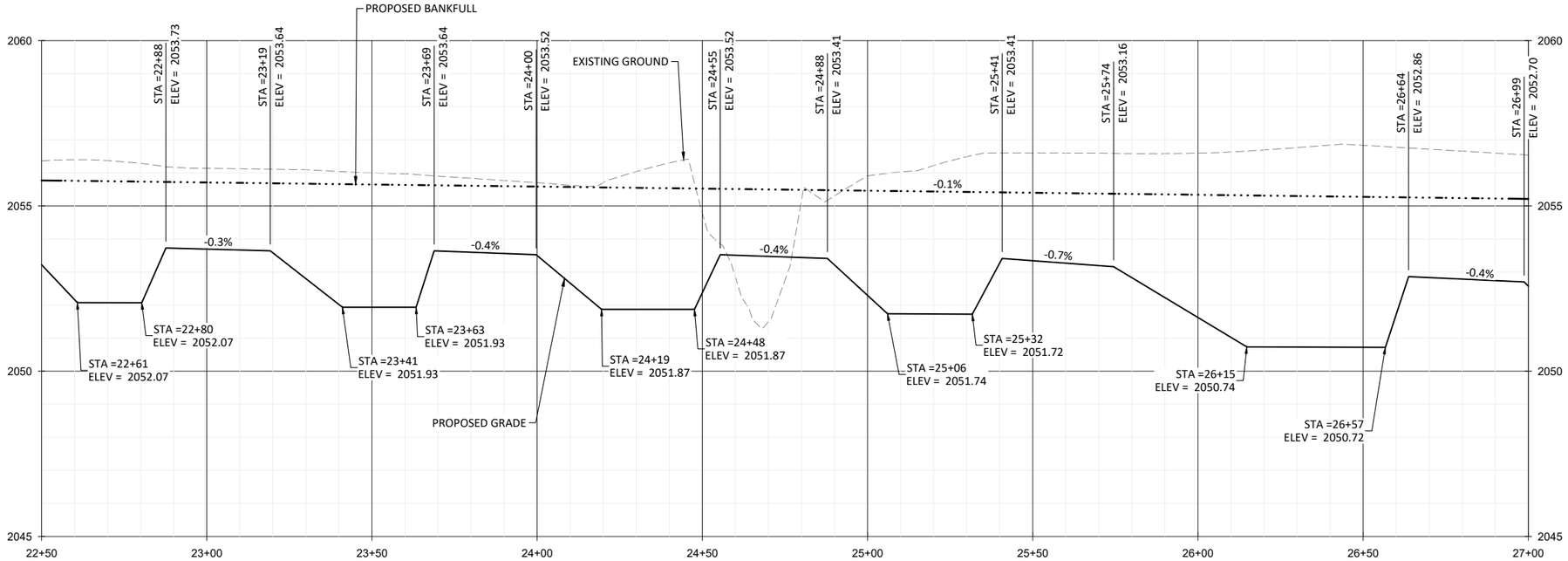

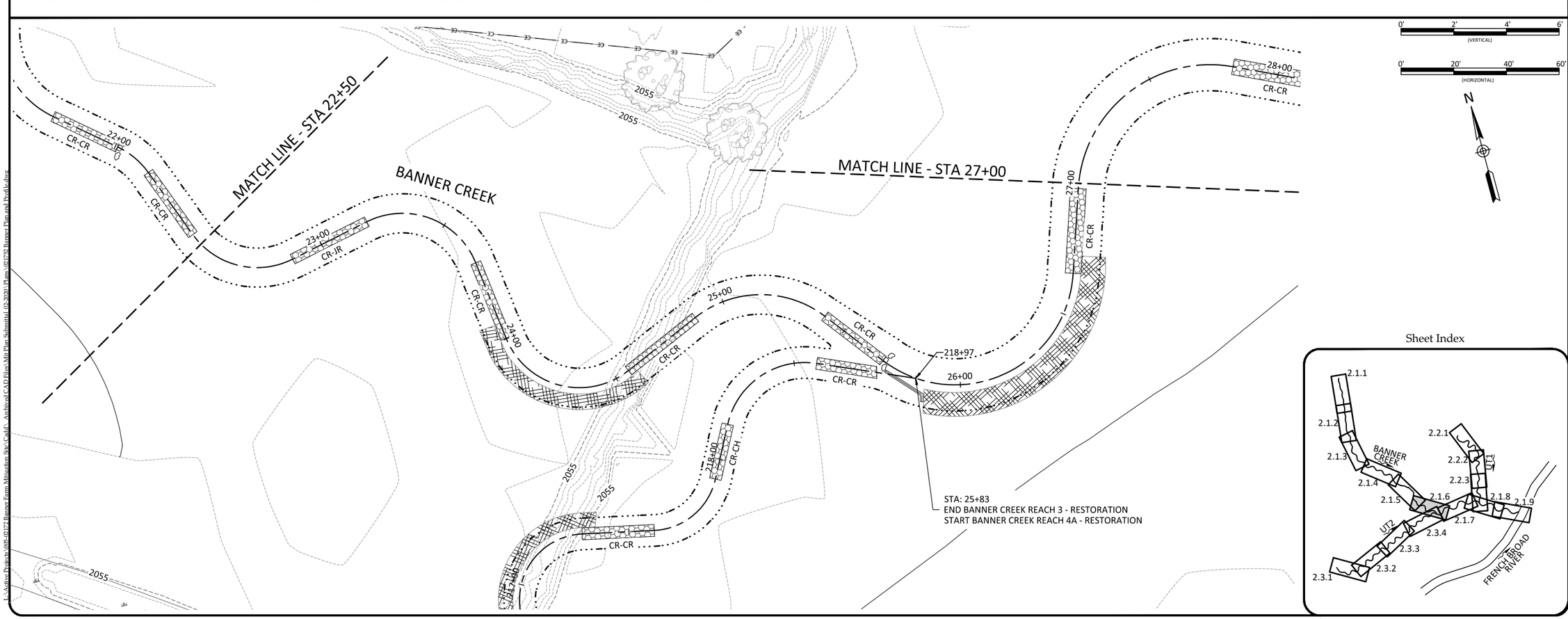

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Banner Farm Mitigation Site
Henderson County, NC

Stream Plan and Profile
Banner Creek

Revisions:

Date:	03.16.2020
Job Number:	005-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

Sheet: 2.1.6

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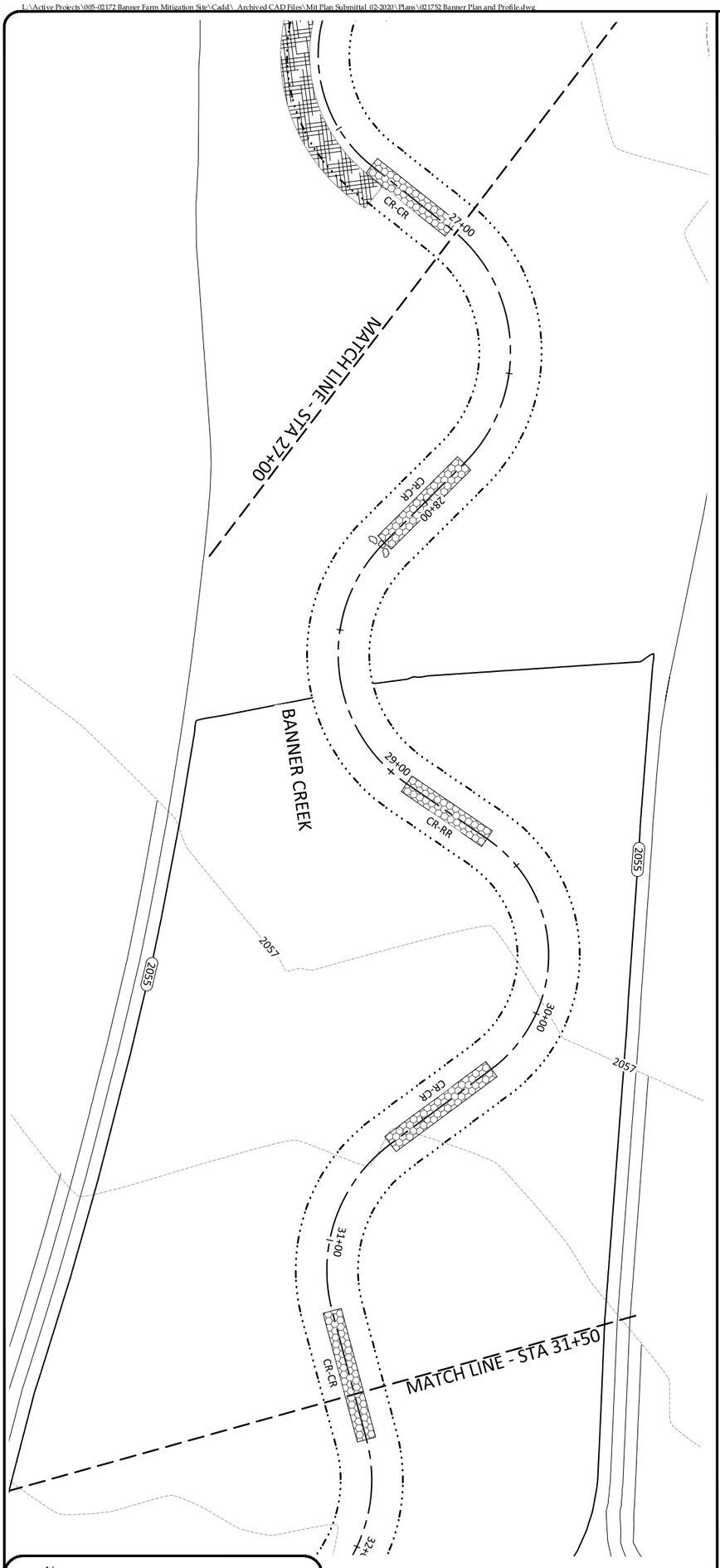

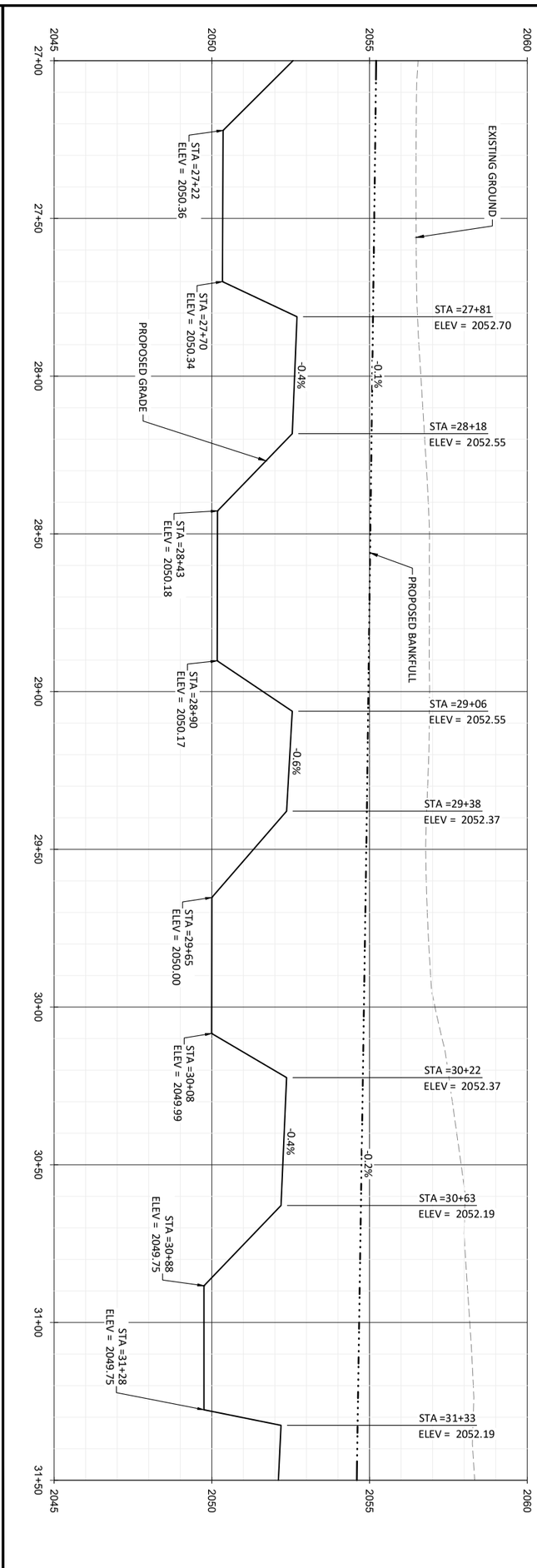

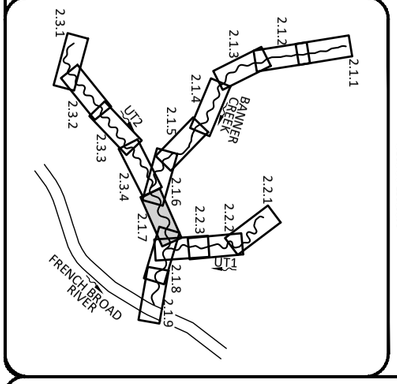

Sheet Index

N

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	03.16.2020
Job Number:	005-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

Revisions:

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Banner Farm Mitigation Site
Henderson County, NC

Stream Plan and Profile
Banner Creek

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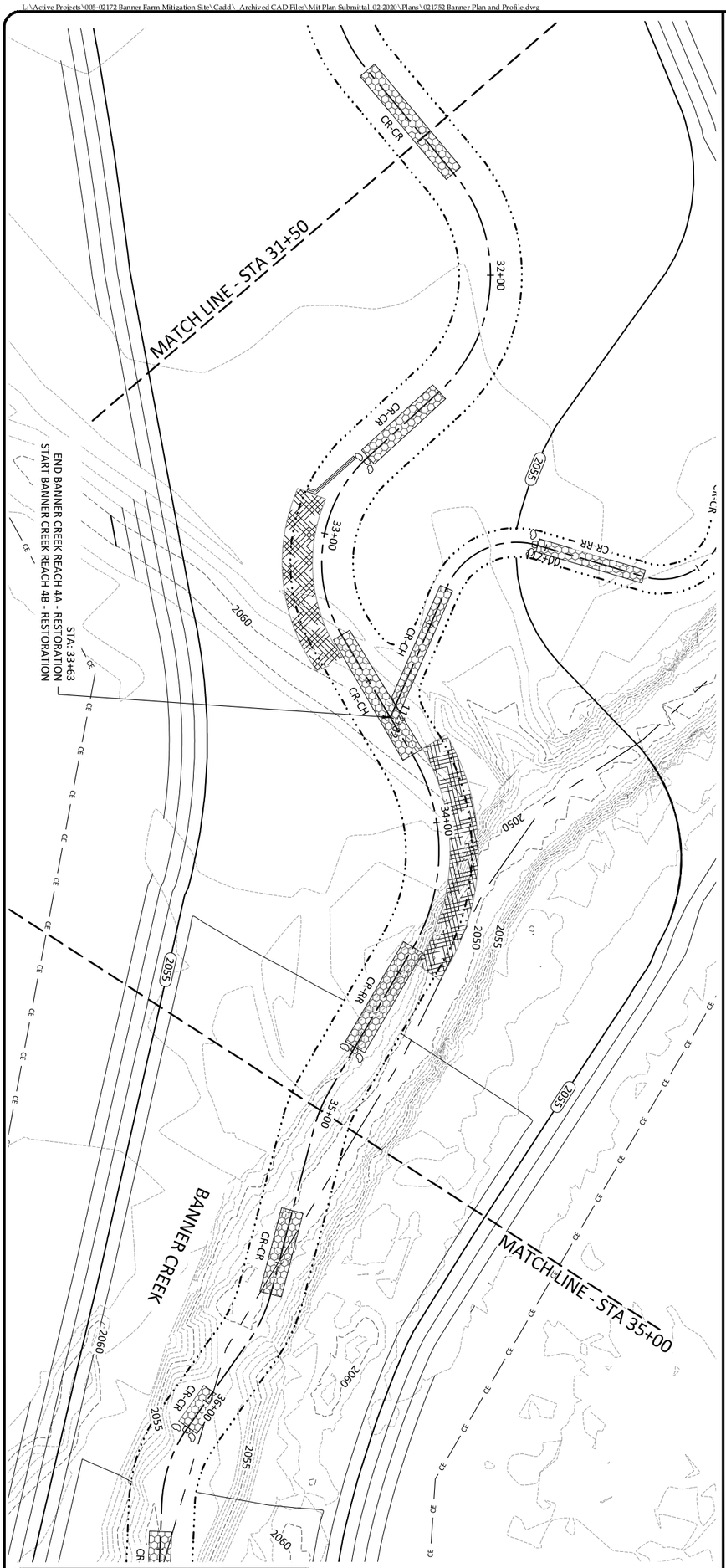

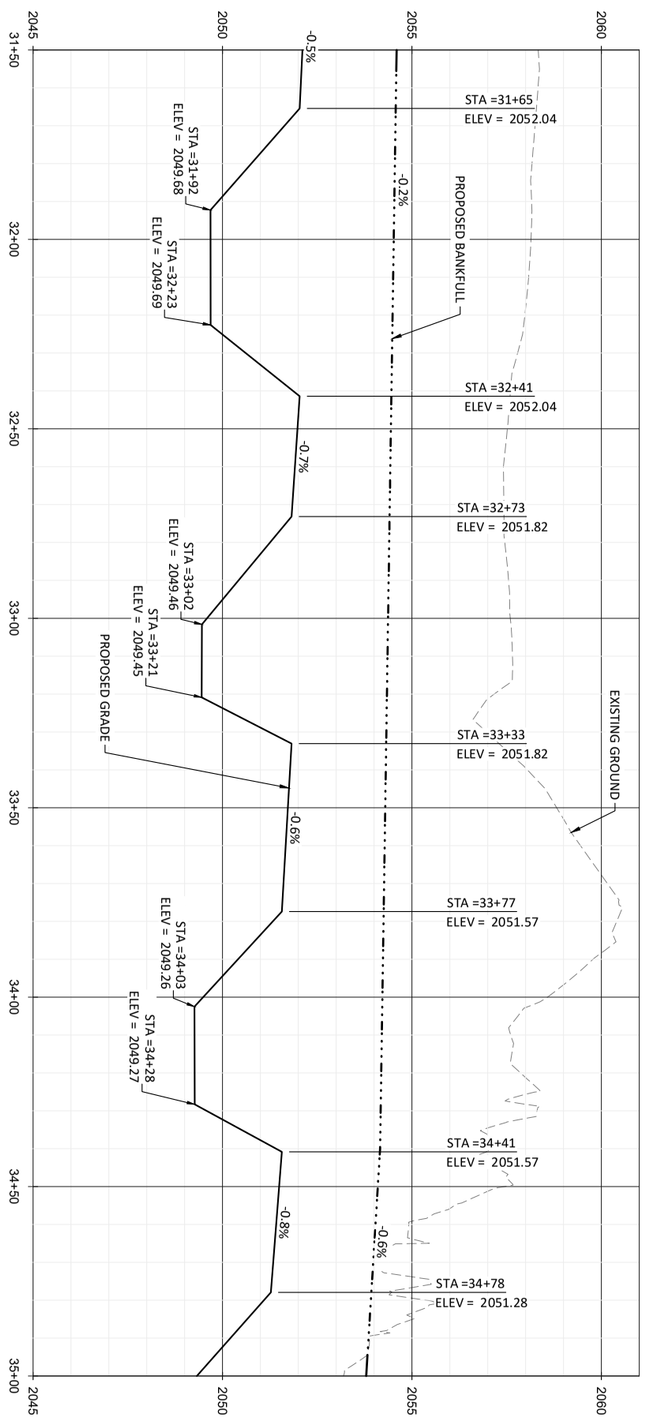

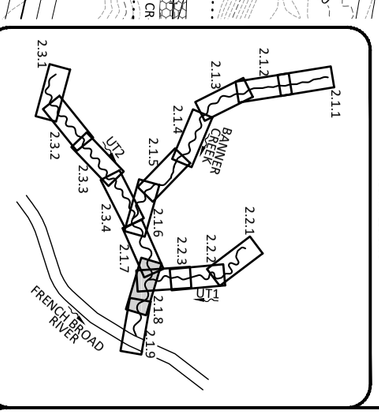

Sheet Index

N

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	03.16.2020
Job Number:	005-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

Revisions:

2.1.8
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Banner Farm Mitigation Site
Henderson County, NC

Stream Plan and Profile
Banner Creek

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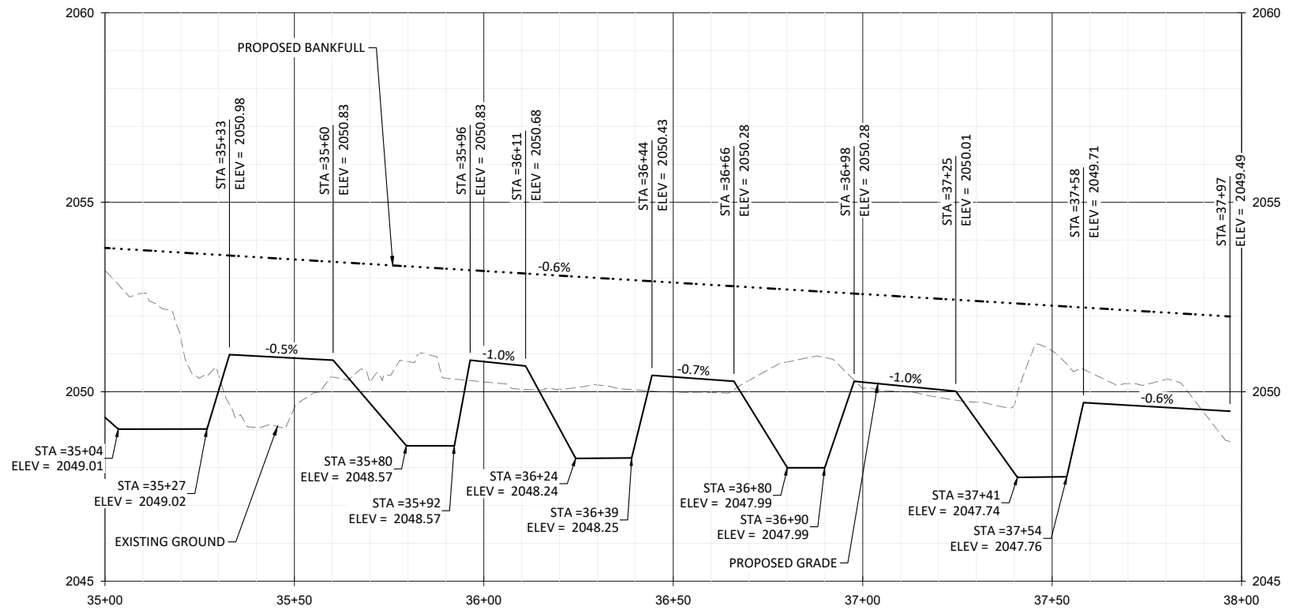

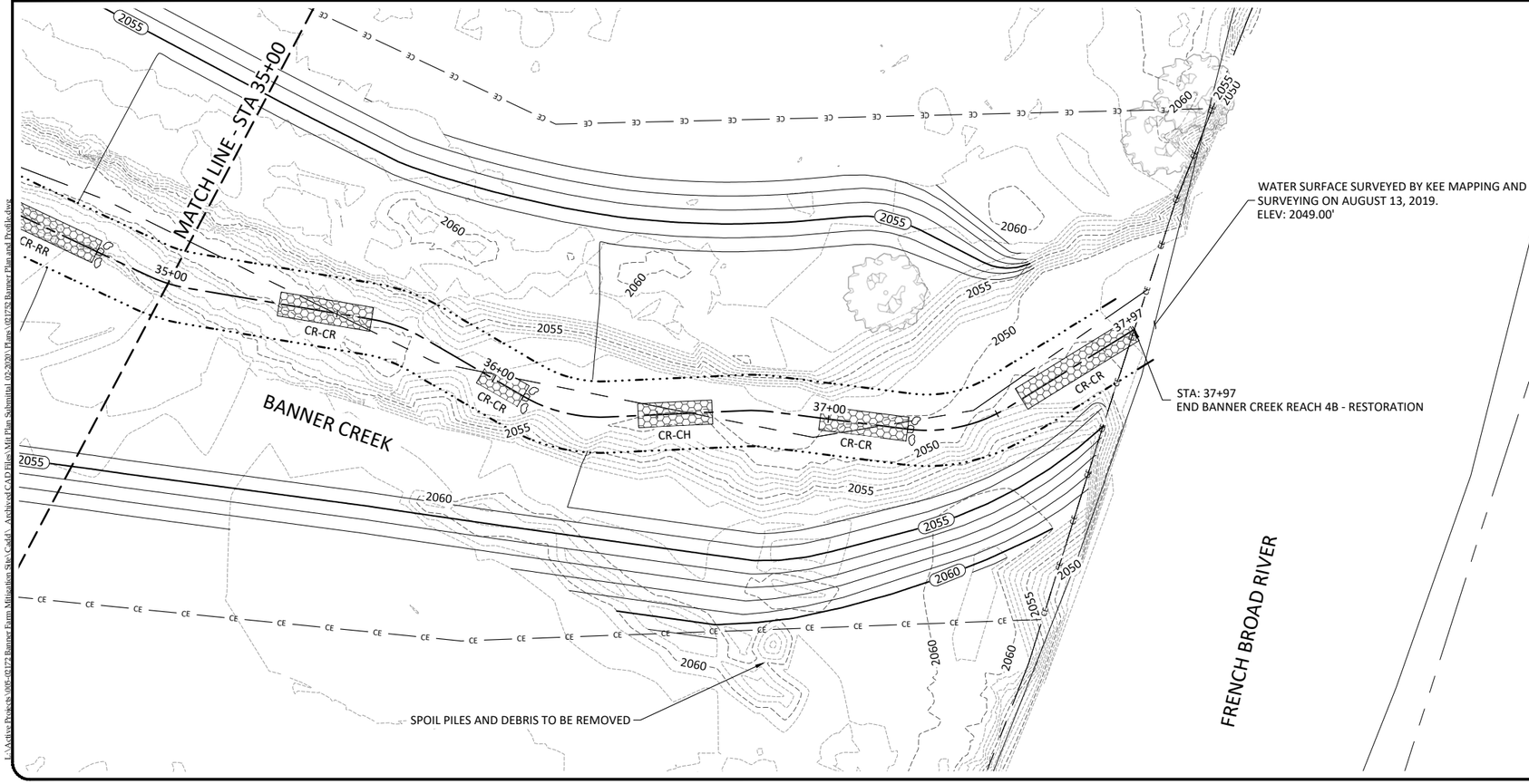

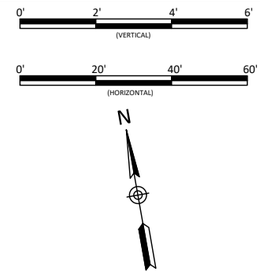

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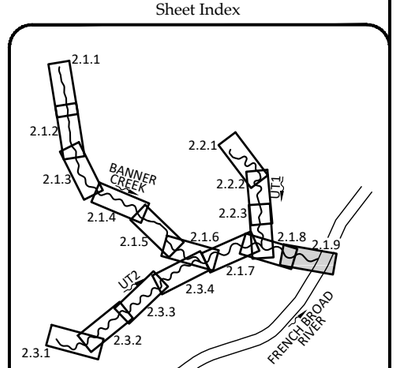

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Banner Farm Mitigation Site
Henderson County, NC

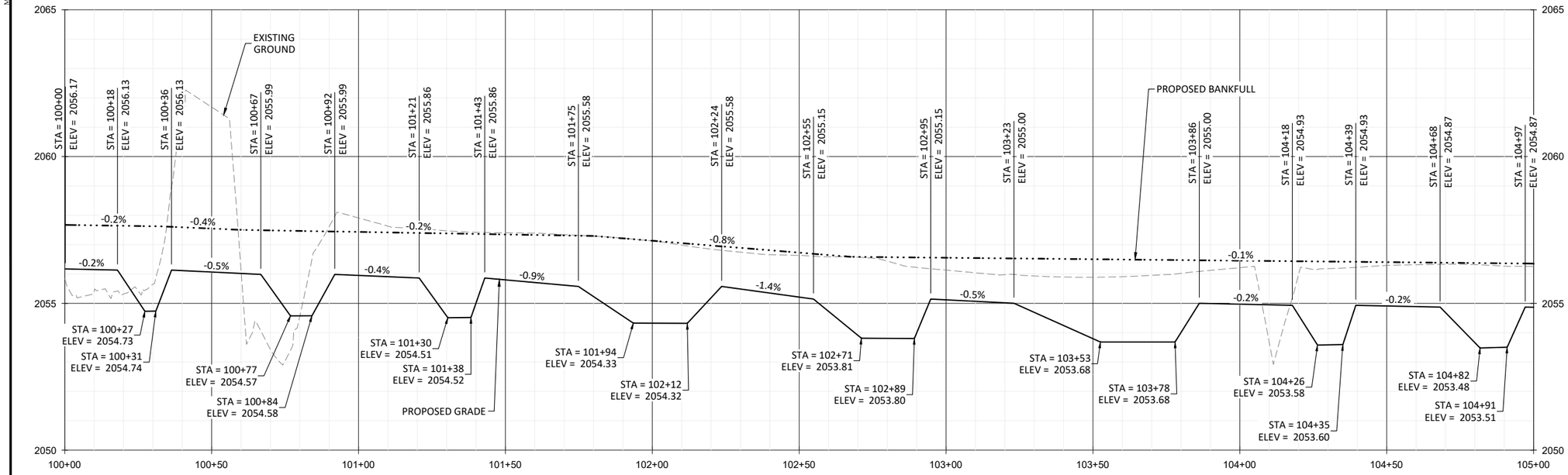
Stream Plan and Profile
Banner Creek

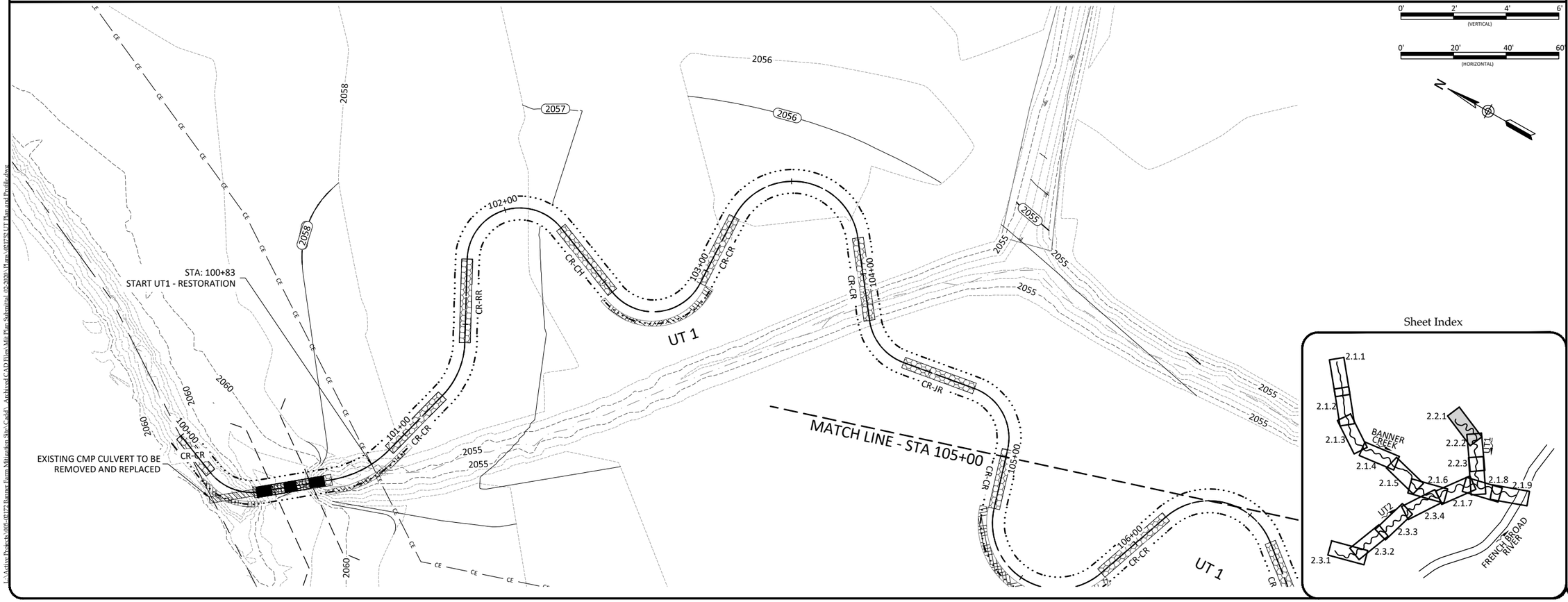
Revisions:

Date:	03.16.2020
Job Number:	005-021752
Project Engineer:	DN
Drawn By:	JDW
Checked By:	JM

Sheet 2.1.9

March 16, 2020





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Henderson County, NC

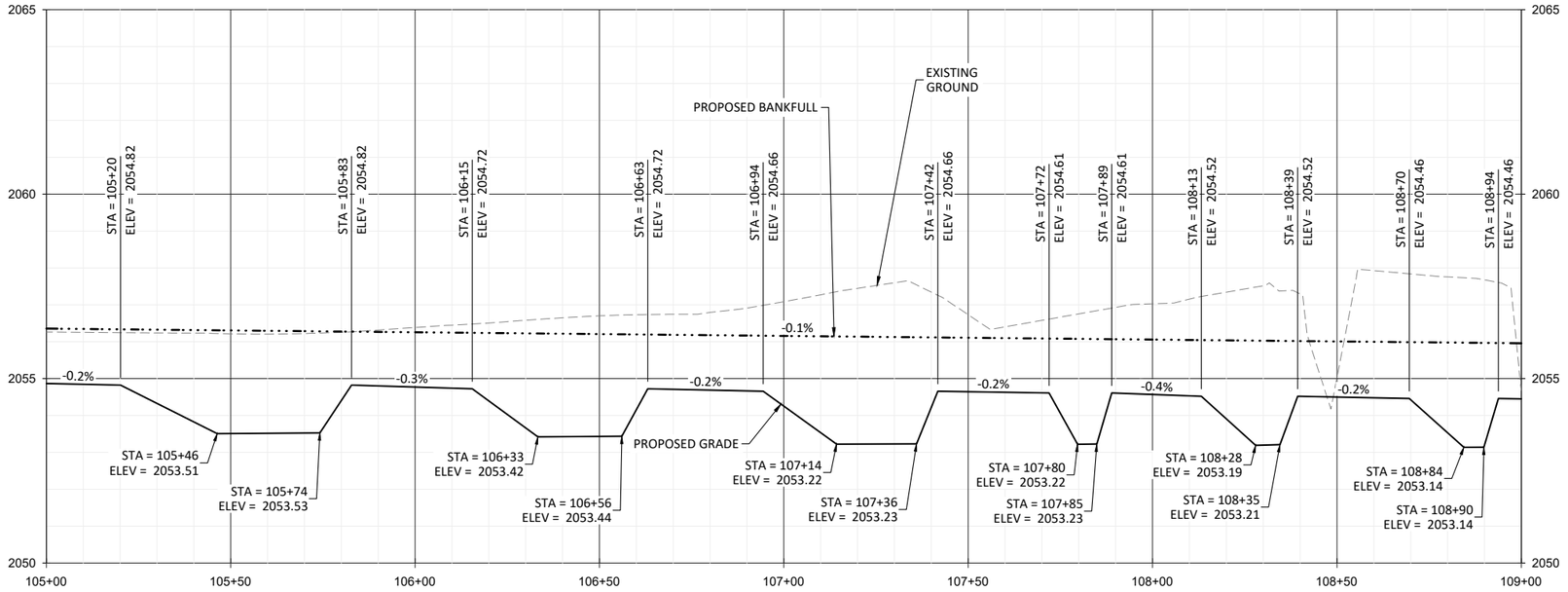
Stream Plan and Profile
UT 1

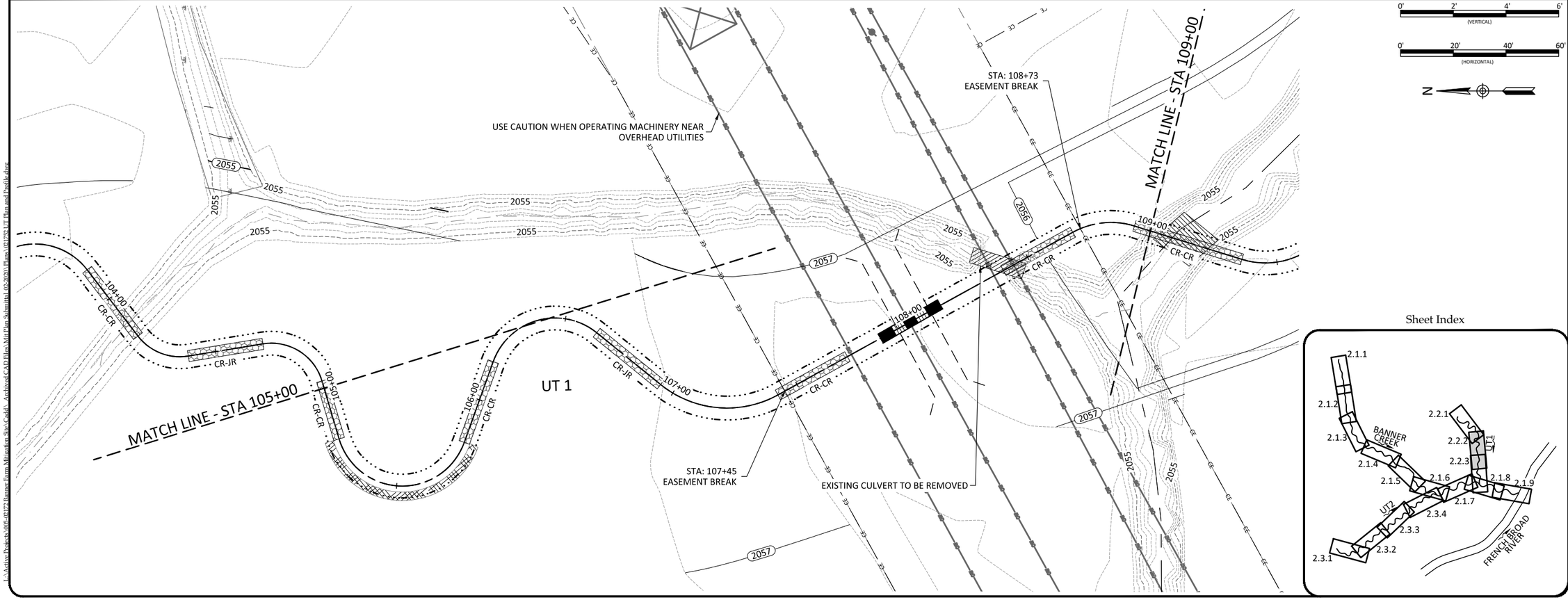
Revisions:

Date:	03.16.2020
Job Number:	005-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

Sheet: 2.2.1

March 16, 2020





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Henderson County, NC

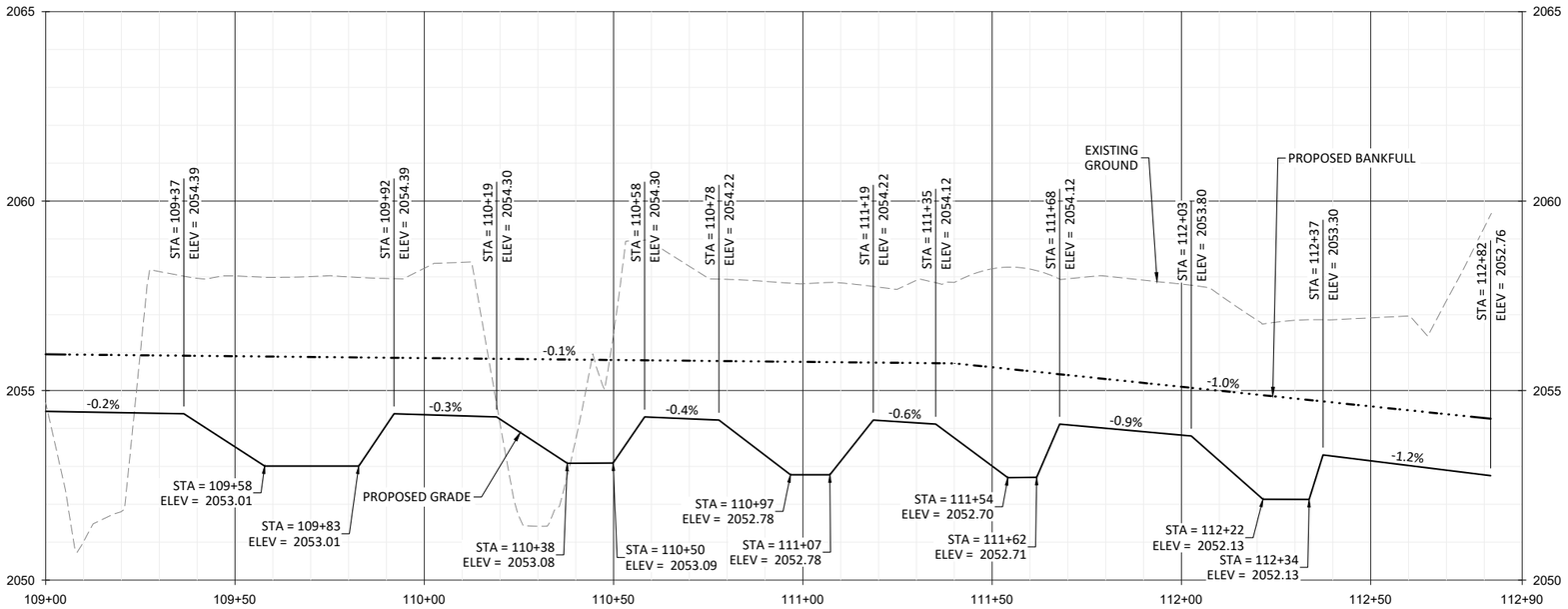
Stream Plan and Profile
UT 1

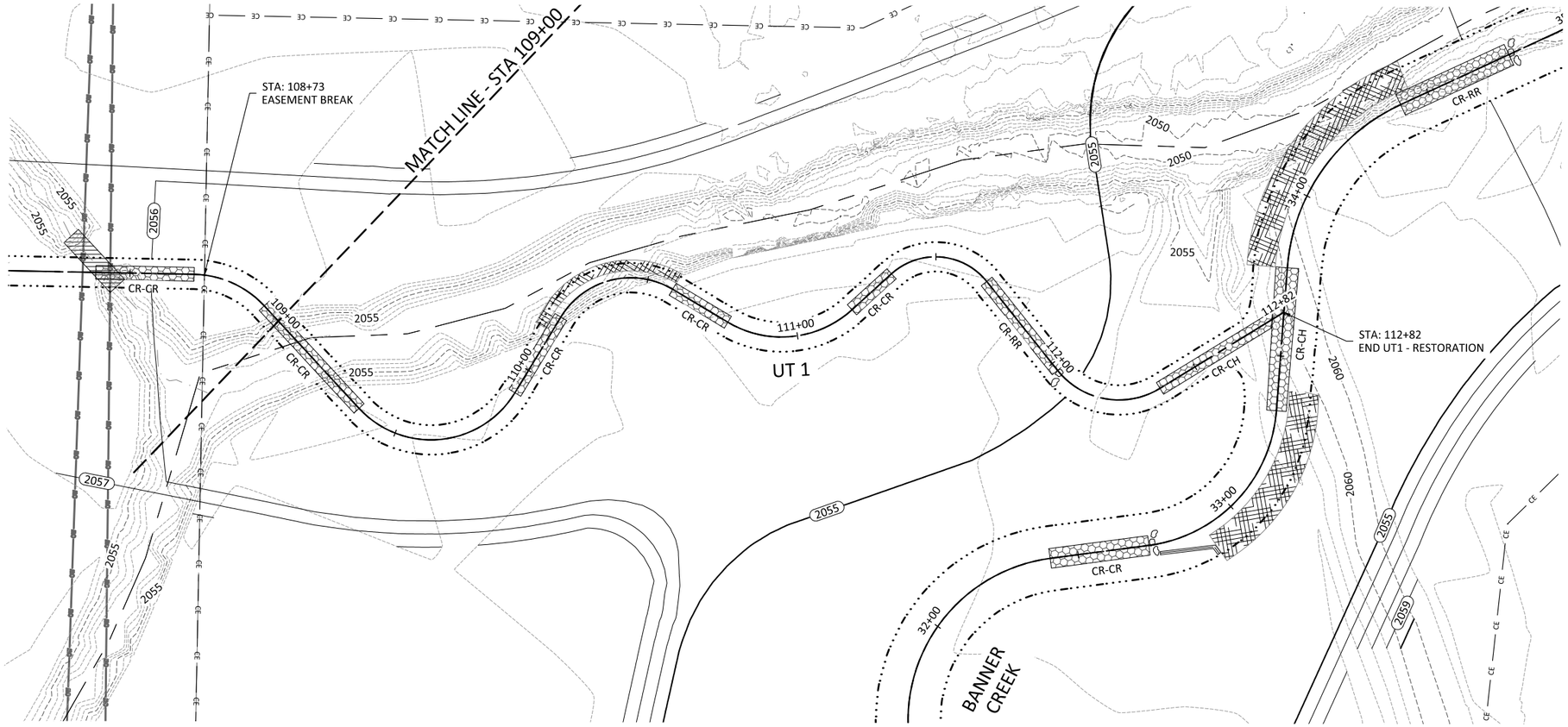
Revisions:

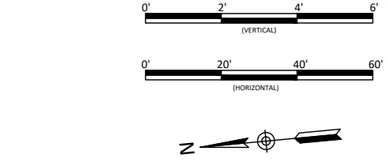
Date: 03.16.2020
Job Number: 005-021752
Project Engineer: JDN
Drawn By: JDW
Checked By: JM

Sheet 2.2.2

March 16, 2020







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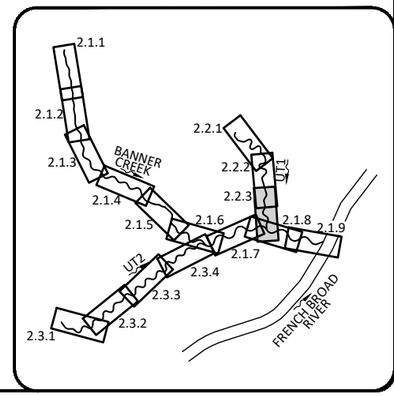

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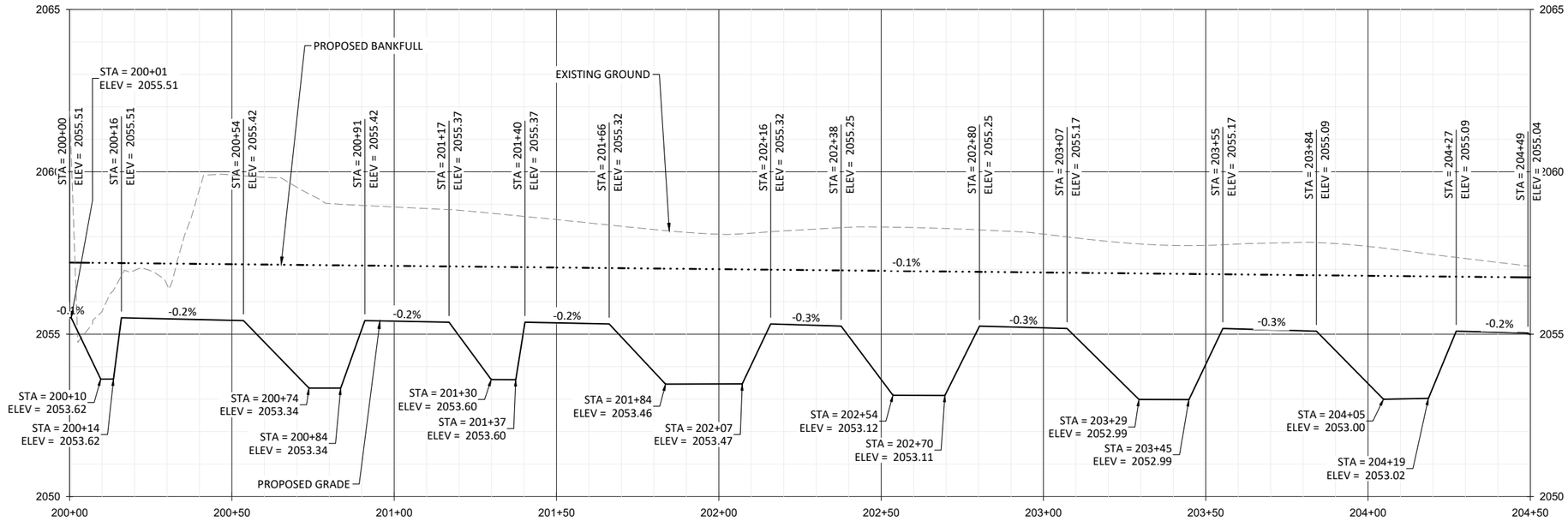
Stream Plan and Profile
UT 1

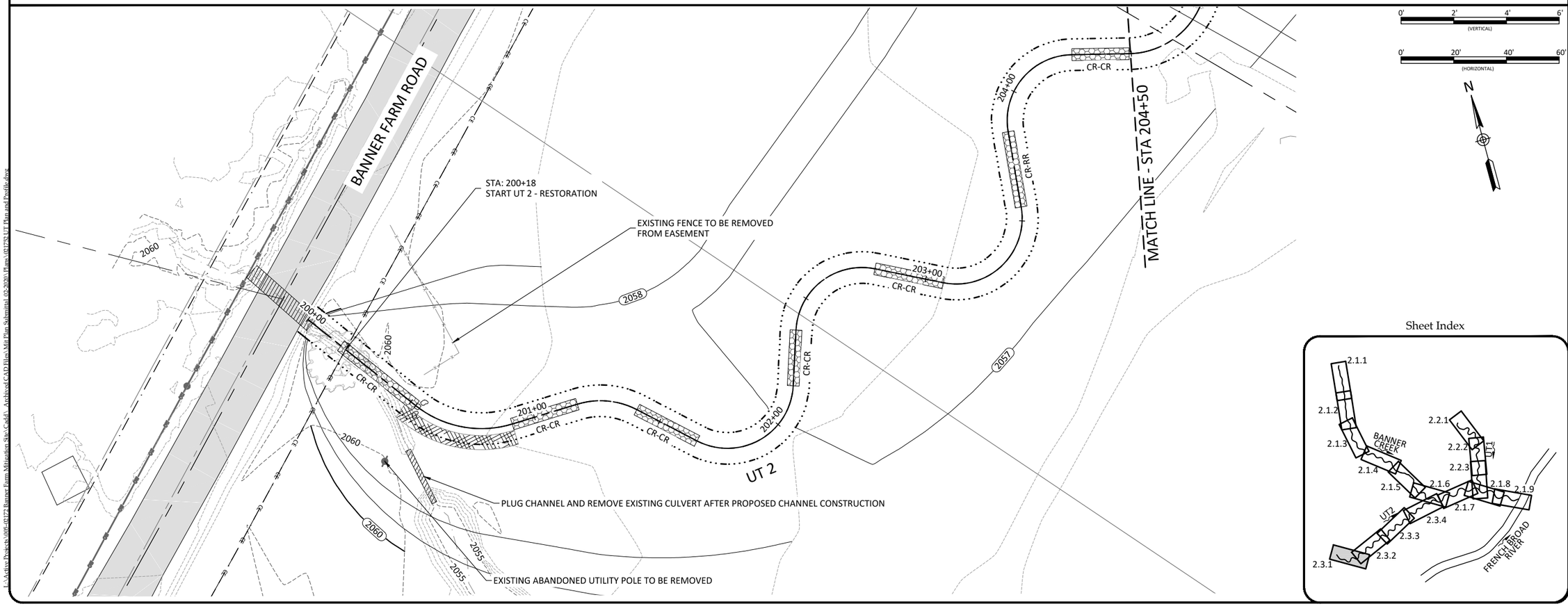
Revisions:

Date:	03.16.2020
Job Number:	005-021752
Project Engineer:	JDV
Drawn By:	JDV
Checked By:	JM

Sheet: 2.2.3

March 16, 2020





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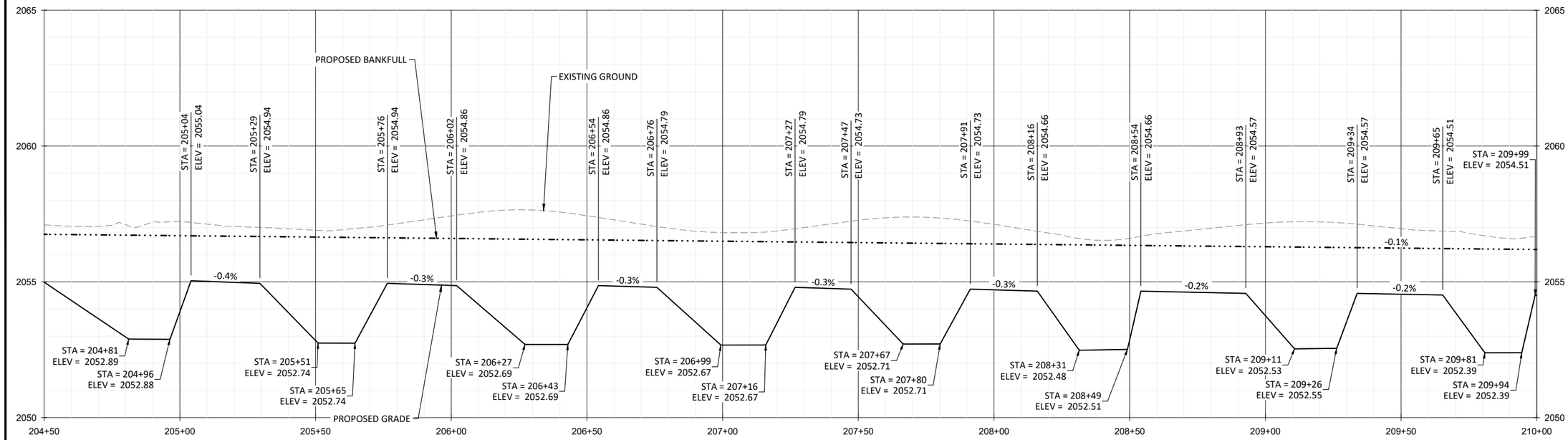
Stream Plan and Profile
UT 2

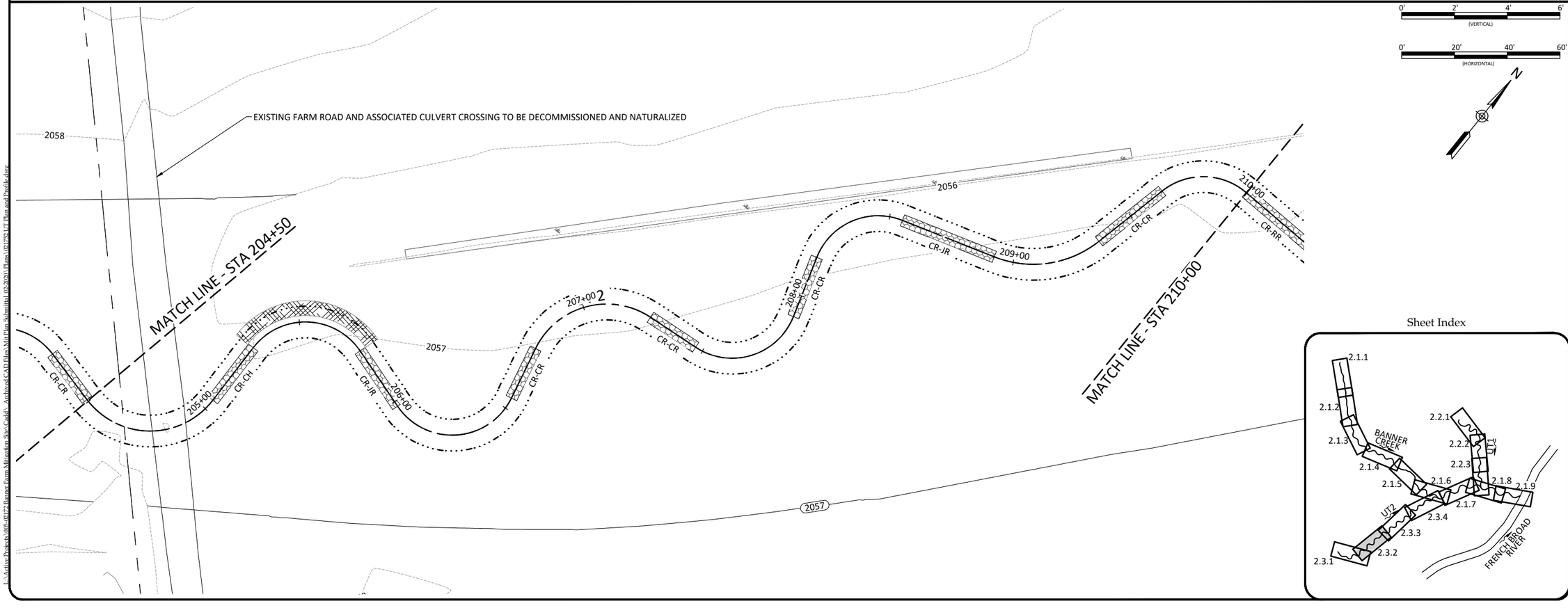
Revisions:

Date:	03.16.2020
Job Number:	000-021752
Project Engineer:	JEN
Drawn By:	JDW
Checked By:	JM

Sheet: 2.3.1

March 16, 2020





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Stream Plan and Profile
UT 2

Revisions:

Date: 03.16.2020
Job Number: 035-021752
Project Engineer: JEN
Drawn By: JDW
Checked By: JM

Sheet 2.3.2

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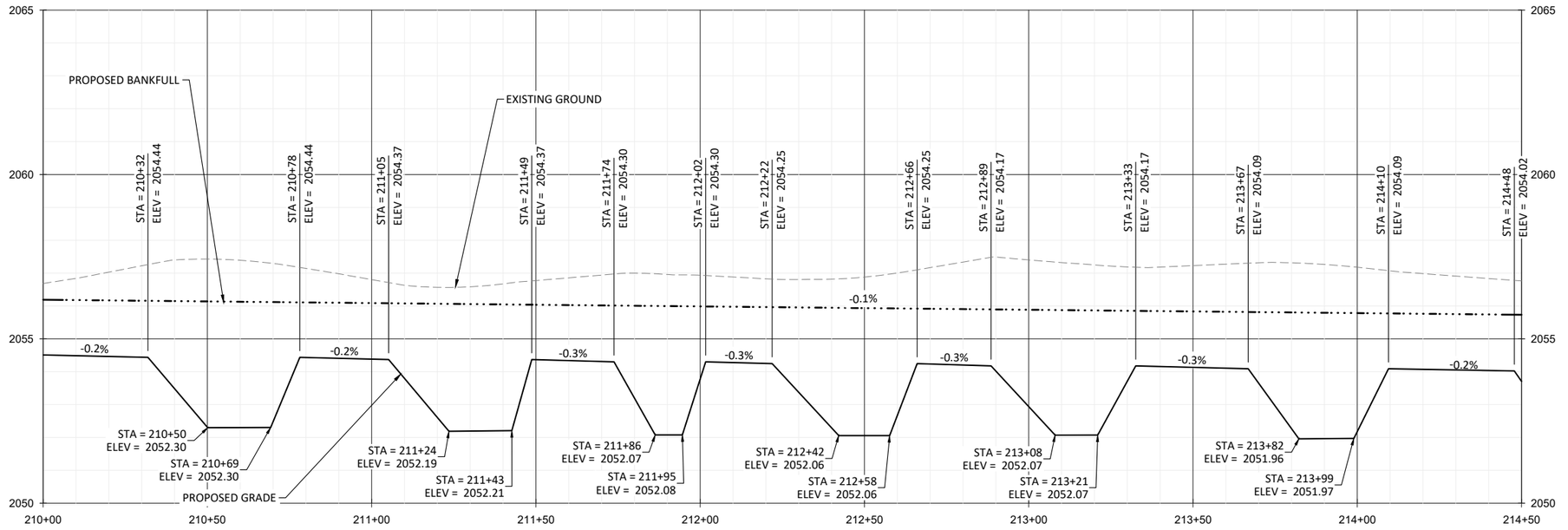
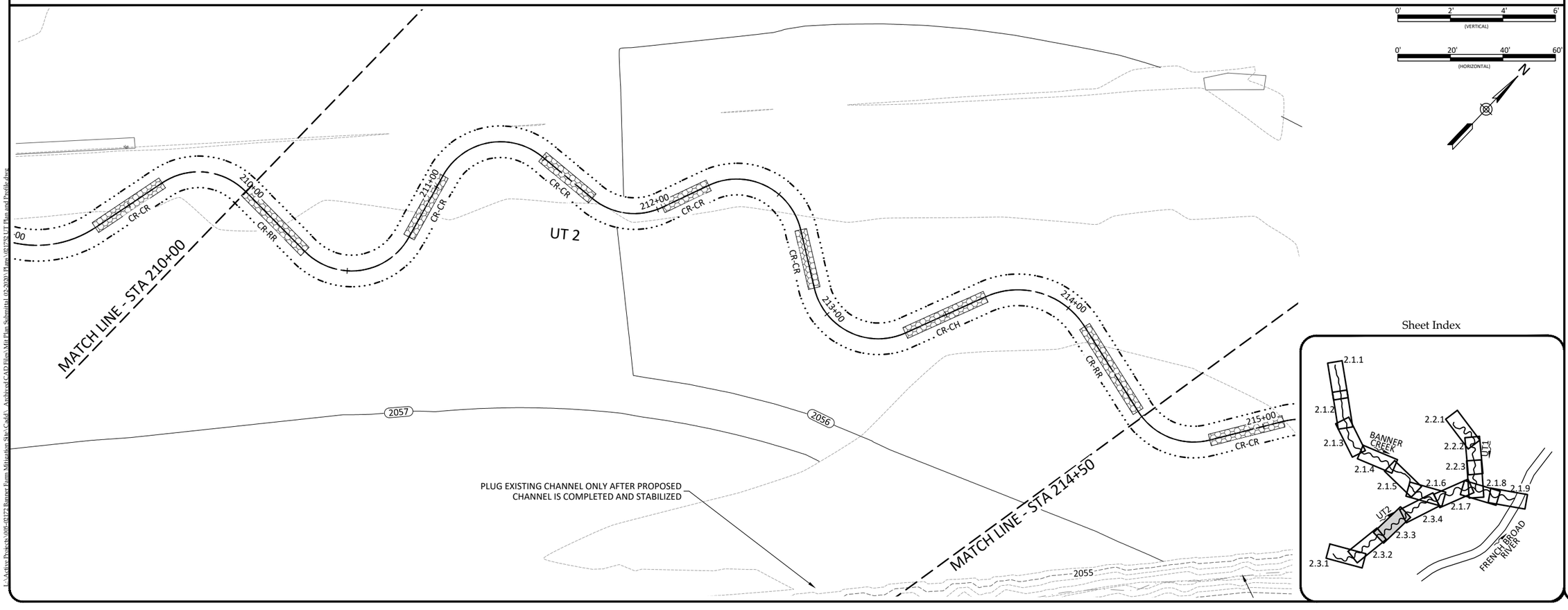
March 16, 2020





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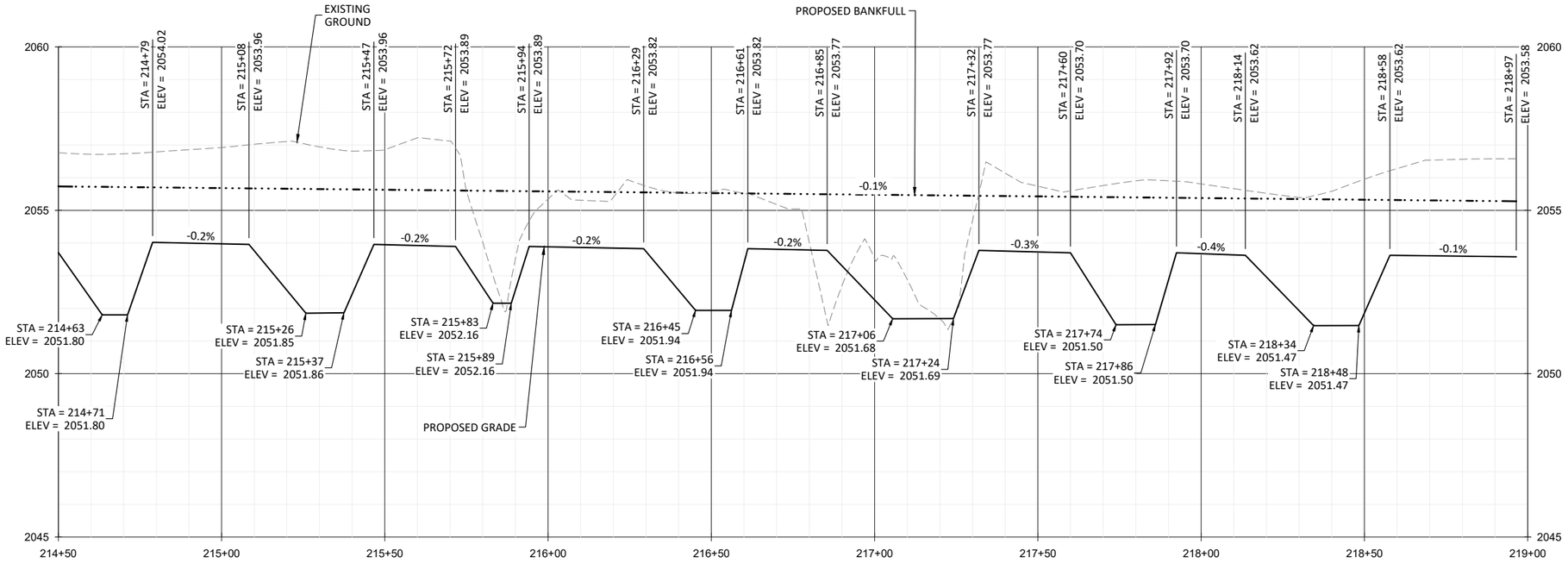
Stream Plan and Profile
UT 2

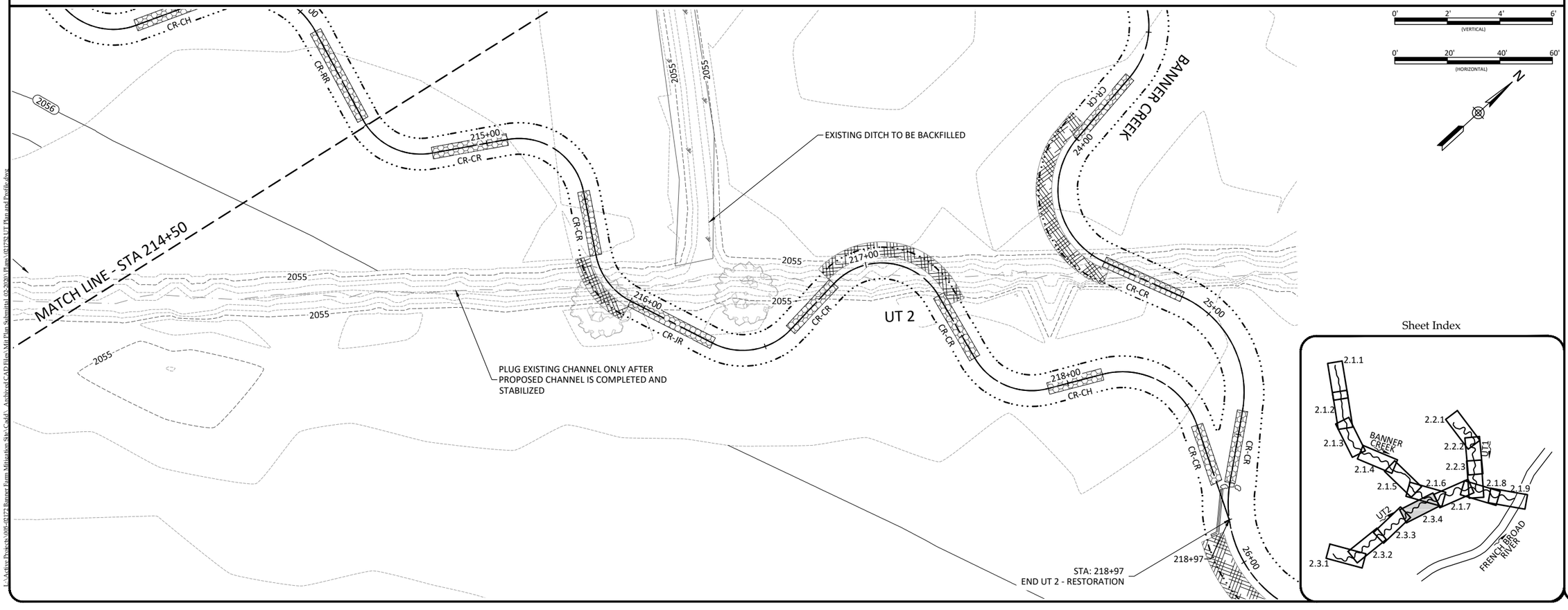
Revisions:

Date:	03.16.2020
Job Number:	005-02752
Project Engineer:	JPN
Drawn By:	JDW
Checked By:	JM

2.3.3
Sheet

March 16, 2020





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Henderson County, NC

Stream Plan and Profile
UT 2

Revisions:

Date:	03.16.2020
Job Number:	008-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

Sheet: 2.3.4

L:\Active Projects\008-021752 Banner Farm Mitigation Site\Grafx\ Archives\GAD Files\Mit Plan Submittal (03-2020) Figs\021752 UT Planned Profile.dwg

July 7, 2020

N

0' 150' 300' 450'
(HORIZONTAL)

WETLAND RE-ESTABLISHMENT
PROPOSED AT A 1:1 RATIO

WETLAND REHABILITATION
PROPOSED AT A 2:1 RATIO

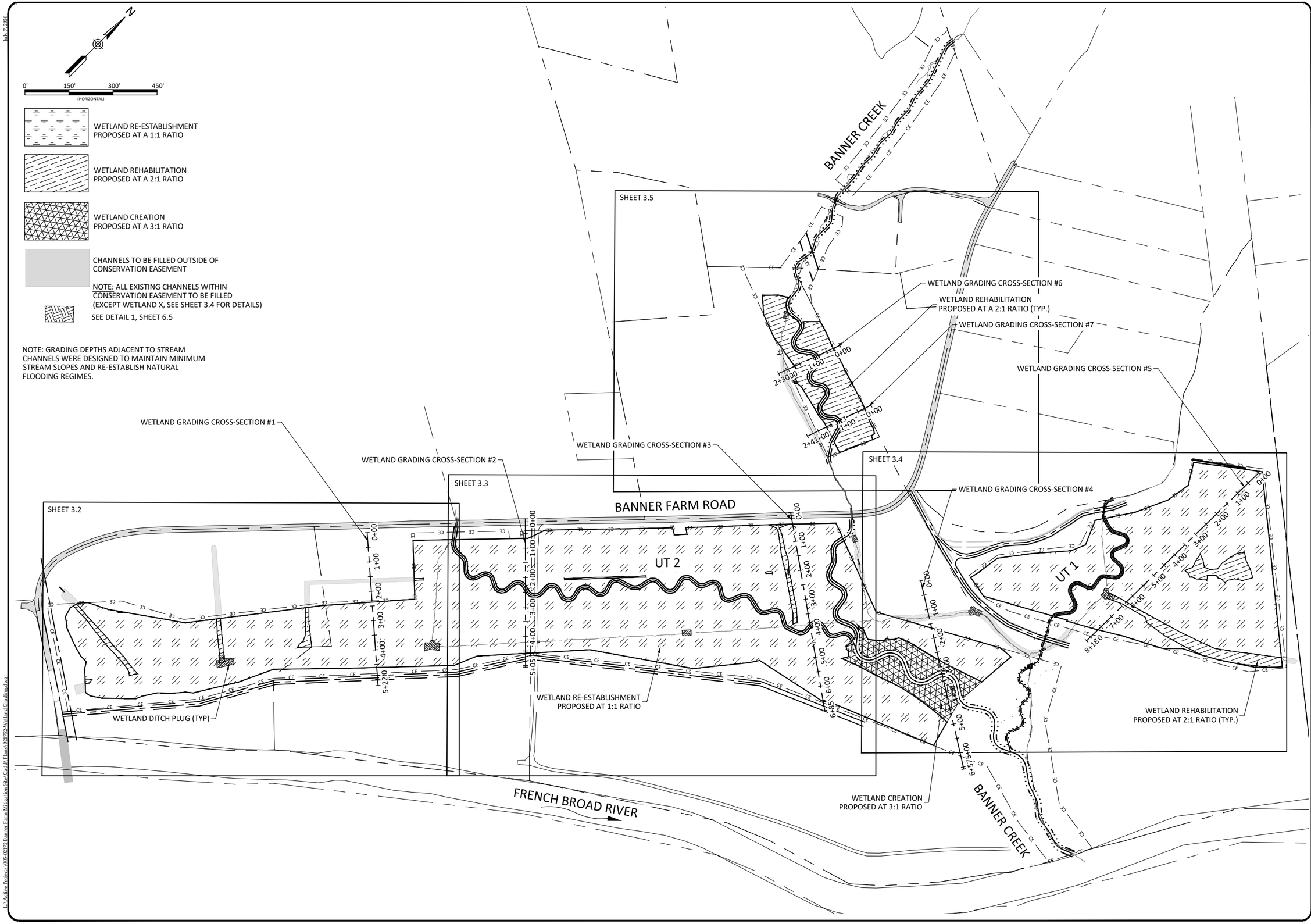
WETLAND CREATION
PROPOSED AT A 3:1 RATIO

CHANNELS TO BE FILLED OUTSIDE OF
CONSERVATION EASEMENT

NOTE: ALL EXISTING CHANNELS WITHIN
CONSERVATION EASEMENT TO BE FILLED
(EXCEPT WETLAND X, SEE SHEET 3.4 FOR DETAILS)

SEE DETAIL 1, SHEET 6.5

NOTE: GRADING DEPTHS ADJACENT TO STREAM
CHANNELS WERE DESIGNED TO MAINTAIN MINIMUM
STREAM SLOPES AND RE-ESTABLISH NATURAL
FLOODING REGIMES.



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Banner Farm Mitigation Site
Henderson County, NC

Overview
Wetland Grading Plan

Revisions:

Date:	02.06.2020
Job Number:	905-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

Sheet 3.1

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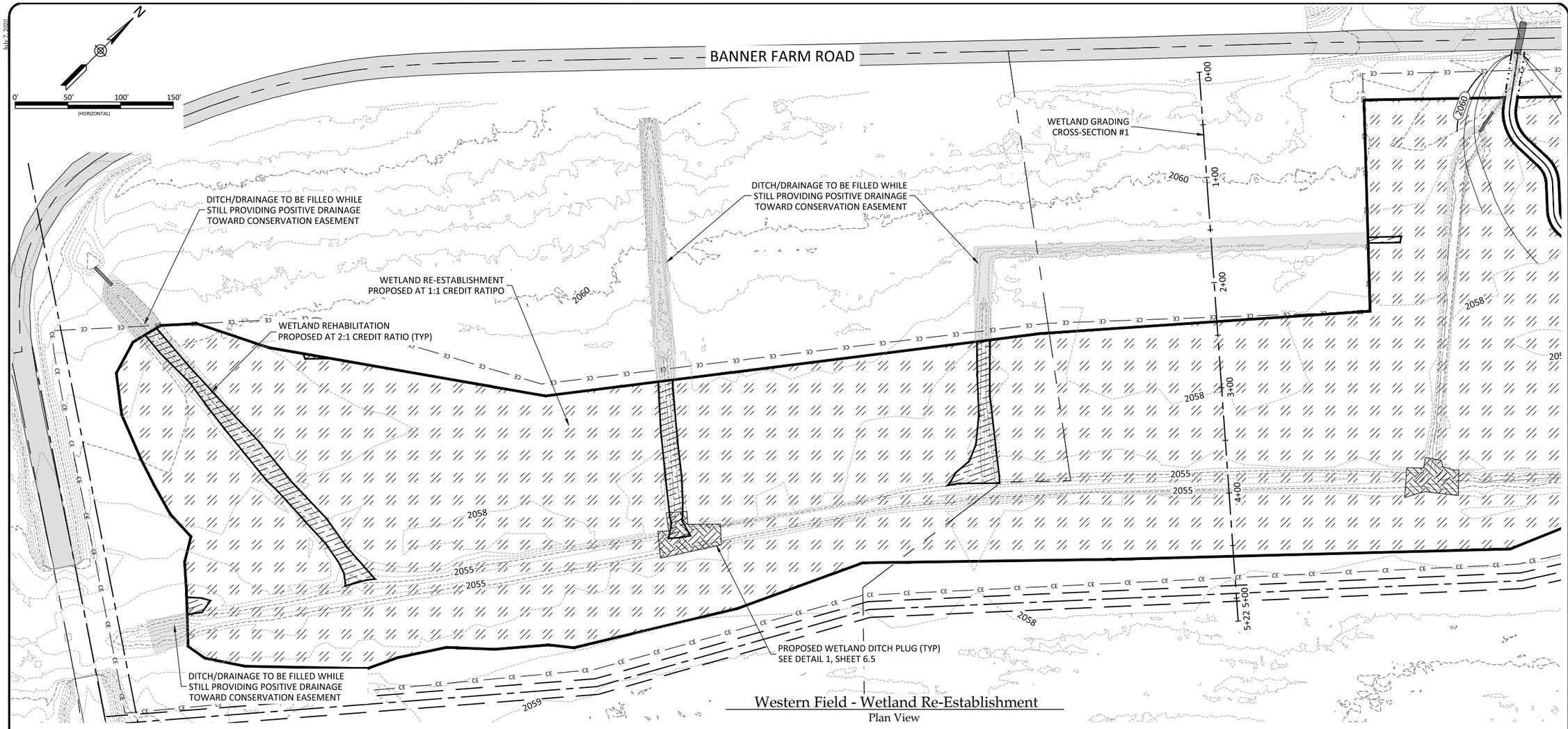
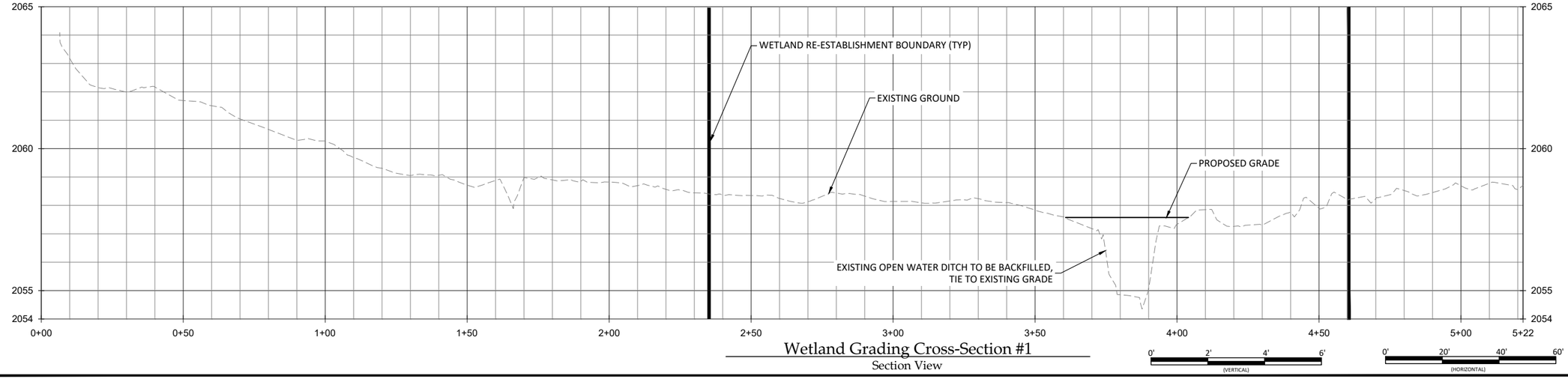


Western Field - Wetland Re-Establishment
Plan View



Wetland Grading Cross-Section #1
Section View

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Banner Farm Mitigation Site
Henderson County, NC

Southwest Field
Wetland Grading Plan

Revisions:

Date: 02.06.2020
Job Number: 005-021752
Project Engineer: EN
Drawn By: TDW
Checked By: JM

Sheet 3.2

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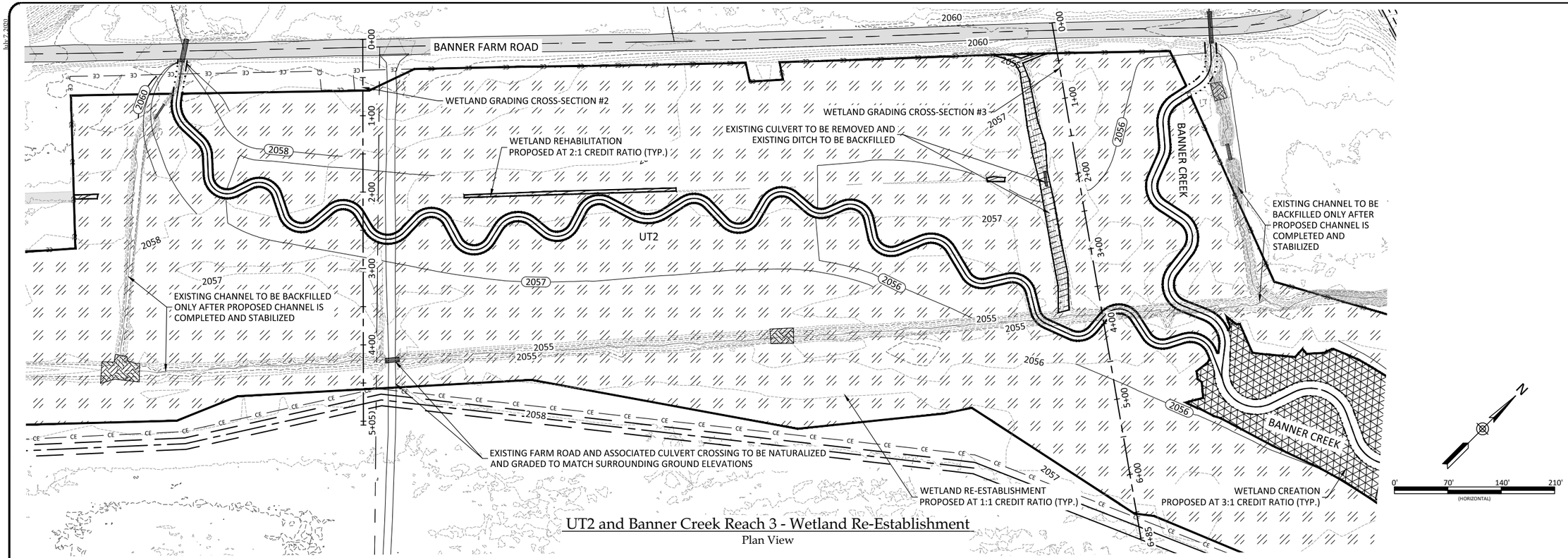
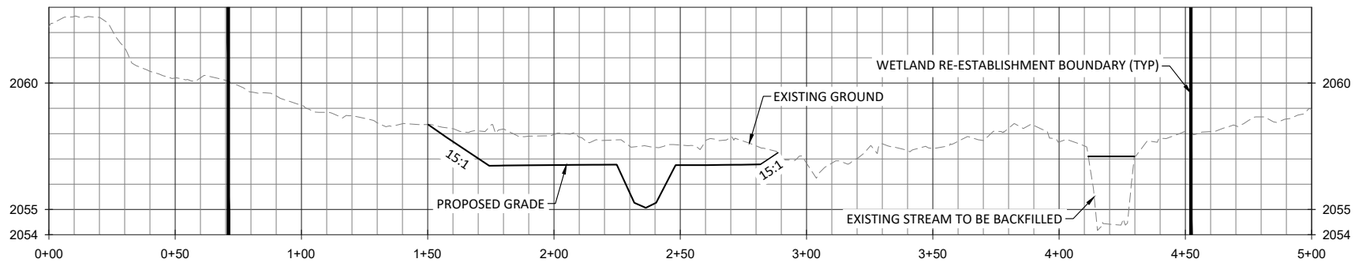


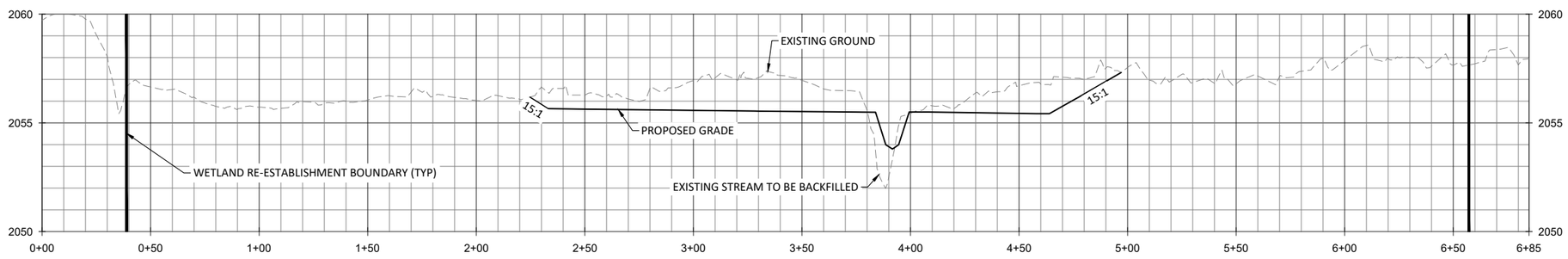
UT2 and Banner Creek Reach 3 - Wetland Re-Establishment

Plan View



Wetland Grading Cross-Section #2

Section View



Wetland Grading Cross-Section #3

Section View

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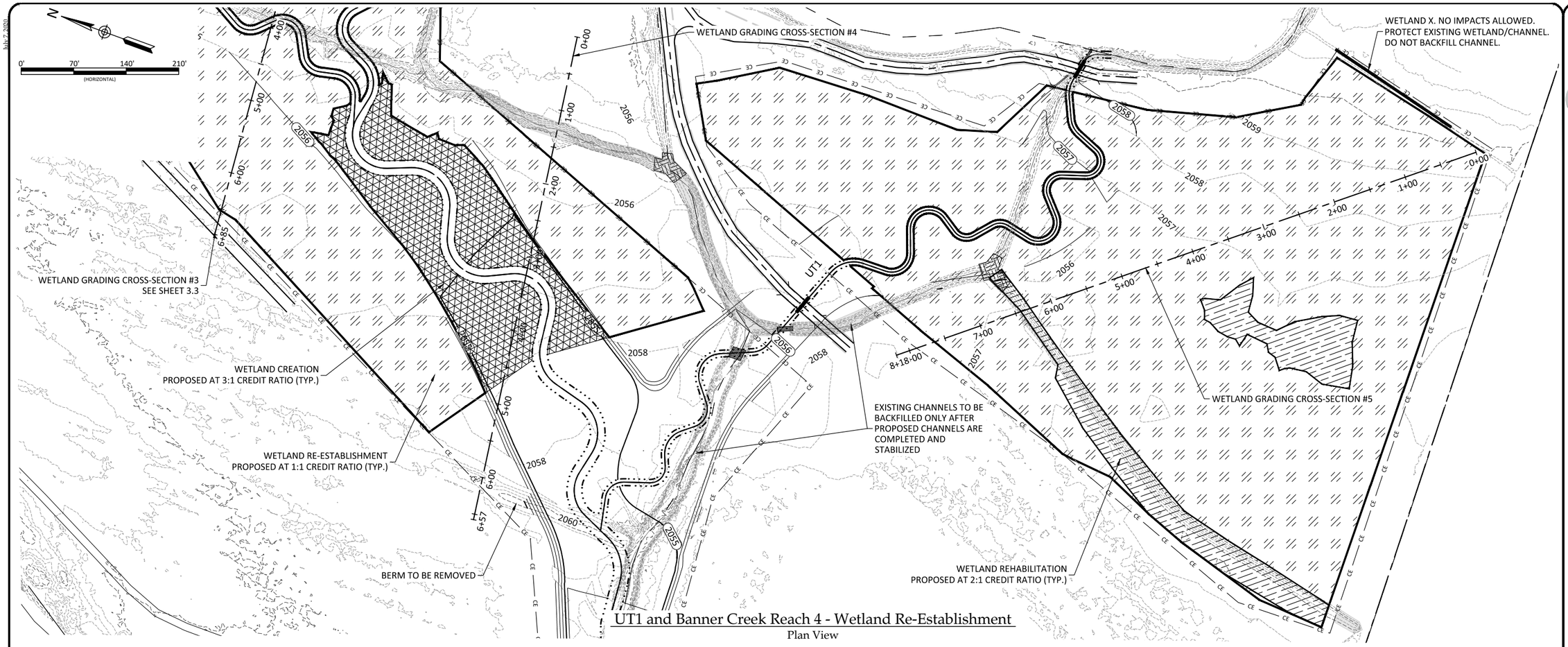
Henderson County, NC

Banner Creek & UT2
Wetland Grading Plan

Revisions:

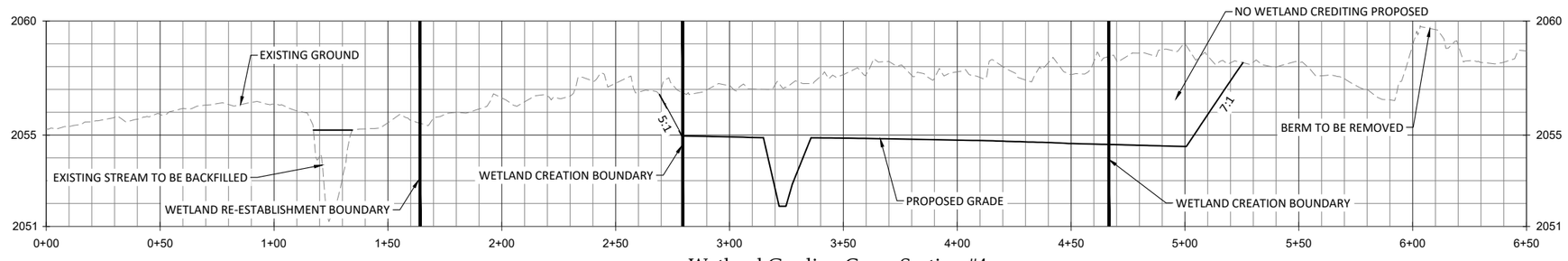
Date: 02.06.2020
Job Number: 005-021752
Project Engineer: DN
Drawn By: JDW
Checked By: JM

Sheet 3.3



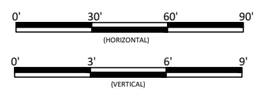
UT1 and Banner Creek Reach 4 - Wetland Re-Establishment

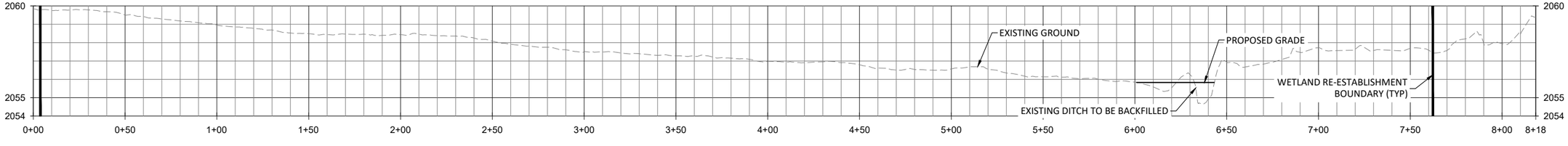
Plan View



Wetland Grading Cross-Section #4

Section View





Wetland Grading Cross-Section #5

Section View

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Banner Creek & Nothern Field
Wetland Grading Plan

Revisions:

Date: 02.06.2020
Job Number: 005-021752
Project Engineer: EN
Drawn By: JDW
Checked By: JM

Sheet 3.4

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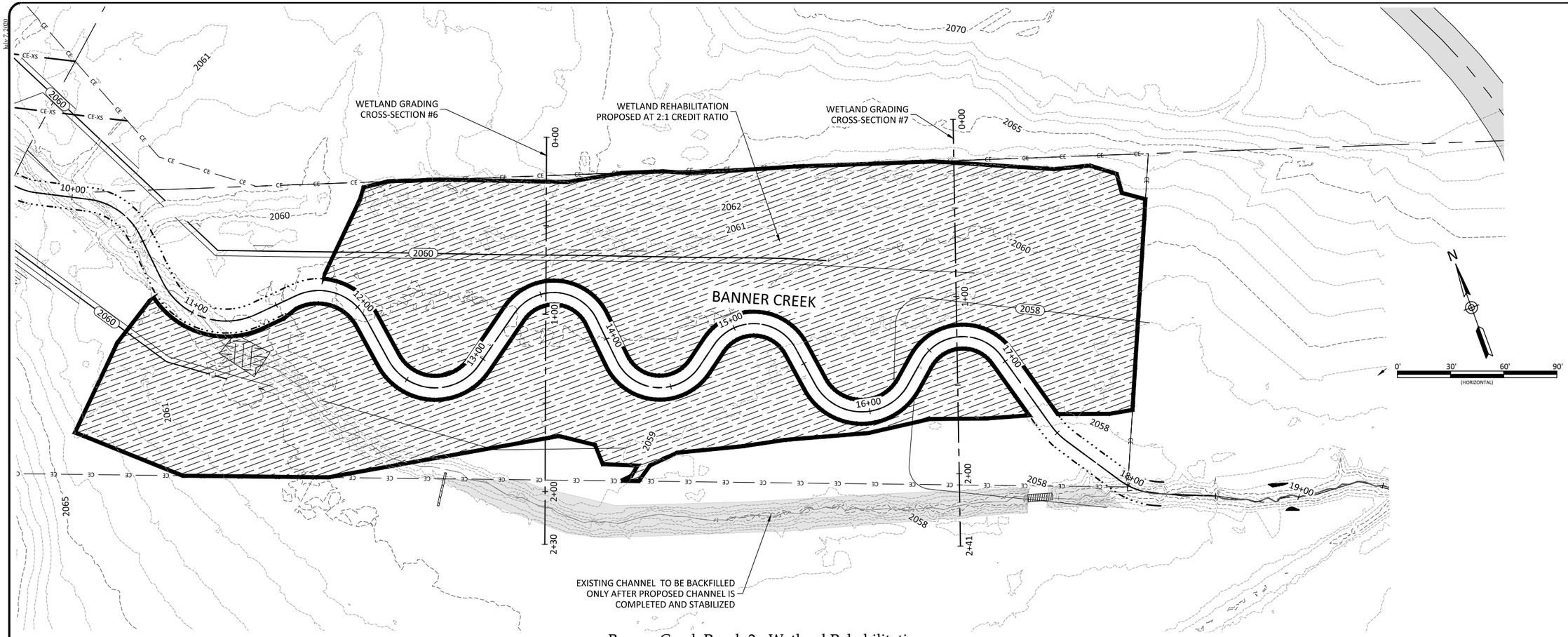
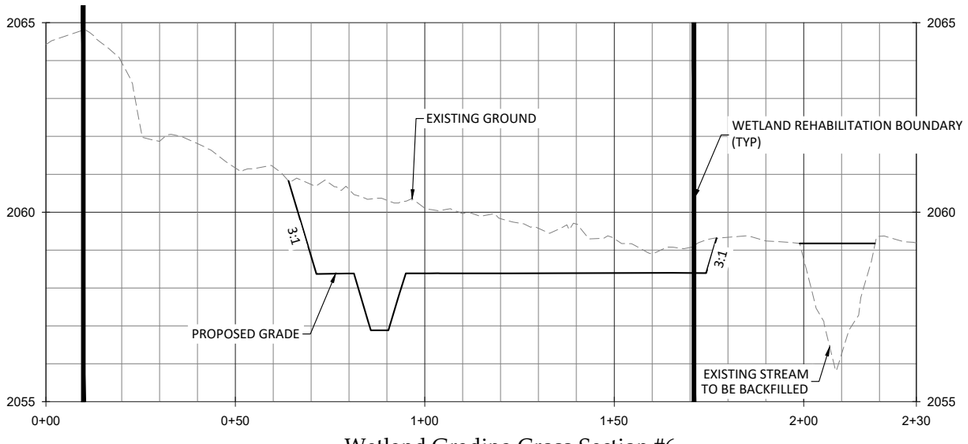
July 7, 2020



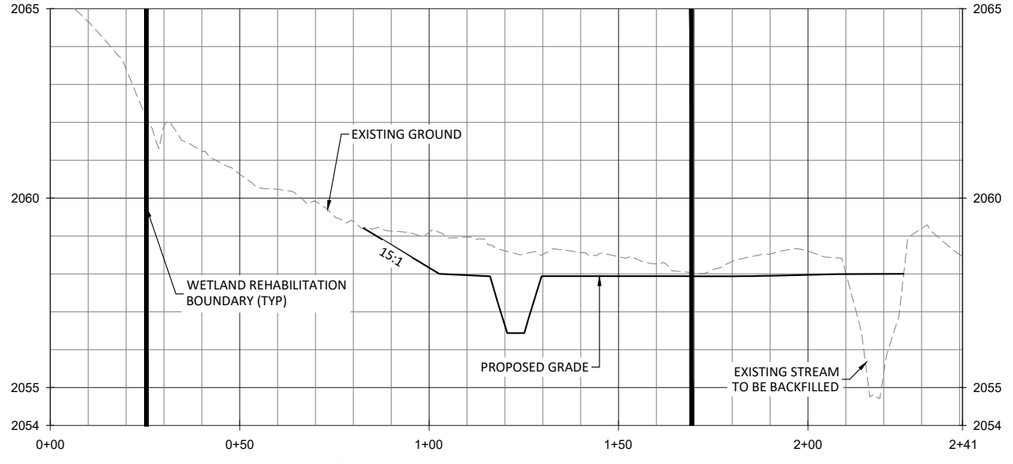
Banner Creek Reach 2 - Wetland Rehabilitation

Plan View



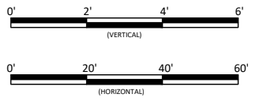
Wetland Grading Cross-Section #6

Section View



Wetland Grading Cross-Section #7

Section View



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Banner Creek Reach 2
Wetland Grading Plan

Revisions:

Date: 02.06.2020
Job Number: 005-021752
Project Engineer: DN
Drawn By: JDW
Checked By: JM

Sheet 3.5

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June 29, 2020

Open Area Buffer Planting

Open Buffer Planting Zone Trees						
Bare Root						
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	**# of Stems**
Nyssa sylvatica	Black Gum	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	5%
Platanus occidentalis	Sycamore	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	15%
Betula nigra	River Birch	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	12%
Liriodendron tulipifera	Tulip Poplar	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	10%
Fraxinus pennsylvanica	Green Ash	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	4%
Prunus serotina	Black Cherry	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	9%
Quercus rubra	Red Oak	12ft.	6-12 ft.	0.25"-1.0"	Canopy	10%
Betula lenta	Sweet Birch	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	8%
Quercus falcata	Southern Red Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	10%
Diospyros virginiana	Persimmon	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	5%
Fagus grandifolia	American Beech	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	2%
					Total	**90%**
Alternates						
Acer saccharinum	Silver Maple	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	0%
Halesia caroliniana	Carolina Silverbell	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	0%
Fraxinus americana	White Ash	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	0%
					Total	0%

Open Buffer Planting Zone Small Trees / Shrubs						
Bare Root						
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	**# of Stems**
Alnus serrulata	Tag Alder	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	2%
Hamamelis virginiana	Witch Hazel	12 ft.	6-12 ft.	0.25”-1.0”	Sub-Canopy	2%
Cornus florida	Flowering Dogwood	12 ft.	6-12 ft.	0.25”-1.0”	Sub-Canopy	2%
Lindera benzoin	Spicebush	12 ft.	6-12 ft.	0.25”-1.0”	Shrub	2%
Amelanchier arborea	Serviceberry	12 ft.	6-12 ft.	0.25"-1.0"	Shrub	2%
					Total	**10%**

Notes:
Transplants from on-site to be used at Designer's discretion for streambank and floodplain planting.
Percentages of each species may be varied at Designer's discretion but shall not exceed 20% per each species.
Designer may substitute container plantings or other plantings for bare roots.

Partially Vegetated Buffer Area Planting

Notes:
used open area buffer planting list and percentages.

Wetland Planting

Wetland Planting Zone Trees						
Bare Root						
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	**# of Stems**
Platanus occidentalis	Sycamore	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	15%
Betula nigra	River Birch	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	15%
Liriodendron tulipifera	Tulip Poplar	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	5%
Ulmus americana	American elm	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	10%
Acer negundo	Box elder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
Nyssa sylvatica	Black gum	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	10%
Salix nigra	Black Willow	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
					Total	**85%**
Alternates						
Acer saccharinum	Silver Maple	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	0%
Acer Rubrum	Red Maple	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	0%
Ulmus americana	American elm	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	0%
					Total	0%

Wetland Planting Zone Small Trees/Shrubs						
Bare Root						
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	**# of Stems**
Alnus serrulata	Tag Alder	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	5%
Carpinus caroliniana	Ironwood	12 ft.	6-12 ft.	0.25”-1.0”	Sub-Canopy	2%
Lindera benzoin	Spicebush	12 ft.	6-12 ft.	0.25”-1.0”	Shrub	2%
Asiminia triloba	Pawpaw	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	2%
Ilex opaca	American Holly	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	2%
Sambucus canadensis	Elderberry	12 ft.	6-12 ft.	0.25"-1.0"	Shrub	2%
					Total	**15%**

Notes:
Transplants from on-site to be used at Designer's discretion for streambank and floodplain planting.
Percentages of each species may be varied at Designer's discretion but shall not exceed 20% per each species.
Designer may substitute container plantings or other plantings for bare roots.

Rivercane Planting

Rivercane Planting Zone						
Bare Root						
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Size**	**Stratum**	**% of Stems**
Arundinaria gigantea	Rivercane	8 ft.	6-8 ft.	0.5”-1.5” cal.	Shrub	100%

Riparian Corridor Planting (Streambanks)

Streambank Planting Zone						
Live Stakes						
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Size**	**Stratum**	**% of Stems**
Salix nigra	Black Willow	8 ft.	6-8 ft.	0.5”-1.5” cal.	Shrub	10%
Cornus amomum	Silky Dogwood	8 ft.	6-8 ft.	0.5”-1.5” cal.	Shrub	20%
Salix sericea	Silky Willow	8 ft.	6-8 ft.	0.5”-1.5” cal.	Shrub	20%
Physocarpos opulifolius	Ninebark	8 ft.	6-8 ft.	0.5”-1.5” cal.	Shrub	20%
Cephalathus occidentalis	Buttonbush	8 ft.	6-8 ft.	0.5"-1.5" cal.	Shrub	15%
Sambucus canadensis	Elderberry	8 ft.	6-8 ft.	0.5"-1.5" cal.	Shrub	15%
					Total	**100%**
Herbaceous Plugs						
Juncus effusus	Common Rush	5 ft.	3-5 ft.	1.0”- 2.0” plug	Herb	40%
Carex crinita	Fringed Sedge	5 ft.	3-5 ft.	1.0”- 2.0” plug	Herb	20%
Carex lurida	Lurid Sedge	5 ft.	3-5 ft.	1.0”- 2.0” plug	Herb	20%
Scirpus cyperinus	Woolgrass	5 ft	3-5 ft.	1.0"-2.0" plug	Herb	20%
					Total	**100%**

Note: See detail for Live Staking instructions on streambanks.

Permanent Seeding

Riparian Seeding - Open Canopy				
Pure Live Seed (20 lbs/ acre)				
Approved Date	**Species Name**	**Common Name**	**Stratum**	**Density (lbs/acre)**
All Year	*Coleataenia anceps*	Beaked Panicgrass	Herb	1.0
All Year	*Panicum virgatum*	Switchgrass	Herb	1.0
All Year	*Chasmanthium latifolium*	River Oats	Herb	1.0
All Year	*Rudbeckia hirta*	Blackeyed Susan	Herb	1.0
All Year	*Coreopsis lanceolata*	Lanceleaf Coreopsis	Herb	2.0
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	2.0
All Year	*Panicum clandestinum*	Deertongue	Herb	4.0
All Year	*Elymus virginicus*	Virginia Wild Rye	Herb	4.0
All Year	*Sorghastrum nutans*	Indiangrass	Herb	3.0
All Year	*Bidens aristosa*	Bur-Marigold	Herb	1.0

Wetland Seeding - Open Canopy				
Pure Live Seed (20 lbs/ acre)				
Approved Date	**Species Name**	**Common Name**	**Stratum**	**Density (lbs/acre)**
All Year	*Coleataenia anceps*	Beaked Panicgrass	Herb	3.0
All Year	*Chasmanthium latifolium*	River Oats	Herb	2.0
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	2.0
All Year	*Elymus virginicus*	Virginia Wild Rye	Herb	4.0
All Year	*Bidens aristosa*	Bur-Marigold	Herb	3.0
All Year	*Tripsacum dactyloides*	Eastern Gamagrass	Herb	3.0
All Year	Carex lurida	Lurida Sedge	Herb	3.0

Notes:
Apply Permanent Riparian seeding in all disturbed areas within Conservation Easement.
Apply Permanent seeding in all other disturbed areas per specification.

Pasture Seeding

Pasture Seeding		
Pure Live Seed (32 lbs/ac)		
Species Name	**Common Name**	**lbs/acre**
Festuca arundinacea	Fescue (KY 31)	20
Dactylis glomerata	Orchard Grass	12

Notes:
Apply Pasture Seeding for grading outside Conservation Easement, utility easements, and stream crossings.
Install temporary seed and mulch with all permanent seed.

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Banner Farm Mitigation Site
Henderson County, NC
Planting List

Revisions:

Date: 02.06.2020
Job Number: 0615-021752
Project Engineer: EN
Drawn By: JDW
Checked By: JM

Sheet 4.1

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June 29, 2020

N

0' 150' 300' 450'
(HORIZONTAL)

Open Area Buffer Planting

Wetland Planting

Riparian Corridor Planting (Streambanks)

Partially Vegetated Buffer Area Planting

Rivercane Planting

BANNER FARM ROAD

BANNER CREEK

UT 1

UT 2

BANNER CREEK

FRENCH BROAD RIVER

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Planting Zone Exhibit

Revisions:

Date: 06.26.2020
Job Number: 005-021752
Project Engineer: EN
Drawn By: JDW
Checked By: JM

Sheet 4.2

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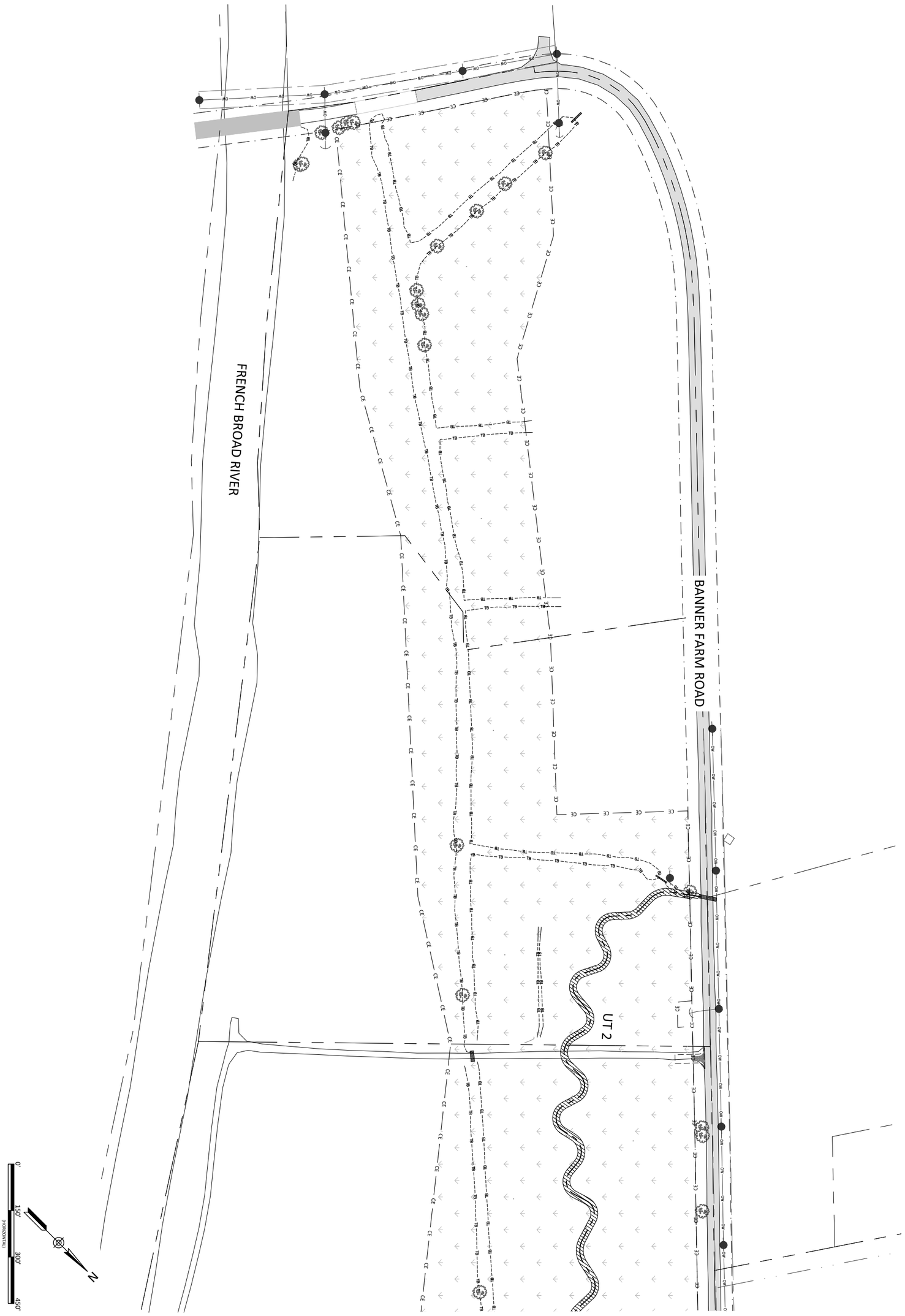

Date:	02.06.2020
Job Number:	005-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

4.3
Sheet

Revisions:

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Wetland and UT2
Planting

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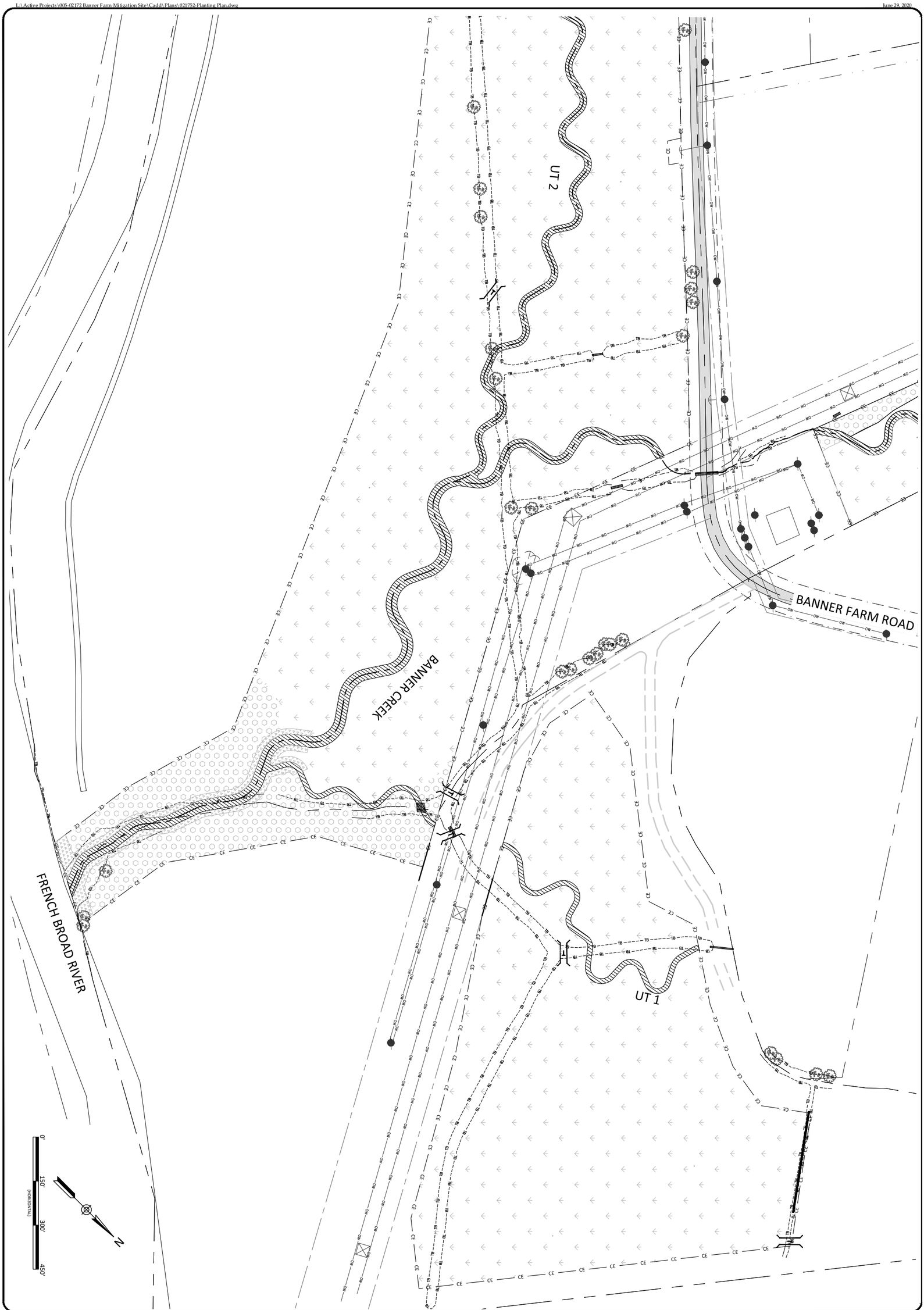

Date:	02.06.2020
Job Number:	005-021752
Project Engineer:	EN
Drawn By:	JDW
Checked By:	JM

4.4
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Revisions:

Banner Farm Mitigation Site
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Wetland, UT1, UT2, and Banner Creek
Planting

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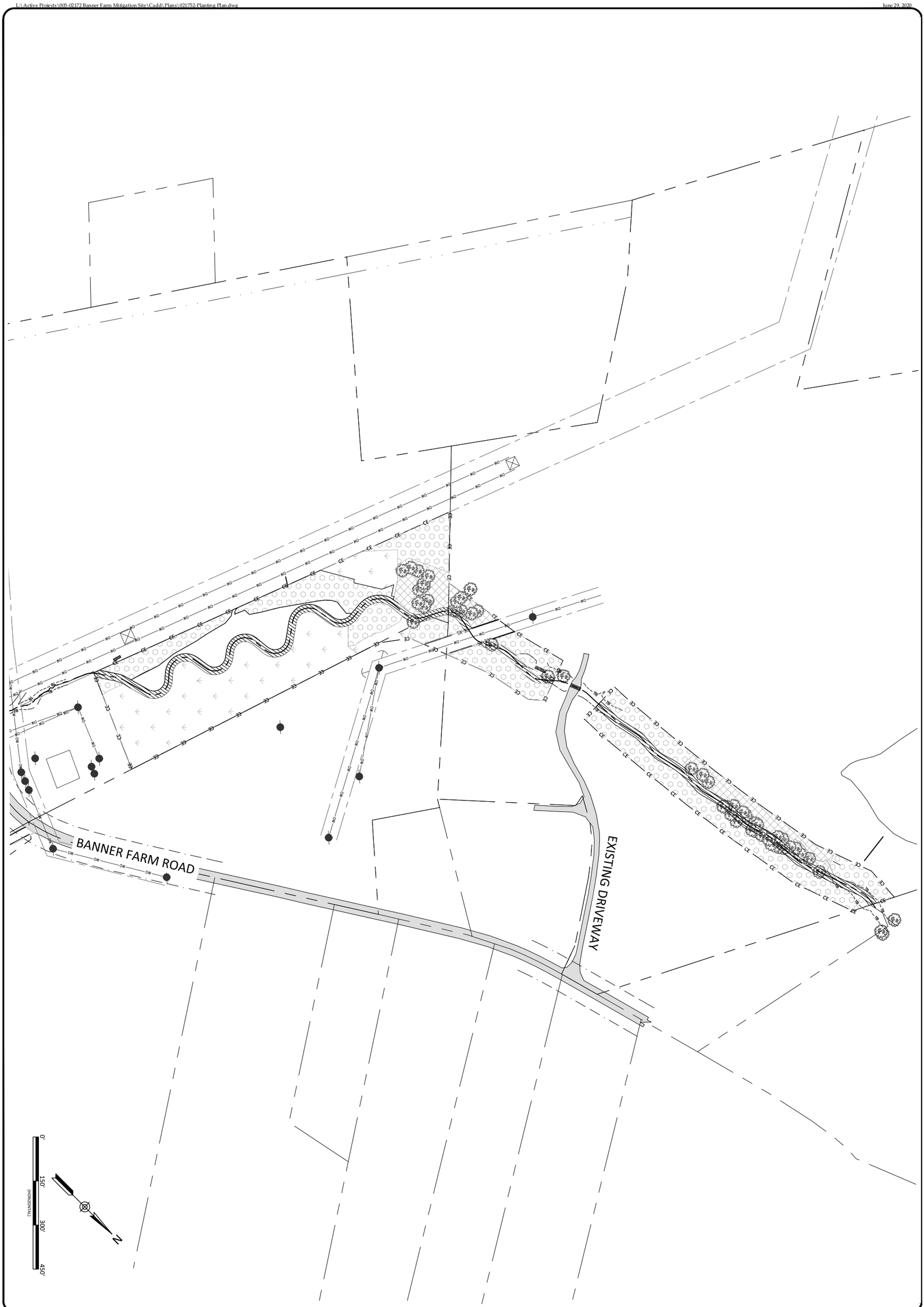

Date:	02.06.2020
Job Number:	005-021752
Project Engineer:	EN
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Banner Creek

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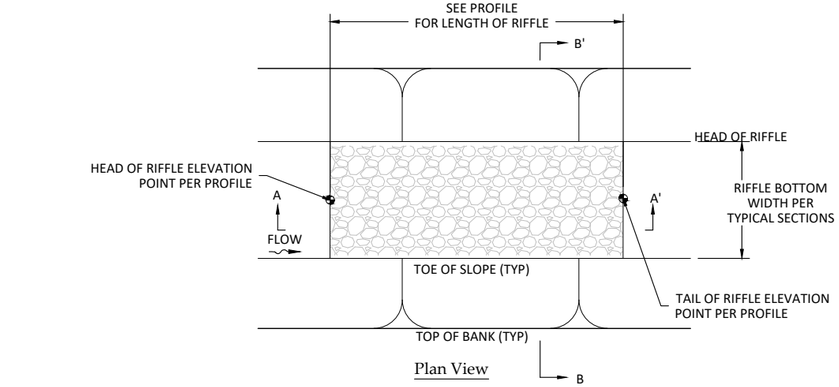
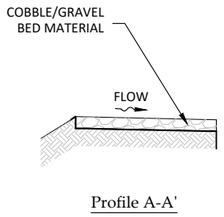
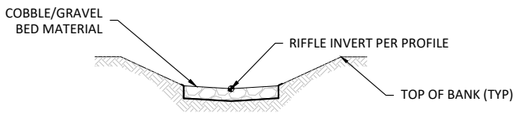
March 7, 2012



Plan View



Profile A-A'

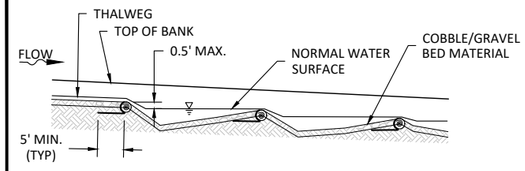


Section B-B'

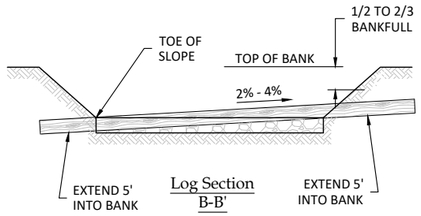
NOTES:

- IF A RIFFLE ENDS WITH A SILL IT WILL BE SHOWN IN THE PLANS. REFER TO LOG/ROCK SILL DETAIL FOR THIS FINAL STRUCTURE.

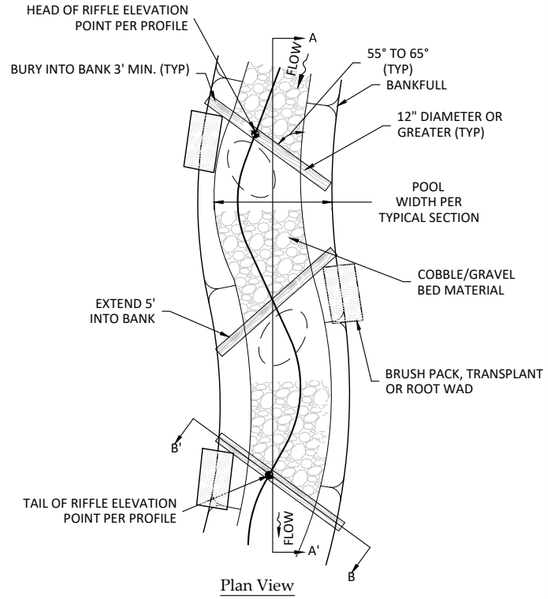
1 / 6.1 Constructed Riffle
Not to Scale



Profile View
A-A'



Log Section
B-B'



Plan View

NOTES:

- IF A RIFFLE ENDS WITH A SILL IT WILL BE SHOWN IN THE PLANS. REFER TO LOG/ROCK SILL DETAIL FOR THIS FINAL STRUCTURE.

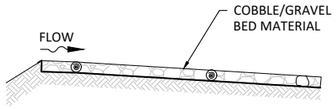
2 / 6.1 Rock and Roll Riffle
Not to Scale

CR-CR

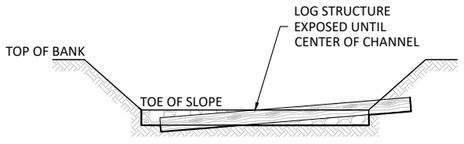
CR-RR

CR-JZ

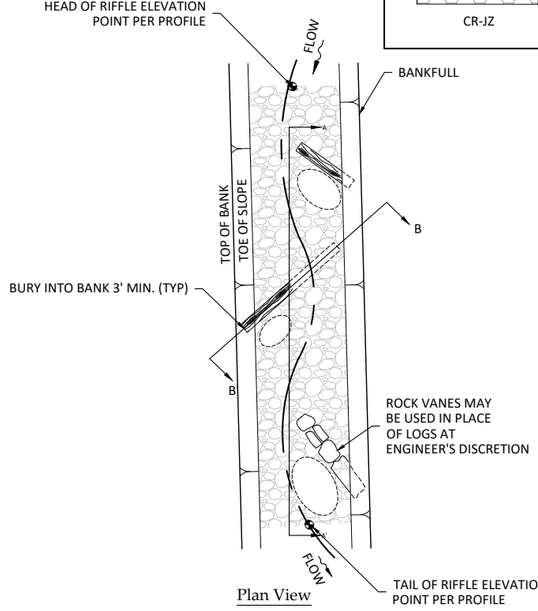
CR-CH



Profile View
A-A'



Log Section
B-B'

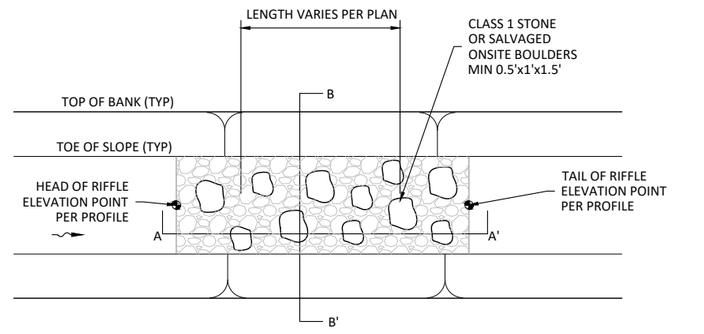


Plan View

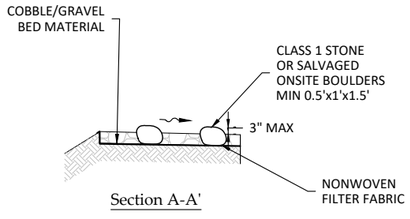
NOTES:

- STRUCTURES SHOULD VARY IN SIZE AND TYPE WITHIN EACH RIFFLE.
- ROCK MAY BE SUBSTITUTED FOR LOGS AT ENGINEER'S DISCRETION.
- IF A RIFFLE ENDS WITH A SILL IT WILL BE SHOWN IN THE PLANS. REFER TO LOG/ROCK SILL DETAIL FOR THIS FINAL STRUCTURE.

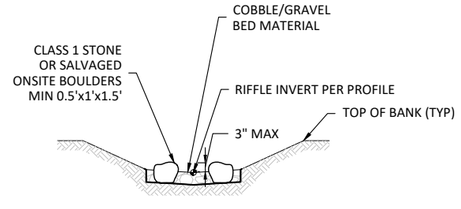
3 / 6.1 Jazz Riffle Structure
Not to Scale



Plan View



Section A-A'



Section B-B'

NOTES:

- IF ONSITE LARGE STONE IS NOT AVAILABLE FOR BOULDERS RIFFLE SHOULD BE CHANGED TO JAZZ RIFFLE OR OTHER PER ENGINEER'S DIRECTION.
- IF A RIFFLE ENDS WITH A SILL IT WILL BE SHOWN IN THE PLANS. REFER TO LOG/ROCK SILL DETAIL FOR THIS FINAL STRUCTURE.

4 / 6.1 Chunky Riffle
Not to Scale

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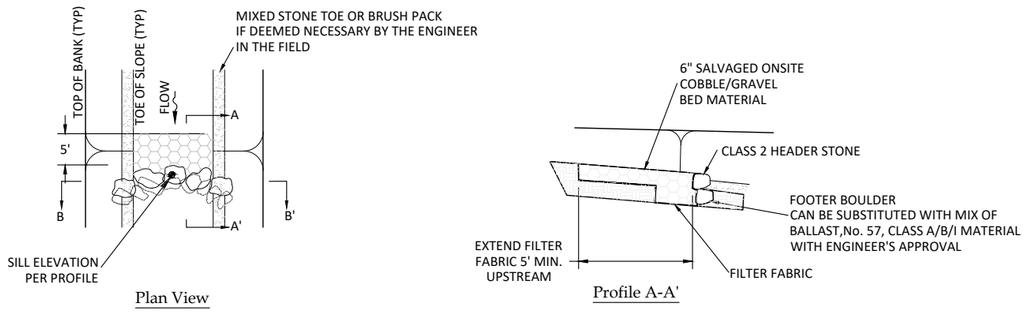
Revisions:

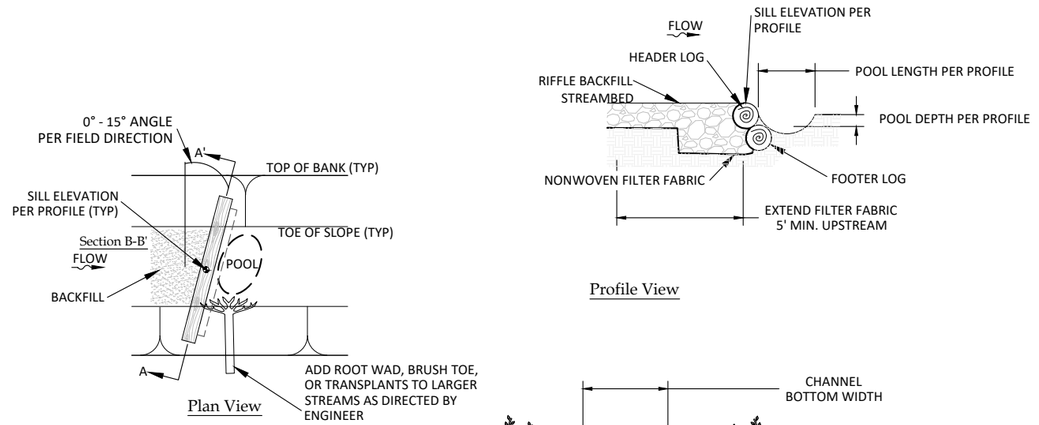
Date: 03.16.2020
Job Number: 005-021752
Project Engineer: EN
Drawn By: JDW
Checked By: JM

Sheet 6.1

March 7, 2012



1 6.2 Rock Sill
Not to Scale



2 6.2 Log Sill
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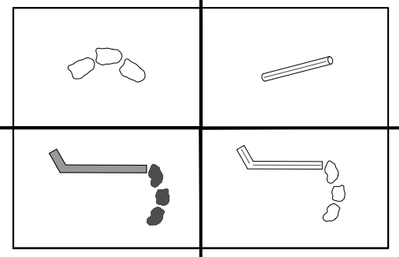
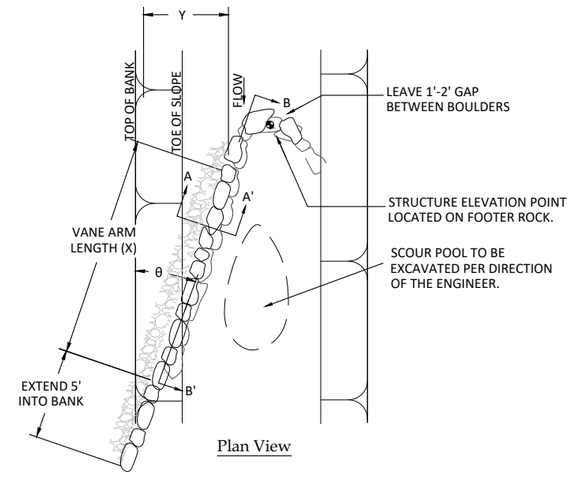
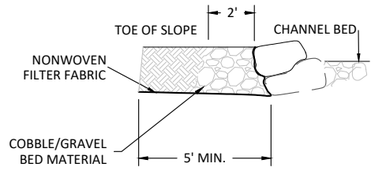
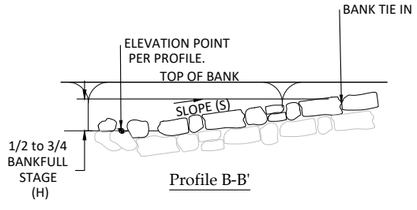




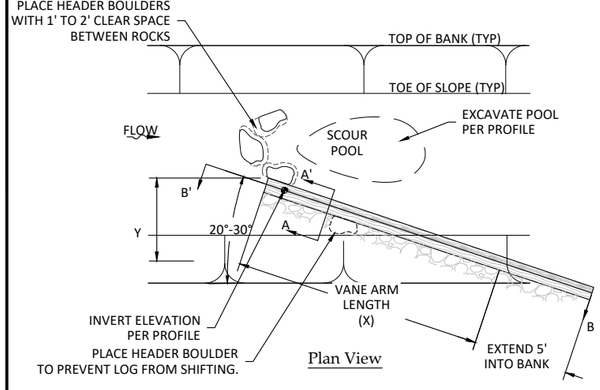


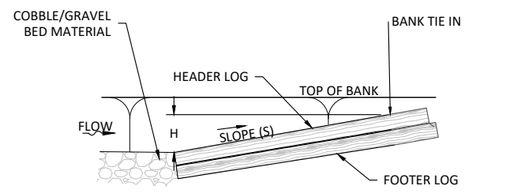


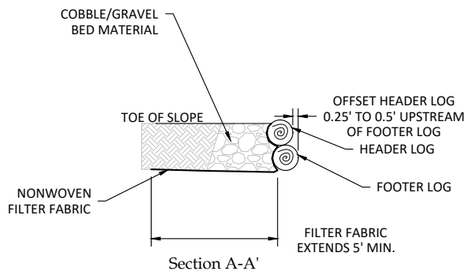
3 6.2 Boulder J-Hook
Not to Scale

NOTE:

- MEASURE ARM LENGTH (X) FROM BANK TIE ALONG BACK OF BOULDERS
- BOULDER J-HOOK DIMENSIONS AND ROCK SIZE TO BE DETERMINED







4 6.2 Log J-Hook
Not to Scale

NOTES:

- MEASURE FROM BANK TIE ALONG BACK OF LOG
- LOG J-HOOK DIMENSIONS TO BE DETERMINED

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Details

Revisions:

Date: 03.16.2020
Job Number: 005-021752
Project Engineer: EN
Drawn By: JDW
Checked By: JM

Sheet 6.2

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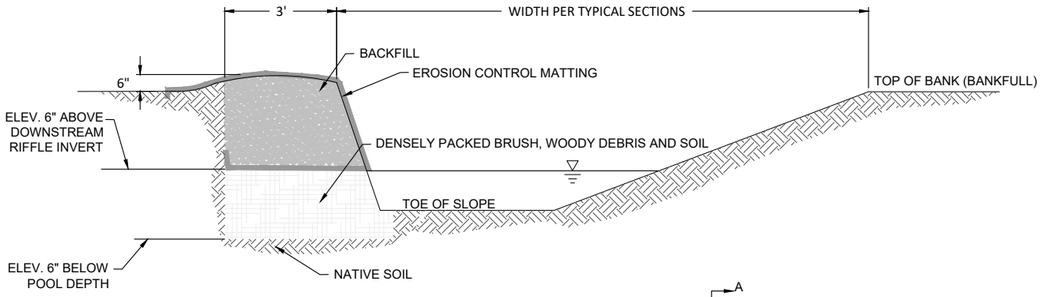

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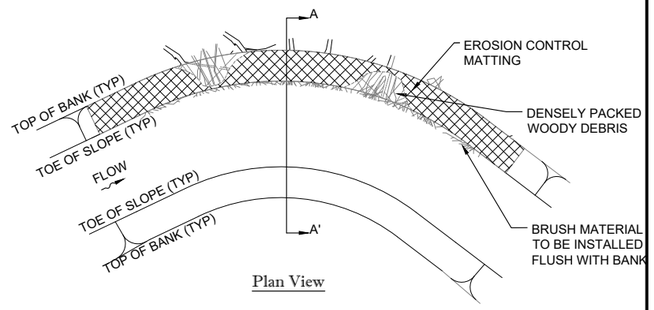
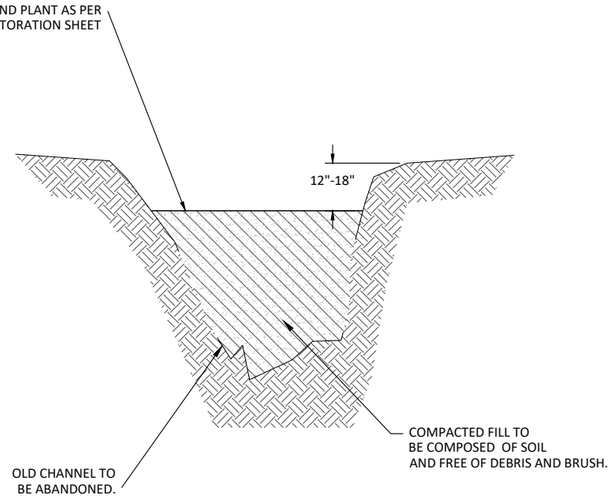


Plan View

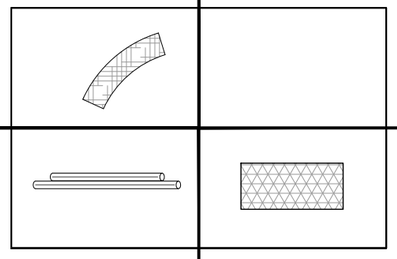
NOTES:

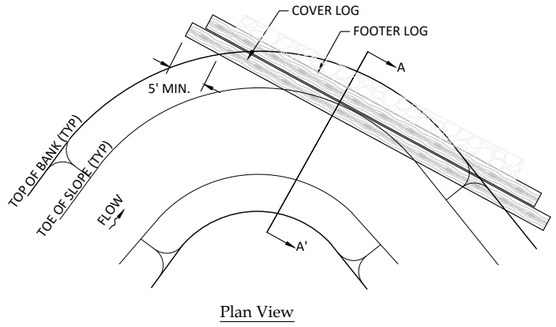
- GEOLIFTS 1.5' MAXIMUM MAY BE REPLACED WITH SOD MATS OR TRANSPLANTS ON REACHES 15' BANKFULL WIDTH OR LESS AT TOP OF BANK.
- OVEREXCAVATE 3' OUTSIDE OF TOP OF BANK (BANKFULL).
- INSTALL A DENSE LAYER OF BRUSH/WOODY DEBRIS, WHICH SHALL CONSIST OF SMALL BRANCHES AND ROOTS COLLECTED ON-SITE AND SOIL TO 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 MATTING 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.

1/6.3 Brush Toe
Not to Scale

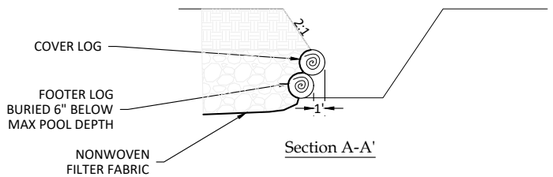


2/6.3 Ephemeral Pool
Not to Scale



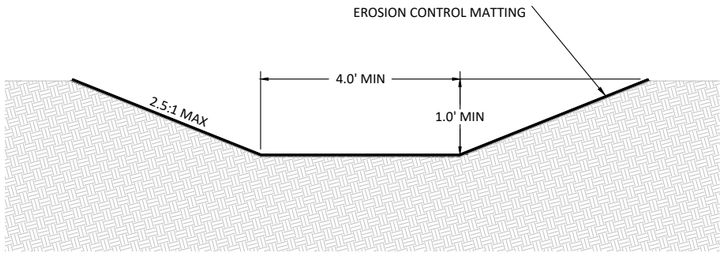


Plan View



Section A-A'

3/6.3 Cover Log
Not to Scale



NOTES:

- CHANNEL STABILIZATION DETAIL MAY BE APPLIED TO ANY DRAINAGES OR SMALL CONVEYANCES WITHIN THE PROJECT AREA AT DISCRETION OF THE DESIGNER.
- SIDE SLOPES AND BOTTOMS TO BE SEEDED WITH PERMANENT RIPARIAN SEED MIX.
- CHANNEL STABILIZATION SHALL NOT BE APPLIED TO ACTIVE PROJECT STREAMS, CHANNEL STABILIZATION FOR DRAINAGE CONVEYANCES AND INTERMITTENT DITCHES ONLY
- CHANNEL DIMENSIONS MAY BE ALTERED AT DISCRETION OF DESIGNER

4/6.3 Channel Stabilization
Not to Scale

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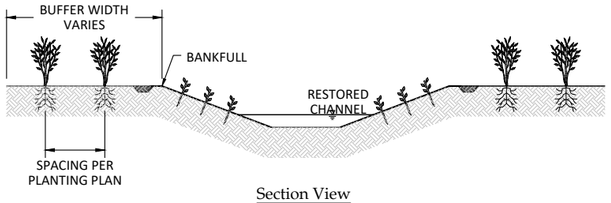


Section View

DIBBLE BAR

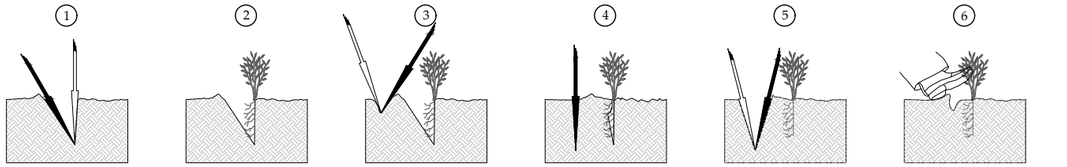
PLANTING BAR SHALL HAVE A BLADE WITH A TRIANGULAR CROSS-SECTION, AND SHALL BE 12 INCHES LONG, 4 INCHES WIDE AND 1 INCH THICK AT CENTER.

ROOTING PRUNING

ALL ROOTS SHALL BE PRUNED TO AN APPORIATE LENGTH TO PREVENT J-ROOTING.

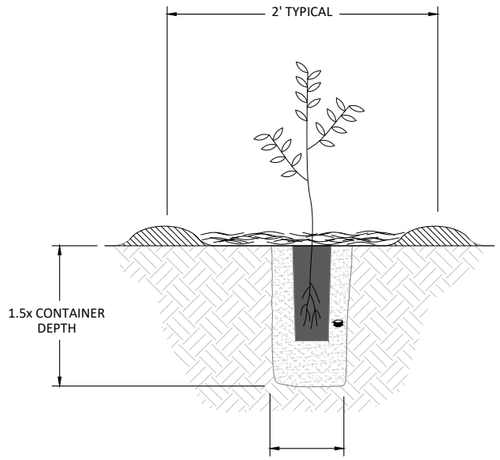
NOTES:

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.

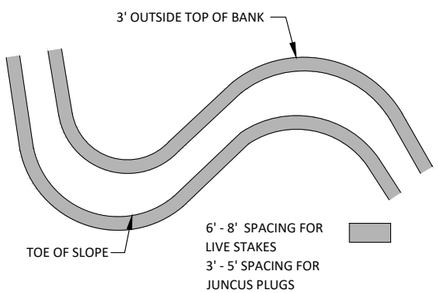


1. INSERT THE DIBBLE, OR SHOVEL, STRAIGHT DOWN INTO THE SOIL TO THE FULL DEPTH OF THE BLADE AND PULL BACK ON THE HANDLE TO OPEN THE PLANTING HOLE. (DO NOT ROCK THE SHOVEL BACK AND FORTH AS THIS CAUSES SOIL IN THE PLANTING HOLE TO BE COMPACTED, INHIBITING ROOT GROWTH.
2. REMOVE THE DIBBLE, OR SHOVEL, 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.

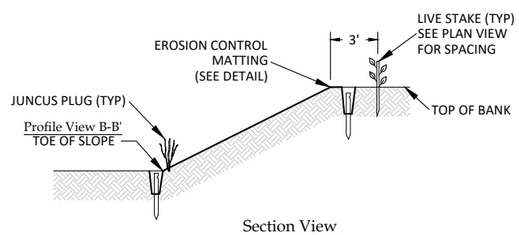
1 / 6.4 Bare Root Planting
Not to Scale



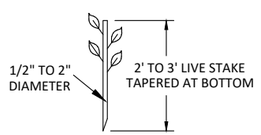
2 / 6.4 Containerized Planting
Not to Scale



Plan View



Section View

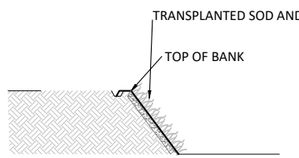


Live Stake Detail

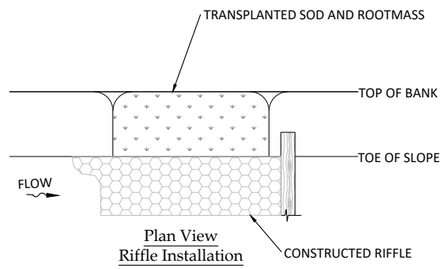
NOTE:

- LIVE STAKES TO BE PLANTED IN AREAS AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.

3 / 6.4 Live Staking & Juncus Plugs
Not to Scale



Section View
Riffle Installation



Plan 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.

4 / 6.4 Transplanted Sod Mats
Not to Scale

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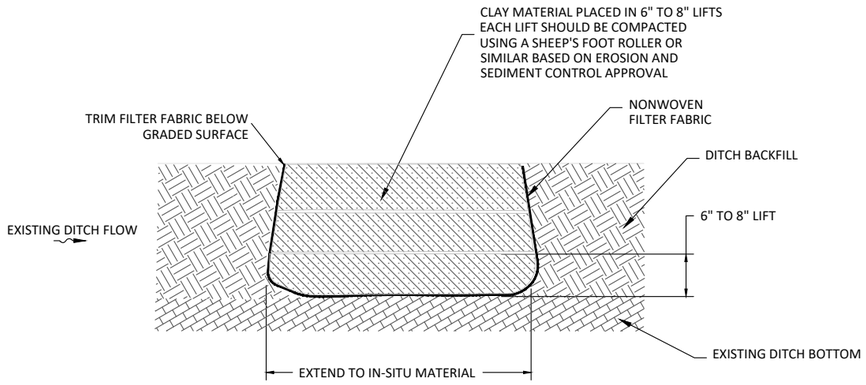
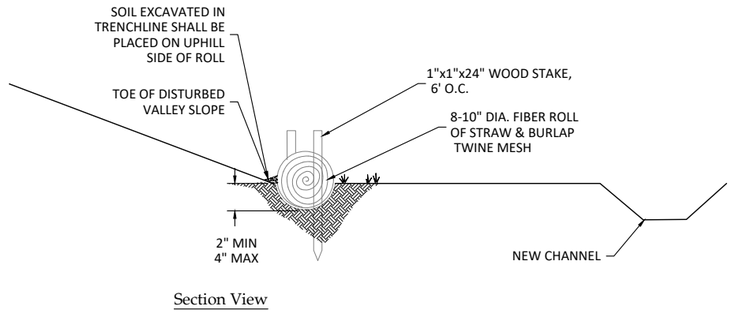


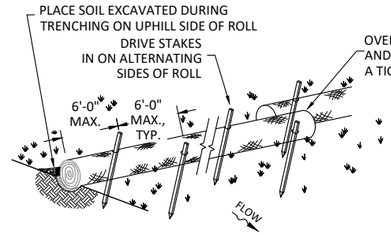
NOTES:

- CLAY MATERIAL TO BE APPROVED BY ENGINEER OR ON-SITE INSPECTOR.
- ALL WOODY AND HERBACEOUS VEGETATION MUST BE REMOVED FROM AREA TO BE PLUGGED PRIOR TO INSTALLATION
- PLUG SHOULD EXTEND FROM TOP OF DITCH TO TOP OF DITCH WITHIN THE DITCH CROSS SECTION

1 / 6.5 Wetland Ditch Plug
Not to Scale



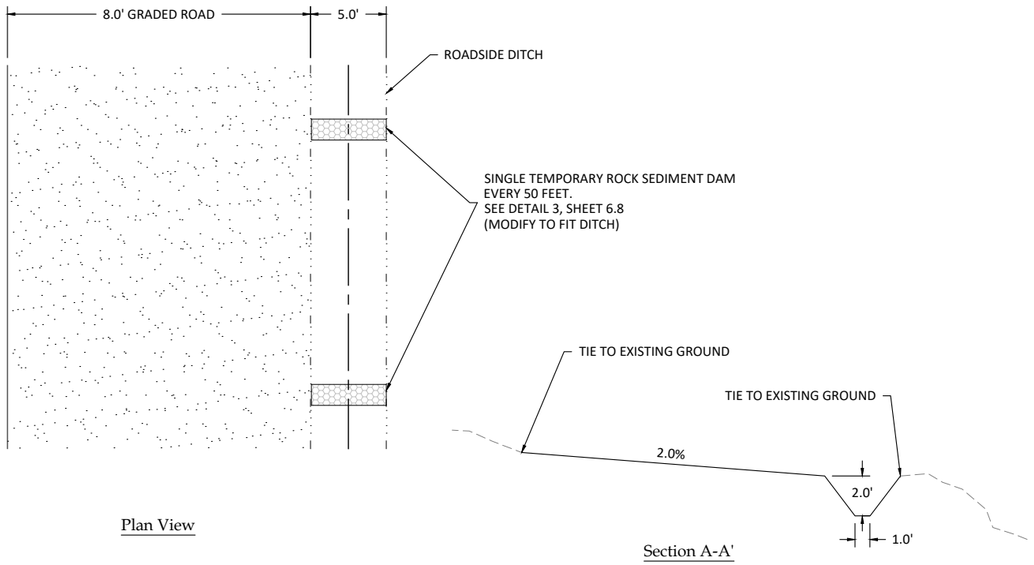
Section View



NOTES:

- FIBER ROLLS WILL BE PLACED AT THE TOE OF SLOPE IN LOCATIONS WHERE DISTURBED VALLEY SLOPES ARE SLOPING TOWARDS THE ACTIVE STREAM. FIBER ROLLS MAY BE PLACED AT OTHER LOCATIONS AS DIRECTED BY THE ENGINEER.
- RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.

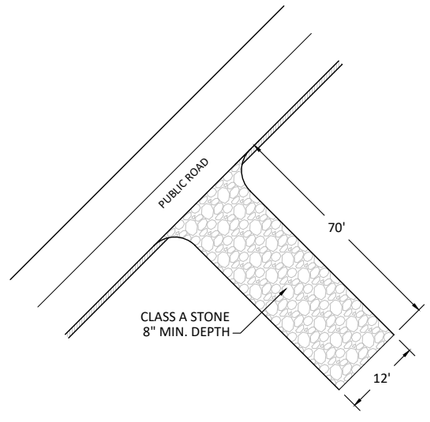
2 / 6.5 Straw Wattles
Not to Scale



Plan View

Section A-A'

3 / 6.5 Farm Road w/Side Ditch
Not to Scale



NOTES:

- PROVIDE TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS.
- LOCATE CONSTRUCTION ENTRANCE AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. PROVIDE FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE.
- 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.
- ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED IMMEDIATELY.
- USE CLASS A STONE OR OTHER COARSE AGGREGATE APPROVED BY THE ENGINEER.
- PLACE FILTER FABRIC BENEATH STONE.

4 / 6.5 Construction Entrance
Not to Scale

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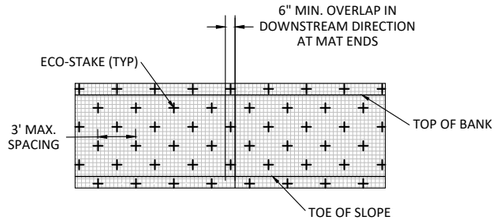
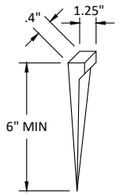
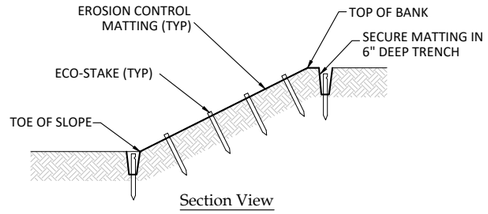


Plan View



Eco-Stake

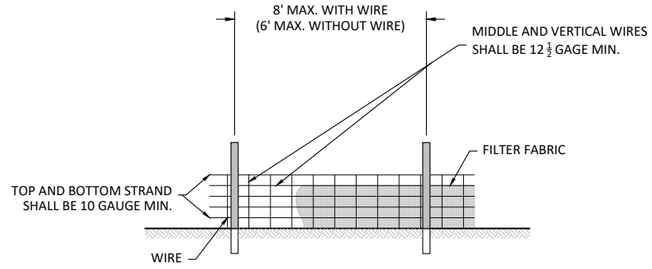


Section View

NOTES:

- TOP ROW OF STAKES SHOULD FACE AWAY FROM THE STREAM.
- BOTTOM ROW OF STAKES SHOULD FACE TOWARDS THE STREAM.
- MIDDLE ROWS OF STAKES SHOULD FACE UPSTREAM.

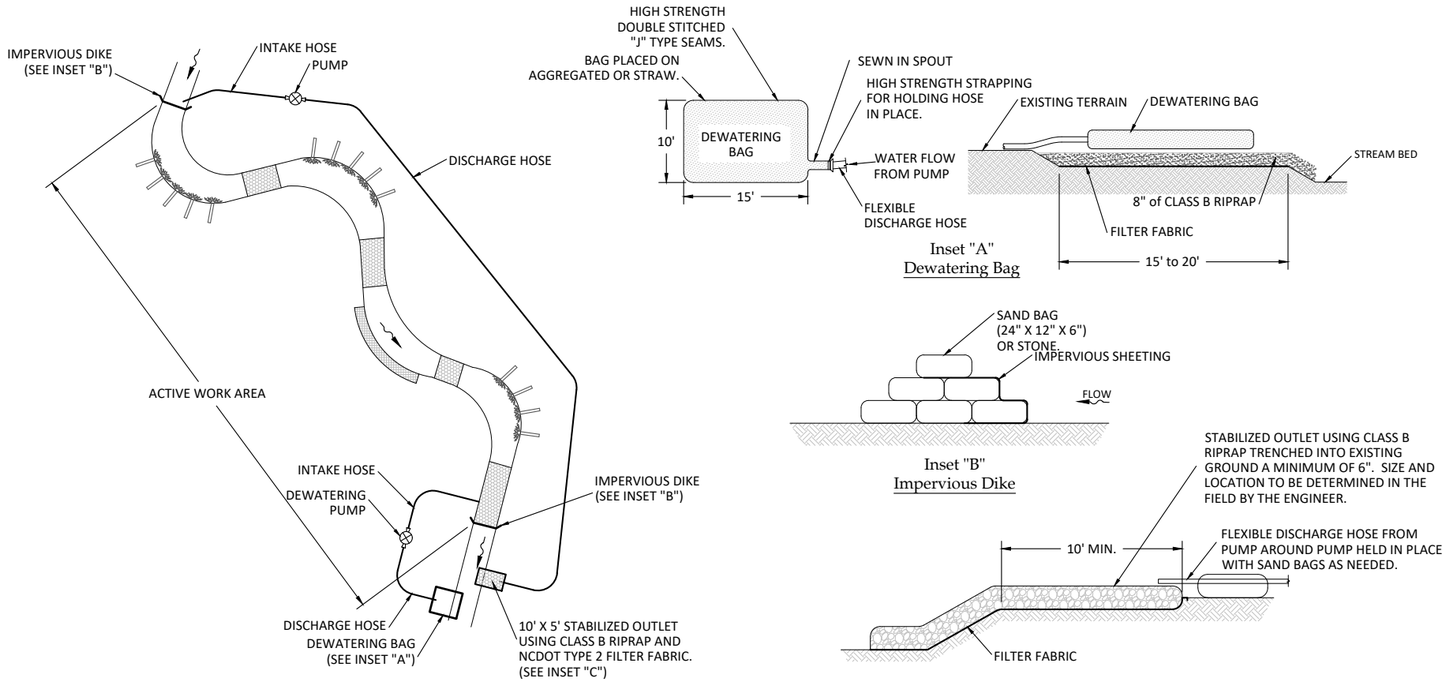
1 6.6 Erosion Control Matting
Not to Scale



NOTES:

- USE WIRE A MINIUM OF 32" IN WIDTH AND WITH A MINIMUM OF 6 LINES OF WIRES WITH 12" STAY SPACING.
- USE FILTER FABRIC A MINIMUM OF 36" IN WIDTH AND FASTEN ADEQUATELY TO THE WIRES AS DIRECTED BY THE ENGINEER.
- PROVIDE 5' STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE. ANGLE STEEL TYPE.

2 6.6 Temporary Silt Fence
Not to Scale



Plan View

Inset "A"
Dewatering Bag

Inset "B"
Impervious Dike

Inset "C"
Stabilized Outlet

NOTE:

- PROVIDE STABILIZED OUTLET TO STREAMBED.

3 6.6 Pump Around System
Not to Scale

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6.6
Sheet

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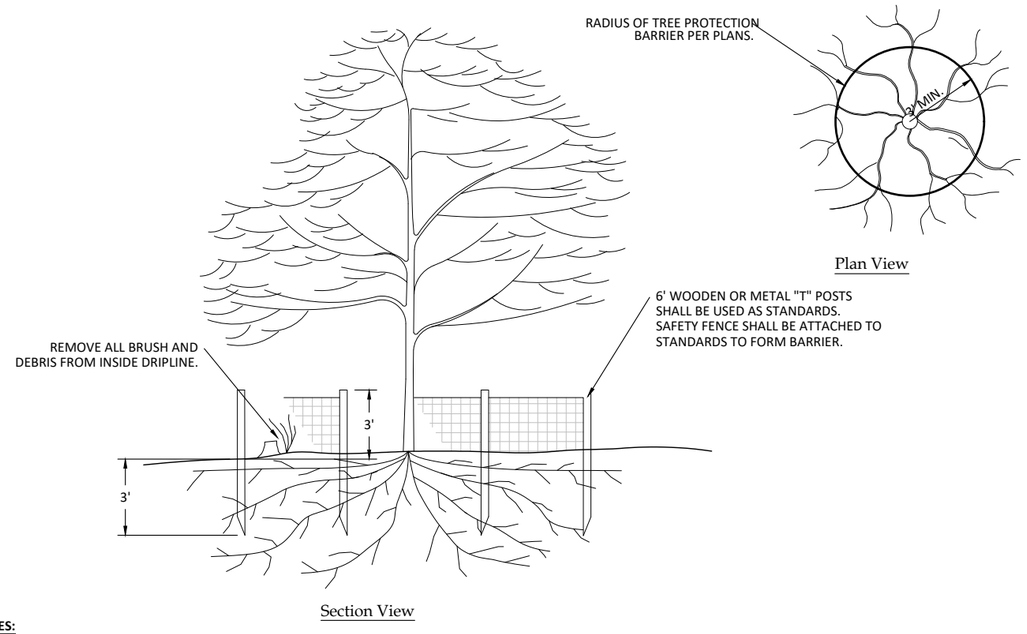
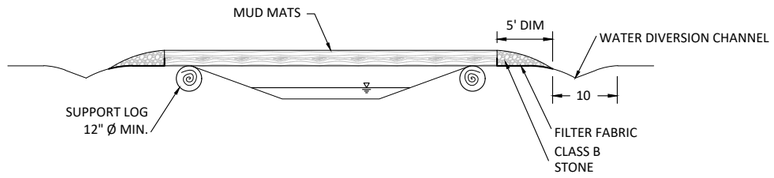


NOTES:

- ALL TREE PROTECTION BARRIERS SHALL BE REMOVED PRIOR TO CONTRACTOR DEMOBILIZATION.
- SEE PLANS FOR LOCATION OF ALL TREE PROTECTION BARRIERS.

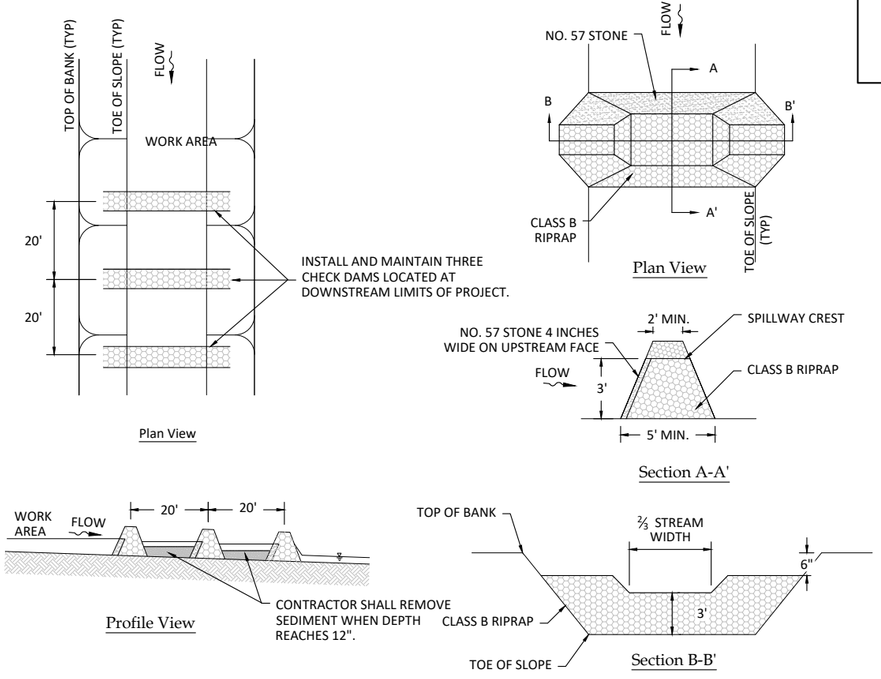
1 / 6.7 Tree Protection
Not to Scale



NOTES:

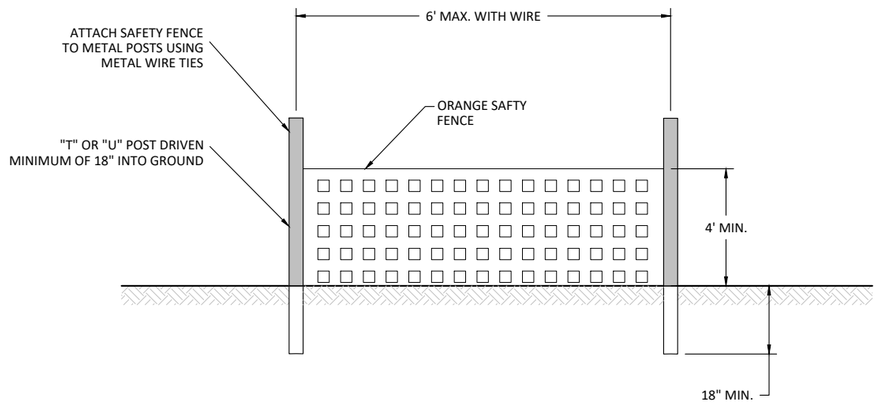
- CONSTRUCT STREAM CROSSING WHEN FLOW IS AT NORMAL BASEFLOW.
- MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM.
- INSTALL STREAM CROSSING PERPENDICULAR TO THE FLOW.
- MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
- STABILIZE AN ACCESS RAMP OF CLASS B STONE TO THE EDGE OF THE MUD MAT.
- CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED.

2 / 6.7 Temporary Stream Crossing - Mud Mat
Not to Scale



3 / 6.7 Temporary Rock Sediment Dam
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



4 / 6.7 Safety Fence
Not to Scale

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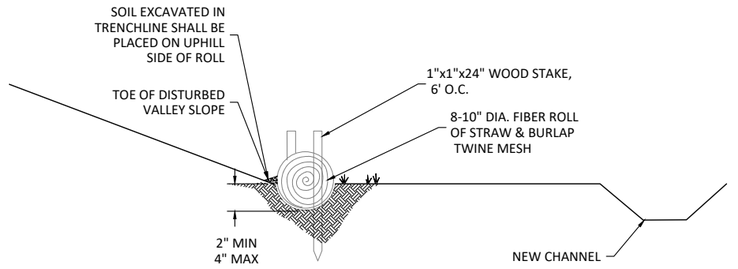
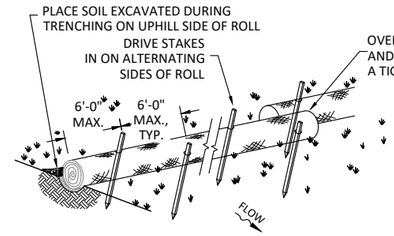
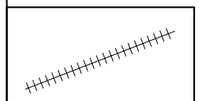


Section View



NOTES:

- FIBER ROLLS WILL BE PLACED AT THE TOE OF SLOPE IN LOCATIONS WHERE DISTURBED VALLEY SLOPES ARE SLOPING TOWARDS THE ACTIVE STREAM. FIBER ROLLS MAY BE PLACED AT OTHER LOCATIONS AS DIRECTED BY THE ENGINEER.
- RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.



2 / 6.8 Straw Wattles
Not to Scale

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Henderson County, NC

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Job Number: 005-02752
Project Engineer: DN
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Checked By: JM

Revisions:

Sheet 6.8

APPENDIX 9
Invasive Species Plan

Appendix 9 Invasive Species Plan

Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. These site inspections may identify the presence of invasive vegetation. If, during the monitoring period, invasive species threaten the survivability of planted woody vegetation in an area that exceeds 1% of the planted easement acreage, the invasive species shall be treated. Smaller areas may be treated at the discretion of the project engineer and biologist, if deemed in the best interest of the Site. Generally, the treatment plan shall follow the below guidelines in Table 1 for common invasive species found in riparian areas; however, the treatment may be changed based on the professional judgement of the project engineer and biologist. For invasive species not listed in the below table that threaten the survivability of the planted woody vegetation, Wildlands shall notify DMS of the invasive species observed and the plan for treatment prior to treating the species. All invasive species treatment will be reported in the following year's monitoring plan.

Table 1. Invasive Species Treatment – *Banner Farm Mitigation Site*

Invasive Species	Recommended Removal Technique
Honeysuckle (*Lonicera japonica*)	Small infestations of *L. japonica* can be pulled by hand. Monitor to remove any re-sprouts. Care should be taken to bag and remove the plants, including mature fruits to prevent re-establishment. Large infestations of *L. japonica* will usually require a combination of cut stump and foliar herbicide treatments. Where vines have grown into the tree canopy, cut each stem as close to the ground as possible. Treat the freshly cut surface of the rooted stem with a 25 percent solution of glyphosate or triclopyr. Remove the twining vines to prevent them from girdling and killing desirable vegetation. Groundcovers of *L. japonica* can be treated with a foliar solution of 2 percent glyphosate or triclopyr plus a 0.5 percent non-ionic surfactant to thoroughly wet all the leaves.
Chinese Privet (*Ligustrum sinense*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant: a glyphosate herbicide as a 3-percent solution (12 ounces per 3-gallon mix) in the late fall or early winter when safety to surrounding vegetation is desired, or elsewhere, Arsenal AC* as a 1-percent solution (4 ounces per 3-gallon mix). Backpack mist blowers can broadcast glyphosate as a 3-percent solution (12 ounces per 3-gallon mix) or Escort XP* at 1 ounce per acre (0.2 dry ounces per 3-gallon mix and 10 gallons per acre) during winter for safety to dormant hardwoods. Summer applications of glyphosate may not be as effective as other times and require a higher percent solution. The best time for Arsenal AC* and Escort XP* is summer to fall. For stems too tall for foliar sprays and when safety to surrounding vegetation is desired, apply a basal spray of Garlon 4 as a 20-percent solution (5 pints per 3-gallon mix) in a labeled basal oil product, vegetable oil or mineral oil with a penetrant, or fuel oil or diesel fuel (where permitted); or undiluted Pathfinder II. Elsewhere, apply Stalker* as a 6- to 9-percent solution (1.5 to 2 pints per 3-gallon mix) in a labeled basal oil product, vegetable oil or mineral oil with a penetrant, or fuel oil or diesel fuel (where permitted) to young bark as a basal spray making certain to treat all stems in a clump; or cut and immediately treat the stump tops with Arsenal AC* as a 5-percent solution (20 ounces per 3-gallon mix) or Velpar L* as a 10-percent solution in water (1 quart per 3-gallon mix) with a surfactant. When safety to surrounding vegetation is desired, immediately treat stump tops and sides with Garlon 3A or with a glyphosate herbicide as a 20-percent solution (5 pints per 3-gallon mix) in water with a surfactant. ORTHO Brush-B-Gon and Enforcer Brush Killer are effective undiluted for treating cut-stumps and available in retail garden stores (safe to surrounding plants). For large stems, make stem injections using Arsenal AC* or when safety to surrounding vegetation is desired, Garlon 3A or a glyphosate herbicide using dilutions and cut-spacings specified on the herbicide label

Invasive Species	Recommended Removal Technique
	(anytime except March and April). An EZ-Ject tree injector can help to reach the lower part of the main stem; otherwise, every branching trunk must be hack-and-squirt injected.
Kudzu (*Pueraria montana*)	Small patches of *P. montana* that are not well-established can usually be eliminated by persistent weeding, mowing, or grazing during the growing season. The spread of a well-established infestation of *P. montana* can be controlled the same way, but cutting will typically not kill the roots of larger plants. For vines in tree canopies, cut the vines near the ground and apply a 50 percent solution of triclopyr to the stumps. This procedure remains effective at lower temperatures as long as the ground is not frozen. Large infestations can be effectively controlled with a foliar solution of 2 to 3 percent glyphosate or triclopyr plus a 0.5 percent non-ionic surfactant to thoroughly wet all leaves. The ambient air temperature should be above 65 degrees Fahrenheit. After the above ground vegetation is controlled and it is possible to dig and cut into the central root crown, apply a 50 percent solution of glyphosate or triclopyr to the wound. The most successful chemical control of *P. montana* can be achieved with a foliar solution of 0.75 percent clopyralid plus a 0.5 percent non-ionic surfactant. Monitor all treatments in subsequent years for re-sprouting.
Multiflora rose (*Rosa multiflora*)	Foliar Spray Method: Apply MSM at 1 ounce per acre between April and June. May to October apply a 4% solution of glyphosate and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species. Glyphosate is a non-selective systemic herbicide that may kill non-target partially-sprayed plants. Cut Stump Method: This control method should be considered when treating individual stems or where the presence of desirable species precludes foliar application. Stump treatments can be used if the ground is not frozen. Glyphosate: Horizontally cut stems at or near ground level. Immediately apply a 20% solution of glyphosate and water to the cut stump making sure to cover the outer 50% of the stump.
Golden bamboo (*Phyllostachys aurea*)	Small infestations can be controlled by repeatedly cutting or mowing the stems as close to the ground as possible several times during the growing season for successive years until the energy reserves in the rhizomes are exhausted. Large infestations of P. aurea can be killed by thoroughly wetting the foliage with a 2 percent solution of glyphosate and a 0.5 percent nonionic surfactant. Ideally, the plants should be sprayed in the late fall or early spring when temperatures are above 65 degrees Fahrenheit to ensure absorption of the chemical. Many native species are also dormant at this time. As long as the ground is not frozen, large plants can be killed by cutting them down near the ground and spraying the freshly cut stump with a 25 percent solution of glyphosate.
Callery Pear (Pyrus calleryana)	In areas with light infestation, small trees can be removed by hand when the soil is moist, with care taken to remove the entire root. When too numerous, foliar spraying with a 2 to 5 percent systemic herbicide solution of glyphosate or triclopyr can be utilized in mid to late summer. Medium to large trees should be cut down and stumps treated immediately with herbicide to prevent re-sprouting. Effective herbicides include glyphosate and triclopyr at a 25 to 50 percent solution. Less labor intensive control options include basal bark treatment and girdling. Basal bark treatment can be used for trees up to 6 inches in diameter by applying a 1:5 ratio of the ester formulation of triclopyr and basal oil in a 12-inch wide band around the entire circumference of the tree base. The most successful period for herbicide uptake is late winter/early spring or during the summer. Mature trees can be girdled during the spring and summer, by cutting through the bark around the entire trunk, 6 inches above the ground. Due to the persistent seed bank and potential for re-sprouting, subsequent treatments will be required for several years.

Invasive Species	Recommended Removal Technique
Tree of Heaven (*Ailanthus altissima*)	Foliar Spray Method: This method should be considered for large thickets of seedlings and small saplings where risk to nontarget species is minimal. Air temperature should be above 65°F to ensure absorption of herbicides. Glyphosate: Apply a 2% solution of glyphosate or triclopyr and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species. Glyphosate is a non-selective systemic herbicide that may kill non-target partially-sprayed plants. Cut Stump Method: This control method should be considered when treating individual trees or where the presence of desirable species precludes foliar application. Stump treatments can be used if the ground is not frozen. Triclopyr: Horizontally cut stems at or near ground level. Immediately apply a 25% solution of triclopyr and water to the cut stump making sure to cover the outer 20% of the stump. Hack and Squirt and Stem Injection Methods: To effectively treat larger saplings to mature trees using the hack and squirt methods, make cuts to the cambium spaced 1" apart and arranged horizontally around the stem. Immediately apply a 50% solution of triclopyr or 25% solution of glyphosate into the cuts. An EZ-Ject tree injector or other similar tool can be used to treat saplings to mature trees. These treatments should occur from mid-late summer to late fall.
Johnson Grass (*Sorghum halepense*)	Recommended control procedures: Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (June to October with multiple applications applied to regrowth). • Recommendation for mature grass control: apply Outrider* as a broadcast spray at 0.75 to 2 ounces per acre (0.2 to 0.6 dry ounce per 3-gallon mix) plus a nonionic surfactant to actively growing Johnsongrass. For handheld and high-volume sprayers, apply 1 ounce of Outrider per 100 gallons of water plus a nonionic surfactant at 0.25 percent. Outrider is a selective herbicide that can be applied over the top of certain other grasses to kill Johnsongrass, or apply Plateau as a 0.25-percent solution (1 ounce per 3-gallon mix) when plants are 18 to 24 inches (45 to 60 cm) tall or larger. • Recommendation for seedling control: apply Journey as a 0.3-percent solution (1.2 ounces per 3-gallon mix) before Johnsongrass sprouts and when desirable species are dormant or apply a glyphosate herbicide as a 2-percent solution (8 ounces per 3-gallon mix) directed at the infestation.

APPENDIX 10
Maintenance Plan

Appendix 10 Maintenance Plan

The site shall be visited semi-annually and a physical inspection of the site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. Additionally, given the potential risk of deposition from backwater flooding of the French Broad River, the site shall be visited after major flooding events associated with the French Broad River to inspect the site and identify potential maintenance concerns. Site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and after major floods associated with the French Broad River and may include the following:

Table 1. Maintenance Plan – *Banner Farm Mitigation Site*

Component/ Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel – these shall be conducted where success criteria are threatened or at the discretion of the Designer. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head-cutting. Beaver activity will be monitored and beaver dams on project streams will typically be removed, at the discretion of the Designer, during the monitoring period to allow for bank stabilization and stream development outside of this type of influence. Deposition within stream channels after French Broad River flood events will be monitored to ensure channels maintain active bed and banks. Minor channel maintenance may be performed if deposition is threatening the geomorphic processes implemented during the restoration design.
Wetlands	Routine wetland maintenance and repair activities may include supplemental installations of target vegetation within the wetland. Areas where storm water and floodplain flows intercept the wetland may also require maintenance to prevent scour that adversely and persistently threatens wetland habitat or function.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species requiring treatment per the Invasive Species Treatment Plan (Appendix 9) shall be treated in accordance with that plan and with NC Department of Agriculture (NCDA) rules and regulations. If deposition associated with French Broad River flooding impedes early vegetation growth, supplemental planting may be performed to ensure the health and vigor of the target community.
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.

APPENDIX 11
Credit Release Schedule

Appendix 11 - 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 – *Banner Farms 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 – *Banner Farms 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 12
Financial Assurances

Appendix 12 - 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 13
IRT Meeting Minutes

WILDLANDS
ENGINEERING

MEETING NOTES

MEETING:	Post-Contract IRT Site Walk **Banner Farm Mitigation Site** French Broad River Basin 06010105; Henderson County, NC DEQ Contract No. 7530 Wildlands Project No. 005-02172
DATE:	Tuesday, July 31, 2018 @ 10:00 AM – 12:00 PM
LOCATION:	54 Banner Farm Road Mills River, NC 28759

Attendees

Todd Tugwell, USACE
Mac Haupt, NC Department of Environmental Quality
Matthew Reid, DMS Project Manager
Paul Wiesner, DMS
Harry Tsomides, DMS
Kirsten Ullman, DMS
Shawn Wilkerson, Wildlands Engineering
Eric Neuhaus, Wildlands Engineering

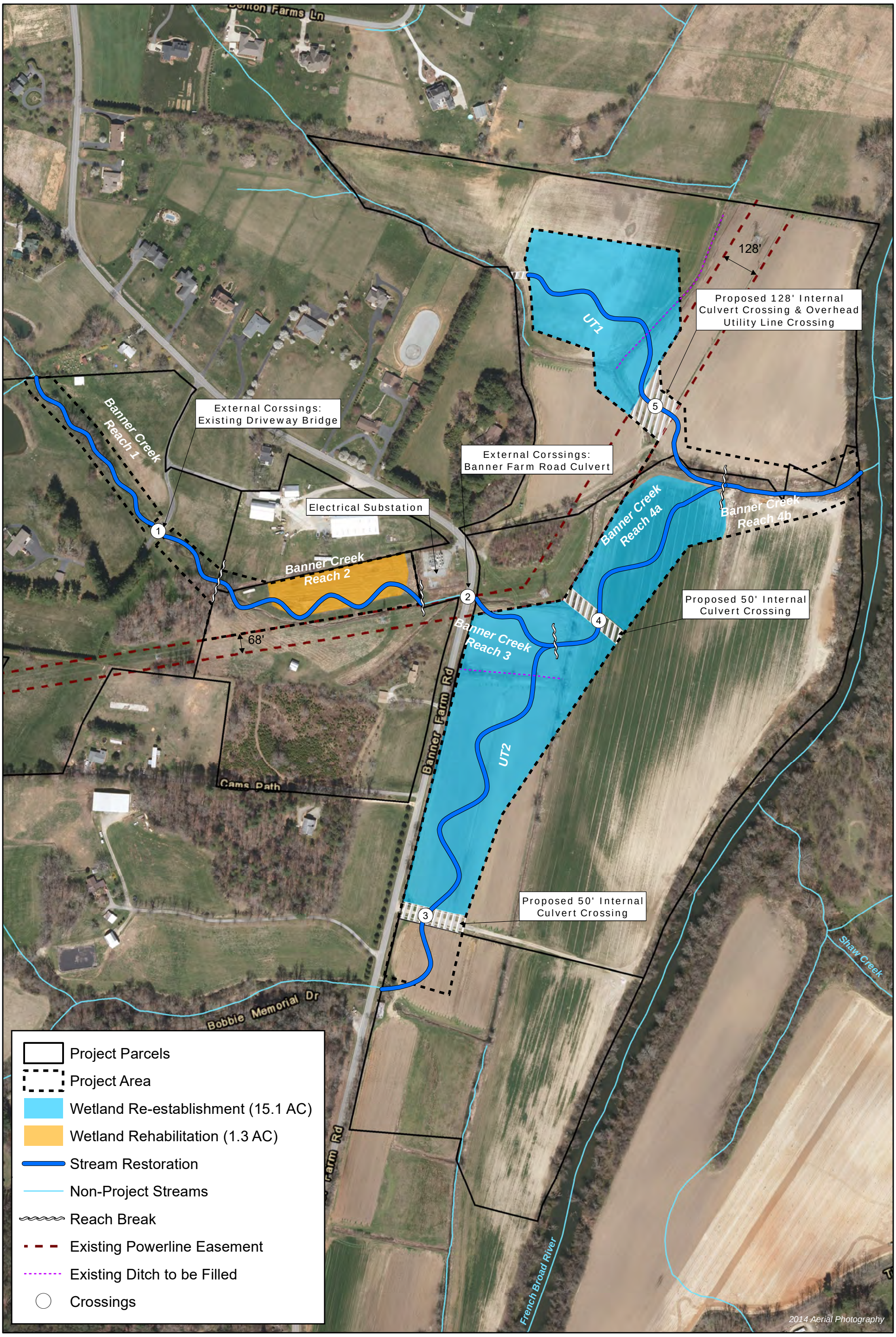
Materials

- Wildlands Engineering Technical Proposal dated 2/8/2018 in response to RFP #16-007334
- Preliminary Hydric Soil Investigation dated 11/20/2017 prepared by Soil & Environmental Consultants

Meeting Notes

1. Wildlands and agency personnel met near Banner Creek Reach 4a and Wildlands gave an overview of the project, outlining stream and wetland restoration approaches. Much of the area proposed for wetland restoration was in active row cropping (corn).
2. The group walked down Banner Creek Reach 4a until its confluence with UT1. The existing culvert crossing along UT1 had been clogged with sand from a previous storm event where the French Broad River had gotten out of bank. The clogged culvert was backing up UT1 as well as the ditch that drains the northeast area proposed for wetland restoration.
3. There was concern expressed that the area proposed for wetland re-establishment adjacent to UT1 may delineate as jurisdictional wetland based on the hydrology and vegetation seen on-site during the day of the visit. It was evident that this hydrology was only a result of the clogged culvert, and that once the landowner performs regular maintenance which includes clearing the culvert, the proposed wetland area will lack sufficient hydrology and vegetation required to jurisdictionally delineate.
4. Multiple soil borings were taken within the wetland area along UT1, and generally agency personnel agreed with the provided soils report and potential for wetland restoration

5. The group continued upstream along UT2 towards Banner Farm Road. At three locations, the group stopped to look at soil borings within the proposed wetland area. General consensus was that the soils along UT2 were not as hydric as along UT1, but there was viable potential for wetland restoration along UT2.
6. There were questions regarding the proposed restoration work wetting up adjacent fields and the potential for a hydrologic trespass issue in the future. Wildlands noted that included with the technical proposal for the site was an amendment to the option agreement signed by the participating property owners that acknowledges the potential for increased water table elevations in adjacent agricultural fields.
7. Based on the #6 above, there was discussion around expanding the wetland restoration portion of the project to include adjacent fields. Wildlands noted that they would investigate this potential further and decide if this was something there was interest in pursuing.
8. At the upstream end of UT2 (existing Banner Farm Road crossing), it was asked if the parcel access, existing barn structure, and the existing farm crossing could be reworked to eliminate the farm crossing in the proposed site condition. Wildlands agreed that this would be the best approach if possible and noted that they will discuss options with the property owner to determine if removal of the farm crossing at that location is possible.
9. The walk continued upstream of Banner Farm Road along Banner Creek Reach 2. A soil sample was taken within the proposed wetland rehabilitation area to look at potential for hydric soils. Agency personnel agreed with Wildlands conclusion that the area would jurisdictionally delineate and noted that some evidence of an increase in wetland hydrology may be required for the area to be considered wetland rehabilitation and that 2:1 credit might be more applicable than 1.5:1. Wildlands does not see this as an issue as the adjacent stream (Banner Creek Reach 2) will be restored and reconnected to the floodplain wetland, which will increase wetland hydrology but understands the concern.
10. The walk continued upstream along Banner Creek Reach 1. Discussion along Banner Creek Reach 1 was centered around whether the reach should be proposed for restoration or enhancement I based on its current condition and the proposed work. Ultimately, it was determined that Wildlands would look at all the data, including the existing condition of the stream, the removal of an abandoned crossing, and the stream grades required to tie to the upstream end of the project and pass through the existing driveway culvert, to propose the appropriate approach for Banner Creek Reach 1.



WILDLANDS ENGINEERING

0 300 Feet

Figure 5 - Concept Map
Banner Farm Mitigation Site
French Broad 06010105

Henderson County, NC